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TYING, BUNDLED DISCOUNTS, AND THE DEATH OF THE SINGLE MONOPOLY PROFIT THEORY

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Einer Elhauge*

Chicago School theorists have argued that tying cannot create anticompetitive effects because there is only a single monopoly profit. Some Harvard School theorists have argued that tying doctrine's quasi-per se rule is misguided because tying cannot create anticompetitive effects without foreclosing a substantial share of the tied market. This Article shows both positions are mistaken. Even without a substantial foreclosure share, tying by a firm with market power generally increases monopoly profits and harms consumer and total welfare, absent offsetting efficiencies. The quasi-per se rule is thus correct to require tying market power and a lack of offsetting efficiencies, but not a substantial tied foreclosure share. However, the quasi-per se rule should have an exception for products with a fixed ratio that lack separate utility, because those conditions generally negate anticompetitive effects absent a substantial foreclosure share. Cases meeting this exception should instead be governed by a traditional rule of reason that requires a substantial foreclosure share or effect.

Bundled discounts can produce the same anticompetitive effects as tying without substantial tied foreclosure, but only when the unbundled price exceeds the but-for price. Thus, when the unbundled price exceeds the but-for price, bundled discounts should be condemned based on market power absent offsetting efficiencies, with the same exception for products with a fixed ratio that lack separate utility. When the unbundled price does not exceed the but-for price or this exception applies, bundled discounts should be condemned only when a substantial foreclosure share or effect exists. Alternative tests for judging bundled discounts, such as comparing the effective price to cost, are not only underinclusive, but perversely exempt the bundled discounts with the worst anticompetitive effects.

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I. OVERVIEW

Tying law has for too long been in the thrall of the single monopoly profit theory. This theory helped talk generations of students and judges out of the usual intuition that tying can be anticompetitive. Using simple examples, like a monopolist in nuts who tied bolts to them, the theory showed that such tying could not increase any monopoly profits that the firm already earned in nuts, and thus suggested tying must reflect real efficiencies. Its analysis was powerful and influential, convincing many Chicago School theorists that tying should be *per se* legal. Even Harvard School theorists who were only half-convinced generally concluded that tying should be illegal only when a substantial foreclosure share was shown in the tied market. Both have been critical of Supreme Court precedent, which has repeatedly stuck to a quasi-*per se* rule that makes tying illegal based on tying market power unless the defendant can prove offsetting efficiencies, explicitly rejecting a traditional rule-of-reason approach that would require proving a substantial tied foreclosure share or effect. However, the critics have been confident that, because the Supreme Court has modified other antitrust doctrines to conform with sound antitrust economics, it will eventually come around to their view on tying and overrule the quasi-*per se* rule.

The Supreme Court should stick to its tying precedent because antitrust economics actually shows that the single monopoly profit theory is wrong in most cases. It is valid only when, as in the nuts and bolts example, five restrictive assumptions hold. (1) Buyers do not use varying amounts of the tied product with the tying product. (2) Buyer demand for the two products has a strong positive correlation. (3) Buyers do not use varying amounts of the tying product. (4) The competitiveness of the tied market is fixed. (5) The competitiveness of the tying market is fixed.

Relaxing those assumptions invalidates the theory. Indeed, as detailed below, each relaxation of an assumption reveals a distinctive way in which tying can increase monopoly profits. (1) *Intra-Product Price Discrimination*. If buyers use varying amounts of the tied product, tying can profitably allow price discrimination among buyers of the tying product. (2) *Inter-Product Price Discrimination*. Without strong positive demand correlation, tying can profitably permit price discrimination across buyers of both products. (3) *Extracting Individual Consumer Surplus*. If buyers purchase varying amounts of the tying product, tying can profitably extract consumer surplus from individual buyers. (4) *Increasing Tied*

Power. Without fixed tied market competitiveness, tying can impair tied rival competitiveness in ways that increase tied product prices and profits. (5) *Increasing Tying Power.* Without fixed tying market competitiveness, tying can increase the degree of tying market power. Because the last two effects require foreclosing a substantial share of the tied market, let's call them the "foreclosure share effects." Because the first three effects instead require only some existing tying market power, let's call them the "power effects."

Although each of these effects has been recognized before, their combined implication has not been: which is that single monopoly profits are the exception, not the rule. At least one of these five profit-increasing effects applies to the lion's share of ties by firms with market power. The single monopoly profit theory does not hold with or without a fixed ratio, with or without a strong positive demand correlation, and with or without substantial tied foreclosure. It takes a combination of a fixed ratio, a strong positive demand correlation, *and* a lack of substantial tied foreclosure for the single monopoly profit theory to hold. I will also show that all five effects generally harm consumer welfare, which is the governing antitrust standard, and usually harm total welfare, especially once one considers the ex ante costs of obtaining market power.

Supreme Court caselaw explicitly holds that the three power effects are anticompetitive. Given that premise, its current quasi-per se rule has the elements precisely right because the three power effects require tying market power, but not a substantial tied foreclosure share. Critics thus ultimately must rely on a claim that the Supreme Court has been wrong to hold that these three power effects are anticompetitive. They partly argue that banning ties just makes firms use less efficient forms of direct price discrimination. But direct price discrimination is often not feasible, and when feasible would usually be more efficient. More fundamentally, they argue that imperfect intra-product price discrimination has ambiguous effects on consumer welfare, but usually increases total welfare given that perfect price discrimination does. But this welfare claim fails for four independent reasons. (1) Their arguments do not apply to the two other power effects. (2) Imperfect intra-product price discrimination actually reduces ex post total welfare, absent an output-increasing efficiency. There is thus no reason to think it usually increases ex post total welfare in cases prohibited by the quasi-per se rule, which does not condemn ties if the defendant proves an offsetting efficiency. (3) Their analogy to perfect discrimination means that imperfect price discrimination likely decreases consumer welfare, which is the actual antitrust

standard. (4) Even when tying increases ex post total welfare, it usually reduces overall total welfare because competition to obtain market power positions will incur ex ante costs that dissipate any increased monopoly profits. Thus, negative consumer welfare effects actually provide a better indicator of overall total welfare effects because any additional monopoly profits largely wash out ex ante. Accordingly, even if total welfare is the right standard, that standard ironically supports focusing on consumer welfare rather than ex post total welfare, and thus justifies the quasi-per se rule even when tying increases ex post total welfare because it usually reduces ex post consumer welfare.

These are contestable policy issues, but Supreme Court caselaw resolves them in favor of concluding that these three power effects are anticompetitive. However, a quasi-per se rule that bases liability on tying power should apply only when the assumptions necessary for the three power effects hold. When the products are used in a fixed ratio, buyers cannot use varying amounts of the tied or tying products, which knocks out the possibility of intra-product price discrimination or individual consumer surplus extraction. When the products cannot be used separately, that generally indicates a strong positive demand correlation that knocks out inter-product price discrimination. Thus, the quasi-per se rule should not apply to cases involving products that both (1) have a fixed ratio and (2) lack separate utility. Instead, such cases should be governed by a traditional rule-of-reason approach that requires proof of a substantial tied foreclosure share or effect. As I will show, this exception helps explain why the factual premises of certain justices led them to be skeptical of the tying claims in *Jefferson Parish* and *Kodak*. It also explains the *Microsoft* holding that substantial tied foreclosure had to be shown for the tying claim there. My recommended exception differs from deeming products meeting these two conditions to be a single product, because finding a single product can also oust rule-of-reason review. My exception also differs from an exception for technological tying, whose fit with the two relevant conditions is both overinclusive and underinclusive. Understanding the effects that animate tying doctrine also, I will demonstrate, clarifies various issues about damages, market definition, foreclosure, and antitrust injury in tying cases.

Bundled discounts have the same power effects as tying when the unbundled price exceeds the but-for price for the product over which the firm has market power. The terminology bundled “discounts” is actually misleading in these situations because it wrongly implies there is a true discount from the but-for price (i.e., the price that would have been charged “but for” the bundling). Instead, a bundled

“discount” just means there is a price difference between what is charged buyers who comply with the bundling condition and those who do not. If the unbundled price exceeds the but-for level, then the price difference we call a “discount” is really a penalty imposed on buyers who refuse the bundle.

