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KEITH N. HYLTON & MICHAEL SALINGER

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TYING LAW AND POLICY: A DECISION THEORETIC APPROACH

Keith N. Hylton and Michael Salinger*

Abstract: This paper offers a decision theoretic framework for analyzing tying law, and presents a critical assessment of post-Chicago tying theory. The decision theoretic framework takes into account the likelihood of judicial error in the application of rules and the costs of such error. We use the decision theoretic framework to assess the proper legal rules regarding tying and technological integration. Three general themes run throughout much of our analysis. First, the per se rule against tying simply has no economic foundation. Second, while the post-Chicago literature established the theoretical possibility of anticompetitive tying, one must know the frequency of anticompetitive tying to formulate a rational legal rule. Because beneficial tying is so pervasive, rules against tying could be harmful even with a small rate of “false convictions.” Third, the most plausible post-Chicago theory of anticompetitive tying is based on the assumption that the tying and tied goods are complementary and that they are both susceptible to market power. However, the long-established principle that integrated complementary monopoly results in lower prices than independent complementary monopolies suggests that a policy biased toward independent complementary monopolies has the predictable consequence of reducing consumer welfare.

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I. Introduction

Like much of antitrust, tying law and theory have developed gradually through a colloquy between the courts and academic commentators. Both law and theory can be divided into roughly three developmental periods: “classical,” “Chicago School,” and “post-Chicago.” In the classical period, antitrust courts developed a complicated per se prohibition based on the theory that the motive for tying was to leverage market power from the tying to the tied product. Classical tying doctrine and theory came under attack from the Chicago School in the 1970s.¹ Armed with a set of arguments drawn from microeconomic theory, the Chicago School suggested that tying should be lawful per se. The Chicago School critique seemed to have an impact on the law, as the Supreme Court took an increasingly narrow view of the scope of the per se prohibition. Indeed, by the mid-1980s, in its *Jefferson Parish* decision,² the Court came within one vote of overturning the per se rule. But even as the Supreme Court was fracturing over the appropriate rule in *Jefferson Parish*, the post-Chicago school analyses began to appear in academic journals.³ Much of this literature applied arguments based on game theory to show that tying and similar tactics could be anticompetitive after all, in contrast to the Chicago School’s conclusions. The post-Chicago literature has not had the same influence on the courts to this point, as did the Chicago School writings, but it has

¹ For discussions of the Chicago School approach, see RICHARD A. POSNER, *ANTITRUST LAW: AN ECONOMIC PERSPECTIVE* (1976); ROBERT H. BORK, *THE ANTITRUST PARADOX: A POLICY AT WAR WITH ITSELF* (1978).

² *Jefferson Parish Hosp. Dist. No. 2 v. Hyde*, 466 U.S. 2 (1984).

³ See, e.g., Steven C. Salop & David T. Scheffman, *Raising Rivals’ Costs*, 73 AM. ECON. REV. 267 (1983); Thomas Krattenmaker & Steven C. Salop, *Anticompetitive Exclusion: Raising Rivals’ Costs to Achieve Power over Price*, 96 YALE L.J. 209 (1986). For an early survey, see Herbert Hovenkamp, *Antitrust Policy After Chicago*, 84 MICH. L. REV. 13 (1985).

affected some decisions, notably the Supreme Court's *Eastman Kodak*⁴ decision and the district court's decision in the *Microsoft* litigation.⁵

This paper presents an assessment of post-Chicago tying law and theory and offers a decision-theoretic⁶ framework for analyzing tying doctrine. The decision-theoretic framework takes into account the likelihood of judicial error in the application of rules and the costs of such error. It is especially important to apply decision analysis to the post-Chicago literature because, as our exposition will make clear, the game theory underpinning the literature rests on highly stylized assumptions that are difficult to apply to the real factual settings courts must confront. One of our main points is that the literature does not contain clear guidance on how to distinguish benign from harmful instances of tying. A rational policy must therefore take account of errors that will inevitably occur.

Three general themes run throughout much of our analysis. First, the per se rule against tying simply has no economic foundation. The courts seem to recognize this, and have tried to preserve the per se rule while limiting the conditions under which it applies.⁷ From an economic standpoint, however, there is no basis for a per se rule even given the

⁴ *Eastman Kodak v. Image Technical Services, Inc.*, 504 U.S. 451 (1992). The Court adopted several post-Chicago arguments, and in footnote 21 cited one article from the post-Chicago literature (Howard Beales, Richard Craswell & Steven C. Salop, *The Efficient Regulation of Consumer Information*, 24 J. LAW & ECON. 491 (1981)).

⁵ *United States v. Microsoft Corp.*, 84 F. Supp.2d 9 (D.D.C.1999) (Findings of Fact); *United States v. Microsoft*, 87 F. Supp.2d 30 (D.D.C. 2000) (Conclusions of Law). Judge Jackson's Findings of Fact seem to mirror some of the arguments made by the government's economic experts in the trial, and these arguments were influenced by the post-Chicago literature.

⁶ For a general treatment of decision theory, see HOWARD RAIFFA, *DECISION ANALYSIS* (Addison-Wesley) (1968). See also Steven C. Salop, *Evaluating Uncertain Evidence With Sir Thomas Bayes: A Note for Teachers*, 1 J. ECON. PERSP. 155 (1987).

⁷ See *infra* section II.A.1. In particular, in *Jefferson Parish* the Supreme Court said that the per se rule applies only when (1) the seller has tied separate products, *Jefferson Parish*, 466 U.S. at 20-21, (2) the seller has market power in the tying product, *id.* at 17, (3) the tie leads to a substantial foreclosure of commerce in the tied market, *id.* at 16.

conditions established in *Jefferson Parish* for triggering the per se rule. Second, the post-Chicago literature merely established the theoretical possibility of anticompetitive tying – and even then under conditions more burdensome to plaintiffs than those established in the case law.⁸ Put another way, the post-Chicago literature has, at best, given us a set of necessary as opposed to sufficient conditions for triggering antitrust scrutiny. Under the decision-theoretic approach, however, one must know the frequency of anticompetitive tying to formulate a rational legal rule. Moreover, in formulating a rule, the utter ubiquity of tying for pro-competitive reasons is an important consideration. Because beneficial tying is so pervasive, rules against tying could be harmful even with a small rate of falsely labeling tying as anticompetitive. Third, the most plausible post-Chicago theory of anticompetitive tying is based on the assumption that the tying and tied goods are complementary and that they are both susceptible to market power and, indeed, monopoly. It is a long-established principle of economics, however, that integrated complementary monopoly results in lower prices than distinct complementary monopolies. A public policy that imparts a bias toward independent complementary monopolies instead of integrated complementary monopolies has the predictable consequence of raising prices and lowering innovation.

We also use the decision-theoretic framework to assess the proper legal rule regarding technological integration. This is an important issue in the *Microsoft* litigation, in which reviewing courts have had to determine whether it was lawful for Microsoft to

⁸ In particular, the Whinston model (*see infra* Part II.C.1) shows that tying may be anticompetitive when the market for the tied good is potentially oligopolistic because of the presence of entry barriers. This suggests that in addition the conditions required by *Jefferson Parish* (separate products, market power in tying good, substantial foreclosure in tied market), the presence of entry barriers in the tied good should be listed as a fourth *necessary condition* for triggering the per se rule. We are unable in our analysis below (*infra* Part IV.B) to identify a set of factors, among those discussed in the literature and case law, that would justify a court's decision to treat these four conditions as *sufficient* for triggering per se analysis.

integrate Internet Explorer and Windows. Given the risk that the appellate decisions in *Microsoft* could establish standards that will be applied across the board to all cases of technological integration, it is difficult to exaggerate the importance of this issue. Legal standards that excessively discourage technological integration could be quite harmful to the whole economy, not just high technology or software markets.

There are two very important legal issues in play at this moment. One is the type of *legal standard* that should be applied to technological tying. Most courts have held that technological tying is permissible unless it is carried out with the sole (or, at least, the overwhelming) aim of hampering competition.⁹ Judge Thomas Penfield Jackson's opinion in *Microsoft III*¹⁰ applies a different test, one that would require courts to balance technological benefits against competitive harms.¹¹ The second issue concerns the *standard of proof* in technological tying cases. Here, again, the courts have provided two clear alternatives. *Caldera, Inc. v. Microsoft Corp.*¹² requires the defendant to produce credible evidence of a significant technological improvement.¹³ The Court of Appeals for the District of Columbia Circuit's decision in the prior round of Microsoft litigation (*Microsoft II*)¹⁴ permits the defendant to satisfy his burden merely by providing a "plausible claim" of the existence of a significant technological benefit.¹⁵

The standard of proof issue in technological tying cases appears to be a new one

⁹ See, e.g., PHILIP E. AREEDA *et al.*, ANTITRUST LAW ¶ 1757c (Boston: Little, Brown, 1996). For further discussion of the law governing technological integration, see *infra* section II.A.2.

¹⁰ United States v. Microsoft Corp., 87 F. Supp.2d 30 (D.D.C. 2000) [hereinafter *Microsoft III*].

¹¹ *Id.* at 48-49.

¹² *Caldera, Inc. v. Microsoft Corp.*, 72 F. Supp.2d 1295 (D. Utah 1999) [hereinafter *Caldera*].

¹³ *Id.* at 1325.

¹⁴ United States v. Microsoft Corp., 147 F.3d 935 (D.C. Cir. 1998) [hereinafter *Microsoft II*].

¹⁵ *Id.* at 950.

for the courts as well as academic commentators. Some judges and academics have strongly criticized the *Microsoft II* test as inconsistent with antitrust doctrine in general and for giving the defendant too much of an advantage in litigation.¹⁶ Indeed, the *Microsoft II* test arguably comes close to a per se legality rule, since most defendants should be able to come up with a plausible claim of consumer utility. Our framework cuts against this current of criticism by providing a broader theoretical justification for the *Microsoft II* test, which we view as superior to that of *Caldera*.

The *Microsoft II* and *Caldera* tests represent points along a continuum of possible proof standards that could be applied to technological integration cases. Whatever the form in which one states the standard of proof, the fundamental choice is between two inquiries. One, a “high burden” inquiry (from the defendant’s perspective), would invite the court to determine, and the defendant to prove, whether the technological benefits are large enough to outweigh competitive harms. The other, a “low burden” inquiry, would instruct the court to give a great deal of deference to the defendant’s claims of intended consumer benefits. The latter test need not operate in effect as a per se legality rule. It would operate in a manner similar to the “business judgment” rule in corporate law,¹⁷ by instructing courts to ignore evidence of negligence and look only for credible evidence that the decision was motivated by bad intent.¹⁸ Similarly, the “low burden” inquiry instructs courts to forgo examining whether the defendant erred unreasonably in the integration decision – i.e., whether a smarter defendant would have known that the

¹⁶ See, e.g., *Caldera*, 72 F. Supp. at 1323; *Microsoft III*, 87 F. Supp. at 47-48; Norman A. Hawker, *Consistently Wrong: The Single Product Issue and the Tying Claims Against Microsoft*, 35 CA. W. L. REV. 1 (1998); Michael Woodrow De Vries, *United States v. Microsoft*, 14 BERKELEY TECH. L. J. 303, 314-22 (1999).

¹⁷ See ROBERT CHARLES CLARK, CORPORATE LAW §3.4, 123-124 (Boston: Little, Brown, 1986).

¹⁸ *Id.* at 124.

consumer benefits were really trivial – and to focus solely on whether the defendant’s apparent sole purpose was to destroy competition.

Part II of this paper provides an overview of the law and literature of tying. Since a large part of the theoretical discussion in this paper is a critique of post-Chicago models and their purported implications for tying law, we devote a substantial amount of space in Part II to a presentation of post-Chicago tying theory. Part III presents the decision theory framework and applies it to classical and Chicago theories. Part IV applies the decision framework to the post-Chicago literature in order to assess the literature’s implications for antitrust enforcement. In particular, we ask in Part IV whether the post-Chicago literature has provided a set of requirements that, when coupled with those of classical tying doctrine, could provide a defensible set of sufficient conditions for triggering the per se prohibition. We consider the following conditions in the tied market: entry barriers, complementary goods, network effects, and technologically advancing industries. We conclude that these conditions fail to provide a compelling set of sufficient conditions, and that it is hard to avoid a rule-of-reason approach that considers potential benefits as well as harms. Moreover, such an analysis requires a decision theoretic framework because of the risk and cost of errors.¹⁹ Part V applies the decision framework to the legal standards governing technological integration.

¹⁹ We have for the most part limited ourselves to exposing the absence of an economic foundation for the per se rule or modifications of it that might be believed to be suggested by the post-Chicago literature. The decision theory framework reveals the empirical assumptions that must underlie any proposed rule governing tying. If, as we think true, beneficial tying is pervasive, our analysis suggests that as a general rule courts should apply a rule-of-reason test with a high burden of proof on plaintiffs in tying cases. *See infra* Part IV.B.4. This would also suggest a convergence of the doctrines governing contractual tying and product integration, with the product integration standard becoming the general rule.

II. The Law and Literature of Tying

A. Law

Tying doctrine, like tying theory, can be analyzed under classical and post-Chicago categories.²⁰ Under classical doctrine the defendant's liability is based on the theory that he has extended or leveraged his market power in the tying product market to the tied product market by "forcing"²¹ consumers to purchase the tied product with the tying product.²² The essential parts of this analysis are three: market power, leveraging, and forcing.²³ The per se tying prohibition, which makes tying unlawful when the tie-in involves separate products, the seller has market power in the tying good, and there is

²⁰ Tying theory includes classical, Chicago, and post-Chicago categories. We refer to only classical and post-Chicago categories of tying law because the Chicago influence, we hope to make clear below, has largely been in the form of altering the interpretation of classical doctrine rather than changing the doctrine itself.

²¹ The term "forcing" is emphasized in *Jefferson Parish*. In the Court's opinion Justice Stevens remarks, "Our cases have concluded that the essential characteristic of an invalid tying arrangement lies in the seller's exploitation of its control over the tying product to force the buyer into the purchase of a tied product that the buyer either did not want at all, or might have preferred to purchase elsewhere on different terms. When such 'forcing' is present, competition on the merits in the market for the tied item is restrained and the Sherman Act is violated." *Jefferson Parish Hospital District No. 2 v. Hyde*, 466 U.S. 2, 12 (1984). No court has provided a special legal definition of forcing. However, the *Jefferson Parish* opinion suggests that forcing can only occur in settings in which the consumers have few alternatives to begin with (because of the defendant's market power) and the defendant has actively restricted their choices further by requiring them to purchase the tied product with the tying product. *Jefferson Parish*, 466 U.S. at 16. *Jefferson Parish* seems to reject the theory that consumers can be "forced" by their own inability to engage in intelligent comparison-shopping. *Id.* at 27-28.

²² The standard example of such leveraging is price-discrimination, *see Fortner Enterprises, Inc v. United States Steel Corp.*, 394 U.S. 495, 513-514 (1969) [hereinafter *Fortner II*] (arguing that antitrust violation is less likely, given that tying arrangement could not have been used as a form of price-discrimination).

²³ In simpler terms, one could say that the doctrine seeks to prohibit tying when the defendant has market power in the tying market, could use that power to gain additional power (usually in the tying market), and also harm consumers. It follows that the doctrine requires plaintiffs to present evidence of market power, consumer harm (forcing), and a credible theory of tying as a method of monopoly extension (leveraging). We interpret the leveraging inquiry as including the case in which tying is used to maintain a monopoly position, *see Robin Cooper Feldman, Defensive Leveraging in Antitrust*, 87 GEO. L. J. 2079 (1999). Our description of classical doctrine leaves out the "separate products" test emphasized by the Court in *Jefferson Parish*, 466 U.S. at 21-22. The reason is that the early case law establishing the classical doctrine implicitly assumed that the separate-products requirement would be satisfied. *Jefferson Parish* is the first Supreme Court tying case to explicitly emphasize the separate-products requirement as a formal part of tying doctrine.

substantial foreclosure in the tied good market,²⁴ is part of classical tying doctrine, though it is not a necessary feature of the doctrine.²⁵ What seems to be essential to the classical framework is the presumption that the defendant should be found in violation of the antitrust laws, in the absence of a good justification, if the classical doctrine requirements (market power, leveraging, forcing) are satisfied.²⁶ We will also include within classical doctrine the case law governing product integration generated by courts over the late 1970s and early 1980s,²⁷ a case law that articulates a far less burdensome standard for defendants. The post-Chicago doctrinal category includes contractual tying cases that do not fit within the classical model, in the sense that the defendant's liability does not seem to hinge on finding each of the three classical components present, and technological integration cases that have deviated from the standard developed in the classical case law.

1. Classical Tying Doctrine

The important cases formulating classical tying doctrine are all well known to antitrust students: *International Salt*, *Northern Pacific*, *Fortner II*, and *Jefferson Parish*.²⁸

²⁴ See *Jefferson Parish*, 466 U.S. at 16-21.

²⁵ As Justice O'Connor noted in her concurrence in *Jefferson Parish*, the lines of inquiry required by classical tying analysis (market power, leveraging, and forcing) could be pursued just as easily, without requiring much more effort, under a rule of reason test. See *Jefferson Parish*, 466 U.S. at 33-35.

²⁶ Consistent with this view, the per se rule can be viewed as an attempt to restrict the set of conditions under which the presumption of illegality may be rebutted.

²⁷ For further discussion, see *infra* section II.A.2.

²⁸ *International Salt Co. v. United States*, 332 U.S. 392 (1947); *Northern Pac. Ry. Co. v. United States*, 356 U.S. 1 (1958). *IBM v. United States*, 298 U.S. 131 (1936) should be named among this list of classical theory cases. *IBM* is important for two reasons. First, it establishes the leverage theory as the basis for concern under tying doctrine. Second, *IBM* establishes the norm under tying doctrine that "goodwill defenses" will have to meet a very high burden. In other words, a defendant who claims that he must tie in order to maintain the quality of the bundle must prove that quality could not be maintained through some less restrictive alternative. This norm has been adhered to in subsequent cases, such as *International Salt*

International Salt and *Northern Pacific* lay the foundations of classical tying analysis and establish the per se test currently applied by antitrust courts.

The International Salt Company tied the sale of two patented salt processing machines with that of salt. Purchasers of International Salt's machines, largely producers of canned foods, agreed to also purchase the salt that would be processed by these machines from the company. The *Northern Pacific* case involved the tying of rail service to the sale of land by the Northern Pacific Railway Company. In both cases the Supreme Court was satisfied that the defendant had market power in the tying product – salt processing machines in *International Salt* and land in *Northern Pacific*. In addition, the Court concluded in both cases that the defendant had extended its market power in the tying product market into the tied market by forcing consumers to purchase the tied product.

International Salt and *Northern Pacific* establish liberal approaches to analyzing the existence of market power, extension, and forcing. Market power was more or less presumed in *International Salt* from the fact that the salt processing machines were patented.²⁹ In *Northern Pacific*, the Court concluded the defendant had market power because of its sizeable holdings and because of what it described as the “strategic location” of the parcels.³⁰ Moreover, the Court said in *Northern Pacific* that market power, in the traditional sense required under Sherman Act Section 2, is not required by

and *Jerrold Electronics* (United States v. Jerrold Electronics Corp., 187 F. Supp. 545, 560 (ED Pa. 1960), *aff'd per curiam*, 365 U.S. 567 (1961)). *Jerrold Electronics* establishes an exception to the per se rule for the case in which tying is used in order to enter into a new industry; see *Jerrold Electronics*, 187 F. Supp. at 557. Under the *Jerrold Electronics* exception courts will impose a much lower burden on defendants who assert a goodwill defense for tying.

²⁹ *International Salt*, 332 U.S. at 395.

³⁰ *Northern Pacific*, 356 U.S. at 7-8.

tying doctrine. The plaintiff need only show that the defendant has sufficient economic power in the tying market to “appreciably restrain competition” in the market for the tied product.³¹

The liberal approach to classical tying analysis reflected in *International Salt* and *Northern Pacific* was taken to a questionable degree in those cases when the Supreme Court examined the extension and forcing issues. In both cases the defendant had included an opt-out clause allowing the consumer to purchase the tied product (or service) from any other seller who provided it at a price lower than the defendant’s.³² Given such a clause, one could argue that the consumer was forced, if at all, by an extremely light hand. Moreover, it is doubtful that the defendant could have included a monopoly surcharge in the price of the tied product.³³ In spite of this, the Court regarded the presence of the opt-out clause as irrelevant in both cases.³⁴

The Supreme Court’s willingness in *International Salt* and *Northern Pacific* to fudge the market power and forcing issues in order to find the defendant’s tie-in unlawful

³¹ More specifically, *Northern Pacific* provides that the per se rule applies if the defendant has sufficient power in the tying market to appreciably restrain competition in the tied product market, and a “not insubstantial” amount of commerce has been foreclosed in the tied market. *Northern Pacific*, 356 U.S. at 11.