Whether or not the unbundled price exceeds the but-for price, bundled discounts can have the same foreclosure share effects as tying when a substantial market share is foreclosed. Bundled loyalty discounts can also produce an anticompetitive effect that tying doesn’t produce – affirmatively discouraging discounting even when rival efficiency is not impaired – though this effect generally also requires proof of a substantial foreclosure share.

Thus, when the unbundled price exceeds the but-for price, bundled discounts should be treated like ties, which means they should be condemned based on market power absent offsetting efficiencies, with the same exception for products with a fixed ratio that lack separate utility. When the unbundled price does not exceed the but-for price or this exception applies, bundled discounts should be condemned only if a substantial foreclosure share or effect is proven. I show below that this test is preferable to alternative tests that are based on whether (1) the bundled or effective price exceeds cost, (2) a high proportion of buyers accept the bundle, or (3) the unbundled price exceeds the pre-bundle price.

II. THE DEATH OF THE SINGLE MONOPOLY PROFIT THEORY

The single monopoly profit theory holds that a firm with a monopoly in one product cannot increase its monopoly profits by using tying to leverage itself into a second monopoly in another product.¹ Suppose nuts and bolts each have a cost and competitive price of 10 cents, and that a monopolist in both would charge 40 cents for a nut-bolt set to earn profits of 20 cents a set. Then with a competitive bolts market charging 10 cents, a nuts monopolist would charge 30 cents for nuts to arrive at 40 cents for the nut-bolt set, earning the same profits of 20 cents. The

¹ See ROBERT BORK, *THE ANTITRUST PARADOX* 372-375, 380-381 (1978); RICHARD A. POSNER & FRANK H. EASTERBROOK, *ANTITRUST* 802-803 (2d ed. 1981); RICHARD POSNER, *ANTITRUST LAW: AN ECONOMIC PERSPECTIVE* 198-199 (2d ed. 2001); Ward S. Bowman, Jr., *Tying Arrangements and the Leverage Problem*, 67 *YALE L.J.* 19, 20–23 (1957); Aaron Director & Edward H. Levi, *Law and the Future: Trade Regulation*, 51 *NW. U. L. REV.* 281, 290-92 (1956); Benjamin Klein, *Tying*, in 3 *THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW* 630, 630-631 (1998); Richard A. Posner, *The Chicago School of Antitrust Analysis*, 127 *U. PA. L. REV.* 925, 926 (1979).

nuts monopolist would thus earn no additional profits by using tying to monopolize both markets. Indeed, if a competitive market efficiently lowered bolts prices to 5 cents, the nuts monopolist would be happier, because then it could sell nuts for 35 cents and earn 25 cents a set.

Where it holds true, this single monopoly profit theory indicates that a firm would use tying only if there were some efficiency to doing so. It also suggests that a buyer would accept a tie only if the discount on the tying product was at least equal to the supracompetitive premium on the tied product, so the tie could not injure buyers. Thus, where the single monopoly profit theory holds, it implies the correct legal standard should be a rule of per se legality.

However, the model indicating a single monopoly profit depended on several key assumptions: (1) fixed usage of the tied product; (2) strong positive demand correlation; (3) fixed usage of the tying product; (4) fixed tied market competitiveness; and (5) fixed tying market competitiveness. As the economic literature shows, different results are reached if one relaxes these narrow assumptions. Indeed, each relaxation of one of these assumptions produces a distinctive profit-increasing effect.

Further, these effects are mutually reinforcing. In particular, the three power effects mean that tying can be profitable without a substantial tied foreclosure share. Thus, tying that does cause foreclosure share effects need not require (as is often assumed) any short-term sacrifice of profits nor any commitment to engage in unprofitable conduct to achieve those foreclosure share effects.

A. With Varying Usage of Tied Product, Tying Can Create Intra-Product Price Discrimination

As Professor Bowman first demonstrated, tying can profitably allow price discrimination among buyers of the tying product if the tied product is a complement that is used in varying amounts with the tying product.² Suppose a firm has market power over some capital product that is used with a consumable product: for example, printers that are used with ink cartridges. Suppose further that usage of the consumable varies for different buyers in a way that positively correlates to the value of the capital product to each buyer. For example, buyers who use more cartridges use their printers more often, and thus usually derive more

² Bowman, *supra* note , at 23-24, 33.

value from their printers. If so, the firm could lower the price for its printer to marginal cost, contingent on buyers taking all their cartridges from the seller, with the cartridge price set well above marginal cost. Then buyers who use more cartridges would pay more, allowing the firm to price discriminate among buyers of printers. Discriminating with ties may be more effective than direct price discrimination if the firm could not otherwise tell how much buyers likely value their printers or prevent low-value buyers who bought printers cheaply from reselling them to the high-value buyers. It could also be more feasible than metering usage if printer use is harder to monitor than cartridge purchases. If so, this form of tying would increase monopoly profits, even if it results in no significant foreclosure share in the cartridge market.

Although Professor Bowman's theory assumed the tied products were complements used with the tying product, the theory is equally applicable whenever tied product demand is positively correlated with tying product demand. Being complements is just one possible way to have positively correlated demand.³

Perfect price discrimination, which charges each buyer precisely how much each values the product, reduces consumer welfare compared to a uniform monopoly price, but increases ex post total welfare if one includes the welfare benefit to the seller of earning additional monopoly profits.⁴ However, tying can achieve only imperfect price discrimination by effectively charging different tying product buyers different prices that may come closer to buyer valuations but won't perfectly match them. Such imperfect price discrimination reduces both consumer and ex post total welfare, absent some output-increasing efficiency, because it reallocates some output to buyers who put less value on it.⁵ It also generally reduces both forms of welfare if, as with almost all actual ties, the buyers are intermediaries.⁶

³ For example, it might be the case that everyone finds Word and Excel more valuable together than separately, but that writers value Word much more than Excel, and number crunchers value Excel much more than Word. In that case, they would be complements with negatively correlated demand. I am indebted to Professor Nalebuff for this example.

⁴ At a uniform monopoly price, buyers who value the product above that price enjoy consumer surplus. Perfect price discrimination transfers all that consumer surplus to the seller and thus reduces consumer welfare. However, perfect price discrimination increases ex post total welfare because it eliminates all deadweight loss by producing all output that some buyer values above cost.

⁵ See *infra* IV.B.1.

⁶ *Id.*

B. Without Strong Positive Demand Correlation, Tying Can Create Inter-Product Price Discrimination

Tying can also profitably permit price discrimination across buyers of both products. This is true even if the products are used or bundled in a fixed ratio. Indeed, Professor Stigler first suggested this theory to explain the Supreme Court's decision in *Loew's*, which banned fixed bundles of movies.⁷ Although Professor Stigler assumed demand for the two products was negatively correlated, later work has shown the theory also applies when demand is positively correlated unless the correlation is strong.⁸ This theory does, however, require some degree of market power in both products.⁹

To illustrate, consider the following situation. A firm has market power in both products *A* and *B*, each of which has a constant marginal cost of \$0. There are 201 buyers whose reservation prices for *A* range from \$0 to \$200, as do their reservation prices for *B*. But their demands for *A* and *B* are negatively correlated, so that a buyer who values *A* at \$200 values *B* at \$0, and vice versa, and the sum of each buyer's valuation of *A* and *B* always equals \$200. Without bundling, the firm would maximize profits by pricing *A* and *B* each at \$100, and 101 buyers would buy each. The monopoly profits would be a total of \$20,200. All the buyers who value the products above the monopoly prices would get positive consumer surplus. For each product, the aggregate consumer surplus would be \$5,050, for a combined consumer surplus of \$10,100.

Now suppose the firm instead ties *A* and *B* by selling them only in a bundle for \$200. All 201 buyers would buy the bundle, and monopoly profits would increase to \$40,200. No buyer would enjoy any consumer surplus, so the tie reduces consumer welfare by \$10,100. In effect, the tie allows the firm to exploit the lack of strong positive demand correlation to price discriminate among buyers even when it doesn't know the individual buyer valuations and cannot prevent resales among them. Such tying can clearly both increase monopoly profits and harm consumer welfare.

⁷ See Stigler, *United States v. Loew's Inc.: A Note on Block Booking*, 1963 Sup.Ct.Rev. 152.

⁸ See Adams & Yellen, *Commodity Bundling and the Burden of Monopoly*, 90 Q.J. ECON. 475, 485 (1976); R. Preston McAfee et al., *Multiproduct Monopoly, Commodity Bundling, and Correlation of Values*, 104 Q.J. ECON. 371, 372-373, 377 (1989); Richard Schmalensee, *Gaussian Demand and Commodity Bundling*, 57 J. BUSINESS S211, S220 (1984). If the strength of demand relative to cost is high enough, then bundling can increase monopoly profits for anything other than a perfect positive correlation. *Id.* at S215, S220. For lower demand to cost ratios, strong but imperfect positive correlations may defeat this strategy.

⁹ See Richard Schmalensee, *Commodity Bundling by Single-Product Monopolies*, 25 J. L. ECON. 67, 67-69 (1982).

More generally, assuming a normal distribution of buyer valuations, tying always decreases consumer welfare absent perfect positive demand correlation.¹⁰ Such tying also decreases ex post total welfare if the strength of demand relative to cost is not high, but increases it otherwise.¹¹ The mixed efficiency effects result because such tying decreases efficiency by reallocating some output to buyers who value it less than those who would have gotten it without tying (and might even value one product at less than it costs to make) unless that allocation inefficiency is offset by an output-increasing efficiency.¹²

C. With Varying Usage of Tying Product, Tying Can Extract Individual Consumer Surplus

As Professor Burstein first pointed out, if buyers buy varying amounts of the tying product, tying can extract individual consumer surplus.¹³ The basic reason is that, even at a monopoly price for the tying product, each multi-unit buyer enjoys some consumer surplus because it values the last unit it purchases at the monopoly price and values the prior (or inframarginal) units at something more, given that any buyer rationally uses the first units to meet its greatest needs first. The difference between each buyer's valuation of those inframarginal units and the monopoly price will be the consumer surplus enjoyed by each buyer. A tying firm can expropriate that consumer surplus by allowing buyers to purchase the tying product at the monopoly price only if buyers agree to purchase their needs of some tied product at supracompetitive prices. Each buyer will accept the tie as long as the burden of paying supracompetitive prices on the tied product is less than the consumer surplus they would lose by being unable to buy the tying product at the monopoly price.

Suppose, for example, the buyers are all businesses that buy printers they use in the conduct of their businesses. Each business values the first printer at \$999, but values each subsequent printer \$1 less than the prior one because the convenience of having an additional printer diminishes the more printers it already has. The printers cost \$200 each to make. A monopolist in printers will thus maximize profits by charging \$600, and each buyer will buy 400 printers and enjoy a

¹⁰ Schmalensee, *supra* note , at S221-222, S229.

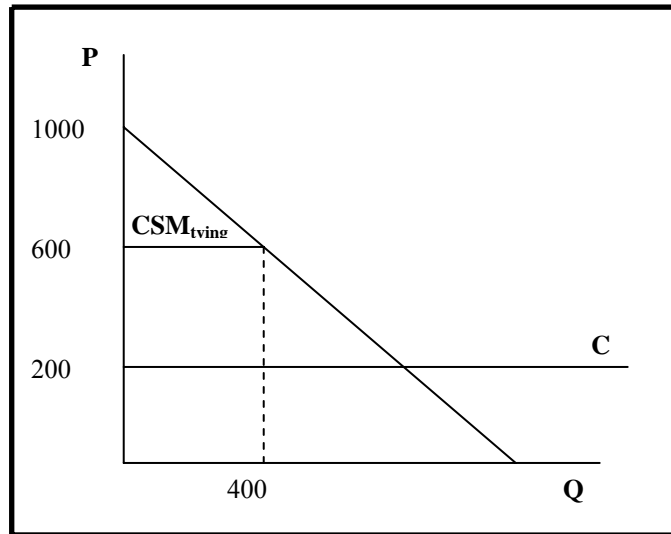
¹¹ *Id.* at S221-S222, S229.

¹² Adams & Yellen, *supra* note , at 482-483, 491-492.

¹³ See M.L. Burstein, *The Economics of Tie-In Sales*, 42 REVIEW OF ECONOMICS & STATISTICS 68, 68-69 (1960); M.L. Burstein, *A Theory of Full-Line Forcing*, 55 NORTHWESTERN LAW REVIEW 62, 73-91 (1960).

consumer surplus at the monopoly price (CSM_{tying} in Figure 1) of \$80,000.¹⁴ Trying to charge any higher price for printers would lower the monopolist's profits. Yet the monopolist is leaving money on the table because each buyer enjoys some consumer surplus at the monopoly price. Nor can the monopolist obtain this consumer surplus by price discriminating between buyers because all the buyers are the same.

Figure 1



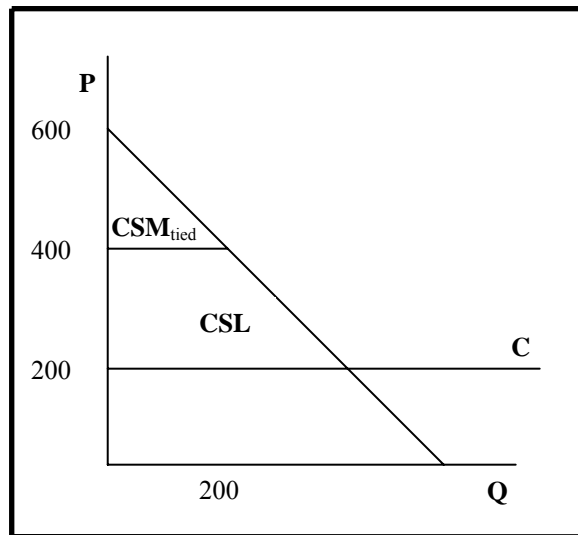
However, the printer monopolist can often extract this individual consumer surplus by refusing to sell its printers at the monopoly price to buyers unless they also agree to buy all their scanners from the printer monopolist at a monopoly price as well. To illustrate, take a case where each buyer values the first scanner it buys at \$599, values each subsequent scanner \$1 less, and scanners are sold in a competitive market at the \$200 they cost to make. The printer monopolist ties by refusing to sell its printers (even at the printer monopoly price) unless buyers agree to buy scanners from it at the scanner monopoly price of \$400, in which case each buyer would obtain \$20,000 in consumer surplus on scanners (CSM_{tied} in Figure 2).¹⁵ Assume the tied foreclosure share is not large enough to increase scanner prices. Thus, buyers who reject the tie pay \$200 for scanners, obtaining a

¹⁴ Each business's individual demand function is $Q = \$1000 - P$, where Q is quantity and P is price, and the marginal cost $C = \$200$. For any linear demand function $Q = A - P$ and a product with constant marginal cost C , the monopoly price will be $(A+C)/2$, resulting in a consumer surplus of $(A-C)^2/8$. Because $A = \$1000$ and $C = \$200$, we get the results noted in text.

¹⁵ For scanners, $A = \$600$ and $C = \$200$, so the monopoly price of $(A+C)/2 = \$400$ and the consumer surplus of $(A-C)^2/8 = \$20,000$.

consumer surplus of \$80,000 on scanners,¹⁶ so that accepting the tie results in a consumer surplus lost of \$60,000 on scanners (CSL in Figure 2). However, each buyer will accept the tie because the \$60,000 in scanner consumer surplus lost (CSL) is less than the \$80,000 consumer surplus they would lose (CSM_{tying}) by being unable to buy the tying product at its monopoly price. Tying here harms each buyer by \$60,000 because without the tie they would not lose the \$60,000 in scanner consumer surplus and would still get \$80,000 in printer consumer surplus at its monopoly price.