³² *International Salt*, 332 U.S. at 396-7; *Northern Pacific*, 356 U.S. at 12.

³³ Given the opt-out clause, and other evidence, John Peterman suggests that the tie in *International Salt* probably served efficiency purposes. John Peterman, *The International Salt Case*, 22 J.L. & ECON. 351 (1979). Since railroads have high fixed costs, and need to maximize service in order to minimize the average cost of rail service, the tie-in in *Northern Pacific* could have been designed to facilitate full or nearly full utilization of the railroad’s infrastructure. This would have benefited the railroad’s consumers by lowering the price of rail service to them over time.

³⁴ *International Salt*, 332 U.S. at 397; *Northern Pacific*, 356 U.S. at 7-8. We note that the market for salt, the tied product in the *International Salt* case, was probably competitive, see Peterman, *supra* note 33, at 357. Given this, the standard Chicago school critique applies, suggesting that the tie-in could not have been used as a method of monopoly extension. However, the Chicago critique does not apply in cases where the tied product market is not competitive, see *infra* sections B.3 and C.1. Our analysis takes this into account.

is consistent with a principle it announced in *Standard Stations*,³⁵ an exclusive dealing case decided soon after *International Salt*. In the course of distinguishing exclusive dealing from tying arrangements, the Court announced in *Standard Stations* that “tying agreements serve hardly any purpose beyond the suppression of competition.”³⁶ The Court went on to contrast exclusive dealing arrangements on the ground that they often served beneficial purposes for both parties.³⁷ While the *Standard Stations* proposition is questionable, it does provide a simple theoretical premise for the Court’s early tying decisions. The later classical cases reveal efforts by the Court to qualify and back away from the *Standard Stations* proposition and its implications. Indeed, the *Fortner II* and *Jefferson Parish* cases suggest that a finding of market power is generally necessary to find a violation of the tying prohibition. In these later decisions, the Court clarified both the limits of classical tying doctrine and of the per se test.

2. The Chicago Influence

In both *Fortner II* and *Jefferson Parish* the Court insisted on a more rigorous notion of market power to form the basis of classical tying doctrine. This was probably a reflection of the Chicago school’s influence; though it is important to note that this insistence did not require a change in the formal doctrine. Whereas the Chicago school arguably led to a change in predatory pricing doctrine,³⁸ this has not been the case in

³⁵ *Standard Oil Co. v. United States*, 337 U.S. 293 (1949) [hereinafter *Standard Stations*].

³⁶ *Id.* at 305.

³⁷ *Id.* at 306.

³⁸ The important Chicago-influenced changes in predatory pricing doctrine are reflected *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574 (1986); *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.* 509 U.S. 209 (1993). *Matsushita* and *Brooke Group* impose a “recoupment” test that requires plaintiffs to show that the defendant reasonably could have expected to recoup losses incurred in a

tying law.

In *Fortner II*, the Court seemed to make a conscious effort to bring tying doctrine in line with the classical analytical requirements of market power, leveraging, and forcing. The defendant U.S. Steel offered to finance the cost of acquiring and developing land provided the developer agreed to purchase prefabricated homes from U.S. Steel.³⁹ The Court regarded credit as the tying product and prefabricated housing as the tied product. The Court held that in the absence of some proof that U.S. Steel had a cost advantage in the credit market, its market position was too small to indicate the degree of market power required under the tying law.⁴⁰ In addition, the Court made two other statements limiting tying doctrine to a form consistent with the classical model. First, the Court noted, as a reason for rejecting the plaintiff's claim, that the tied product did not come in a variable quantity, and thus the tie-in could not have been used as a method of price discrimination.⁴¹ Second, the Court said that it would be improper to infer unlawful tying without analyzing the price of the whole bundle in comparison to the market,⁴² suggesting that some indication of consumer harm is an important component of tying analysis.

Jefferson Parish dealt with a hospital's tying of anesthesiology services with surgery. Any patient planning to undergo surgery at the East Jefferson Hospital had to

predatory pricing campaign. For a critique of this doctrine, as well as the Chicago theory that inspired it, see Joseph F. Brodley, Patrick Bolton, and Michael H. Riordan, *Predatory Pricing: Strategic Theory and Legal Policy*, 88 GEO. L. J. 2239 (2000).

³⁹ *Fortner II*, 394 U.S. at 496-97.

⁴⁰ *Id.* at 504.

⁴¹ *Id.* at 504-5.

⁴² *Id.* at 507-9.

use the anesthesiologists on the hospital staff.⁴³ The Court concluded that the hospital did not have sufficient economic power because it lacked market power within its geographic market.⁴⁴ The hospital serviced only 30 percent of the population within its geographic market.⁴⁵ The plaintiff claimed that the defendant had sufficient economic power because even though its market share was only 30 percent, consumers could not effectively choose anesthesiologists – and therefore use the threat of switching to control monopoly pricing – because of imperfect information.⁴⁶ The Court rejected the imperfect information argument as a basis for finding sufficient economic power,⁴⁷ and in so doing suggested that evidence of market power in the traditional Section 2 sense is required to find unlawful forcing. Such forcing, the Court stressed, requires the blocking of competition on the merits,⁴⁸ and imperfect information does not imply that the seller’s tie-in has restricted competition – in the sense of forcing a purchase that would not have otherwise been made or preventing a purchase that would have been.

Probably reflecting the influence of the Chicago School literature, *Jefferson Parish* is the Court’s most vigorous effort to date to put limits on the *Standard Stations* proposition and its expansive implications for the per se rule. The Court focused on two limiting principles: the separate-products distinction and the forcing requirement. On the separate-products question, the Court announced that the tying and tied products would

⁴³ *Jefferson Parish*, 466 U.S. at 4-5.

⁴⁴ *Id.* at 27-29.

⁴⁵ *Id.* at 26.

⁴⁶ *Id.* at 27-28. The Court used the more general term “market imperfections,” which were caused by the fact that “the prevalence of third-party payment for health care reduces price competition,” and “a lack of adequate information renders consumers unable to evaluate the quality of medical care provided by competing hospitals.” *Id.* at 27.

⁴⁷ *Id.* at 28-29.

⁴⁸ *Id.* at 28 (“...such an arrangement cannot be said to have foreclosed a choice that would have otherwise

be regarded as separate products (rather than a single integrated product) if there is “sufficient demand” for the tied product “to identify a distinct product market in which it is efficient to offer” the tied product separately from the tying product.⁴⁹ On forcing, the Court said, “the essential characteristic of an invalid tying arrangement lies in the seller’s exploitation of its control over the tying product to force the buyer into the purchase of a tied product that the buyer either did not want at all, or might have preferred to purchase elsewhere on different terms.”⁵⁰ The Court’s majority found that surgery and anesthesiological services were separate products, but that the plaintiff had not been “forced” to purchase the hospital’s anesthesiological services.

Justice O’Connor’s concurring opinion, joined by three other justices, differed from the majority in two important respects. First, it would have overturned the per se rule, replacing it with a rule-of-reason test.⁵¹ Second, and more important for our purposes, the concurring justices would require, for two products to be considered as distinct, that at a minimum some consumers might wish to purchase separately the tied product without also purchasing the tying product.⁵² In addition, the concurring Justices would hold that the package is a single integrated product when the “economic advantages of joint packaging are substantial.”⁵³ The separate-products test of O’Connor’s opinion would create a per se legality rule, a safe harbor of sorts, which

been made “on the merits.”)

⁴⁹ *Id.* at 21-22. Although the Court’s use of the term “efficient” in its separate-products standard has not, to our knowledge, been a major focus of the literature or case law following *Jefferson Parish*, it is potentially a key consideration. On the efficiency of bundling and the decision to sell products separately, *see infra* Part III.B (example of bundling to save packaging costs).

⁵⁰ *Id.* at 12.

⁵¹ *Id.* at 33.

⁵² *Id.* at 39.

⁵³ *Id.* at 40.

probably would have applied to the East Jefferson Hospital. Moreover, the per se legality rule clearly would apply to most product integration decisions, such as the integration of lenses into cameras, or engines into cars. As we will see shortly, this result would have brought contractual tying doctrine in line with the case law developed in lower courts regarding technological integration.

3. Technological Integration and Classical Tying Doctrine

As Justice O'Connor's *Jefferson Parish* opinion suggested, tying doctrine has implications for technological integration. If it is unlawful to package two goods together, a seller may have an incentive to bolt or paste the two goods together, and call it a single integrated product. Justice O'Connor's opinion alluded to the fact that tying doctrine does create this incentive. In general, the law provides an exception to the tying prohibition for the case of technological integration. In other words, if we view classical tying doctrine broadly as consisting of case law on contractual tying and case law on technological integration, we see entirely different standards in the two sub-fields of tying law. In the contractual tying law, we have a complicated per se illegality rule, and in the technological tying case law, we have a test that adopts a presumption of legality.

Courts generally have held that in order to succeed in a technological tying claim, a plaintiff must show that the defendant integrated the two products for the sole purpose of hampering competition, rather than to produce some additional utility to consumers. More specifically, the prevailing standard is that articulated in *Response of Carolina, Inc. v. Leasco Response, Inc.*,⁵⁴ which requires proof that the integration was solely “for the

⁵⁴ *Response of Carolina, Inc. v. Leasco Response, Inc.*, 537 F.2d 1307, 1330 (5th Cir. 1976) [hereinafter *Leasco*].

purpose of tying the products, rather than to achieve some technologically beneficial result.”⁵⁵ For example, a car manufacturer that bolts a radio onto the dashboard would not fall under the safe harbor of *Leasco* if it could be shown that the bolting offers consumers no additional utility beyond what they could achieve on their own by purchasing the car and a radio separately. If the seller’s integration provides no additional utility to consumers, the proper inference, it would appear, is that the seller did it for the sole purpose of harming competition.

In operation, the *Leasco* standard has proved to be a formidable barrier to plaintiffs. For example, in a prominent series of cases involving IBM’s efforts to integrate the functions of various peripheral devices into and to otherwise redesign the central processing unit – hereinafter the *IBM cases* – courts uniformly rejected the tying claims brought by plaintiffs.⁵⁶ In each of these cases, the essence of the plaintiff’s claim was the same: that IBM had excluded them from the market by redesigning the mainframe in a way that made their products superfluous or incompatible. Courts refused to apply the tying prohibition, generally holding that innovation is too important to the

⁵⁵ *Id.* at 1330; see also PHILIP E. AREEDA, ANTITRUST LAW ¶ 1757c (Boston: Little, Brown, 1996) (Technological tying claim requires proof that design or redesign of product is “artificial” in that it lacks a technological advantage or purchaser utility”).

⁵⁶ *Calif. Computer Prods., Inc. v. IBM*, 613 F.2d 727 (9th Cir. 1979) (directed verdict for IBM because design changes made to product were a cost saving effort rather than an attempt to monopolize); *Innovation Data Processing, Inc. v. IBM*, 585 F. Supp. 1470, 1476 (D. N.J. 1984) (finding that IBM’s integration of a “dump-restore” utility into mainframe operating system was a lawful package of technologically interrelated components); *ILC Peripherals Leasing Corp. v. IBM*, 448 F. Supp. 228 (N.D. Cal. 1978), (finding that disk drives and head/disk assembly combination were lawful), *aff’d per curiam sub nom.*, *Memorex Corp. v. IBM*, 636 F.2d 1188 (9th Cir. 1980); *In re IBM Peripheral EDP Devices Antitrust Litig.*, 481 F. Supp. 965 (N.D. Cal. 1979), (finding, among other things, that IBM’s design changes for the interface between the central processing units and certain peripherals and for certain models of central processing units were not unreasonably restrictive of competition), *aff’d sub nom.*, *Transamerica Computer Co. v. IBM*, 698 F.2d 1377 (9th Cir. 1983), *cert. denied*, 464 U.S. 955 (1983); *Telex Corp. v. IBM*, 367 F. Supp. 258 (N.D. Okla. 1973), (denying a claim that IBM’s integration of additional memory and control functions into its central processing unit constituted unlawful tying), *rev’d on other grounds*, 510 F.2d 894 (10th Cir. 1975), *cert. denied*, 423 U.S. 802 (1975).

competitive process to subject to judicial second-guessing.⁵⁷ Another prominent case of integration involved Kodak's simultaneous introduction of the 110 instamatic camera and Kodacolor II film, requiring new equipment for development.⁵⁸ Foremost, one of Kodak's competitors in the photo finishing business, brought suit on the theory that this constituted an unlawful tying arrangement. The court rejected Foremost's claim on the ground that "any other conclusion would unjustifiably deter the development and introduction of those new technologies so essential to the continued progress of the economy."⁵⁹

4. Post-Chicago Tying Doctrine

a) Eastman Kodak

We have described classical tying doctrine as consisting of the Supreme Court's decisions up to *Jefferson Parish*, and the lower court decisions on technological integration issued in the same period. Within this set of cases, courts have not explicitly deviated from the classical framework, though implicit deviations have been common. Indeed, one could say that the history of tying doctrine has been dominated by the Supreme Court's failure to consistently apply the classical doctrinal requirements of market power, leveraging, and forcing. As a result, the Court has applied the per se prohibition to cases that do not seem to satisfy the classical requirements.

Explicit deviations from the classical framework have been rare in the cases

⁵⁷ See, e.g., *Telex Corp. v. IBM*, 367 F. Supp. at 306 ("In the court's view it would not be a proper application of the antitrust laws under the circumstances shown by the record to preclude or discourage the utilization of advancing technology by this type of integration.").

⁵⁸ *Foremost Pro Color, Inc v. Eastman Kodak Co.*, 703 F.2d 534 (9th Cir. 1983), *cert. denied*, 465 U.S. 1039 (1984).

following *Jefferson Parish* as well. Of the Supreme Court's cases only one, *Eastman Kodak v. Image Technical Services*,⁶⁰ arguably falls in this set of explicit deviations, which we call the post-Chicago category. Kodak sold copying machines and provided parts and service for the machines. In an attempt to eliminate independent service organizations, the company adopted a policy of selling parts only to equipment owners who relied on Kodak for service or who self-serviced their equipment.⁶¹ In other words, Kodak tied service to parts. Although Kodak was obviously a monopolist in its own parts, the original equipment market was competitive.

Eastman Kodak involves some elements consistent and some inconsistent with the classical model of tying. Consistent with the classical model, one could view Kodak's tying policy as an effort to extend its market power in the parts market to the service market. However, the apparent consistency with the classical model breaks down after this observation. The key difficulty is that Kodak did not have market power in the original equipment market.⁶² Thus, equipment purchasers could not have been compelled to purchase the tied product by the lack of alternatives in the equipment market. The Court concluded that market imperfections (lack of information, switching costs) could make it difficult for competition in the original equipment market to discipline monopoly extension efforts in the after-market for service.⁶³

Since the conclusion in *Eastman Kodak* is not easily reconcilable with that of *Jefferson Parish*, where the Court rejected the theory that market imperfections could

⁵⁹ *Id.* at 542-43.

⁶⁰ 504 U.S. 451 (1992).

⁶¹ *Eastman Kodak*, 504 U.S. at 458.

⁶² *Id.* at 451.

⁶³ *Id.* at 477-8.

supplant market share analysis as a basis for finding market power, lower courts have been forced to reconcile the two cases. Circuit courts generally have limited the holding in *Eastman Kodak* to the case in which the firm *changes* its service policy after consumers have purchased the equipment.⁶⁴ If a firm that does not have market power in the original equipment market announces in advance that it will tie service to parts, then it will not be found liable under the Sherman Act for unlawful tying.⁶⁵

b) Microsoft and Technological Tying

Other than *Eastman Kodak*, the only other significant deviations from the classical tying model have occurred in the course of the *Microsoft* litigation, which involves the problem of technological tying. As we have noted, classical tying doctrine viewed broadly creates a safe harbor for technological integration. The most prominent illustration of this doctrinal safe harbor is provided by the *IBM cases*. The *Microsoft* litigation has generated two cases that have gone against the classical tying case law on technological integration.

In *Caldera*,⁶⁶ the court distinguished Microsoft's integration of MS-DOS and Windows from the technological tying in the *IBM cases* on the ground that Microsoft had taken the further step of refusing to sell Windows separately from MS-DOS after the release of Windows 95.⁶⁷ For this reason and because of evidence submitted by the

⁶⁴ Metzler v. Bear Automotive Service Equipment Co., 19 F. Supp.2d 1345, 1357 (S.D. Fla. 1998) [hereinafter *Metzler*]; Lee v. Life Ins. Co. of N. Am., 23 F.3d 14, 19 (1994); Queen City Pizza, Inc. v. Domino's Pizza Inc., 124 F.3d 430, 440 (3d Cir. 1997).

⁶⁵ *Metzler*, 19 F. Supp.2d at 1364-5.

⁶⁶ *Caldera, Inc. v. Microsoft Corp.*, 72 F. Supp.2d 1295 (D. Utah 1999).

⁶⁷ *Id.* at 1324 ("However, as noted by the D.C. District Court, on remand in the internet explorer case, Microsoft has taken an additional step beyond the defendants in the *IBM cases* by not only bundling two

plaintiff suggesting that the integration may have provided only trivial technological benefits (relative to hypothetical upgraded versions of DOS and Windows),⁶⁸ the court refused to grant summary judgment in favor of Microsoft. However, the court did articulate a legal standard for technological tying cases that is similar to that adopted by other courts. The *Caldera* court held that a tying claim must be rejected “if the evidence shows that a valid, not insignificant, technological improvement has been achieved by the integration of two products.”⁶⁹

The court in *Caldera* distinguished its standard from that articulated by the United States Court of Appeals for the District of Columbia Circuit in *Microsoft II*.⁷⁰ In *Microsoft II*, the D.C. Circuit suggested that a technological tie-in should be deemed lawful if “there is plausible claim that the tie-in brings some advantage.”⁷¹ The standard announced in *Caldera* requires credible evidence of a significant technological improvement, rather than the existence of a “plausible claim” of consumer advantage.⁷² While *Microsoft II* places the burden of proof almost entirely on the plaintiff, *Caldera* shifts a substantial part of the burden to the defendant.

products together, but also by prohibiting the unbundling of the two...In the instant case, unlike the *IBM* cases, Microsoft ceased selling Windows and DOS separately after the release of Windows 95.”) The court’s distinction apparently applies only to the integrated version of Windows, since earlier “separate” versions of Windows presumably were available after the release of Windows 95.

⁶⁸ *Id.* at 1326 (“*Caldera* asserts that the Windows 95 package consists of two separate products to which the link is no stronger than it was between the prior products and can be easily separated (PL.’s Expert, Dr. Hollaar’s Report at 20-26).”).

⁶⁹ *Id.* at 1325.

⁷⁰ *Id.* at 1323-1325.

⁷¹ *Microsoft II*, 147 F.3d at 950.

⁷² *Caldera*, 72 F. Supp.2d at 1325-1326 (“Accordingly, the technological improvements must have demonstrated efficiencies. This is more than just a ‘plausible claim that brings some advantage.’”). The fundamental difference between the *Caldera* and *Microsoft II* tests concerns the burden of proof. In particular, the significant-technological-improvement standard differs from the plausible-benefit standard in two respects: it seems to involve a hindsight judgment and it focuses on the quality of the technological improvement rather than the benefit to the consumer. For the economic implications, see *infra* Part V.A.

In *Microsoft III*, Judge Thomas Penfield Jackson held that Microsoft violated Section 1 of the Sherman Act by integrating the Internet Explorer web browser with the Windows operating system.⁷³ Judge Jackson relied on the Supreme Court’s analyses in *Jefferson Parish* and *Eastman Kodak*,⁷⁴ even though those cases did not involve technological tying. Using the separate-products test of the *Jefferson Parish* majority,⁷⁵ Judge Jackson concluded that the web browser and the operating system were indeed separate products.⁷⁶ Judge Jackson also rejected the deferential standard of *Microsoft II* as inconsistent with *Eastman Kodak*,⁷⁷ which in his view required the defendant to demonstrate justifications sufficient to outweigh anticompetitive effects.⁷⁸ Judge Jackson saw no need to follow the precedents established in earlier technological tying cases, such as the *IBM cases*, given the implications of the Supreme Court’s tying decisions.⁷⁹

Caldera and *Microsoft III* obviously break from the earlier technological tying case law that had become part of classical tying analysis. Of course, one might argue that the contractual tying standards developed by the Supreme Court are the appropriate ones in this context. However, even under this assumption it is not at all clear that the *Caldera* and *Microsoft III* decisions are consistent with the classical framework. If we take the forcing requirement seriously, as the Court suggested in *Jefferson Parish*, it is not clear

⁷³ United States v. Microsoft Corp., 87 F. Supp.2d 30, 47-51 (D.D.C. 2000).