Figure 2



These results depend on buyers purchasing varying amounts of the tying product. Tying cannot extract individual consumer surplus if buyers purchase only one tying unit or if the products are used or tied in fixed ratios, because then buyers would experience any tied product price increase as an increase in the marginal price of buying the tying product.¹⁷ However, extracting individual consumer surplus does not necessitate a requirements tie that forbids buying the tied product from rivals, as Burstein seemed to suppose. A firm could achieve the same effect by requiring buyers to buy some fixed quantity of the tied product at a supracompetitive price (say 200 scanners at \$400) if they want to make purchases of the tying product at the monopoly price. Such a buyer would then be free to buy 200 more scanners from rivals at \$200 and thus would not have to purchase its

¹⁶ For any linear demand function $Q = A - P$ and a product with constant marginal cost C , the competitive price will be C resulting in a consumer surplus of $(A-C)^2/2$. Because here $A = \$600$ and $C = \$200$, this comes to \$80,000.

¹⁷ Mathewson & Winter, *Tying as a Response to Demand Uncertainty*, 28 RAND J. ECON. 566, 570 (1997).

requirements from the tying firm. But its consumer surplus would be extracted just the same. Indeed, it would be extracted more efficiently because it would not require the deadweight loss from being unable to buy 200 more scanners whose cost is lower than buyer value.

The relationship between prices with and without tying will depend on the relative magnitudes of the respective consumer surpluses. Take first cases where, as in my printer-scanner hypothetical, the sum of the consumer surpluses from buying both products at the monopoly price ($CSM_{\text{tying}} + CSM_{\text{tied}}$) exceeds the consumer surplus from buying only the tied product at competitive prices (CSC_{tied}). Then buyers would accept a requirements tie even if both products were priced at monopoly levels.¹⁸ The tying firm could not extract any more profit by trying to price the products above monopoly levels, so would choose monopoly prices for both products. In such cases, tying does not result in *any* discount on the tying product, but does elevate tied prices to monopoly levels. In short, such tying produces precisely the leveraging of one monopoly profit into two monopoly profits that the single monopoly profit theory said was impossible. And it does so without any need for substantial tied foreclosure share.

Assuming linear demand, consumer surplus for any product is four times greater at the competitive price than at the monopoly price.¹⁹ Thus, the condition $CSM_{\text{tying}} + CSM_{\text{tied}} > CSC_{\text{tied}}$ is the same as saying $CSM_{\text{tying}} + CSM_{\text{tied}} > 4CSM_{\text{tied}}$. Accordingly, this condition is met when $CSM_{\text{tying}} > 3CSM_{\text{tied}}$ or, equivalently, when $CSC_{\text{tying}} > 3CSC_{\text{tied}}$.²⁰ In other words, a firm will be able to impose a requirements tie that leverages one monopoly profit on the tying product into two monopoly profits on the tying and tied products whenever the buyers covered by the tie get consumer surplus from the tying product that is more than three times what they get from the tied product (when both are priced at either monopoly or competitive levels). If, as in the hypotheticals, the two linear demands have the same slope, this condition will hold when the difference between the cost and value of the first unit of the tying product is at least 73% higher than the same difference for the tied product.²¹ Because typical tying cases involve buyers whose

¹⁸ Greenlee, Reitman, & Sibley, *An Antitrust Analysis of Bundled Loyalty Discounts*, 26 INTERNATIONAL J. INDUSTRIAL ORG. 1132, 1137 (2008); Mathewson & Winter, *supra* note , at 568-69.

¹⁹ As noted in prior footnotes, with linear demand $Q = A - P$, the consumer surplus at the competitive price = $(A - C)^2/2$ and the consumer surplus at the monopoly price = $(A - C)^2/8$. Thus, $CSC = 4CSM$. (The analysis extends to any linear demand $Q = A - sP$ because one could convert that into an equation that takes the form $Q = A - P$ by using a measure of units that makes the slope $s = 1$.)

²⁰ See Greenlee, et al, *supra* note , at 1137.

²¹ This is because consumer surplus varies with the square of the difference between the highest buyer valuation and

valuations or expenditures for the tying product are far higher than for the tied product, this condition is probably usually met.

Now suppose this condition is not met. Then, a tying firm could still impose a requirements tie that maintained the tying product at its monopoly price and required purchasing the tied product from it at some supracompetitive price. However, when a tying firm cannot price both products at monopoly levels, it would make even more money if it lowered the tying product price below the monopoly level and raised the tied product price further. The reason is that the monopoly price is the price at which further price increases would produce no marginal gain. Thus, a reduction in the monopoly price on the tying good produces a relatively small loss of profits, whereas increasing the lower price on the tied product produces a relatively large gain in profits.²² Accordingly, a firm using a requirements tie can reap more monopoly profits by lowering the tying price and raising the tied price, and buyers will accept as long as the sum of the consumer surplus at supracompetitive prices in both markets ($CSS_{\text{tying}} + CSS_{\text{tied}}$) is greater than CSC_{tied} .

Even though the tying price may sometimes be discounted from monopoly levels, that is only to allow an even greater supracompetitive increase in the tied product price, and the combined net effect is still to extract consumer surplus and harm consumer welfare. Indeed, the existence of a discount on the tying product actually implies a *greater* loss of consumer welfare because it reflects a greater ability to extract consumer surplus by raising tied product prices. When a tie results in monopoly prices on both products, consumers will get consumer welfare of $CSM_{\text{tying}} + CSM_{\text{tied}}$, which may be significantly greater than CSC_{tied} . The lost consumer welfare, $CSC_{\text{tied}} - CSM_{\text{tied}}$, may thus be significantly less than CSM_{tying} , in which case the tie fails to extract all the consumer surplus in the tying product. This consumer welfare cannot profitably be lowered further with tying because both products are sold at their profit-maximizing level. In effect, the monopoly price level for the tied product in such cases imposes a constraint on the ability of the monopolist to expropriate fully all the consumer surplus in the tying product. In contrast, when both products are being sold below their monopoly prices, there is no monopoly price constraint on the tying firm further increasing the tied

cost. Thus, $CSM_{\text{tying}} > 3CSM_{\text{tied}}$ is equivalent to $(A_{\text{tying}} - C_{\text{tying}})^2 > 3(A_{\text{tied}} - C_{\text{tied}})^2$, which is true when $A_{\text{tying}} - C_{\text{tying}} > \sqrt{3}(A_{\text{tied}} - C_{\text{tied}})$, which with rounding means $A_{\text{tying}} - C_{\text{tying}} > 1.73(A_{\text{tied}} - C_{\text{tied}})$.

²² See Greenlee, et al., *supra* note , at 1136;); Nalebuff, *Bundling as a Way to Leverage Monopoly*, Yale Working Paper No. ES-36, at 8, 10-11 (Oct. 2004).

product price to extract a little more consumer surplus. Thus, the tying firm can pick prices so that $CSS_{\text{tying}} + CSS_{\text{tied}}$ is barely greater than CSC_{tied} , effectively extracting all of CSM_{tying} .

In short, there are two possibilities when tying extracts consumer surplus without a significant foreclosure share. Either both the tying and tied products will be sold at monopoly price levels, and thus one monopoly really will be leveraged into two monopolies. Or the tying price will be discounted somewhat from monopoly levels, but this reflects a greater ability to extract consumer surplus in the tied market and thus indicates an even *larger* loss of consumer welfare.

Requirements tying that results in both products being sold at monopoly prices also lowers total welfare (even without a significant foreclosure share) because it reduces allocative efficiency in the tied market without improving it in the tying market.²³ When requirements tying results in both products being sold at submonopoly prices without a significant foreclosure share, the total welfare effect depends on the relative size of the covered buyers' consumer surplus for the tying and tied products. With linear demand, requirements tying with submonopoly prices will reduce ex post total welfare whenever $CSC_{\text{tying}} \geq (16/9)CSC_{\text{tied}}$, or equivalently when $CSM_{\text{tying}} > (16/9)CSM_{\text{tied}}$, and increase it when that condition does not hold.²⁴ If, for example, the two linear demands have the same slope, this condition will hold when the difference between the cost and value of the first unit of the tying product is at least 33% higher than the same difference for the tied product.²⁵

To summarize, in all cases, tying without a significant foreclosure share reduces consumer welfare if the tying firm chooses profit-maximizing prices. The ex post total welfare effects will turn on the extent to which consumer surplus is greater for the tying product than the tied product, when both are priced at monopoly or competitive levels. Measuring and comparing these consumer surpluses in particular cases can be hard. But we can say roughly that if, for buyers subject to the tie, spending or valuation is significantly higher for the tying product than the tied product, then requirements tying will reduce ex post total welfare. And if

²³ Tying that merely requires buying a certain volume of the tied product may not reduce allocative efficiency in the tied market without a significant foreclosure share because such tying leaves buyers free to buy more of the tied product at competitive prices.

²⁴ See Greenlee, et al., *supra* note , at 1137, 1151.

²⁵ $CSM_{\text{tying}} > (16/9)CSM_{\text{tied}}$ means $(A_{\text{tying}} - C_{\text{tying}})^2 > (16/9)(A_{\text{tied}} - C_{\text{tied}})^2$, which is true when $A_{\text{tying}} - C_{\text{tying}} > 1.33(A_{\text{tied}} - C_{\text{tied}})$.

those buyers' spending or valuation is sharply higher for the tying product than the tied product, then tying will leverage one monopoly profit into two monopoly profits.

The relevant comparison depends on spending and valuation for the buyers subject to the tie, not for the tying and tied markets in general. For example, if there are many buyers who buy only the tied product, and would continue to do so at competitive prices despite the tie, total spending on the tied product may be much higher than for the tying product. Nonetheless, if the buyers who are subject to the tie spend far more on the tying product, the tie will still inflict allocative inefficiency on their purchases.

While I have used the monopoly case for simplicity, the same analysis holds as long as the tying firm has some market power in the tying product. The reason is that all this theory requires is a declining individual demand curve for that firm's tying good, so that there is some extractable individual consumer surplus at the tying product's profit-maximizing price. Possible substitutions to rivals or other products are all taken into account by the firm-specific demand curve.

D. Without Fixed Tied Market Competitiveness, Tying Can Increase Tied Market Power

The single monopoly profit theory also assumes that the tied market is perfectly competitive in a way that tying cannot alter. It does so with various sub-assumptions: namely that tied market rivals face no entry or fixed costs, have constant marginal costs that do not vary with output, have incentives to always price at cost, and can expand instantaneously to supply the whole market. Suppose we relax any or all of those sub-assumptions to consider more realistic cases. Then the economic literature shows that a tie which forecloses enough of the tied market can reduce rival competitiveness by impairing rival efficiency, entry, existence, aggressiveness, or expandability. Any one of those adverse effects on rival competitiveness can in turn anticompetitively increase the tying firm's market power in the tied market, thus raising prices and harming consumers.

Consider first situations where tying can reduce tied rival efficiency. If there are costs to entering the tied market, tying can profitably deter entry by an equally-efficient rival by foreclosing enough of the tied market to make entry profits lower

than entry costs.²⁶ Likewise, if there are fixed costs to operating in the tied market, tying can cause equally-efficient rivals in the tied market to exit (or deter their entry) and thus enable the tying firm to obtain a monopoly in the tied market.²⁷ Other articles generalize the point to show that foreclosing a market can create anticompetitive effects by depriving rivals of network effects or economies of scale, scope, distribution, supply, research, or learning.²⁸ If foreclosure decreases rival efficiency in any of those ways, it will worsen the market options available to buyers and lessen the constraint on the tying firm's market power in the tied market, thus enabling it to raise prices in the tied market even though rivals are not completely eliminated.

Even if tying does not impair rival efficiency, foreclosure can impair rival competitiveness by decreasing rival aggressiveness or expandability. Tying can decrease rival aggressiveness in at least two scenarios. First, if firms in the tied market engage in Cournot competition, where each firm sets output in response to the output choices of others, then tying can encourage tied product rivals to reduce output and charge higher prices.²⁹ Second, if the tied market is concentrated, but (absent tying) would be undifferentiated and result in Bertrand competition that drives prices down to cost, tying can effectively differentiate the tied market (because buyer valuations for the tying product vary) and induce the rival to charge higher tied product prices.³⁰ Tying in both scenarios will increase profits for the tying firm if, absent tying, tying product revenue would exceed tied product revenue, which is typical in tying cases.³¹ Tying in both scenarios will also harm consumer welfare.³²

²⁶ See Barry Nalebuff, *Bundling as an Entry Barrier*, 119 Q.J. ECON. 159, 160–61, 168-70 (2004).

²⁷ See Michael D. Whinston, *Tying Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837, 840, 846 (1990).

²⁸ See, e.g., Elhauge, *Defining Better Monopolization Standards*, 56 STANFORD L. REV. 253, 320-324 (2003); Eric Rasmusen, Mark Ramseyer & John Wiley, *Naked Exclusion*, 81 AMER. ECON. REV. 1137 (1991); Thomas G. Krattenmaker & Stephen C. Salop, *Anticompetitive Exclusion: Raising Rivals' Costs to Achieve Power Over Price*, 96 YALE L.J. 209, 234-45 (1986); Stephen C. Salop & David T. Scheffman, *Raising Rivals' Costs*, 73 AM. ECON. REV. 267 (1983) (Special Issue).

²⁹ See Jose Carbajo et al., *A Strategic Motivation for Commodity Bundling*, 38 J. INDUSTRIAL ECONOMICS 283, 285-86, 290-92 (1990). The reason is that tying effectively commits the tying firm to increase its share of tied product output, which makes it profitable for rivals to lower output and increase prices, reducing total output of the tied product. *Id.*

³⁰ See *id.* at 285, 287-89. Without tying, the tied market would be undifferentiated because even though buyer valuations of the tied product vary, they consider the tied products of the firm and its rival to be fungible. With tying, however, the fact that buyer valuations of the tying and tied products vary will differentiate buyers in their willingness to shift from the rival tied product to the tied bundle in response to a rival price increase.

³¹ The models conclude that tying would increase profits in this situation if the tying product price exceeds the tied product price. *Id.* at 288, 291. Given that the models assume a set of buyers with equal reservation prices in both products, *id.* at 286-87, this is equivalent to saying tying product revenue exceeds tied product revenue.

³² *Id.* at 289, 292.

Tying can also decrease rival expandability and increase tied prices if the tying firm has market power in the tied market. Standard economic models calculate market power to be directly proportional to a firm's market share and inversely proportional to its rivals' supply elasticity, which is the percentage increase in rival supply that would result from a 1% increase in market price.³³ These standard models reasonably assume rivals' ability to expand depends on how large they already are. Thus, if a tying firm can through foreclosure obtain a higher share of the tied market for reasons unrelated to product merits, it will lower rivals' share of the tied market and thus lessen rival expandability and the constraint on tied product prices.

Under any of the above theories, tying can impair rival competitiveness only if it helps foreclose a substantial share of the tied market. However, this foreclosure share effect is independent of whether tying produces power effects. Indeed, the models proving the anticompetitive effects from impairing tied rival competitiveness often bar the power effects by assuming fixed unit-to-unit tying and buyer valuations that are either uniform or have perfect positive correlation.³⁴ But where real market conditions do allow them, the power effects reinforce the rival impairment theory by proving that a foreclosing tie does not require any short-term profit sacrifice by the tying firm. Likewise, any anticompetitive benefit from impairing rival competitiveness makes the power effects all the more attractive to tying firms and exacerbates the anticompetitive effects. The theories thus are mutually reinforcing and should be assessed in combination.

To illustrate, suppose we have tying that not only extracts individual consumer surplus, but also impairs rival competitiveness in the tied market. Then buyers deciding whether to accept a tie would no longer compare consumer surplus on both products with the tie to the consumer surplus they would have enjoyed on the tied product *at competitive prices*. Instead, they would compare consumer surplus on both products with the tie to the consumer surplus they would enjoy on the tied product *at prices inflated by the rival impairment*. In other words, instead of accepting the tie only if $CSM_{\text{tying}} + CSM_{\text{tied}}$ exceeded CSC_{tied} , consumers will

³³ Define P as price, C as marginal cost, S as the firm's market share, ϵ_{rs} as the rival supply elasticity, and ϵ_m as the market demand elasticity (the percentage reduction in market output that would result from a one percent increase in market price). Then the firm's degree of market power (as measured by its ability to raise prices above cost) is determined by the equation $(P-C)/P = S/[\epsilon_m + \epsilon_{rs}(1-S)]$. See William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 HARV. L. REV. 937, 945 (1981).