⁷⁴ *Id.* at 47-49.

⁷⁵ *Id.* at 48. The Court in *Jefferson Parish* held that the tying and tied products would be regarded as separate products (rather than a single integrated product) if there is “sufficient demand” for the tied product “to identify a distinct product market in which it is efficient to offer” the tied product separately from the tying product. *Jefferson Parish*, 466 U.S. at 21-22.

⁷⁶ *Microsoft III*, 87 F. Supp.2d at 49.

⁷⁷ *Id.* at 47-48.

⁷⁸ *Id.* at 48-49.

⁷⁹ *Id.* at 50.

that it is satisfied in these cases. In neither case is there clear evidence of the type of reduction in consumer choice, or consumer harm, anticipated by classical tying analysis.⁸⁰

There were many reasons to doubt that there was any reduction of consumer choice or harm in *Microsoft III*. Both the tying (operating system) and tied products (web browser) remained, in effect, available separately in an updated form. Every consumer could obtain the competing web browser, Netscape Navigator, and install it on his operating system – and could do so at considerably lower cost by using Microsoft’s browser to download it from the web. Since competition on the merits between the Netscape and Microsoft browsers was not foreclosed and arguably was facilitated by Microsoft’s decision to tie its browser and operating system, the forcing analysis of *Jefferson Parish* would seem to require a different conclusion from that of the trial court in *Microsoft III*. Though restriction of consumer choice appears to be a necessary component of classical forcing, if one were to look more generally for consumer harm, it is doubtful that the facts of *Microsoft III* provide clear evidence on this issue too.

Consumers were forced to take Microsoft’s browser as part of the Windows 98 operating system, but that browser was also available independently free of charge.⁸¹ Microsoft did

⁸⁰ *Fortner II* suggested that consumer harm is a necessary implication of the classical tying framework, see *Fortner II*, 394 U.S. at 507-9 (on importance of comparing price of bundle to price of comparable unbundled package in market).

⁸¹ Microsoft’s browser was available separately for free (as an add-on to Windows 95); see, e.g., William H. Page & John E. Lopatka, *The Dubious Search for “Integration” in the Microsoft Trial*, 31 CONN. L. REV. 1251, 1270 (1999); and Netscape’s browser was available free of charge to most users even before Microsoft’s actions made it free of charge to everyone. In a 1995 interview with the Smithsonian Institution, Marc Andreessen (Netscape founder) professed, “I knew at that time that we basically wanted to give away the web browser side.” (David K. Allison, *Excerpts from an Oral History Interview with Marc Andreessen*, SMITHSONIAN INSTITUTION ORAL AND VIDEO HISTORIES (June 1995)). Michael Cusumano and David Yoffie describe Netscape’s policy as follows: “The final policy was very creative. Netscape browsers were free to anyone to download on a 90-day trial basis, free for students and educational institutions, and \$39 (later raised to \$49) for everyone else. At the time, Netscape management had no

not make available to consumers a separate browser-less version of Windows 98 at a discounted price. However, if the implicit price of the browser was zero,⁸² as implied by the fact that Microsoft offered it independently free of charge, this would not have provided a significant benefit to any consumer.⁸³

The integration of Windows and MS-DOS examined in *Caldera* arguably presents a slightly different case, though it is still doubtful that it rises to the level of classical forcing. After the integration of Windows and MS-DOS in Windows 95, consumers could use a competing version of DOS only with an old version of Windows. Thus, one could argue that the technological integration in *Caldera*, unlike that in *Microsoft III*, may have cut off options for consumers to use the most recent version of the tying product (Windows) with a competing version of the tied product (DOS). To be sure, this is a questionable argument because neither of the hypothesized products existed. Under

illusions. Some people would pay after the trial period, and some wouldn't. In effect, the browser would be free. But if the name of the game was volume and market share, 'free, but not free' offered the perfect solution." MICHAEL CUSUMANO & DAVID YOFFIE, *COMPETING ON INTERNET TIME* 99 (1998).

⁸² For further discussion, see Page & Lopatka, *supra* note 81, at 1270. Of course, if the implicit price of the browser is not zero, then this conclusion can be questioned. Microsoft could have included a surcharge for the browser in Windows and offered the browser independently for free without worrying about the competitive harm since the browser was useful only with Windows.

⁸³ If the implicit price of the browser is really zero, then a browser-less version of Windows 98 presumably would have been sold for the same price as the standard version. Thus, consumers would get no discount for purchasing the stripped-down version. Consumers would also lose the transaction-cost savings of using Microsoft's browser to download Netscape Navigator. In light of these considerations, even those consumers who strongly preferred Netscape's browser to Microsoft's may have preferred to purchase the standard (i.e., bundled) version of Windows, if only to use Microsoft's browser to download Netscape's. If the implicit browser price is zero, the only route through which consumers could have been harmed is by degradation of the operating system that could result from disk space used up by Microsoft's browser. Judge Jackson's findings suggest that some consumers may have been harmed because they did not want a browser, and suffered because Microsoft's browser took up hard disk space and otherwise reduced the performance of their computers. *Microsoft III*, Findings of Fact, at ¶ 152. For opposing views on the consumer harm question, see Nicholas Economides, *The Microsoft Antitrust Case*, Working Paper 2000-09, Stern School of Business, New York University (available at <http://www.stern.nyu.edu/networks/>) at 26 ("The number of consumers who have been harmed in the way suggested by the Judge is likely to be very small, and in an age of cheap computers, memory, and hard drive capacity, their losses could not be very large."); Page & Lopatka, *supra* note 81, at 1271-1272 ("Forcing" these consumers to accept unwanted code imposes a cost on them by needlessly using system resources. But these costs are likely to be minimal, particularly given the capacious resources of even inexpensive computers.).

the same reasoning, the integration of Windows and MS-DOS may have effectively foreclosed competing DOS makers from competing for Windows customers.

The different types of foreclosure alleged in *Caldera* and *Microsoft III* serve as alternative models of fact patterns observed in the *IBM cases*. In some of these cases, IBM's technological integration did not foreclose rival tied product makers from selling to purchasers of IBM's operating system. For example, in *Innovation Data Processing, Inc. v. IBM Corp.*,⁸⁴ IBM integrated its dump-restore utility program into its mainframe operating system, but also continued to offer a non-integrated version of the operating system that could be used with a dump-restore program sold by a competitor.⁸⁵ Another set of cases deals with IBM's decisions to redesign parts of its system, such as the central processing unit, in order to regain customers it had lost to other makers of plug-compatible peripheral devices.⁸⁶ In these cases, competitors were effectively foreclosed from competing for purchasers of the operating system, unless or until they redesigned their products to make them compatible with IBM's new designs.

As a general rule, the technological integration cases do not seem to involve the kind of forcing envisioned by the classical model of tying. In the classical model, a consumer is compelled by the lack of substitutes in the tying product market to purchase a tied product that he does not want or would prefer to purchase from another source. In the case of technological integration, a consumer is typically given the choice of continuing to use or purchase A (tying good) and B (tied good) separately, or to purchase

⁸⁴ *Innovation Data Processing v. IBM*, 585 F. Supp. 1470 (D.N.J. 1984) [hereinafter *Innovation Data Processing*].

⁸⁵ *Id.* at 1473-4.

⁸⁶ *Memorex Corp. v. IBM*, 636 F.2d 1188 (9th Cir. 1980), cert. denied, 452 U.S. 972 (1981); *Calif. Computer Prods., Inc. v. IBM*, 613 F.2d 727 (9th Cir. 1979).

a new product that integrates A and B, often in some upgraded form. Where the makers of B are not foreclosed from competing for the consumers of A, as in *Innovation Data Processing* and in *Microsoft III*,⁸⁷ one can question whether there is any forcing at all, since the consumer's choice set has been expanded by technological integration. Where the makers of B are foreclosed from competing for the new purchasers of A, as alleged in *Caldera*, the consumer's choice set arguably has been reduced in one sense. But this alone seems insufficient to bring these cases within the classical tying model, since the integration may enhance consumer choices overall.⁸⁸

One can also question whether the foreclosure that allegedly occurs in cases such as *Caldera* is of the type envisioned in the classical model of tying. In the classical model, a maker of B is prevented from selling an equivalent or superior product to consumers of A, as a consequence of the A monopolist's tie-in. However, unlike the classical tying model, many consumers of an integrated product would not view the stand-alone version of the tied component as a functional substitute. Consider a car manufacturer that includes a tape player in the basic model. Manufacturers of portable tape players are not producing perfect substitutes to the tape player integrated with the car. The integrated tape player fits neatly into a special place on the dashboard and streams through the car radio's amplifiers. A portable or independently installed tape

⁸⁷ *Microsoft III* is a more difficult case than *Innovation Data Processing*. The key difference is that Microsoft could be analogized to "pure bundling," where the seller refuses to sell the two goods separately. One could argue that this is a clear reduction in consumer choice. However, if the implicit price of the browser was zero, then it is hard to see how pure bundling in this context could hurt the consumer (unless one believes that the absorption of disk space is key, *see supra* note 83). Also, to the extent Microsoft's browser reduced the costs of acquiring Netscape's, it clearly contributed to the enhancement of consumer choice.

⁸⁸ Of course, this assumes that the technological integration offers a non-trivial benefit consumers – which is required in order to be immune from liability under the *Leasco* standard. Under this assumption, technological integration would seem to be defensible under the *Sylvania/BMI* theory that it enhances inter-brand competition or opens new markets, *see Continental T.V. v. GTE Sylvania*, 433 U.S. 36 (1977);

player would either sit on the dashboard, creating a distraction, or take up room in the cabin. Admittedly, it would be a different case if the car maker merely pasted a radio onto the dashboard, for that would offer consumers no additional utility beyond what they could achieve on their own by purchasing the car and the radio separately. In the case of a mere “pasting together,” the integrated tied-product is a perfect substitute to the stand-alone version of the same item. The technological tying case law has incorporated this distinction by exempting from the tying prohibition only those cases in which the integration offers some nontrivial utility to consumers above what they could achieve on their own by pasting together different products.⁸⁹

To reconcile the anticompetitive theory of technological tying with the classical contractual theory, one could argue that once a manufacturer integrates A and B, it should continue to offer A and B separately to avoid foreclosing other producers of B from a substantial market. But this argument shifts the focus of tying analysis from forcing to foreclosure. Since any manufacturer of a new product is likely to gain some sales from consumers switching products, significant foreclosure will occur in every case of integration in which the manufacturer initially has a significant market share in the tying product. This is inconsistent with the classical model’s emphasis on the use of

Broadcast Music v. Columbia Broadcasting System (BMI), 441 U.S. 1 (1979).

⁸⁹ *Leasco*, 537 F.2d at 1329-31. Generalizing, let us label as weak integration the case in which the monopolist in A produces a technologically integrated A-B in a manner that does not prevent consumers from using rival versions of B. Again, this describes the *Microsoft III* and *Innovation Data Processing* cases. Since weak integration involves the enhancement of consumer choices in all relevant markets (for both A and B), it seems inappropriate to treat such conduct as equivalent to classical forcing, which involves only the restriction of consumer choice in the market for B. Let us label as strong integration the case in which the monopolist in A produces a technologically integrated A-B in a manner that prevents consumers from using a rival version of B along with the new A-B hybrid. This also seems inconsistent with classical forcing, because outside of the case of a mere “pasting together,” this form of integration enhances choice and competition in the tying product market while reducing choice in the tied product market.

compulsion to extend market power from the tying to the tied market.⁹⁰

B. Classical and Post-Chicago Theories

In what remains of Part II, we will discuss the progression from classical to Chicago to post-Chicago analyses of tying. We will spend considerably more time on the post-Chicago framework because it purports to be more general, incorporating as special cases the results of the classical and Chicago models.

1. Classical Tying Analysis

The early tying case law began without a rigorous theory of anticompetitive harm. As we noted earlier, *U.S. v. IBM* established the leverage hypothesis as the foundation for the anticompetitive theory of tying.⁹¹ The simple and undeveloped leverage theory has since been supplemented in the case law by the more rigorous theory of tying as a form of price discrimination.⁹² This version of the classical theory envisions a firm with

⁹⁰ In drawing the boundaries on tying doctrine when confronting technological tying claims, courts have taken care to emphasize the forcing requirement of tying doctrine. For example, in a frequently-cited passage the court in *Ungar v. Dunkin' Donuts of America, Inc.* said that

“... coercion is implicit – both logically and linguistically – in the concept of leverage upon which the illegality of tying is premised: The seller with market power in one market uses that power as a “lever” to force acceptance of his product in another market. If the product in the second market would be accepted any way, because of its merit, then, of course, no leverage is involved...”

Ungar v. Dunkin' Donuts of America, Inc., 531 F.2d 1211, 1218 (3d Cir. 1976). When read in light of the technological tying decisions, it becomes clear that the forcing requirement is an important restriction on the scope of tying doctrine. The forcing requirement effectively restricts application of the per se rule only to traditional contractual tying cases and to technological tying that is equivalent to “mere pasting.”

⁹¹ See *supra* note 28 (discussing *U.S. v. IBM*).

⁹² See *infra* notes 106 and 107 and accompanying text (discussing Bowman and Oi articles). Bowman offered the price discrimination theory as a more rigorous version of the leverage hypothesis. Oi's analysis, on the other hand, can be interpreted as a critique of the price discrimination version of the leverage theory – since it shows that tying, while increasing profits, may enhance consumer welfare. In any event, the notion that tying may be an undesirable form of price discrimination has apparently been absorbed by the classical framework, as it is described in judicial opinions. For example, the *Fortner II* opinion discusses the potential for price discrimination as a triggering factor for application of the per se prohibition, see *Fortner II*, 394 U.S. at 513-514.

monopoly power in the tying product using the tie-in as a method of transferring additional wealth from consumers, beyond the amount that could be secured from simply setting a monopoly price for the tying product. Thus, although tying does not increase the monopolist's market power in the classical version of the price discrimination model, it does allow the monopolist to exploit it to a greater degree.⁹³

U.S. v. IBM serves as an illustration of the classical model concerns. If IBM lowered the price of a machine and raised the price of a punch card above its competitive level, IBM could use the sale of punch cards to sort the market into high and low demand segments. Consumers with high demand would pay a larger price, over the long term, because they would be most likely to have a greater need for punch cards. Moreover, by tying punch cards to machines, IBM could prevent consumers from engaging in arbitrage schemes that would unravel its price discrimination effort.

The classical model formed the theoretical foundation for the early cases establishing the per se rule, such as *International Salt* and *Northern Pacific*. *U.S. v. IBM*, preceded these cases by a decade, and although it applied a rule of reason analysis, its theory of harm was grounded squarely in the leverage model.

2. The Chicago Critique

Starting in the 1950's,⁹⁴ Chicago School scholars challenged virtually every aspect

⁹³ We should note that the Supreme Court began to expand beyond the classical model concerns in its later tying cases, such as *Jefferson Parish*. For example, the Court noted in *Jefferson Parish* that tying could be used to deter entry by rival firms, and thus expand the monopolist's power beyond the level that it would enjoy in the absence of a tie-in. However, in the early cases that formed the foundation of tying law (*U.S. v. IBM*, *International Salt*, *Northern Pacific*, *Fortner II*), the Supreme Court analysis is largely consistent with the leverage/price discrimination model.

⁹⁴ For early examples, see Aaron Director & Edward Levi, *Law and the Future: Trade Regulation*, 51 NW. U. L. REV. 281 (1956); Ward S. Bowman, *Tying Arrangements and the Leverage Problem*, 67 YALE L.J.

of antitrust doctrine with the exception of the *per se* ban on horizontal price fixing. A broad theme that permeated Chicago school analysis was that antitrust enforcement reflected a fundamental confusion between protecting competition and protecting competitors. Part of the Chicago school remedy was to evaluate antitrust policy in the context of formal microeconomic analysis. This approach forced analysts to explain precisely how consumers would be harmed by a particular practice. It was also based on the implicit assumption that the law should only bother sanctioning anticompetitive actions that firms had a positive incentive to carry out.

Chicago School legal theorists relied on Chicago school industrial economics.⁹⁵ That is, they relied on models in which markets were assumed to be either monopolistic or perfectly competitive. Thus, the analysis of actions such as tying and vertical integration turned on whether a monopolist in one market could use these practices to extend the monopoly to another.⁹⁶ They also analyzed situations in which two products were monopolized and asked whether the coordination of these monopolies could harm consumers.⁹⁷

The analysis of tying tended to focus on one of three assumptions about demand. In one the demand for the tied products are independent in the economic sense of that term. That is, if the goods were sold separately, the demand for one would not depend on

19 (1957).

⁹⁵ For an example of the Chicago school approach to industrial economics, *see* GEORGE J. STIGLER, *THE ORGANIZATION OF INDUSTRY* (1968). Contrast it with, for example, F. M. SCHERER, *INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE* (1970).

⁹⁶ J. Vernon & D. Graham, *Profitability of Monopolization by Vertical Integration*, 79 *J. POL. ECON.* 924 (1971).

⁹⁷ Joseph J. Spengler, *Vertical Integration and Antitrust Policy*, 58 *J. POL. ECON.* 347 (1950).

the price of the other.⁹⁸ In the second, the two goods are “perfect complements.” The technical definition of perfect complementarity is that if the goods were sold separately, the demand for each would depend on the sum of the prices of the two goods. In the third, the tying good is a machine or apparatus and the tied good is a supply that effectively monitors the intensity of use. Possible examples are cameras and film and copiers and paper (or toner). We will refer to these examples as “potentially metered systems.” We consider each of the three cases in turn.

a) Independent demands

(1) Competitive supply of tied good

To understand the Chicago school argument for why a monopolist has no incentive to extend its market power by tying a competitively supplied good, consider a firm with a monopoly over widgets and suppose that the monopoly price of widgets (assuming they are sold alone) is \$2. Suppose gadgets are sold in a perfectly competitive market for a price of \$1. Can the monopolist increase its profits by selling widgets only in combination with gadgets? Given these assumptions, it has the ability to tie. Moreover, if everyone who wants a gadget also wants a widget and if the seller prices the bundle at low enough price that everyone who wants a gadget gets one as part of the bundle, then no other gadget producers can survive. According to Chicago School analysis, the law should nonetheless not concern itself with these situations. Whatever the monopolist charged for the bundle, consumers would recognize \$1 of the price as

⁹⁸ The economic sense of independence is different from statistical independence. This distinction is crucial in this literature because the analysis of tying of economically independent goods viewed the statistical correlation of reservation values as a key issue. That is, the profitability of tying widgets and gadgets depends on whether the people who are willing to pay a high price for widgets are also the people

being for the gadget and the rest for the widget. The policy would be neutral provided that the monopolist sold the bundle at \$3 and all the customers who buy the widget at \$2 buy the bundle at \$3. However, if some widget customers are not willing to pay \$1 for the gadget, then the tying strategy effectively raises the price to them and might induce some of them not to buy, thus lowering the monopolist's profits.

(2) Monopoly over tied good

Now, rather than assuming that the market for the tied good is perfectly competitive, assume that the seller has a monopoly over the tied good. Given this assumption, tying does not create a monopoly that would not otherwise exist. Still, one must consider whether tying makes the monopolies more harmful. For there to be a sound public policy stake in preventing the tie, it should not be sufficient to show just that the monopolist can make more money. Rather, one would have to show that consumers are harmed.

In his analysis of block booking by movie distributors, Stigler presented a simple example that laid the foundation for the view that tying is a form of price discrimination.⁹⁹ In his analysis, one firm distributes two films, X and Y. Half of all theaters are willing to pay \$8,000 for movie X and \$2,500 for movie Y. The other half are willing to pay \$7,000 for movie Y and \$3,000 for movie X. With unbundled sales, the distributor would charge \$8,000 for movie X and \$7,000 for movie Y. Each theater would take one of the two films, and consumer surplus (treating the theaters as consumers) would be 0. With bundling, the distributor would charge \$10,000 for the two

who are willing to pay a high price for gadgets.

films together. All theaters would take both films. The distributor's profits would go up by \$2,000 per theater for the first group and \$3,000 for the second. Moreover, each of the first type of theater would get a surplus of \$500. Thus, tying would make the distributor and some consumers better off while not harming any other consumer.

Since this analysis was based on a single highly stylized example, a literature developed to explore the applicability of the findings to more general sets of assumptions.¹⁰⁰ The result that tying increases consumer surplus is not a general result, but neither is there any reason to suppose that tying lowers consumer welfare. As Adams and Yellen observed, tying does lead to certain types of inefficiencies. In some cases, people end up purchasing goods that they value at less than marginal production cost. Another effect of bundling is that goods are not allocated efficiently among consumers.¹⁰¹ With unbundled sales, this misallocation does not happen. Going in the opposite direction, however, is that the price a company charges for a bundle of goods is typically less than the sum of the prices it would choose if it sold them separately. Thus, people who would have purchased both goods if they were sold separately typically benefit from bundling.

The literature building on Stigler's analysis has also reexamined the relationship between the profitability of bundling and the correlation of reservation prices. In

⁹⁹ GEORGE J. STIGLER, *THE ORGANIZATION OF INDUSTRY* 165-170 (1968).

¹⁰⁰ Walter J. Adams & Janet L. Yellen, *Commodity Bundling and the Burden of Monopoly*, 90 Q. J. ECON. 475 (1976); Richard L. Schmalensee, *Gaussian Demand and Commodity Bundling*, 57 J. BUS. S211 (1984); R. Preston McAfee, John McMillan, & Michael D. Whinston, *Multiproduct Monopoly, Commodity Bundling, and Correlation of Values*, 114 Q. J. ECON. 371 (1989); Michael A. Salinger, *A Graphical Analysis of Bundling*, 68 J. BUS. 85 (1995); Yannis Bakos & Eric Brynjolfsson, *Bundling Information Goods: Pricing, Profits, and Efficiency*, 45 MGMT. SCI. 1613 (1999).

¹⁰¹ That is, even if someone who obtains a gadget along with a widget values the gadget at more than the cost of production, there might be another customer that does not purchase the bundle who values gadgets more than some of the people who obtain them.

Stigler's analysis, it appears that what makes bundling profitable is that the reservation prices of the two groups of movie theaters are negatively correlated. This result is not general. The relationship between the profitability of bundling on the one hand and the correlation of reservation values is related to the cost of production and to the cost savings from bundling. When the marginal cost of the components is low, all else equal, negative correlation does make bundling more profitable.¹⁰² However, as was first demonstrated by Schmalensee,¹⁰³ bundling can be profitable even when the reservation prices for the components are uncorrelated or even positively correlated. When the marginal cost of the components is higher, bundling tends to be less profitable unless it generates cost savings. If bundling lowers costs and if the marginal cost of production is significant, then bundling can be profitable with highly positively correlated demands even if it is unprofitable with negatively correlated demands.¹⁰⁴

b) Perfect complements

(1) Competitive supply of tied good

To understand the Chicago school arguments about the incentive to leverage monopoly in one good into a complementary good that would otherwise be supplied in a competitive market, suppose that consumers purchase one gadget with every widget.

¹⁰² A prominent example of bundling in which marginal cost is low and demands may be negatively correlated is basic cable television service. Basic cable television service is a bundle that typically includes general entertainment, sports, news, home shopping, music video, children's entertainment, and religious networks, among others. Even recognizing that many subscribers are households in which individuals have distinct interests, most households receive at least some networks on which they place little or even negative value. They subscribe, however, because they place substantial value on at least some of the networks included in the package. Another example in which goods with low marginal cost are included in a bundle is the computer software included with many computer packages.

¹⁰³ Richard L. Schmalensee, *Gaussian Demand and Commodity Bundling*, 57 J. BUS. S211 (1984).

Consider a firm with a monopoly over widgets and suppose that gadgets are supplied competitively. Does the widget monopolist have an incentive to monopolize the gadget industry by selling a gadget along with every one of its widgets? Assuming that gadgets are used only in conjunction with widgets, it obviously has the ability to be the sole supplier of gadgets. Again, though, one must ask whether the firm would both increase its profits and harm consumers by doing so.

To non-economists, it might seem self evident that a monopoly over computers and monitors would be more valuable than a monopoly over just computers and that a monopoly over cameras and lenses would be more valuable than a monopoly over just cameras. To economists, the proposition is not so obvious. In the widget-gadget example, suppose that the widgets and gadgets both cost \$1 to produce and that the widget monopolist would charge \$3 if it bundled. In what is sometimes referred to as the single monopoly profit theory, the firm can do just as well by charging \$2 for widgets and relying on the competitive markets to supply gadgets for \$1.

To add one slight complication to the hypothetical, suppose that an entrant into the gadget market is willing to sell gadgets for \$0.90. Should the widget monopolist try to keep it out by tying widgets and gadgets? It might seem as if it should in order to prevent being excluded from the gadget market. Given these assumptions, however, it earns no profits from gadgets and has no reason to stay in that market. Moreover, the availability of cheaper gadgets benefits the widget monopolist. Because gadgets are complements for widgets, a reduction in the price of gadgets increases the demand for widgets.

¹⁰⁴ Michael A. Salinger, *A Graphical Analysis of Bundling*, 68 J. BUS 85 (1995).

(2) Monopoly over tied good

To understand the Chicago school arguments about tying when a firm has monopolies over complementary goods, suppose that widgets and gadgets are perfect complements and suppose that both are provided by a monopolist. If the same company has the monopoly over both, then its profits depend on the sum of the prices it charges; and it does not matter whether the company charges for the components separately or not. It is of interest to consider, however, whether society should have any preference for having different firms be the monopolists for the two goods. In contrast to the intuition that many people have, economic theory suggests that society should prefer that a single firm have a monopoly over both products. As was first shown by Cournot in 1838, a single firm with a monopoly over two complementary products will charge lower prices than if the sellers of the two products are different. Having two separate monopolists creates what is sometimes referred to as a double marginalization effect.¹⁰⁵

c) Potentially Metered Systems

(1) Competitive supply of tied good

With some goods, tying can be a device for quantity-based pricing. Suppose that a firm had a monopoly on a particular type of camera and that the film for the camera was

¹⁰⁵ It is perhaps more common to hear this term in the analysis of vertical integration. “Double marginalization” (or the “successive monopoly problem”) arises in the vertical relationship context when a monopolist producer sells his product to a monopolist-distributor. The successive application of monopoly surcharges reduces total welfare substantially below the level that would be observed under a single, vertically integrated monopoly. Vertical integration is often described as a potential solution to the double marginalization problem that arises in vertical market settings. See Spengler, *supra* note 97. See also, Andy C.M. Chen and Keith N. Hylton, *Procompetitive Theories of Vertical Control*, 50 HASTINGS L. J. 573, 592-98 (1999). The analyses of vertically related products and of complementary products are virtually identical, and the double marginalization phenomenon that arises in vertical integration applies equally to complementary products.

competitively supplied. If everyone who bought the camera used it to take exactly 1000 pictures, then this example would be a case of fixed proportions. If, however, some people would naturally take more pictures than others, then consumers do not buy the camera and film in fixed proportions. Bowman discussed this case as an example in which a firm would have an incentive to tie.¹⁰⁶ Requiring consumers to use only the camera monopolist's film and charging more than the competitive price for the film allows the company in effect to charge more for the camera to people who take many pictures. Oi constructed the first formal model of the optimal pricing strategy in such cases.¹⁰⁷

There is no general economic result that such pricing is economically harmful. To be sure, it does result in higher price for film than would normally prevail. At the same time, however, it would generally result in a lower price for cameras. More people would buy cameras, and such people take pictures that they otherwise would not have taken. Because of the higher price of film, however, those who would have purchased cameras at the higher price that would prevail without tying take fewer pictures than they otherwise would. Whether or not tying results in more or fewer pictures (and therefore more or less film sold) depends on the details of the situation.¹⁰⁸

(2) Imperfect competition for the tied good

For completeness, we should consider the case in which the market for the tied good is not perfectly competitive. The effects are similar to when the market for the tied

¹⁰⁶ Ward S. Bowman, *Tying Arrangements and the Leverage Problem*, 67 YALE L.J. 23 (1957).

¹⁰⁷ Walter Oi, *A Disneyland Dilemma: Two-Part Tariffs for a Mickey Mouse Monopoly*, 85 Q. J. ECON. 77 (1971); ROBERT B. WILSON, *NONLINEAR PRICING* (1993).

¹⁰⁸ These details include the cost of producing cameras, the cost of producing film, and the distribution

good is perfectly competitive. The camera monopolist has an incentive to tie in order to use the tied good as a metering device. The main difference is that the outcome without tying is less desirable if the price of the tied good exceeds the competitive price, but the outcome with tying is the same. Thus, whatever the merits of banning tying when the market for the tied good would be perfectly competitive, it is less persuasive when the market for the tied good would not be perfectly competitive.¹⁰⁹

3. Assessment

The fundamental premise of classical tying doctrine is that tying is a device for extending market power from one market to another. The models described in this section called this premise into question and seemed to provide a justification for *per se* legality. In this sense, the Chicago school suggested a radical departure from classical tying doctrine and the rationale for it stated in *Standard Stations*.

Two essential features of Chicago school analysis made it susceptible to criticism from post-Chicago theorists. First, the arguments were stated entirely as theoretical arguments. Of course, Chicago school theorists may well have developed theories that matched their casual empiricism about the cases being brought, but the arguments they made were not that anticompetitive tying is rare. They argued that it is fundamentally illogical – i.e., that there is no logically sound explanation for why tying could be anticompetitive. That feature of the argument would not necessarily make the analysis

across the population of demand to take pictures.

¹⁰⁹ One might argue that with imperfect competition in the market for the tied good, one must consider that the outcome without tying entails the inefficiencies that generally arise when there is market power in complementary goods. (See section B.2.b(2) *supra*). This point is relevant for the analysis of whether the camera producer should be allowed to sell film at all, but it does not affect whether or not it should be allowed to tie. To the extent that the camera monopolist wants to bring down the price of film in order to

vulnerable if the theory were completely convincing. The second key feature though was that the Chicago school models did not address the situations that at least today seem to be the most likely ones for intervention. The leveraging of monopoly into markets that would otherwise be perfectly competitive is not an issue. Rather, the more modern concerns are the use of market power (that might fall short of pure monopoly) to distort competition in an otherwise oligopolistic market. A key feature of essentially all post-Chicago analysis is a reliance on economic models either of oligopoly or of entry deterrence.

While Chicago school tying analysis was susceptible to criticism, the courts never fully adopted it. As we argued above, Chicago school analysis arguably made the courts take a harder look at whether the market power test was satisfied. Note, however, that the Chicago school analysis did not merely suggest that anticompetitive tying could not occur when the seller had no market power in the tying good. Rather, it suggested that anticompetitive tying could not occur *even if* the seller had market power in the tying good. If the courts had adopted the apparent implications of this literature, tying would have become *per se* legal.¹¹⁰

C. Post-Chicago Analysis

The post-Chicago analysis of tying was a response to suggestions that tying should be legal *per se*. Every post-Chicago article that suggests that tying might be

stimulate camera sales, it simply needs to charge a lower price for film than its rivals.

¹¹⁰ Yet, the *per se* illegal doctrine has survived, and not even Justice O'Connor's concurring opinion in *Jefferson Parish* suggested *per se* legality. Her opinion argued for a rule of reason test.

harmful assumes separate goods and market power in the tying good,¹¹¹ and they rule out by assumption convenience or any other benefits generally associated with tying. Thus, instead of justifying a relaxation of the classical tying standard, their potential value lies in identifying additional necessary factors for tying to be harmful. These factors could conceivably be used as considerations in a rule-of-reason analysis.

1. The Whinston article

Michael Whinston's "Tying, Foreclosure, and Exclusion" is widely recognized as the seminal post-Chicago article on tying.¹¹² Whinston addresses both the independent and complementary products cases.

a) Independent Products

Whinston considered a firm with a monopoly over two goods, one of which was subject to potential competition. He assumed that the tied good was produced with scale economies, which has the implication that the market for it cannot be perfectly competitive.¹¹³ As a result, an entrant would need to attain sufficient scale to survive in the market. In the Whinston model, tying can foreclose the entrant from enough sales to

¹¹¹ Whether the amount of commerce in the tied good qualifies as being non-trivial is rarely a practical issue, and it's not clear what it would mean in a model such as this to assume that the amount of commerce is substantial.

¹¹² Michael D. Whinston, *Tying, Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837 (1990).

¹¹³ For the purposes of this article, "scale economies" means that average cost (AC) is lower for higher levels of output. As a matter of pure arithmetic, marginal cost (MC) must therefore be below average cost. To see this point, suppose that the total cost of producing 1,000 units was \$10,000, which would imply that the average cost is \$10. If average cost is a declining function of output, then the average cost of producing 1,001 units must be less than \$10. For that to be the case, the total cost of producing 1,001 units must be less than \$10,010, which would in turn mean that the marginal cost of the 1001st unit must be less than \$10. Under perfect competition, price equals marginal cost. The combination of $MC < AC$ with scale economies cannot exist (in the long run) with the condition that $P = MC$ in perfect competition. Together, they imply $P < AC$, which means that firms earn negative profits.

be the difference between making entry profitable and unprofitable. In those cases, tying can both increase profits and harm consumers.

The simplest version of the analysis goes as follows. Suppose there are 1 million potential customers. The incumbent firm (Monocorp) has a monopoly over a good (widgets) that costs \$1 per unit to produce and that all customers value at \$2 per unit. In addition, Monocorp sells gadgets, which also cost \$1 per unit to produce. Absent the threat of entry, Monocorp maximizes its profits at \$2 million by charging \$2 for both widgets and gadgets and selling 1 million units of each.

Now suppose that there is a potential competitor (Entcorp) in the market for gadgets. Although it is not essential to the argument, suppose that Entcorp's gadgets are better than Monocorp's. If Entcorp indeed enters, suppose that it charges \$1.50 for its gadgets and that, because of its quality disadvantage, Monocorp would rationally reduce its price to \$1.25. Suppose furthermore that the quality difference is such that 666,667 people buy Entcorp's gadgets despite the higher price whereas only 333,333 buy Monocorp's.¹¹⁴ Thus, Entcorp earns \$333,333 gross of entry costs and Monocorp's profits are reduced to \$1,083,333 (of which \$1 million is from the sale of widgets).

Whinston considers whether Monocorp would find it profitable to bundle the monopolized good with its competitive good. On the surface, the bundling strategy seems like a device to force customers to buy the inferior gadgets in order to get widgets. Upon further examination, however, the desirability of the strategy is not obvious at all. Entcorp's customers get no surplus from the \$2 they pay for an unbundled widget. Since they prefer Entcorp's gadgets at \$1.50 to Monocorp's at \$1.25, they would not rationally

¹¹⁴ Michael D. Whinston, *Tying, Foreclosure, and Exclusion*, 80 AM. ECON. REV. (1990) at §I Ex. 2.

pay \$3.25 for the bundle of a gadget and a Monocorp widget. The consequence of the bundling strategy with the \$3.25 price is simply to pass up the sale of 750,000 widgets. Consistent with Chicago school analysis, this model suggests that the efficient way to exploit the monopoly over widgets is through the pricing of widgets and that the monopolist only ends up hurting itself by trying to force unwanted gadgets on its widget customers.

One might suspect that Monocorp could get the benefits of bundling while avoiding the cost by selling unbundled widgets for \$2 in addition to the bundle of widgets and gadgets for \$3.25. While doing so would indeed prevent Monocorp from losing any sales of widgets, it would confer no strategic advantage to Monocorp over a strategy of unbundled sales. With widgets priced at \$2 and a widget-gadget bundle priced at \$3.25, Monocorp is effectively selling gadgets for \$1.25.¹¹⁵

If Monocorp does sell widgets and gadgets only as bundles, then, as Whinston demonstrated, it would rationally charge less than \$3.25. Of course, the price that Entcorp charges depends on Monocorp's price, and a reduction in the price of the Monocorp's bundle below \$3.25 would have the predictable consequence of inducing Entcorp to charge less than \$1.50. Given the precise assumptions Whinston makes about the oligopolistic interaction between the two firms, Monocorp charges \$2.58 for the bundle while Entcorp charges only \$1.17 for its gadgets. At these prices, demand for the Monocorp's bundle is 777,778 and demand for Entcorp's gadgets is only 222,222. Monocorp's profits are \$453,704 while Entcorp's profits gross of entry costs drop to \$37,037. Note that Monocorp's profits, while greater than they would be at a bundle

¹¹⁵ This argument rests on the assumption that everyone buys a widget at a price of \$2.

price of \$3.25, are less than when it sells its products unbundled (or when it sells widgets separately from the bundle).

The crucial last step in Whinston's analysis is to consider Entcorp's cost of entry. Suppose that the cost of entry is \$100,000, which is between the \$37,037 gross profits that Entcorp can make when Monocorp bundles and the \$333,333 gross profits it can make when Monocorp does not. In that event, the Monocorp decision to bundle is the difference between making entry profitable or unprofitable for Entcorp. Moreover, if Entcorp stays out, then Monocorp does not even have to cut the bundle price. In the example here, it can raise the bundle price to \$4 and earn \$2 million, the same as it would earn if it was immune from entry.¹¹⁶

In assessing this model, it is important to recognize that the situation Whinston analyzed falls into a more general class of situations in which an incumbent in a market

¹¹⁶ For an extended analysis, *see* Barry Nalebuff, Bundling (November 22, 1999) (unpublished manuscript available on SSRN electronic library). Nalebuff examines two effects of tying and the interrelationship between them. The first is that even a monopolist over two products might have an incentive to bundle them even if there is no threat of entry. The incentive to do so depends on the correlation of reservation values across customers, the marginal cost of the goods, and the extent to which bundling itself saves costs. The second is that bundling two products might make it difficult to enter with just one. This effect is related to one of the traditional concerns about vertical integration, which is that it makes entry more difficult by making it impossible to enter at just one stage. The relationship between the two is that bundling can be a relatively inexpensive form of entry deterrence.

Suppose a company has a monopoly over widgets and gadgets and that the monopoly price for each is \$2. Depending on the marginal cost of production and the correlation of reservation values, it might be able to earn more money by selling them only as a bundle and charging, say, \$3.50. Moreover, the company might not be able to charge the \$2 each selling the goods separately because it might face entry. If so (and if it cannot deter entry by threatening to cut its price once entry occurs), it cannot get the full monopoly price. With bundling, however, it might be able to get the full \$3.50 because entry is less of a threat. Without bundling, an entrant into the widget market can capture the entire market simply by offering a lower price. With bundling, people who value gadgets will get widgets in their bundle. This limits the potential market for a widget producer and, given Nalebuff's assumption of increasing returns to scale, makes it possible that a would-be widget competitor cannot enter profitably.

In the Nalebuff analysis, it is not clear that tying is harmful. He primarily examines cases in which tying, in the absence of the threat of entry, would be beneficial. His observation is that it might also have the side-benefit of deterring entry. Given that his assumptions are somewhat unconventional, some will question his conclusions. Even if they are correct, however, they are points about corporate strategy. By themselves, at least, they do not justify any limitation on tying.

with scale economies wants to deter an entrant. Analysis of this problem dates back at least to Joe Bain's seminal work *Barriers to New Competition*.¹¹⁷ Bain suggested that a firm would expand production beyond monopoly levels to the point where entry at any scale would drive the price below an entrant's average cost, thus insuring that the entrant would lose money.¹¹⁸ A criticism of the model is that the price reduction after entry would make the market unprofitable for the incumbent as well (and on a larger scale than for the entrant).¹¹⁹ According to this critique, the incumbent would rationally cut its output once entry occurred to increase its own profits; and the potential entrant would choose to enter based on the expectation that the incumbent would follow its self interest. Using the terminology of game theory, the incumbent's threat to let the price drop after entry to non-remunerative levels is not credible.¹²⁰

While it is now widely accepted by economists that the Bain model was not fully worked out, there have been modern extensions that suggest (in a way that economists accept as valid) that an incumbent might be able to deter entry. Dixit showed that while scale economies alone are not an entry barrier, the combination of scale economies and sunk costs could be.¹²¹ In its simplest form, the Bain model considers the actions of a monopolist faced with a single potential entrant. In practice, one would expect multiple potential entrants; and one would generally expect that a firm might have an incentive to

¹¹⁷ JOE BAIN, *BARRIERS TO NEW COMPETITION* (1956).

¹¹⁸ For a recent exposition of what is known as the "Bain limit pricing model," see Richard J. Gilbert, *Mobility Barriers and the Value of Incumbency*, in *HANDBOOK OF INDUSTRIAL ORGANIZATION* 476-535 (Richard Schmalensee & Robert D. Willig eds., 1989) at 480.

¹¹⁹ *Id.* at 485.

¹²⁰ Reinhard Selten, *Reexamination of the Perfectness Concept for Equilibrium Points in Extensive Games*, 4 *INT'L J. GAME THEORY* 25 (1975).