³⁴ See Whinston, *supra* note , at 841-42; Carbajo, *supra* note , at 286-87.

accept the tie whenever it exceeds the consumer welfare they would enjoy on the tied product if they rejected the tie (CSR_{tied}) and purchased the tied product at inflated prices. Because a substantial foreclosure share that impairs rival competitiveness lowers CSR_{tied} , it increases buyer willingness to accept an anticompetitive tie.

For example, take our hypothetical above about printers and scanners with the alteration that the highest price buyers would pay for scanners is now \$1000, so that both demand curves are identical. Because the consumer surplus for printers and scanners would thus equal each other, a tie that does *not* foreclose a substantial share of the tied market would extract consumer surplus and lower consumer welfare but would not reduce ex post total welfare. But suppose the tie does impair rival competitiveness by foreclosing a large enough share of the tied market that rivals cannot achieve economies of scale and will have their costs increased from \$200 to \$500. Then, buyers will accept a tie even if the tying firm charges a monopoly price for both the tying and tied products because, if buyers accept, the consumer surplus will be $CSM_{\text{tying}} + CSM_{\text{tied}} = \$160,000$, whereas if they reject the tie, their consumer surplus will be \$125,000.³⁵

In this case, the tie once again succeeds in leveraging a single monopoly profit into two monopoly profits. Further, it does so even though equal amounts are spent on both products and each is priced well above cost. Thus, no short-term profit sacrifice is ever required, which is one more nail in the coffin of the claim that establishing monopolization should require proving a profit sacrifice.³⁶ Both consumer welfare and total welfare decrease because allocative efficiency (and rival productive efficiency) is reduced in the tied market with no benefit in the tying market.

Unless it also alters the degree of tying market power, tying to impair tied rival competitiveness cannot increase monopoly profits if (1) the products are used or bundled in a fixed ratio *and* (2) the tied product has no utility without the tying product.³⁷ The reason is that buyers of the tying product would interpret any

³⁵ The consumer surplus at the monopoly price of \$600 with $A = \$1000$ and $C = \$200$ is \$80,000 in each market. See *supra* at ___. The consumer surplus if buyers reject and buy only the tied product from rivals at \$500 is the area of the triangle above the price = $\frac{1}{2}(A-P)^2 = \frac{1}{2}(\$1000-\$500)^2 = \$125,000$.

³⁶ For other arguments against the profit-sacrifice theory, see Elhauge, *Defining Better*, *supra* note, at 268-294; Steven C. Salop, *Exclusionary Conduct, Effect on Consumers, and the Flawed Profit-Sacrifice Standard*, 73 ANTITRUST L.J. 311 (2006); Elhauge, *How Loyalty Discounts Can Perversely Discourage Discounting*, 5 J. COMPETITION LAW & ECONOMICS 189, 216-17 (2009).

³⁷ See Whinston, *supra* note, at 840, 850.

premium on the tied product as a per-unit price increase on the tying product. Thus, a firm using a tie cannot reap any additional profits from those buyers that the firm could not have achieved without a tie by simply exercising its power to increase the tying product price, a tying market power which is by hypothesis fixed in this section.

However, even without affecting tying market power, tying to impair tied market rivals can increase monopoly profits if only one of the above two conditions holds. If the products are used or bundled in a fixed ratio, but the tied product also has separate utility when not used with the tying product, then additional profits can be reaped because the firm can (given diminished rival competitiveness) charge higher than but-for prices on purchases of the tied product that are not used with the tying product. Likewise, if the products are always used together, but in varying ratios, then tying that impairs rival competitiveness can increase monopoly profits, as in the above example of the printer-scanner tie where both are used to run a business.

Finally, even if the products are used or bundled in fixed ratios *and* lack separate utility, foreclosing the tied market might still create anticompetitive effects if it alters the degree of tying market power, as the next theory demonstrates.

E. Without Fixed Tying Market Competitiveness, Tying Can Increase Tying Market Power

If one relaxes the assumption that the degree of tying market power is fixed, then tying can create additional anticompetitive effects by making the degree of tying market power higher than it would have been without tying. Tying can increase tying power above but-for levels by either (1) foreclosing enough of the tied market to deter or delay later entry into the tying market, (2) raising the costs of a partial substitute that constrains tying market power, or (3) transferring market power from a waning technology to the next-generation technology. Let's take each scenario in turn.

First, suppose that a firm's tying market power is vulnerable to an increased threat of future entry if successful rival producers exist in the tied market. If so, then the firm has incentives to engage in defensive leveraging, foreclosing the tied market in order to deter or delay later entry into the tying market, thus maintaining its

tying market power for longer or at a higher degree than it would have without tying.

For example, modern literature shows that successful tied product makers are often more likely to evolve into tying product makers in future periods, in which case a firm has incentives to foreclose rivals in the tied market in order to prevent or reduce the erosion of its tying market power over time.³⁸ Tying can produce this anticompetitive effect even though the rival is not just equally efficient, but more efficient than the tying firm in that the rival can produce a higher quality product at the same cost.³⁹

Alternatively, a firm's tying market power might be vulnerable to future entry or expansion by a single-market rival. Such a rival is often more likely to enter the tying market if buyers have attractive rival options in the tied market, especially if both products are essential inputs into some larger operation.⁴⁰ For example, suppose each buyer needs both product *A* and product *B* to stay in business. If a monopolist in *A* could use tying to eliminate rival makers of *B* or to render the rival options in *B* less attractive to buyers, then entrants will have a harder time entering market *A* because buyers would have to combine any entrant's *A* with either no *B* or a less attractive *B* option. Again, this anticompetitive effect holds even if the tied product rival would have been equally efficient without the tie.

Second, defensive leveraging has even stronger—and more immediate—anticompetitive effects if a firm's tying market power is otherwise constrained by the fact that the tied product is a partial substitute for the tying product. Foreclosing the market for the tied partial substitute can immediately protect or enhance the firm's tying market power, even if such foreclosure does not deter or delay entry into the tying market.⁴¹ Such suppression of competition from partial substitutes is one of the most anticompetitive effects of tying agreements.⁴²

³⁸ See, e.g., Dennis W. Carlton & Michael Waldman, *The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries*, 33 RAND J. ECON. 194, 194–96, 198–212 (2002); Dennis W. Carlton, *A General Analysis of Exclusionary Conduct and Refusal to Deal*, 68 ANTITRUST L.J. 659, 668–70 (2001); Feldman, *Defensive Leveraging in Antitrust*, 87 GEO. L.J. 2079 (1999); IX AREEDA & HOVENKAMP, ANTITRUST LAW ¶1705 (2d ed. 2004).

³⁹ See Carlton & Waldman, *supra* note , at 198, 203; Carlton, *supra* note , at 669.

⁴⁰ See Choi & Stefanadis, *Bundling, Entry Deterrence, and Specialist Innovators*, 79 J. BUSINESS 2575 (2006); Choi & Stefanadis, *Tying, Investment, and the Dynamic Leverage Theory*, 32 RAND J. Econ. 52 (2001); Barry Nalebuff, *Exclusionary Bundling*, 50 ANTITRUST BULLETIN 324–327 (2005).

⁴¹ See Ordover & Willig, *An Economic Definition of Predation*, 91 YALE L.J. 8, 38–41 (1981); Whinston, *supra* note, at 852–54.