¹²¹ Avinash Dixit, *The Role of Investment in Entry Deterrence*, 90 *ECON. J.* 95 (1980).

behave aggressively toward one in order to establish a reputation with the others.¹²²

In the Whinston model, tying is theoretically a device for committing to a low price for gadgets once entry occurs.¹²³ In that model, however, all of these other explanations for why Monocorp might respond aggressively to entry are ruled out.

There are a number of other reasons to question whether the Whinston model of tying independent goods to deter entry raises serious policy concerns. First, it is possible to have excessive entry (from the standpoint of total economic welfare) when scale economies are present.¹²⁴ One might argue, of course, that the antitrust laws are concerned with maximizing consumer surplus (which in this context is the same as minimizing prices), so that any profitable entry is desirable. Even under this standard, however, one must recognize that antitrust enforcement is inherently imperfect. As a result, intervention is only warranted to prevent effects that are quantitatively important. As Schmalensee has demonstrated,¹²⁵ there are natural limits to the size of the entry barrier that can arise due to production scale economies alone. This result arises in Whinston's model as well, since there is a limited range of fixed costs for which Monocorp can use tying to deter entry. If the gadget market were larger (in which case

¹²² See Richard J. Gilbert, *Mobility Barriers and the Value of Incumbency*, in HANDBOOK OF INDUSTRIAL ORGANIZATION 476-535 (Richard Schmalensee & Robert D. Willig eds., 1989) at 515.

¹²³ As a matter of formal economics, the available margin on the widget becomes a reduction in the marginal cost of gadgets when Monocorp sells widgets only in combination with gadgets. That is, when gadgets are sold unbundled, the marginal cost of a gadget is \$1. When the two are bundled, the difference between the bundle price and what Monocorp would sell the widget for unbundled (\$2) can be interpreted as the implicit price of the gadget. When Monocorp determines this price, it acts as if the marginal cost of a gadget is \$0, which is the actual marginal cost of \$1 minus the \$1 margin on the widget. It is precisely because the Monocorp has an effective marginal cost of \$0 that it is willing to charge an implicit price of only \$0.58 for the gadget.

¹²⁴ See A. Michael Spence, *Product Selection, Fixed Costs, and Monopolistic Competition*, 43 REV. ECON. STUD. 217 (1976); C. C. von Weizsacker, *A Welfare Analysis of Barriers to Entry*, 11 BELL J. ECON. 399 (1980); Gregory Mankiw & Michael D. Whinston, *Free Entry and Social Inefficiency*, 17 RAND J. ECON. 48 (1986).

¹²⁵ Richard L. Schmalensee, *Economies of Scale and Barriers to Entry*, 89 J. POL. ECON. 1228 (1981).

the leveraging of market power would be more costly), entry could not be deterred. Related to this point, if the market for gadgets is growing, as would typically be the case, then it would eventually reach the point where entry cannot be prevented.¹²⁶ That is, tying could at most delay entry rather than prevent it altogether. If the tying were then irreversible once the entry occurred, then it is not at all clear that the benefits of delaying entry would outweigh the substantial cost of tying after entry occurred.

Even if one were to conclude that there are potentially significant welfare gains from preventing some entry-detering behavior in markets where scale economies are a barrier to entry, arguments about entry barriers that rest critically on scale economies necessarily cast antitrust analysis into treacherous territory. One of the fundamental issues in the enforcement of the antitrust laws is the distinction between protecting competitors and protecting competition. When scale economies are present, this distinction gets blurry. Harm to a competitor can prevent it from being able to achieve the necessary scale economies and thereby induce exit. It is easy to construct models in which the distinction between competing vigorously and harming competitors is clear. In evaluating the facts associated with any real market, however, the distinction is unlikely to be clear.

b) Complementary Products

In his analysis of tying of complementary goods, Whinston modified Chicago school assumptions to allow for the possibility of a competitor, albeit an inefficient one, in the sale of the tying good. Recall that under Chicago school theory, a monopoly over one of a pair of perfectly complementary products is as good as having a monopoly over

¹²⁶ A. Michael Spence, *Investment Strategy and Growth in a New Market*, 12 BELL J. ECON. 1 (1979).

both. If so, competition in the sale of one of the components does not harm and, indeed, can help the monopolist because it provides an opportunity to raise the price of the other. Whinston showed, however, that potential competition in the sale of the (potentially) tying good limits the firm's ability to get all available profits from the sale of that good and provides an incentive to use tying to preserve its monopoly over the tied good.

The analysis of the tying of complementary products is of particular interest for the analysis of policy toward product integration because the integration that tends to occur is of system components, which are inherently complementary. The issues involved in the tying of complementary products are much different from those with independent products. There is little doubt that a firm with a monopoly over one component of a system has the ability to monopolize the entire system. The entire controversy about tying as a leveraging strategy concerns whether a firm has any incentive to do so.

Consider, for example, computers and monitors, and suppose that everyone with a computer uses exactly one monitor. Assume that a computer costs \$300 to produce and a monitor costs \$200. Since consumers demand computers and monitors only in combination, the demand for the two depends on the sum of the prices. If one firm had a monopoly over both computers and monitors, therefore, it would need to determine the profit-maximizing sum of the two prices. It could then allocate that sum between the two components any way it chose. Suppose that the profit-maximizing sum is \$2000, and that the seller divided that into \$1400 for the computer and \$600 for the monitor. The firm's profits would then be \$1500 per system sold.

Now suppose that Entcorp can sell monitors and either that it has lower

production cost per monitor or that some people prefer a system with a Monocorp computer and an Entcorp monitor to one supplied entirely by Monocorp. Intuitively, one might expect competition by Entcorp to be harmful to Monocorp and Monocorp to respond by selling its computers and monitors only as a bundle. Whinston presents a simple model, however, in which Monocorp would actually benefit from Entcorp's entry and therefore would have no incentive to exclude it by bundling. This model captures the Chicago school argument that tying is not a monopolization strategy. If Monocorp raises the price for the computer to \$1801 and lowers its price on monitors to \$199, its profits will be at least as great and perhaps greater regardless of what Entcorp does. Its combined price for a system is still \$2,000. With this pricing, it earns \$1,500 on every system it sells and \$1,501 on every computer it sells for use with an Entcorp monitor. Thus, far from being hurt from the "competition" from Entcorp from its monitors, Monocorp benefits.

Whinston then presents some variants of this model in which Monocorp does have an incentive to tie in order to keep Entcorp out of the market. The argument that Monocorp is not harmed by entry into the production of monitors rests on the assumption that Monocorp is a true monopolist in the production of computers. Suppose, however, that there is a firm (Schlockcorp) that produces competing but inferior computers. To keep matters simple, suppose that Schlockcorp's cost per computer is \$300, the same as Monocorp's. Yet, everyone considers a system with a Schlockcorp computer to be worth \$100 less than a system with a Monocorp computer.

Absent Entcorp, Schlockcorp poses no problem for Monocorp. It can keep Schlockcorp out by charging \$350 for computers and \$1650 for monitors. Its system

price would still be \$2000. The strategy excludes Schlockcorp because the minimum price Schlockcorp can profitably charge is \$300 per computer and no one would pay that price when Monocorp computers are available for \$350. As noted above, absent Schlockcorp, Entcorp's entry does not threaten (and indeed even helps) Monocorp. The combination of the two, however, is a problem. The presence of Schlockcorp prevents Monocorp from charging anything more than \$400 for its computers, which in turn prevents it from reacting to Entcorp's entry by the combination of lowering its monitor price and recouping the loss through increases in the system price.

Finally, even if Schlockcorp does not exist, Whinston observes that the argument that Monocorp necessarily benefits from Entcorp's entry rests on the assumption that monitors are purchased only in conjunction with computers. If there is another use of monitors, however, then there might be an incentive to tie for much the same rationale that arises in Whinston's core model (in which goods are not complements). If Entcorp's monitors did not exist, then Monocorp could choose the price for its monitors that maximizes its profits in the market for the alternative use. Suppose that price is \$600. It could then charge \$1400 for a computer to achieve the desired price of a computer-monitor system. When Entcorp comes into the market and forces it to lower its monitor price, Monocorp's profits in the sale of monitors for the alternative use would drop. Indeed, Entcorp's entry would hurt Monocorp even if no one desired Entcorp's monitors for the alternative use. Of course, if some people did buy Entcorp's monitors for the alternative use, the damage to Monocorp would be even greater.

Under these circumstances, selling computers only in packages with monitors can be an effective strategy. First of all, it would preserve Monocorp's profits in selling

computers. Secondly, the strategy would deny Entcorp any profits from selling monitors for sales in computer systems. To the extent that such profits are necessary to cover the fixed costs of entry, the strategy could prevent Entcorp from entering the market.

While Whinston succeeds in demonstrating that a firm with market power in one component of a system might have an incentive to extend its market power to another component of the system, the policy implications are not clear. The result certainly does not justify a rule as broad as prohibiting a firm with market power over one part of a system from tying it to any other part that might be produced by other firms. First of all, to the extent that product integration is an example of a tie, then such a rule would prevent integration that saves costs, improves performance, or provides convenience. Indeed, even without true product integration, it is almost always plausible that tying systems together through packaging might lower transactions costs or provide convenience. Of course, one might imagine a rule in which tying (in any form) by a firm with market power in one component of a system is suspect but can be defended with an affirmative showing of benefits. With such a rule, however, one would have to decide how universal the benefits would have to be.¹²⁷

To sum up, three aspects of the Whinston model are worth noting. First, the tying strategy only works if it actually deters entry. Taking sales of the tied good from other firms without keeping them out of the market accomplishes nothing. Second, the strategy is potentially expensive. Tying widgets to gadgets makes the widgets more expensive to

¹²⁷ For example, suppose it is cheaper to package computers and printers together rather than separately and that some but not all people want Monocorp's printer. In that case, tying with a corresponding reduction in price benefits the people who want Monocorp's printer but hurts those who do not. This will be the case with both anticompetitive and beneficial tying. In all likelihood, relatively more people benefit from beneficial tying and relatively more are hurt by anticompetitive tying, but exactly where to draw the line is not at all clear.

customers who do not want gadgets and, all else equal, lowers sales. Third, by introducing scale economies to the analysis, Whinston considers a situation in which a variety of entry deterring or exit inducing strategies (e.g., predatory pricing) might work. In Whinston's analysis, tying is the only one considered.

2. Carlton and Waldman

Carlton and Waldman extend the Whinston analysis to entail assumptions that they claim more nearly fit the government's theories in the Microsoft case.¹²⁸ First, they consider sellers of systems of two components, a primary good and a complementary good. The primary good can be used by itself, while the complementary good can be used only in conjunction with the primary good. One firm is initially a monopolist in both. A firm with a superior complementary good has the opportunity to enter. It cannot enter the market for the primary good at the same time, but it has the prospect of doing so at some point down the line. This possibility of the entrant also producing the primary good serves the same role in the Carlton-Waldman analysis as the potential entrant in the tying good in Whinston's. Without that possibility, the monopolist would benefit from entry by a superior complementary product. Once the entrant can sell the primary good as well, the monopolist cannot hope to reap the gains from improvement in the complementary good by raising the price of the primary good.

Carlton and Waldman also construct a model in which there are two complementary goods and one is subject to network externalities. As in their first model,

¹²⁸ Dennis W. Carlton & Michael Waldman, *The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries*, NBER Working Paper No. 6831, December 1998, available at <http://www.nber.org/papers/w6831/>.

one firm is initially able to enter with one good (the one with network externalities) but it cannot enter with the other (the one that is complementary to the good with network externalities) until later. In the Carlton-Waldman model, the presence of network externalities gives the monopolist an incentive to get a head start in the race to be the standard by tying. Absent the threat of entry in the primary good, the firm would have no incentive to seek this advantage. It would prefer to have competition to be the standard in the complementary product result in adoption of the best available standard. It could then realize the benefits of that standard through its price for the primary good. Once entry into the primary good becomes possible, however, the firm can no longer try to extract all the available rents through that good.

3. Farrell and Katz

The competitive effects of tying are related to the competitive effects of integration because a firm with market power over one product can only tie it to another product by producing a second product. Farrell and Katz do not address directly the question of tying, but they do analyze the competitive effects of integration. In particular, they examine the effect of integration on incentives to innovate.¹²⁹

The Farrell-Katz model analyzes a market in which consumers buy a system of two components (computers and printers, say). Only one company produces computers. It can choose to produce printers as well, but there are many potential suppliers of printers. Consumers place no value on a computer alone or a printer alone. They always buy exactly one printer per computer.

¹²⁹ Joseph Farrell & Michael L. Katz, Innovation, Rent Extraction, and Integration in Systems Markets (January 4, 2000) (unpublished manuscript).

In the Farrell-Katz model, printer producers not only compete in the price they charge, but also in research & development (R&D) to improve the printers. As was the case in the Whinston model, computer producers benefit from improvements in the price-quality profiles of printers. A printer producer benefits from R&D if it develops a product that is superior to its competitor's. If so, it can charge a price premium that fully reflects the difference between its quality and its competitor's. To get some sense of the model's results, suppose that two firms initially sell the same quality printer and then only one of them innovates. Given the stark assumptions of the model, the innovating firm gets all of the benefits from the R&D (in the form of a higher price), leaving none of the surplus for consumers or the computer producer. In contrast, if both firms improve their quality by the same amount, price competition between them eliminates any benefit to them.¹³⁰

Farrell and Katz show that in their model, the computer manufacturer would spend more on R&D if it integrated into printers than would a stand-alone printer producer.¹³¹ This effect might initially appear to be procompetitive, since the merged entity competes more aggressively. Farrell and Katz interpret it as being anticompetitive, however, in part because it lowers the R&D by independent firms and in part because the integrated firm's R&D exceeds the socially optimal level.

In evaluating the practical implications of the Farrell-Katz arguments, three points are worth considering. First, the criterion they use is controversial. While it is

¹³⁰ They cannot raise their price. The quantity they sell goes up, but they get no benefit because they are charging a price that just covers their marginal cost.

¹³¹ A firm's optimal expenditure on R&D turns on a weighing of the marginal benefit and the marginal cost. Marginal cost does not depend on whether the firm is integrated. The integrated firm does get a greater marginal benefit from innovation because R&D expenditures by printer producers can benefit computer producers. The integrated firm captures this latter benefit whereas an independent printer

theoretically possible for competition to be harmful, it is not clear that harmful competition is "anticompetitive." Second, the result that independent firms lower their R&D in response to increases by the integrated firm's is not a general result. Third, the incentives for R&D are almost never socially efficient.¹³² Under a wide variety of circumstances, firms are not able to expropriate the full benefits from their R&D.¹³³ Thus, even if one accepts social welfare as the appropriate criterion, the result that integration creates incentives to perform too much R&D is unlikely to be general.

The Farrell and Katz paper would seem to suggest that it would be desirable to have a policy in which the monopolist over a standard was not allowed to develop applications for the standard, the rationale being that its motives would be to reduce the return to independent R&D. While the phenomenon they raise is theoretically possible, other effects would seem to be far more important in practice. For example, an implication of the Farrell-Katz assumptions is that, absent integration, each independent firm can capture the full surplus from its innovation. In practice, the monopolist over the standard and the producer of the best application would find themselves in a bargaining situation. If so, the monopolist would likely be able to get some of the surplus from an application producer's innovation even without integration. In recognition of this likelihood, independent applications providers would be reluctant to engage in development; and the standard monopolist would need to develop its own applications in order to stimulate demand for its core product. Indeed, it is precisely this phenomenon that arguably explains why vertical integration into cable networks by cable operators

producer does not.

¹³² See JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 389-401 (Cambridge, MIT Press, 1988).

¹³³ *Id.*

was so essential to the development of that industry.¹³⁴

III. A Decision Theoretic Approach

The ultimate objective in formulating tying doctrine is to outlaw tying or product integration that lowers consumer surplus (or, alternatively, economic welfare) and allow tying or product integration that does not. As a practical matter, however, courts must rely on inherently imperfect tests. Decision theory provides a powerful framework for understanding situations in which choices among alternative actions must be based on imperfect information. It helps us understand the tradeoffs between, in effect, convicting the innocent and absolving the guilty.

As we will see, decision theory makes clear that a rational legal standard for tying must come to grips with the utter ubiquity of the practice. A moment's reflection reveals how common it is. For example, when a law school offers its courses only to degree candidates, it sells an integrated product. Even if it were to allow students to enroll for individual courses, charging for a course as opposed to individual sessions and including the cost of evaluating a student's work in the fee for the course are all examples of product integration. When a law firm offers legal services, it offers the services of its partners only in conjunction with the services of its associates, paralegals, and secretaries. Clients cannot pick a partner from one firm, a paralegal from another, and a secretary from a third. While some clients with strong preferences for particular paralegals or secretaries might conceivably be harmed by this bundling, most clients benefit from the

¹³⁴ See DAVID H. WATERMAN & ANDREW W. WEISS, VERTICAL INTEGRATION IN CABLE TELEVISION

convenience it provides. These examples are just two of a virtually infinite number of possibilities. As Carlton and Perloff have put it, "[i]n the extreme, every product can be thought of as composed of multiple products."¹³⁵ The implications of this point are not merely that "[u]nless it is illegal to sell cars with engines or cameras with lenses, [tying doctrine] ... must be guided by some limiting principle."¹³⁶ Rather, decision theory implies that the ubiquity of benign tying affects how aggressive the law should be in trying to prevent harmful tying.

A. Decision Theory Framework

According to the decision-theory framework, a legal rule divides cases (of tying and product integration) into two categories: those that are legal under the rule and those that are illegal. Because the rule is inherently imperfect, this categorization is not identical to the distinction between the cases that are harmful and benign. Thus, one can further categorize cases according to whether the practices found legal or illegal are harmful or not. This leads to the following cross-classification scheme:¹³⁷

(Cambridge: MIT Press, 1997).

¹³⁵ DENNIS W. CARLTON & JEFFREY M. PERLOFF, *MODERN INDUSTRIAL ORGANIZATION* 466 (1990). For the observation that tying is ubiquitous, *see also* LAWRENCE A. SULLIVAN, *ANTITRUST* 443 (1977).

¹³⁶ *Jefferson Parish*, 466 U.S. at 39 (O'Connor, J., concurring).

¹³⁷ The matrix need not be 2x2. There can be different gradations of harmful and different gradations of illegal.

| | <i>Harmful</i> | <i>Not Harmful</i> |
|---------|--|---|
| Illegal | % of cases that both are harmful and violate the legal standard | % of cases that violate the legal standard even though they are not harmful |
| Legal | % of cases that are harmful even though they do not violate the legal standard | % of cases that are both benign and legal under the standard |

In this matrix, the upper left and lower right-hand cells represent cases that the legal standard judges appropriately. The upper right and lower-left hand cells are ones those in which the legal standard is in error. Note that there are two distinct types of errors that the legal standard can make, false "convictions"¹³⁸ and false "acquittals."¹³⁹ Under a decision theoretic approach, the basis for comparing two standards is their respective rates of these two types of errors.

Suppose, for example, that courts are comparing two rules, A and B, whose properties are represented by the following matrices.¹⁴⁰

¹³⁸ It is important to be clear, though, that a false conviction does not necessarily mean that a trial would actually occur and result in a conviction. Included in false convictions are benign occurrences that do not occur because of the belief that they could be challenged in court. Indeed, some false convictions might entail cases that would not be found in violation of the law if they went to trial but which nonetheless do not occur because of uncertainty about the law or courts' enforcement of it.

¹³⁹ The terms that are more commonly used in decision theory for the two possible types of errors are "false negatives" and "false positives." Here, we adopt the terminology used in C. Frederick Beckner III & Steven C. Salop, *Decision Theory and Antitrust Rules*, 67 ANTITRUST L.J. 41 (1999).

¹⁴⁰ Because the percentage of harmful and benign cases is not a function of the legal rule, the sums of the respective columns in the two tables are the same. In this particular case, 30% of the cases are harmful and 70% are not. In contrast, the fraction of cases that are legal is not constant. Under Rule A, 25% of cases violate the rule whereas only 23% violate Rule B.

| <i>Rule A</i> | | |
|---------------|---------|-------------|
| | Harmful | Not Harmful |
| Illegal | 20% | 5% |
| Legal | 10% | 65% |

| <i>Rule B</i> | | |
|---------------|---------|-------------|
| | Harmful | Not Harmful |
| Illegal | 22% | 1% |
| Legal | 8% | 69% |

In this example, Rule B is superior to Rule A because it entails a lower probability of both types of errors. Note that it is possible with these matrices that there are some cases that are judged correctly under rule A but not under rule B. For every such case, however, there is at least one other case that is judged correctly under rule B but not rule A.

In some cases, the choices that courts must make are more akin to choosing between the following two options:

| <i>Rule C</i> | | |
|---------------|---------|-------------|
| | Harmful | Not Harmful |
| Illegal | 20% | 5% |
| Legal | 10% | 65% |

| <i>Rule D</i> | | |
|---------------|---------|-------------|
| | Harmful | Not Harmful |
| Illegal | 10% | 1% |
| Legal | 20% | 69% |

In this example, Rule C is the stricter rule. Of the instances of the practice in question, 25% are illegal as opposed to the 11% under rule D. The stricter standard is a mixed blessing. Fewer harmful instances escape legal sanction, but more benign instances get penalized.

In order to choose between Rules C and D, the courts must assess the cost of each type of error. For example, if the courts decided that false acquittals and false convictions were equally costly, then it would opt for Rule C, which has the lower combined error rate. If, however, it views a false conviction as being three times as costly as a false acquittal, then it would opt for Rule D, which has a much lower rate of such errors.¹⁴¹

In these matrices, error rates are represented as what is known in probability as "joint probabilities." In rule D, for example, 1% of all cases are illegal despite being benign. Given that tying is ubiquitous and that under any sensible legal standard, the vast majority of instances of tying are legal, any representation of a legal rule on tying and product integration will necessarily have a very high number (much more than 99%) in the lower right hand corner. Thus, the error rates as represented by joint probabilities

¹⁴¹ The cost of a false conviction is the cost of forgoing a beneficial occurrence of tying. As noted in *supra* note 138, this cost occurs as long as the law or concern about it induces a firm not to tie. It does not necessarily depend on a case going to trial and a court finding that a tie is illegal. Of course, false convictions do include cases in which firms are ordered by courts to cease tying that is beneficial.

might appear small.

This perspective is misleading, however. By way of analogy, suppose one were to assess different legal standards for murder convictions. Because the fraction of people who murder and the fraction of people convicted of murder are both small, the false convictions and false acquittals for any realistic standard are small when viewed as a percentage of the total population. In comparing which of two rules is better, however, what matters is the relative size of the different error rates.

As a practical matter, one cannot measure these percentages objectively. Instead, legal standards must be based either implicitly or explicitly on subjective notions of the probabilities.¹⁴² To form these subjective notions, it is useful to view the error rates as percentages not of the total population but rather as percentages of a subset. In the language of probability theory, one might be able to get a better sense of conditional probabilities rather than the joint probabilities.

There are two distinct ways of looking at these conditional probabilities, and it is important to understand the distinction between them. One way is to determine the fraction of benign cases that violate the law and the fraction of harmful cases that do not. In the language of probability, the rate of false convictions is represented as the conditional probability of conviction given that a case is benign. The rate of false acquittals is defined as the conditional probability of acquittal given that a case is harmful. The alternative is to condition on the actual outcome rather than the desirable outcome. With this approach, the rate of false acquittals is the fraction of all acquittals that are harmful and the rate of false convictions is the fraction of all convictions that are

¹⁴² For a discussion of "subjective" probability, see virtually any textbook on probability and statistics such as, ROBERT D. MASON ET AL., *STATISTICAL TECHNIQUES IN BUSINESS AND ECONOMICS* 10th ed. (1999) at

benign.

These two ways of describing error rates are not identical, but there is a famous result in probability theory known as Bayes Theorem that links them.¹⁴³ This link depends on one other essential input, the fraction of instances in which the conduct at issue is harmful. With this "base rate" probability in hand, one can move easily between the two alternative ways (conditioning on actual outcome versus conditioning on desirable outcome) of thinking about error rates.

Let's apply this "rule matrix" framework to tying. Given that tying is ubiquitous and that under any sensible legal standard, the vast majority of instances of tying are legal (e.g., cameras and lenses), any representation of a legal rule on tying and product integration will necessarily have a very high number in the lower right hand corner of the rule matrix. Suppose, for example, that only 0.1% of all instances of bundling are anticompetitive. Furthermore, suppose that courts can always identify harmful cases as being illegal and that they judge 98% of benign cases to be legal. Most people's reaction to this set of assumptions is that the judgment of the courts is highly accurate. Given these assumptions, the rule matrix is:

147-8.

¹⁴³ *Id.* at 163-4.

| <i>No Bundling with Market Power Rule</i> | | |
|---|---------|-------------|
| | Harmful | Not Harmful |
| Illegal | 0.1% | 1.96% |
| Legal | 0% | 97.94% |

In this matrix, 99.9% of all instances of bundling are not harmful.¹⁴⁴ According to Bayes' Theorem and as can be seen in the table, 95.1% of the instances of bundling found to be illegal under this rule are benign.¹⁴⁵ In other words, even though the proposed tying standard is highly accurate in the eyes of most observers, the vast majority of "convictions" under the standard are false. This is a general result that is observed whenever the relevant base rate probability -- in this case, the fraction of instances in which tying is harmful -- is low. As we will see below, this has important implications for the design of the appropriate legal standard for tying.

We have referred to the importance of the relative costs of false convictions and false acquittals in determining the appropriate legal standard. The best standard minimizes the sum of overall error costs. It is easy to demonstrate that a relatively accurate test may not be desirable if false conviction costs are large. To take a concrete and striking example, consider an AIDS test that, like our tying test above, judges 98 % of uninfected cases to be uninfected. If used in a population in which only 0.1% is

¹⁴⁴ The title "No Bundling with Market Power Rule" in the matrix should be understood as describing a rule under which tying will be deemed unlawful whenever the seller has market power. Since only 0.1% of instances of bundling are harmful, it follows that 99.9% are not. In the table, the sum of the percentages under "Harmful" is 0.1% and the sum of the two cells under "Not Harmful" is 99.9%.

¹⁴⁵ Note that 95.1% = 1.96% divided by (0.1% + 1.96%).

infected, the test will have an outcome similar to that shown in the matrix: 95.1 % of cases which the test reports as infected will be uninfected. Given the potentially high cost of a false AIDS report, one could easily generate a scenario in which people are better off either not taking the test, or taking it only under carefully controlled circumstances.

To summarize this section, decision theory says that a comparison of legal standards should be based on the relative rates of false convictions and false acquittals and that how these two kinds of errors should be weighed against each other depends on the relative cost of the two different kinds of errors. In thinking about relative error rates, we also need to pay attention to base-rate assessments of the extent to which the conduct at issue is harmful. While we do not suggest that it is feasible to measure these factors directly, any proposed standard is based implicitly on assumptions about what they are. Moreover, in evaluating the implications of the academic literature for the legal standard, it is useful to consider what implicit assumptions had been built into the legal standards and then to assess what the implications of the literature are for how those assumptions should change.

B. Implications for Tying Law and Early Literature

We can apply this framework to identify the implicit assumptions underlying alternative legal standards for tying. There are essentially three legal rules that courts could apply to tying. One is the per se illegality rule currently in the case law. The second is a rule-of-reason test that weighs the social costs and benefits of tying in a particular case in order to determine whether it should be deemed unlawful. The third is

a per se legality rule. To be sure, one could propose variations on these three, but these are the only tests that have been discussed in the literature and case law.

Decision theory implies that the best legal rule is the one that minimizes the overall expected costs of error. The expected cost of a particular type of error - say of a false acquittal - is simply the product of the false acquittal rate and the cost of a false acquittal. It follows that the per se legality rule is more desirable as the expected cost of a false conviction increases relative to that of a false acquittal. This, in turn, is more likely as either the probability or the cost of a false conviction increases. Thus, as courts have greater difficulty in distinguishing harmful from benign instances of tying, and as the cost of mistaking benign instances for harmful instances increases -- say because penalties reduce incentives to innovate -- the case for adopting a per se legality rule gets stronger. Similarly, as the expected cost of a false acquittal rises relative to that of a false conviction, the case for the per se illegality rule gets stronger.

Decision theory tells us that we need to think about the size and distribution of error probabilities and the costs of error in assessing the merits of alternative legal rules. We can use these factors to articulate, with more precision than we have so far, the assumptions underlying proposed tying standards. Other things equal, false acquittal costs are likely to be small relative to false convictions when there are (1) market constraints on the firm's conduct, (2) strategies other than tying that the firm could use to gain the same advantage in the market, or (3) no clear incentive to use tying in order to harm consumers. On the other hand, false conviction costs are likely to be relatively large when (1) there are substantial potential efficiencies associated with tying and (2) tying is an important competitive instrument.

A few examples can be used to illustrate these factors. Market constraints are most obvious in the instances where the tying firm does not have market power in the tying product. For example, when a firm sells widgets and gadgets only in combination, the concern is that someone who wants a widget but not a gadget is forced to buy a gadget. If, however, other firms sell widgets separately (so that the seller has no market power in widgets), then there cannot be any sense in which the bundling forces an unwanted gadget on someone. Because the widget market is competitive, no widget seller has the power to force a gadget or any other good on a consumer.

There are plenty of instances of tying in which one cannot reasonably argue that the seller's only plausible objective is to restrict competition. Goods are often sold together in competitive markets when the joint selling either saves cost or provides convenience. Indeed, even a monopolist has an incentive to cut costs and provide convenience. Suppose for example that 80% of the purchasers of widgets also want gadgets, that gadgets cost \$1 to produce, and that the incremental cost of packaging gadgets separately from widgets is \$0.30. In this example, it is cheaper to provide a gadget for those who do not want it (a cost of \$1 per customer for 20% of the customers) than it is to package the goods separately (\$0.30 per customer for 80% of the customers). Customers who want both widgets and gadgets are likely to get a lower price than they would if the company were forced to sell the goods separately. Those who do not want gadgets would likely end up paying more for the bundle than they would just for a widget (under unbundled sales). Thus, they are “forced” to buy gadgets, and the 20% is presumably large enough so as not to be considered *de minimus*.¹⁴⁶

¹⁴⁶ The principle of allowing tying in cases when it would arise in a competitive market underlies the test proposed by Ordovery and Willig. For a discussion of the general principle, see Janusz A. Ordovery &

The case of the widget monopolist who can cut his packaging costs by tying gadgets also reveals ways in which market constraints reduce the relative cost of false acquittals. The Chicago school literature has shown that the likelihood of anticompetitive harm is extremely small when the market for the tied good is competitive, so we need only consider the case where the market for the tied good is susceptible to monopolization. Even in this case competitive pressures constrain the relative frequencies of harmful and beneficial tying. If the savings that result from bundling are sufficiently large, they may so far outweigh any losses due to competitive barriers that all consumers are better off under the tie-in. In the mixed case where some consumers gain and others lose, this may not be the case. Still, given the risk that entry can occur in the case where consumers are harmed, one should expect that most cases of bundling observed in the market will be those in which the typical consumer is better off on net.

The remaining factor that needs illustration is the existence of alternative strategies with the same effect as the challenged conduct. In many instances, a seller who is told that he cannot bundle widgets and gadgets may have an incentive to offer consumers a menu in which they can choose to buy them separately or buy them bundled for a discount. When such alternative strategies are available, the costs of false acquittals relative to false convictions are likely to be low.

It is straightforward to see the implications of this argument for the classical and Chicago theories. Recall that the classical theory assumes that tying is used by the seller as a leveraging mechanism, and more precisely (in some versions) as a form of price

Robert D. Willig, *An Economic Definition of Predation: Pricing and Product Innovation*, 91 YALE L.J. 8 (1981). For a discussion of how the principle relates to tying in technologically advanced markets such as computer software, see Janusz A. Ordover & Robert D. Willig, *Access and Bundling in High-Technology Markets*, in COMPETITION, INNOVATION, AND THE MICROSOFT MONOPOLY: ANTITRUST IN THE DIGITAL

discrimination. The classical theory provides a justification, on decision theory grounds, for the limitation that the seller must have market power in the tying good. However, since even monopolists have incentives to cut costs and provide convenience to consumers, a *per se* rule against tying whenever the seller has market power creates a substantial risk of false convictions because it outlaws tying for beneficial reasons. Even though classical theory justifies a *per se legality* rule for instances in which the seller does not have market power in the tying good, it does not justify a *per se illegality* rule for those instances in which the seller has market power. In order to use classical theory to justify the *per se* illegality rule, one must assume that expected false conviction costs are essentially zero. This is a highly questionable assumption.

Now consider the Chicago School through the lens of decision theory. Recall that the Chicago School analysis suggested a radical departure from Classical tying theory. The Chicago School critique suggested that because there was no logically sound explanation for why tying could be anticompetitive, the appropriate legal doctrine was *per se* legality. Such a rule would create no risk of false acquittals, and any stricter rule would run a risk of false convictions. False acquittals costs are assumed to be zero under the Chicago analysis because the Chicago School could find no plausible basis in microeconomic theory for the anticompetitive view of tying. False conviction costs, on the other hand, are assumed to be substantial under the Chicago analysis because the Chicago School found many ways in which tying could be efficient.

The Chicago School analysis was incomplete because it did not address the case in which tying is used to distort competition in a market that is already oligopolistic. The

MARKET PLACE (Jeffrey A. Eisenach & Thomas M. Lenard, eds., 1999).

post-Chicago literature has analyzed this problem, and as a byproduct provided a more general framework for tying analysis. Although the post-Chicago analysis suggests that false acquittal costs may be positive, this is not enough to make a detailed judgment about the law (e.g., whether a *per se* prohibition is justifiable) because we need to also have some sense of the relative frequencies of false acquittal and false conviction costs. Decision theory helps us answer these questions, and at the same time provides synthesizing framework for the classical, Chicago and post-Chicago schools. In the next section, we apply the decision theory perspective to the post-Chicago tying model.

IV. A Decision Theoretic Perspective on the Post-Chicago Literature

Having laid out the fundamentals of a decision theoretic approach and described the post-Chicago literature on tying and product integration, we now use the decision-theoretic approach to assess the literature.

A. Implications for continuation of per se rule

The Chicago school literature arose as a reaction to legal doctrine that it viewed as being excessively hostile to tying. It suggested that rather than being *per se* illegal even under a limited set of circumstances, tying and product integration should be *per se* legal. As we argued in the introduction, the courts have, with the notable exception of the Court's decision on summary judgment in *Eastman Kodak*, largely sought to narrow the conditions that triggered the *per se* rule. In part, the trend in the law reflects the influence of the Chicago school literature. Given the utter prevalence of tying and product integration, some of this trend would have occurred even if no one had articulated the

single monopoly profit theory.

The post-Chicago literature arose in reaction to the Chicago school's prescriptions that tying should be *per se legal*, not to the state of the law. As we have suggested, nothing in this literature justifies continuation of the *per se illegal* rule. Within our decision-theoretic framework, there are two conceivable foundations for a *per se illegal* rule. One possibility would be that the courts could identify a checklist of conditions under which tying was sufficiently likely to be anticompetitive that no further inquiry was merited. Under this "checklist" theory, courts could use the post-Chicago literature to develop a stable list of features that justify application of the *per se* prohibition. The other foundation for the *per se* prohibition would be that the harmful effects of tying are so great relative to the potential benefits that the courts would be willing to risk a high rate of false convictions.

All of the post-Chicago models of anticompetitive harm from tying rest on very specific assumptions about such issues as demand, costs, timing of when firms enter or can enter the market, and the ways that firms within the market compete. Within each model, it would be a trivial exercise to modify the assumptions so that tying would not be a profitable strategy. Of course, the tying that occurs in those models is anticompetitive, so a *per se* law against tying would benefit consumers within the fictionalized world of the model. In reality, though, there are potentially beneficial effects of tying that the models exclude by assumption. It is hard to see why one would ever choose not to consider the possibility of these alternative explanations. Given the post-Chicago models' reliance on assumptions that may not hold, and their exclusion of obvious efficiency motivations, it is hard to see how the post-Chicago models can provide a

defensible checklist that courts could use in implementing a modified per se prohibition.

As for quantification of costs and benefits, the post-Chicago models give us little if any guidance. While the models lay out a set of assumptions under which tying is anticompetitive, none of the models can be said to lay a serious framework for quantifying the costs of such behavior. To the extent that tying lowers costs or provides convenience, there is no reason to suppose that its benefits are insubstantial. Thus, there is no justification for being willing to tolerate large rates of false convictions.

In short, post-Chicago models do not provide a justification for the existing per se rule, nor a justification for a modified version of the per se prohibition. The models rely on assumptions that are by no means generally valid, and exclude potential efficiency justifications that are commonly asserted by firms. In addition, the models fail to quantify the relative costs and benefits of tying.

Indeed, the clearest implication of the post-Chicago literature is that the per se rule is inappropriate. The post-Chicago literature implies that in addition to market power and substantial foreclosure, one must have evidence of the presence of entry barriers in the tied good market; and that these conditions are *necessary* rather than sufficient for tying to be harmful. It follows that instead of a per se prohibition triggered by a finding that the tie-in involves separate products, market power in the tying good, and substantial foreclosure in the tied good; a superior rule would be one of per se legality unless these three elements are satisfied and there are entry barriers in the tied good market. An economically defensible, “neoclassical” tying doctrine would require, at a minimum, evidence favorable to the plaintiff on these four conditions in order to survive a motion for summary judgment.

The post-Chicago models could be used to justify and formulate a rule-of-reason approach – provided evidence exists of market power in the tying good and barriers to entry in the tied good. Under a rule of reason, a court would have to weigh the likelihood that an example of tying or product integration would be anticompetitive against the benefits from tying or integration that defendants would inevitably present. In assessing the implications of the post-Chicago literature, it is natural to examine what insights it yields into what conditions in the tied market the court should look to in assessing the likelihood that an example of tying could be anticompetitive. We consider four conditions below: entry barriers, complementary goods, network effects, and technologically advancing markets.

B. Basic conditions in the market for the tied good

Under classical tying doctrine, tying is illegal per se if the seller has market power in the tying good and if a significant amount of commerce in the tied good is affected. One common link among all of the theories of anticompetitive tying is that the market for the tied good has basic conditions that are conducive to market power. More precisely, the existing models are based on the assumption of scale economies in the production of the tied good.¹⁴⁷

If courts were to modify the classical per se rule or to adopt a rule of reason, they might rely on an analysis of whether the market for the tied good was susceptible to

¹⁴⁷ An area that arguably needs further exploration in the literature is whether tying can be a successful strategy in the presence of entry barriers other than scale economies. Because the direct mechanism through which tying is potentially anticompetitive is to foreclose sales to competitors, it was natural for economic theorists to base their models of anticompetitive tying on assumptions of scale economies. However, as was suggested by Bain in *Barriers to New Competition* and subsequently proved more formally by Schmalensee (*see* the discussion in section C.1 *supra*), there are limitations to the amount of market power that can be attributable to scale economies.

market power. Courts could, for example, apply a test similar to the “dangerous probability of success” standard in the attempts-to-monopolize doctrine.¹⁴⁸ Under such an analysis, the courts would reject tying claims in settings where market conditions, such as easy entry or competitive structural features, indicate that the prospects for successful monopolization are low. In implementing the test, courts could employ a variety of options that would have the effect of trading off the risks of false convictions and false acquittals. For example, in undergoing an analysis of the basic conditions of the tied market, the courts could inquire not only whether tying could be a successful monopolization strategy but also whether there are other strategies that would be equally plausible. If there are, then the costs of a false acquittal would be relatively low because the seller could substitute some other monopolization strategy for the tie.¹⁴⁹

1. Independent goods vs. systems goods

The economics literature on tying has focused on the two extreme cases of economically independent goods and on goods that are perfect complements, which we might refer to as systems goods. Given the prominence of the role of this distinction in the literature, it is natural to consider what role it should play in the law.

The post-Chicago arguments that tying can be a monopolization device with

¹⁴⁸ The legal test governing attempts to monopolize was first articulated by Justice Holmes in *Swift & Co. v. United States*, 196 U.S. 375 (1905). The test requires the plaintiff to prove intent to monopolize plus a “dangerous probability of success.” *See, e.g.*, HERBERT HOVENKAMP, *FEDERAL ANTITRUST POLICY: THE LAW OF COMPETITION AND ITS PRACTICE* §6.5 at 280 (St. Paul: West Pub., 2d ed. 1999). The “dangerous probability” part of the attempt test generally requires the plaintiff to show that the defendant has market power in the relevant market. *Spectrum Sports v. McQuillan*, 506 U.S. 447 (1993).