⁴² See IX AREEDA, ANTITRUST LAW ¶1705f (1991); X AREEDA, ELHAUGE & HOVENKAMP, ANTITRUST LAW ¶1747c

That the tying and tied products are partial substitutes does not mean they are in the same market. They would be in the same market only if the tied product would constrain a tying product monopolist to price at no more than 5% above the competitive level.⁴³ Suppose, for example, that product *A* costs \$1000 to make and product *B* costs \$2000. Suppose further that some buyers find *A* and *B* to be fungible and would pay \$3000 for either, whereas other buyers have special needs that make them value only *B*. Then *B* would not be in the same market as *A*, because *B* could not prevent an *A* monopolist from charging more than \$1050 (5% over *A*'s competitive price) given that *B* costs \$2000. But a competitive *B* market would constrain the *A* monopolist from charging more than \$2000. Thus, if an *A* monopolist could foreclose a substantial enough share of market *B* to raise the costs of rival *B* producers to \$2500, then the *A* monopolist could increase its *A* prices to \$2500. Moreover, and if it could eliminate rival *B* makers or raise their costs to over \$3000, then the *A* monopolist could raise its prices for *A* to the full \$3000 that reflects its maximum monopoly price.

Third, defensive leveraging also has even stronger—and more permanent—anticompetitive effects if the technological trend is from the market where the firm has market power to the market where the foreclosure is occurring. In such a case, a firm can use foreclosure not just to delay the erosion of its current market power over a waning technology, but to develop new market power over the technology of the future.⁴⁴ This can have long-lasting adverse effects by creating market power in the new technology that otherwise might not have existed or by preventing the most efficient firm from winning the new market.

In all three scenarios, tying makes the degree of tying market power higher than it would have been in the but-for world without tying. Absent offsetting efficiencies, such tying thus lowers consumer and total welfare below but-for levels. In many cases, the degree of tying power may have declined from past levels, but that is irrelevant because the correct baseline for assessing causal effects is the but-for world, not the past world.

(1996).

⁴³ See ELHAUGE, U.S. ANTITRUST LAW & ECONOMICS 207-208 (Foundation Press 2008).

⁴⁴ See Carlton & Waldman, *supra* note , at 194, 196–97, 212–15; Carlton, *supra* note , at 670–71.

F. Combined Implications

It is time to declare the death of the single monopoly profit theory. This analytical autopsy indicates the cause of death was a dependence on five highly restrictive assumptions that frequently do not hold, and probably rarely hold in combination. Relaxing each of these assumptions produces a distinctive profit-increasing effect, as the following table summarizes.

THE DEATH OF THE SINGLE MONOPOLY PROFIT THEORY		
Assumption of Theory	Frequent Reality	Profit-Increasing Effect
Unvarying Tied Product Usage	Varying Tied Product Usage	Intra-Product Price Discrimination
Strong Positive Demand Correlation	No Strong Positive Demand Correlation	Inter-Product Price Discrimination
Unvarying Tying Product Usage	Varying Tying Product Usage	Extracting Individual Consumer Surplus
Tied Market Competitiveness Fixed	Tied Foreclosure Can Reduce Tied Rival Competitiveness	Increased Tied Market Power
Tying Market Competitiveness Fixed	Tied Foreclosure Can Protect Tying Market Power	Increased Tying Market Power

Although each of these effects has individually been recognized in the economic literature, their combined implications have not been appreciated because economic models are generally designed to isolate each effect. Thus, there is a tendency to minimize each modeled effect by saying it applies only in certain circumstances. But in assessing the wisdom of tying doctrine's quasi-per se rule, one must consider the combined implications, and they are striking. Tying can profitably increase monopoly profits whether the ratios are variable *or* fixed, whether demand is positively *or* negatively correlated, and with *or* without a substantial foreclosure share. It takes a combination of a fixed ratio *and* a strong positive demand correlation *and* no substantial foreclosure share to prevent tying from increasing monopoly profits. It thus seems clear that single monopoly profits are the exception, not the rule. Tying by a firm with tying market power typically does increase monopoly profits, even when the tie has no efficiencies. Such tying also usually harms consumer and total welfare absent offsetting efficiencies.

Nonetheless, many have argued that antitrust law does not consider the power effects to be anticompetitive, or should not do so. I thus consider those claims next.

III. SUPREME COURT CASELAW DEEMS ALL FIVE PROFIT-INCREASING EFFECTS TO BE ANTICOMPETITIVE

I begin with the question of positive law, leaving till the next section the policy question about whether the law is desirable. On the question of positive law, the answer seems resoundingly clear. The current quasi-per se rule makes sense only if one deems the power effects to be anticompetitive. Further, the Supreme Court has explicitly embraced the proposition that all three power effects justify its quasi-per se rule.

Unless a defendant can prove offsetting efficiencies, the quasi-per se rule makes it illegal to tie together separate products when the defendant (1) has tying market power and (2) forecloses a nontrivial dollar amount of sales in the tied market.⁴⁵ The fact that the quasi-per se rule bases liability on tying market power rather than requiring a substantial tied foreclosure share has been roundly condemned, even by some Harvard School scholars who accept the existence of foreclosure share effects and thus reject the single monopoly profit theory.⁴⁶ But those who condemn the quasi-per se rule assume that the power effects should not be deemed anticompetitive.⁴⁷ Once one dismisses all the power effects, it is not surprising that one would conclude that the law should require proof of the substantial tied foreclosure share that is necessary for the remaining theories.

If one instead assumes that the power effects are anticompetitive, then the quasi-per se rule nicely fits the conditions for proving anticompetitive effects. After all, the power effects do not require a substantial tied foreclosure share, but they do require tying market power. Further, the extent to which the power effects harm consumer welfare turns on the dollar amount of the tied market covered, rather

⁴⁵ See ELHAUGE, U.S. ANTITRUST, *supra* note, at 358-360; *Jefferson Parish v. Hyde*, 466 U.S. 2 (1984); *International Salt v. United States*, 332 U.S. 392 (1947); *Northern Pacific Railway v. United States*, 356 U.S. 1 (1958); *United States v. Loew's Inc.*, 371 U.S. 38 (1962).

⁴⁶ See IX AREEDA & HOVENKAMP, *supra* note, ¶1701, at 26, ¶1703d3, at 38; U.S. DEPARTMENT OF JUSTICE, COMPETITION AND MONOPOLY: SINGLE-FIRM CONDUCT UNDER SECTION 2 OF THE SHERMAN ACT 89-90 (2008) [hereinafter “Bush DOJ Single Firm Conduct Report”] (collecting sources).

⁴⁷ See IX AREEDA & HOVENKAMP, *supra* note, ¶1703e, ¶¶1710-1711; Bush DOJ Single Firm Conduct Report, *supra* note, at 85-87.

than on the tied market foreclosure share.

Thus, the quasi-per se rule makes perfect sense if the power effects are deemed anticompetitive, but no sense if they are not. If we restrict ourselves to the traditional legal question of figuring out which normative theory best fits the legal doctrine,⁴⁸ treating Supreme Court caselaw as authoritative, then the clear answer is that the doctrine must embrace the proposition that the power effects are anticompetitive. Further, EU tying law also bases liability on tying market power without requiring proof of substantial tied foreclosure shares,⁴⁹ suggesting that the conclusion that these power effects are anticompetitive is not idiosyncratic to U.S. caselaw, but has more universal appeal.

Tying doctrine is clearly inconsistent with any claim that antitrust law prohibits vertical agreements only when they weaken rival competition because the quasi-per se rule condemns ties without the substantial tied foreclosure share that would be necessary to weaken rival competition. Instead, tying doctrine is consistent with the principle that antitrust law protects “competition, not competitors.” Normally this principle is invoked to emphasize that antitrust law does not condemn conduct that harms competitors but benefits competition, with “competition” measured by the effects on consumer welfare.⁵⁰ But the flip side to this principle is that antitrust does condemn conduct that distorts the competitive process in ways that harm consumer welfare even if it does not harm competitors.

In any event, we need not limit ourselves to inferences from doctrinal structure or general antitrust principles, because Supreme Court caselaw has explicitly relied on the three power effects to justify the quasi-per se rule. This reliance was first stated in a dissent by Justices White and Harlan, which later cases incorporated into Supreme Court majority opinions. In *Fortner I*, the White-Harlan dissent stated “the Court should have in mind the rationale on which the illegality of tying arrangements is based,” and then stressed that the rationale included not only concerns about foreclosing competition in the tied market, but:

⁴⁸ See, e.g., RONALD DWORKIN, *LAW’S EMPIRE* (Harvard University Press 1986).