¹⁴⁹ For example, the firm could set prices for two products that it sells in a way that accomplishes the same effect as a tie-in, *see Carlton & Waldman, supra* note 128, at 17-18. If the resultant prices are not predatory, then the alternative pricing strategy is certainly legal. Moreover the legal standard governing predatory pricing places a high burden of proof on the plaintiff, *see generally* Brodley, Bolton & Riordan, *supra* note 38 (criticizing existing standard for predation and proposing an alternative). Thus, while a per se prohibition applies to tying, the alternative pricing strategy would be treated under a test that clearly

independent goods are relatively unpersuasive. Obviously, this claim entails a good deal of judgment on our part. Still, the Whinston model makes clear that a monopolist can incur substantial costs in sales of its core product if it ties something else to it. While Whinston does show that the cost could theoretically be a commitment device that excludes competitors, his articulation of why tying is costly to the seller is arguably a more fundamental lesson of that model.¹⁵⁰

The logic of the models of anticompetitive tying with complementary goods is more compelling than the logic in the independent goods case. Indeed, the post-Chicago literature in this area succeeded in demonstrating the extent to which the Chicago school arguments rested on special assumptions.

One might be tempted to conclude from this point that courts should be particularly suspicious of tying with systems goods such as computers and peripherals, cameras and lenses, and the like. Such a conclusion would be a mistake, however. Under a decision-theoretic approach, the appropriate legal rules turn on the relative risks of false acquittals and false convictions. It may well be that the risk of false acquittals from either *per se* legality or a strong burden of proof on plaintiffs is higher with complementary goods than for independent goods. Before adopting a stricter standard in response, however, one must ask whether the risk of false convictions from a stricter standard for complementary goods would be correspondingly greater.

While it may well be true that anticompetitive tying is more plausible with system goods, the potential benefits from tying are also more plausible. First of all, the demands

disadvantages plaintiffs.

¹⁵⁰ Indeed, one might interpret Whinston's independent goods model as a mere expositional device to reveal the role of scale economies in the underlying structure of his complementary goods model.

for components of systems goods are necessarily positively correlated. People who buy computers are more likely to demand computer monitors than people who do not. With positively correlated demands, it is much more plausible that direct cost savings and increased convenience are real benefits of tying. Legal hostility toward tying under such circumstances would pose a risk of preventing these benefits from occurring.

As was argued above, the theories of anticompetitive tying require the potential for market power in the markets for both goods. Legal hostility to tying of complementary goods would necessarily create a bias in the system toward having the components of systems goods provided by different firms. If one knew that market power would be present in the sale of each component of a systems good, then consumers would benefit if the same firm or firms were suppliers in both markets. Having separate firms with market power in the provision of complementary goods results in double marginalization. Also, the Farrell-Katz argument notwithstanding, it can result in inefficient incentives for research and development, as the reward for innovation to complementary monopolists is smaller than the reward to the integrated monopolist. Thus, a legal bias toward having separate providers of complementary goods would result in economic inefficiency.

In response, one might argue that hostility toward tying would not eliminate the natural advantage that the seller of one systems component would have in the market for the complementary good. Even without tying, a firm with market power in the sale of computers would have an incentive to compete more aggressively in the sale of monitors. However, it is possible to use pricing to create a “virtual tie” even when a literal tie is not in place – by setting the price for the complementary good at a level that makes entry

unprofitable.¹⁵¹ Thus, to be effective, a ban on tying must also limit the seller's freedom to offer discounts for buying both components of the system. There may, however, be real cost savings from selling a system instead of individual components, and it would be desirable for firms to pass some of these cost savings on to consumers. Legal hostility toward tying which in turn treats discounts as virtual ties would limit such desirable behavior. One might argue that a seller would be allowed to rebut allegations that its pricing constituted an illegal tie by demonstrating that its package discounts merely reflected cost savings. Such a doctrine would place the burden of proof on defendants. Given the risk of error and the cost of litigation, some sellers would simply forgo the practice rather than put themselves in a position of having to defend it in court. That is, such a legal doctrine would entail a higher risk of false convictions, with additional false conviction costs.

Because both the benefits from tying and the risk of anticompetitive harm are higher for system goods than for others, the stakes in tying doctrine are higher. Thus, the courts should arguably be more willing to devote their efforts to such cases. The point that the stakes are higher for complementary goods does not, however, imply that the courts should be more hostile to tying in these cases.

2. Network externalities

As described in Section C.2 above, Carlton and Waldman lay out the economic logic under which bundling can be used to gain an advantage in a market with network externalities. Recall the basic set up of the model. Widgets and gadgets are

¹⁵¹ Carlton & Waldman, *supra* note 128, at 17-18 (introducing and analyzing effects of "virtual tying" through pricing).

complements. One firm initially has a monopoly over widgets, although subsequent entry into widgets is possible. Gadgets are subject to network externalities.

In assessing that model, the key issue is whether it justifies making the presence of network externalities in the tied good a factor in judging that a tie is illegal. Within the decision theoretic framework, such a conclusion could be valid for one of two reasons. The first would be if the model demonstrated that the difference between the probability of anticompetitive tying and procompetitive tying was greater when the tied good is subject to network externalities. The second would be if there was reason to believe (either because of the model or for some other reason) that the network externalities in the tied good makes the cost of a false acquittal greater than the cost of a false conviction.

A topic of particular interest in the analysis of network industries is whether the better standard necessarily comes to dominate. It is theoretically possible that if an inferior standard gets a head start or has any other sort of artificial advantage, then it could prevail over a superior standard because of the network externality effect.¹⁵² On the surface, this possibility might seem to suggest that with network externalities in the tied good, anticompetitive tying is both more likely and more costly when it occurs. The argument that it is more likely would be that the potential pay-off is greater. The argument that it is more costly is that it results in everyone adopting the wrong standard.

Neither of these arguments is completely compelling as positive predictions, and they are even less compelling as justifications for making network externalities in the tied good as a "plus factor" in determining that a tie is illegal. First, as a matter of pure logic, laying out a set of stylized assumptions under which tying is anticompetitive cannot

¹⁵² Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 AM. ECON. REV. 424 (1985).

possibly justify conclusions about the probability of observing such occurrences. Judging by academic interest in the topic, it appears that many economists find compelling the hypothesis that markets can gravitate to the wrong standard. One must consider, however, that the most commonly cited example of the wrong standard prevailing is the QWERTY standard for typewriter keyboards.¹⁵³ The example continues to be cited even though 1) it makes no logical sense,¹⁵⁴ and 2) there was never any evidence that QWERTY was worse than a competing standard.¹⁵⁵ Even if the QWERTY example were a case of the choice of an inefficient standard, the lack of a more recent example casts considerable doubt on the empirical importance of the theoretical possibility that markets adopt the wrong standard. Moreover, several examples in which new standards supplanted old ones¹⁵⁶ suggest that such mistakes, if they indeed occur, are not necessarily permanent.

Moreover, even if one could establish a significant probability of anticompetitive tying in the presence of network externalities, one would need to consider the probability of error due to legal hostility toward tying under such circumstances. The probability of error would be amplified by the incentives competitors would have to bring a legal

¹⁵³ See Paul A. David, *Clio and the Economics of QWERTY*, 75 AM. ECON. REV. 332 (1985).

¹⁵⁴ The explanation typically given is that once typewriters with the QWERTY standard came into existence, all typists learned the QWERTY system. With all typists trained on QWERTY, typewriter manufacturers only produced QWERTY typewriters. The training of typists and the production of machines was mutually reinforcing, and no individual could break the standard. That is, of course, until people started typing almost exclusively on computers where a keyboard could easily be programmed to any more efficient standard. Arguably, the evidence against the QWERTY myth began to mount with the introduction of the IBM Selectric, which had detachable, relatively inexpensive "track balls" that could be made to different standards.

¹⁵⁵ See S. J. Liebowitz & Stephen E. Margolis, *The Fable of the Keys*, 33 J.L. & ECON. 1 (1990); S. J. Liebowitz & Stephen E. Margolis, *Network Externality: An Uncommon Tragedy*, 8 J. ECON. PERSP. 133 (1994).

¹⁵⁶ For example, compact disks completely replaced records, and 3.5" diskettes completely replaced 5 1/4" diskettes.

challenge. Would such hostility increase the risk of incorrectly rejecting the offering of the firm that produces the complementary product?

In the Carlton-Waldman model of complementary products, a "virtual tie" through pricing is as effective as an actual tie.¹⁵⁷ That is, the widget producer can sell widgets and gadgets separately but charge a high price for the former but not the latter.¹⁵⁸ Since every consumer needs the primary good (widget), the widget producer creates a virtual tie by raising the price of the widget and reducing the price of the gadget to a level that makes it impossible for a competing gadget producer to enter and make a profit. However, a legal doctrine that attempts to prohibit virtual ties necessarily would entail restrictions on the pricing of one firm in the market but not the other. The possibility of sanctioning virtual ties as well as actual ties necessarily increases the risk of false convictions, since it would be difficult as a general matter to determine whether a seller set his prices in order to compete effectively or to harm competition.¹⁵⁹

The fundamental dilemma of all leveraging policy relating to complementary goods is that it applies asymmetrically to one firm. Moreover, there are compelling arguments why it is in society's interest to have that particular firm prevail. If widgets and gadgets are complementary and both are going to be monopolized, then consumers are generally better off if a single firm has the monopoly over both.

¹⁵⁷ Carlton & Waldman, *supra* note 128, at 17-18.

¹⁵⁸ Since every consumer needs the primary good (widget), the widget producer can create a virtual tie by raising the price of the widget and reducing the price of the gadget to a level that makes it impossible for a competing gadget producer to enter and make a profit.

¹⁵⁹ Admittedly, the choice here is between false acquittals and false convictions. A policy that exempts virtual ties while restricting actual ties encourages firms to substitute the former for the latter and generates false acquittals. However, a policy that restricts virtual ties necessarily generates false convictions, for reasons given in the text. Moreover, legal rules that restrict price-cutting must be considered especially costly, since they work against the fundamental policy of the antitrust laws. Any legal rule governing tying should be capable of handling instances of actual and virtual tying with low error costs.

To be sure, there is a counterargument, which is that complementary monopolists are the most likely entrants into each other's markets and therefore act as competitive constraints. The basis for the claim is sometimes based on capability. That is, by virtue of operating in the related gadget market, a firm will have knowledge and other assets that make entry into widgets easier. Because the same logic would seem to justify protecting an inefficient widget producer, this rationale gets perilously close to being a justification of protecting competitors for the sake of protecting competition. A widget producer that is currently inefficient often has a better chance of overtaking the leader than a new entrant. At other times, the argument is based on incentives. A gadget monopolist's margin in the gadget market gives it an extra incentive to enter the widget market in order to bring widget prices down and stimulate demand for the gadget. This argument turns a problem, excessive prices in each market, into a virtue, an incentive to bring them down. As a theoretical matter, one might be able to defend this proposition in at least some cases. As a practical matter, it is unlikely that economics can provide clear guidelines to delineate when high prices are to be preferred to low ones. Thus, a coherent legal doctrine has to be based on the presumption either that lower prices are on balance preferable to higher prices or the reverse. Put this way, we believe most courts and economists would say that lower prices are to be preferred.

3. Technologically advancing versus stable markets

There is a longstanding issue about the relative role of antitrust in stable as opposed technologically advancing markets.¹⁶⁰ The view that has probably predominated

¹⁶⁰ For one economic perspective on this view, see Richard A. Posner, *Antitrust in the New Economy*, University of Chicago Working Paper, available in the SSRN Electronic Paper Collection: http://papers.ssrn.com/paper.taf?abstract_id=249316.

historically is that antitrust is better suited to deal with stable markets than technologically advancing markets. Within the context of decision theory, there are three parts to the argument. The first is that the maintenance of market power is harder in the presence of opportunities for technological advance. Thus, the cost of false acquittals is less. The second is that short run market power is a necessary cost of generating technical change, and there is a concern that antitrust enforcement focuses too narrowly at eliminating short run market power. Third, technologically advancing markets may be harder for courts to understand so that the risk of incorrect decisions is greater.

Again, there is a dissenting view. One might argue that it is precisely when a firm with market power faces the threat of being replaced by a superior competitor that it has an incentive to use anticompetitive means to thwart its rivals. Even if the positive part of the argument is true, however, the policy implications are not clear. A firm with market power that faces threats to its market has a strong incentive to use all means, competitive and anticompetitive, that it has available. Thus, the fundamental policy dilemma of distinguishing competitive from anticompetitive actions applies in technologically advancing markets. Appropriate policies turn on the relative probabilities and costs of false convictions and false acquittals. Many of the arguments about the role of technological advance imply that the stakes are higher, but doubling the cost of both types of possible mistakes does not justify a tilt toward stricter (or less strict) enforcement policies.

4. Assessment

We conclude that each of the four tied-market conditions considered in this section, and emphasized by the post-Chicago literature, -- entry barriers, complementary

goods, network effects, and technologically advancing markets – would be insufficient to justify a per se prohibition even if coupled with the existing requirements for the per se rule. Given the potential benefits of tying, none of these conditions raises the threat of anticompetitive harm to a level that would justify the adoption of a per se prohibition. It follows that the post-Chicago literature has at best provided arguments for applying a rule-of-reason analysis, provided that the plaintiff can pass the threshold requirements of proving that the tie-in involves separate products, market power in the tying good, substantial foreclosure in the tied good, and entry barriers in the tied good market.

Further, in light of the frequency with which beneficial tying probably occurs, a rule-of-reason analysis should be conducted in a manner that puts a high burden of proof on the plaintiff. The reason for this is that false conviction costs are likely to be high, relative to false acquittal costs, in a setting in which the challenged conduct has many procompetitive uses. In order to minimize overall error costs, the proof standard should require the plaintiff to present evidence excluding the possibility that the tie-in could serve beneficial or pro-consumer purposes. In particular, the plaintiff should be required to show that tying is profitable to the defendant only if it has an exclusionary effect, and that the cost of tying to the defendant is likely to be recouped through its exclusionary impact.¹⁶¹

¹⁶¹ This approach is consistent with the vertical-restraints test proposed by Janusz Ordovery and Robert Willing. See Janusz A. Ordovery & Robert D. Willing, *Access and Bundling in High-Technology Markets, in COMPETITION, INNOVATION, AND THE MICROSOFT MONOPOLY: ANTITRUST IN THE DIGITAL MARKET PLACE* (Jeffrey A. Eisenach & Thomas M. Lenard eds., 1999). We should note that this standard also has the substantial virtue of being equally applicable to cases of “virtual tying” through pricing (see *supra* Part IV.B.2), since it is a generalization of the *Brooke Group* predatory pricing standard.

V. Some Implications for Law: Tying Standards and Technological Integration

The post-Chicago literature has not had a big impact on the Supreme Court's tying case law. Except for *Eastman Kodak*, all of the important tying decisions – *IBM*, *International Salt*, *Northern Pacific*, *Fortner II*, *Jefferson Parish* – are consistent with and reasoned within the classical framework. Moreover, *Eastman Kodak* serves to some extent as an illustration of the post-Chicago school's tenuous influence to date. The decision itself is based largely on information cost arguments rather than the more rigorously developed entry deterrence theory. Moreover, lower courts have severely limited *Eastman Kodak* by holding that a tie between original equipment and derivative after-markets can be deemed unlawful, when the original equipment market is competitive, only if the tie-in is the result of a change in the seller's marketing policy.¹⁶²

The classical framework has given us the per se test announced in *Northern Pacific*, a standard that is difficult to justify on decision theoretic grounds. However, the classical model has also given us two substantial areas in which there is a presumption of legality. One follows from the market power requirement: if the seller does not have market power in the tying good, his tie-in is unlikely to violate the law. The other regards technological integration: the prevailing standard effectively immunizes the seller who integrates two products unless the integration produces no significant technological benefits.¹⁶³

Though we think such a view would be incorrect, the post-Chicago literature

¹⁶² See *Metzler*, 19 F. Supp.2d.

¹⁶³ See *Leasco*, 537 F.2d.

might be viewed as providing a set of potential arguments for extending the per se illegality rule – or more generally, the presumption of anticompetitive harm – outside of the classical legal framework. Two potential extensions of the per se rule are obvious: (1) instances where the seller lacks market power in the tying good or (2) instances of technological integration. *Eastman Kodak* and its aftermath in the case law can be viewed as the first type of innovation. The Court’s decision in *Eastman Kodak* has the effect of extending the per se rule to a limited set of instances in which the seller lacks market power in the relevant market. Lower courts have made that set of instances even narrower than indicated by the Court’s language in *Eastman Kodak*.

The other possible extension of the presumption of anticompetitive harm would apply it to instances of technological integration. This innovation has also occurred, though it has not reached the level of the Supreme Court or even the federal appellate courts. In *Microsoft III*, Judge Jackson held that the seller who integrates two products must prove that the consumer benefits outweigh the alleged competitive harms. In *Caldera* the court held that the seller must provide credible evidence of the existence of significant technological benefits resulting from the integration of two products. To grasp the importance of these extensions of tying law to technological integration, one should consider the prevailing standards. With respect to product integration, the prevailing standard of *Leasco* requires the plaintiff to show that the defendant’s sole purpose behind the integration was to hamper competition rather than provide additional utility to consumers. The standard of proof question had been addressed by the D.C.Circuit in *Microsoft II*, which said that the defendant satisfies his burden under *Leasco* by providing a “plausible claim” of additional utility.

We now have a conflict between both substantive and procedural standards regarding technological integration. The opposing substantive standards are represented by *Leasco* and *Microsoft III*, where *Leasco* requires proof of specific intent to harm while *Microsoft III* requires proof of something analogous to negligence or unreasonable conduct. The opposing procedural standards are represented by *Caldera* and *Microsoft II*, where *Caldera* requires credible evidence of significant additional utility, while *Microsoft II* requires only a prima facie case.

A. The optimal legal standard for integration

To simplify the comparison of legal standards, suppose we are comparing two, a strict one and a lax one. For example, the strict standard could be *Caldera* and the lax standard could be *Microsoft II*. Or the strict standard could be the combination of *Caldera* and *Microsoft III*, while the lax standard could be the combination of *Microsoft II* and *Leasco*. The existence of separate substantive and procedural tests suggests four potential combinations of substantive and procedural standards that courts could apply. However, for our purposes now, it is enough to consider only extremes. We know that the relevant choice is between subjecting product integration and contractual tying to the same doctrines, or remaining with the current regime that creates a pocket of virtual per se legality for product integration. Is this difference in standards defensible?

Under the decision-theoretic approach, the choice between strict and lax standards is determined by three factors. The first is the base-rate probability that product integration is benign, or not anticompetitive. The second factor is the ratio of the cost of a false conviction to the cost of a false acquittal. An assumption that the ratio is higher in

the case of technological tying would be justified if the benefits of technological tying were typically greater than the benefits (reduced transaction costs or greater convenience) due to contractual tying. In this case, false conviction costs would be relatively high in the case of technological integration, other things being equal. Alternatively, the ratio of false conviction to false acquittal costs may be relatively high because the costs of false acquittals are relatively low in the case of technological integration. This assumption would be justifiable if in markets where integration is common, such as software, the market positions of dominant firms were especially vulnerable to the innovative efforts of rivals. The third factor determining the choice between strict and lax standards is relative probabilities of false convictions and false acquittals. We do not mean to suggest that this information is objectively observable. Rather, a choice of one legal standard over another rests on implicit assumptions about these values.

Consider the first factor: the base-rate probability of harm. Is there a good reason to believe that the base-rate probability of anticompetitive harm is larger in the case of technological integration than in the case of contractual tying? We do not believe so. Whether the seller ties two goods contractually or technologically, the foreclosure effect on rival sellers should be the same. Moreover, the case of technological integration may have weaker foreclosure effects, given that some of these instances involve integration that does not foreclose rival sellers – as observed in *Innovation Data Processing* and in *Microsoft III*.

Indeed, there are good reasons to believe that the base-rate probability of anticompetitive harm is lower for technological integration than for contractual tying. The technological integrator incurs a substantial sunk cost in setting up a specialized

production process for the integrated product. The integrator incurs a relatively large opportunity cost as well. Technological integration is difficult to reverse, relative to contractual tying. In addition, the seller's decision to integrate two products, A and B, makes it more difficult for the consumer to reverse the decision by combining A with another good C.¹⁶⁴ In other words, technological integration entails sunk, irreversibility, and consumer-utility costs that are generally larger than those associated with contractual tying. The risks are larger for the technological integrator, and the market is likely to impose relatively severe penalties for mistakes – in comparison to contractual tying.

Consider the second factor: the relative ratios of false convictions and false acquittal costs. We noted that it would be justifiable to assume that the ratio is larger for technological tying if the benefits from technological integration were typically greater than the benefits from contractual tying. Since technological integration will typically involve goods that are functional complements, in the sense that they are often used together, this seems plausible. Consider pencils and erasers, cameras and lenses, cars and engines, or computers and monitors. Although this is a biased sample because these are technological bundles that have survived in the market, there is a plausible argument in each case that the benefits of integration exceed the benefits of a contractual tie.

At the risk of belaboring the point, take the case of pencils and erasers, probably the simplest integrated product commonly used at work. The integrated product obviously offers benefits that are not provided by the contractual tie of a pencil and an eraser. The connected eraser does not reduce the utility of the pencil, and it provides

¹⁶⁴ Of course, this is not true in every case. As we noted in our discussion of *Microsoft III* (see *supra* Part II.A.4), a seller's decision to integrate a browser with an operating system may facilitate the consumer's decision to use another firm's browser – by making it easy for the consumer to use the web to download an alternative browser.

certainty that the most important functional complement to the pencil will always be there. This example suggests that even the most trivial cases of integration, bordering on a mere “pasting together,” can provide substantial benefits beyond the contractual tie.¹⁶⁵

Lastly, consider the probabilities of false convictions and false acquittals. As we have noted, applying a strict legal standard to technological integration could mean a number of things, depending on whether the court adopts the proof standard of *Caldera* or that of *Microsoft II*. However, any strict standard presumably would entail, relative to a lax standard, a more searching inquiry by the court into whether the seller’s intent was to harm competition or to generate additional utility for consumers. In the case of technological integration, this is a tougher question to resolve because it would require courts to examine product design decisions. Whether courts could carry out this function well is beside the point. However accurate courts might be in this area, they are likely to make more errors when examining design questions than when they examine contractual tying decisions. The reason for this is that in determining whether a producer’s integration decision reasonably could have been expected to generate substantial additional utility to consumers, a court would have to reexamine the issues considered by product engineers, issues that are ordinarily outside of the expertise of judges. Moreover, the administrative burden of decision-making should be substantially higher in the case in which courts review technological integration decisions.

The different standards applied to contractual and technological tying seem to be

¹⁶⁵ The integrated pencil-eraser example also carries an important lesson for the legal standard governing technological integration. Any test that removes immunity for instances of mere “bolting together” should do so only when the bolting provides no significant benefits beyond what a consumer could gain on his own by purchasing the two goods on the market and pasting them together. In other words, the *Leasco* standard (see *supra* Part II.A.3) should be applied not with a view to the ease with which the goods can be integrated, but with a view toward the benefits consumers derive.

justifiable on error cost grounds. Of course, we do not have enough information to be certain of this, because we cannot observe the relevant costs and probabilities. However, the different tests the courts have settled on appear consistent with plausible a priori judgments regarding base-rate probabilities, error rates, and error costs.

One might argue that a differential standard is justifiable but that courts have gone too far. Perhaps the virtual per se legality standard that results when *Leasco* is combined with *Microsoft II* gives the technological integrator more freedom than the law should allow. But there is no reason to believe that any of the stricter standards available could be applied without generating significant false conviction costs. Consider the balancing test of *Microsoft III*. The seller's ex ante judgment regarding prospective consumer benefits may turn out to be incorrect ex post. In many of these cases, the product will not survive in the market. However, in the cases where it does survive, the seller faces the risk under *Microsoft III* that a court will later determine that the consumer benefits were insufficient to outweigh competitive harms to rivals.¹⁶⁶ Facing this risk, many firms contemplating the integration of two products will do so only when they can be almost certain that a court would not later find that the additional utility was insufficient. This is bound to deter product integration efforts, an important form of innovation.

One could impose a requirement that the plaintiff prove a net harm to consumers in order to minimize the risk that the test of *Microsoft III* would punish firms whose integration decisions enhanced consumer welfare. In theory, this could reduce the risk of error in the application of a balancing test by forcing the plaintiff to bring in concrete evidence that the typical consumer was made worse off by the seller's actions. However,

¹⁶⁶ As a concrete example of this danger, return to the *Caldera* case (*see supra* Part II.A.4.b). In refusing to grant summary judgment, the court relied heavily on claims that the integration was technologically easy;

the problem with any test that focuses on the end state of the competitive process is that it risks punishing some firms for misjudging the market. And in the presence of error in the application of such a test, it introduces the additional risk of punishing some firms that did not misjudge the market. If one accepts the premise that the underlying activities – technological innovation, the opening of new markets, the introduction of new products – are socially desirable, and perhaps fundamental to the competitive process, the costs of discouraging such activity would appear to be unacceptably high.

It does not advance the case for a strict standard to say that courts already examine product design decisions under product liability law. First, there may, for all we know, be too many false convictions in the product liability context,¹⁶⁷ and if this is the case there is no reason to transfer the same process to the antitrust arena. Second, and more important, there are several substantial differences between the product liability and antitrust contexts that make it inappropriate to think that whatever courts do in one setting they can do in the other. In the product liability setting, courts typically refuse to engage in risk-utility analysis when the risk characteristics are so obvious that the product meets “consumer expectations.”¹⁶⁸ There is no analogous safe harbor in the antitrust setting. In addition, excluding latent-risk cases like asbestos or silicone implants, the risks considered in the product liability context are often fairly obvious, as in the case of lawnmower with an exposed blade. The potential competitive risks (e.g., entry deterrence) in antitrust, however, are relatively uncertain and highly contingent on the way rivals and consumers react. In light of the thicker blanket of uncertainty in the

Caldera, 72 F. Supp.2d at 1324; rather than focusing on the benefits the integration provided to consumers.

¹⁶⁷ PAUL RUBIN, TORT REFORM BY CONTRACT 62- 63 (1993).

¹⁶⁸ See, e.g., PROSSER & KEETON ON THE LAW OF TORTS §99 at 698-99 (W. Page Keeton, Dan B. Dobbs,

antitrust context, a competitive risk-utility test could easily create significantly larger innovation disincentives than we observe in the product liability setting.

One could concede to all of the doubts concerning the balancing test of *Microsoft III* and still argue that the appropriate *proof standard* should be that of *Caldera*, which is quite strict in comparison to *Microsoft II*. But this returns us to the same problems pretty quickly. A requirement that the seller of an integrated product provide credible evidence of substantial consumer benefits could be quite difficult to meet if a court chooses to make it so. The most direct way of meeting this test would be to show that the benefits clearly outweigh the harms associated with any competitive barriers created by the integration. Since this direct method is equivalent to meeting the balancing standard of *Microsoft III*, the *Caldera* test does not clearly reduce the risk of false convictions relative to the *Microsoft III* test. Moreover, since the *Caldera* test refers to a significant technological improvement, there is a risk that false conviction costs will be larger under it than under the *Microsoft III* test. By shifting the inquiry from the consumer benefits of integration (relative to what consumers could do on their own) to the quality of technological improvement, the *Caldera* test thrusts courts into product design analysis and threatens liability on integration decisions that could be considered obvious on the basis of hindsight.

To be sure, a serious evaluation of the error probabilities and costs associated with alternative legal standards requires information that is not at hand. We can make some progress in this respect through empirical research. However, in the end, the underlying values may be unobservable, and we may have to make inferences. At this stage, without

Robert E. Keeton & David G. Owen eds., St. Paul: West Pub., 5th ed. 1984).

the aid of empirical evidence, we will have to make inferences based on a mixture of assumptions and analysis of the incentives created by legal rules. On this basis the prevailing lax legal regime for product integration decisions seems to be pretty easily justifiable.

B. The substitution critique

Lessig has argued that particularly in the case of computer software, different standards for contractual and technological tying will distort product design decisions.¹⁶⁹ If the standards are different, a company that would prefer to do contractual tying to exclude competitors might choose product integration instead in order to be on more solid legal ground. Under such circumstances, not only does an objectionable form of tying escape legal sanction, but there is an additional cost to society. The seller's preference for contractual tying likely reflects the judgment that putting the tied products in the same box is cheaper than integrating them technologically. If so, then even though the best outcome is not to have tying at all (again, on the assumption that the seller's use of tying to harm competition), contractual tying is a better outcome than technological tying.

To evaluate Lessig's "substitution critique," we first lay out the decision theoretic assumptions under which product integration and contractual tying should be treated differently. We initially assume that a firm has only one natural tying strategy (i.e., contractual or technological) so that choosing one based on the difference in legal standards is not an issue.

As described above, the decision-theoretic approach entails evaluating each rule

¹⁶⁹ See *Microsoft III*, 97 F. Supp. 2d, Brief of Professor Lawrence Lessig as *Amicus Curiae* (filed February 1, 2000).

based on a weighted error rate, with weights reflecting the relative costs of different classes of error. To implement this analysis, one selects a benchmark type of error. In what follows, we let a false conviction be the benchmark and use the notation $C()$ to indicate the cost of other errors relative to a false conviction. Thus, if "A" stands for a false acquittal, then $C(A) = 3$ means a false acquittal is as costly as three false convictions.¹⁷⁰

Each rule has a weighted error rate for each class of tying. Let $w(i,j)$ be the weighted error rate of applying rule i to class j , where $i = s$ indicates a strict legal standard, $i = \ell$ indicates a lax legal standard, $j = b$ indicates contractual tying, and $j = t$ indicates technological tying. For example, $w(\ell,t)$ indicates the weighted error rate from applying a lax standard to technological tying.

As described in Section III.A, one of the key insights of decision theory is that the fraction of cases that are harmful is a relevant consideration in formulating the legal rule. Thus, let $H(j)$ be the percentage of all cases of tying in class j that are harmful. In addition, we need to know the error rates associated with each type of rule. Let $FC(i)$ and $FA(i)$ be the rates of false convictions and false acquittals for rule i . As we define the terms here, the error rates are conditional probabilities. For example, $FC(s)$ is the percentage of benign cases for which the strict standard generates false convictions; and $FA(s)$ is the percentage of harmful cases for which the strict standard generates false acquittals.

Table 1 summarizes the variables and the notation and provides an assumed value

¹⁷⁰ The choice of benchmark is simply a matter of labeling and does not have any substantive implications. The conclusions are the same when we view a false acquittal as being three times as costly as a false conviction as when we view a false conviction as being one third as costly as a false acquittal.

for each variable. In order to assess the Lessig critique, one must begin with values under which it would be optimal to have different standards for different classes of tying assuming that sellers could not substitute technological for contractual tying. These values have that feature.

Table 1

| Nature of Information | Notation | Hypothesized Value |
|--|--------------|--------------------|
| % of technological ties that are harmful | H(t) | 1% |
| % of contractual ties that are harmful | H(b) | 5% |
| Strict standard probability illegal given benign | FC(s) | 1% |
| Strict standard probability legal given harmful | FA(s) | 0% |
| Lax standard probability illegal given benign | FC(ℓ) | 0% |
| Lax standard probability legal given harmful | FA(ℓ) | 20% |
| Ratio of cost of false acquittal to false conviction | C(A) | 3 |

Given these values, we can compute the weighted error rates for each standard and rule. For the strict standard for contractual tying, the weighted error rate is:¹⁷¹ $w(s,b)$
 $= 95\% \times 1\% + 5\% \times 0\% \times 3 = 0.95\%$

For the lax standard for contractual tying, the weighted error rate is:

$$w(\ell,b) = 95\% \times 0\% + 5\% \times 20\% \times 3 = 3.00\%$$

The strict standard is therefore better for contractual tying.

For the strict standard for technological tying, the weighted error rate is:

$$w(s,t) = 99\% \times 1\% + 1\% \times 0\% \times 3 = 0.99\%$$

For the lax standard for technological tying, the weighted error rate is:

$$w(\ell,t) = 99\% \times 0\% + 1\% \times 20\% \times 3 = 0.60\%$$

The lax standard is therefore better for technological tying.

While there is no reason to believe that these particular assumptions are realistic,

¹⁷¹ The general formula is: $w(i,j) = [1-H(j)] FC(i) + H(j) FA(i) C(A)$.

they do make clear the types of implicit assumptions that justify a different standard for technological and contractual tying. In this particular set of parameters, the difference entails the difference in the fraction of all cases that are benign. Although not embodied in this particular set of values, an alternative justification would be that $C(A)$, the ratio of the cost of a false acquittal to the cost of a false conviction is lower for technological tying. Such an assumption would be justified if the benefits from technological integration were typically greater than the benefits (reduced transactions cost or greater convenience) that can be due to contractual tying. The third possible justification would be that the rates of false convictions or false acquittals would be different for the two different types of tying.

With this example as a base case, we can now assess the implication of Lessig's argument that different standards for technological and contractual tying create a perverse incentive for firms that would normally use contractual tying to choose technological tying instead. Qualitatively, of course, the effect he focuses on is a real possibility. As with many of the other issues in this debate, however, the implications cannot be inferred from the qualitative point alone. The frequency of such switching and the costs of it when it occurs are essential inputs to the proper conclusions.

If all firms could substitute technological ties for illegal contractual ties, then it would be impossible to have a stricter standard for contractual ties than for technological ties. Of course, under such circumstances, a uniform lax standard for both might yield better results than a uniform strict standard. To analyze the preferred standard, define $W(i_b, i_t)$ to be the weighted over-all error rates where i_b is an index for the legal standard used for contractual tying and i_t is an index for the legal standard for technological

tying.¹⁷² Also, let T be the fraction of all instances of tying that are technological, and suppose that T = 90% of all instances of bundling are technological. The weighted overall error rate for the strict standard would then be:¹⁷³

$$W(s,s) = 10\% \times [95\% \times 1\% + 5\% \times 0\% \times 3] \\ + 90\% \times [99\% \times 1\% + 1\% \times 0\% \times 3] = 0.986\%$$

The weighted overall error rate for the lax standard would be:

$$W(\ell,\ell) = 10\% \times [95\% \times 0\% + 5\% \times 20\% \times 3] \\ + 90\% \times [99\% \times 0\% + 1\% \times 20\% \times 3] = 0.840\%$$

In reality, of course, it is not always possible (or worthwhile) to substitute technological tying for contractual tying. If only a fraction of firms that would like to use contractual ties would switch to technological ties in response to a difference in the legal standard, then it is feasible to have different standards. To extend our analysis to consider these cases, three more pieces of information are necessary. Naturally, one is the fraction of illegal contractual cases that would switch to technological tying under a mixed standard. Let M be the percentage of such cases. The other necessary pieces of information are the relative costs of the two additional classes of inefficient outcomes created by the possibility of switching. Both classes entail using technological rather than contractual tying simply to take advantage of the mixed legal standard.¹⁷⁴ The difference between them concerns whether the tie is inherently harmful. Let C(HS) be the cost (relative to a false conviction) of a harmful switch and C(BS) be the cost (again,

¹⁷² In contrast to $w(i,j)$, which is an error rate for a single class of tying (i.e., contractual or technological), $W(i_b, i_t)$ is an error rate for both classes of tying pooled together into one group.

¹⁷³ The general formula (assuming a uniform standard for the two classes of tying) is: $W(i_b, i_t) = (1-T)\{[1-H(b)] FC(i_b) + H(b) FA(i_b) C(A)\} + T\{[1-H(t)] FC(i_t) + H(t) FA(i_t) C(A)\}$

¹⁷⁴ That is, contractual tying would be used under a lax standard for contractual tying. Under a strict

relative to a false conviction) of a benign switch.¹⁷⁵

Table 2 is an extension of Table 1 that adds the information needed to evaluate the Lessig argument, the notation, and a set of hypothesized values.

Table 2

| Nature of Information | Notation | Hypothesized Value |
|--|--------------|--------------------|
| % of technological ties that are harmful | H(t) | 1% |
| % of contractual ties that are harmful | H(b) | 5% |
| Strict standard probability illegal given benign | FC(s) | 1% |
| Strict standard probability legal given harmful | FA(s) | 0% |
| Lax standard probability illegal given benign | FC(ℓ) | 0% |
| Lax standard probability legal given harmful | FA(ℓ) | 20% |
| Ratio of cost of false acquittal to false conviction | C(FA) | 3 |
| % of ties that are inherently technological | T | 90% |
| Cost of harmful switch under mixed standard | C(HS) | 4 |
| Cost of beneficial switch under mixed standard | C(BS) | 0.5 |
| % of illegal contractual ties that switch under mixed standard | M | 7.5% |

With these assumptions, the weighted over-all error rate with a strict standard for technological tying and a lax one for technological tying is:¹⁷⁶

$$W(s,\ell) = 10\% \times [95\% \times 1\% \times (92.5\% + 0.5 \times 7.5\%) + 5\% \times (0\% \times 3 + 7.5\% \times 4)] \\ + 90\% \times [99\% \times 0\% + 1\% \times 20\% \times 3] = 0.781\%$$

This weighted over-all error rate for the mixed standard is lower than the 0.84% derived

standard, however, the tie is illegal.

¹⁷⁵ A harmful switch is similar to a false acquittal. Absent the legal asymmetry, however, the seller would have an incentive to make the efficient choice between a contractual and a technological tie. A harmful switch is therefore worse than a false acquittal and we should expect $C(HS) > C(A)$. A beneficial switch is better than a false conviction because the benign tie is allowed to exist. It is nonetheless worse than keeping the tie contractual and making it legal. Since all costs are measured relative to a false conviction, $1 > C(FS) > 0$.

¹⁷⁶ The general formula is:

$$W(s,\ell) = (1-T) \{ [1-H(b)] FC(s) [(1-M) + M C(BS)] + H(b) \{ FA(s) C(A) + [1-FA(s)] M C(HS) \} \} + T \{ [1-H(t)] \times FC(\ell) + H(t) \times C(A) \times FA(\ell) \}.$$

above for the universal lax standard, which is in turn less than the 0.986% for the universal strict standard. Given these assumed parameter values, therefore, a strict standard for contractual tying and a lax standard for technological tying is optimal even though: 1) the discrepancy in the standard induces some cases of product integration simply to avoid the standard; and 2) the relative costs of such cases are quite high.

The above example does not prove that the optimal legal standard is strict for contractual tying and lax for technological tying.¹⁷⁷ It is easy to assume other values for the parameters in which the opportunity to switch makes it optimal to have a uniform standard even though a mixed standard would be best if switching were impossible. Nevertheless, the Lessig critique cannot stand as an entirely theoretical point. It is only valid to the extent that the effect underlying it is sufficiently important empirically to outweigh other considerations. Moreover, to the extent that the opportunity to switch from contractual to technological tying makes a uniform standard necessary, the appropriate uniform standard is not necessarily a strict one.

VI. Conclusion

In this article, we have reviewed both legal doctrine toward tying and the development of the academic literature on tying doctrine from the Chicago critique of classical doctrine to post-Chicago revisionism. As we have argued, the post-Chicago critiques are more compelling as attacks on the logic of the Chicago school arguments than on the substance of tying doctrine as it exists.

¹⁷⁷ Indeed, our arguments in the earlier parts of the text can be interpreted as favoring a uniform “lax” standard. The new approach to contractual tying suggested in Part IV.B.4 would make the standards for contractual and technological tying roughly congruent. Both standards would effectively place a high burden of proof on plaintiffs.

Indeed, to the extent that the primary message of the Chicago critique is that existing doctrine is overly hostile to tying, the post-Chicago literature is arguably more in agreement with the Chicago school than seems to have been recognized. Even though we suspect that many post-Chicago school writers would not support *per se* legality of either technological or contractual tying, we reiterate that nothing in the literature justifies the current *per se* illegality of tying even under the sorts of tightly prescribed conditions that the courts have been seeking to articulate. All the post-Chicago literature has done is to establish that if one rules out any beneficial effects of tying, there are some conditions under which tying could theoretically be harmful to consumers. It has, in our view, justified focusing on complementary goods and restricting attention to those instances where market analysis suggests that the tied good is susceptible to market power. Within this broad class of cases, however, it has not identified a narrow set of assumptions in which tying is likely to be particularly harmful.

The broad class of cases identified by the post-Chicago literature – complementary goods, market power in the tying good, and the potential for market power in the tied good – creates a fundamental dilemma for tying policy. Given this set of conditions, the plausible market outcomes are complementary (or successive) monopoly and integrated monopoly. Since tying doctrine necessarily places limits on one (or possibly a small number) of firms in a market but not others, it risks creating a bias for complementary monopoly. To be sure, more complicated economic analysis suggests that the case for integrated monopoly is not as airtight as the simple analysis makes it appear. Still, in deciding legal doctrine toward tying, courts must judge whether these qualifications in the literature overturn the main thrust of the basic economics of

how complementarity affects incentives.

Indeed, more generally, the courts need to make a judgment about the relative frequencies of harmful tying under a lax legal standard on the one hand and the beneficial tying that will not occur under a stricter standard. In so doing, they should recognize that tying is so pervasive even in competitive markets that there is ample evidence that procompetitive tying is a common occurrence. This is particularly the case with technological tying, since technological tying often is synonymous with improving a product by adding features to it.