⁴⁹ ELHAUGE & GERADIN, *GLOBAL ANTITRUST LAW & ECONOMICS* 609 (Foundation Press 2007); Commission Decision 88/138/EEC, *Eurofix–Bauco v. Hilti*, O.J. 1988, L65/19; Commission Decision 92/163/EEC, *Tetra Pak II*, O.J. 1992, L 72/1.

⁵⁰ *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 224 (1993) (concluding that the principle that antitrust law protects “competition, not competitors” means that below-cost predatory pricing should be allowed if recoupment is not plausible because, even though such pricing harms both competitors and efficiency, it benefits “competition” in the sense that “consumer welfare is enhanced”); *infra* at ___ (showing that caselaw measures competition by consumer welfare effects).

“[i]n addition to these anticompetitive effects in the tied product, tying arrangements may be used . . . as a counting device to effect price discrimination; and they may be used to force a full line of products on the customer so as to extract more easily from him a monopoly return on one unique product in the line.”⁵¹

The dissent separately cited the Bowman and Burstein articles that I discussed in Part II for, respectively, the points on price discrimination and extracting individual consumer surplus on the tying product, thus making clear that the dissent embraced both points and believed that discrimination and extraction created anticompetitive effects separate from any anticompetitive effects in the tied market.⁵² The dissent also made clear it understood that it was rejecting the single monopoly profit theory, stating that, although “theoretically” a tie could not increase monopoly profits under certain assumptions, “difficulty in extracting the full monopoly profit without the tie, Burstein, *A Theory of Full-Line Forcing*, 55 *Nw.U.L.Rev.* 62 (1960), . . . or other advantages mentioned in the text, may make the tie beneficial to its originator.”⁵³

This analysis did not remain buried in a dissent. In *Jefferson Parish*, the Supreme Court considered and rejected the argument that it should overrule the quasi-per se rule and require a substantial tied foreclosure share.⁵⁴ It justified the fact that the quasi-per se rule required tying market power rather than a substantial tied foreclosure share by quoting extensively from the above *Fortner I* dissent, including the above proposition that part of the rationale was that, separate from any anticompetitive effects in the tied market, tying could create price discrimination or extract individual consumer surplus on the tying product.⁵⁵

The *Jefferson Parish* Court also went far beyond incorporating the *Fortner I* dissent’s analysis. It explicitly stated that a quasi-per se rule that focused on tying market power was justified because “the law draws a distinction between the exploitation of market power by merely enhancing the price of the tying product, on the one hand, and by attempting to impose restraints on competition in the market for a tied product, on the other.”⁵⁶ While using market power over a

⁵¹ *Fortner Enter. v. United States Steel*, 394 U.S. 495, 513–514 & n.8 (1969) (White, J., joined by Harlan, J., dissenting)

⁵² *Id.* at 513-14& n.8.

⁵³ *Id.* at 513 n.3.

⁵⁴ *Jefferson Parish*, 466 U.S. at 9-11, 13-15.

⁵⁵ *Id.* at 13 n.19.

⁵⁶ *Id.* at 14.

product to merely increase its price was not necessarily anticompetitive, the Court concluded that using that market power to impose a tie was anticompetitive because then “that power is used to impair competition on the merits in another market . . . This impairment . . . can increase the social costs of market power by facilitating price discrimination, thereby increasing monopoly profits over what they would be absent the tie.”⁵⁷ In support of this last proposition, the Court cited not only the Bowman and Burstein articles about how tying achieves intra-product price discrimination and extracts individual consumer surplus, but also Stigler’s article explaining *Loew’s* as a ban on using tying to achieve inter-product price discrimination.⁵⁸

Thus, *Jefferson Parish* cited the seminal articles for each of the three power effects to explain why it was sticking to the quasi-per se rule. It also explicitly embraced the proposition that all three power effects were anticompetitive because they increased monopoly profits and the social costs of market power. The Court’s citation to Stigler’s article indicates it also shared his understanding that stopping inter-product price discrimination was the rationale for *Loew’s*, another decision that condemned a tie based on market power and a lack of offsetting efficiencies without requiring proof of a substantial foreclosure share.⁵⁹

Jefferson Parish’s market definition analysis likewise confirms its doctrinal reliance on power effects. If foreclosure share effects were the only ones that mattered, then the geographic market should have been defined by examining the alternatives to which tied rivals (there, anesthesiologists) could reasonably turn. This likely would have been a much larger geographic market than the local hospital area. But if power effects matter, then the market should be defined by assessing the alternatives to which buyers (there, patients) could reasonably turn, because that would determine whether the defendant had the market power over those buyers to inflict power effects through tying. The Court did the latter when applying its quasi-per se rule, defining the relevant market by the alternatives available to buyers.⁶⁰ Only when it concluded that such tying power over buyers was absent, thus triggering the need to prove a substantial tied foreclosure share, did it switch to a market definition that instead focused on the alternatives reasonably available to rival anesthesiologists.⁶¹

⁵⁷ *Id.* 15.

⁵⁸ *Id.* 15 n.23.

⁵⁹ *United States v. Loew's Inc.*, 371 U.S. 38 (1962).

⁶⁰ 466 U.S. at 18, 26-29.

⁶¹ *Id.* at 29 & n.48.

One might wonder whether the same result would hold on the current, more conservative, Supreme Court. However, even relatively conservative justices have embraced the conclusion that the power effects are anticompetitive effects that justify current tying doctrine. In *Kodak*, Justices Scalia, O'Connor and Thomas dissented in as skeptical an opinion on tying doctrine as we have had in recent years. But they too quoted the *Fortner I* dissent for the proposition that price discrimination and extracting surplus justifies a quasi-per se rule that focuses on tying power rather than tied foreclosure share, stating:

Despite intense criticism of the tying doctrine in academic circles, see, e.g., R. Bork, *The Antitrust Paradox* 365-381 (1978), the stated rationale for our per se rule has varied little over the years. When the defendant has genuine "market power" in the tying product – the power to raise price by reducing output – the tie potentially enables him to extend that power into a second distinct market, enhancing barriers to entry in each. In addition: "[T]ying arrangements may be used . . . as a counting device to effect price discrimination; and they may be used to force a full line of products on the customer so as to extract more easily from him a monopoly return on one unique product in the line."⁶²

Thus, they also subscribed to the proposition that, separate from any anticompetitive effects in the tied market, tying was anticompetitive if it created price discrimination or extracted individual consumer surplus on the tying product, and that those anticompetitive effects justify the quasi-per se rule.

Beyond relying on the *Fortner I* dissent's analysis, the *Kodak* dissenters acknowledged that "leveraging *and* price discrimination concerns [are] behind the per se tying prohibition."⁶³ Further, the *Kodak* dissenters pointed out that tying doctrine prohibited ties:

when the manufacturer's monopoly power in the equipment, coupled with the use of derivative sales as "counting devices" to measure the intensity of customer equipment usage, enabled the manufacturer to engage in price discrimination, and thereby more fully exploit its interbrand power.⁶⁴

Thus, even these conservative justices clearly concluded that Supreme Court

⁶² *Eastman Kodak v. Image Technical Servs.*, 504 U.S. 451, 487 (1992) (Scalia, J., joined by O'Connor & Thomas, JJ., dissenting) (quoting *Fortner I*).

⁶³ *Id.* at 494 (emphasis added).

⁶⁴ *Id.* at 499.

caselaw embraces the view that enhancing price discrimination and increasing the exploitation of tying power are anticompetitive effects that justify the quasi-per se rule.

Illinois Tool Works confirms the Court's understanding that, even when no foreclosure share effects exist, power effects justify condemning ties absent offsetting efficiencies. In that case, the Court held that the quasi-per se rule applied to a tie of unpatented ink to patented printheads used to print barcodes, and that such a tie was thus illegal upon proof of market power over printers, absent offsetting efficiencies.⁶⁵ The Court did not conclude that foreclosure share effects were necessary. If it had, it would have required evidence of a substantial tied foreclosure share, which would have been implausible because the ink used for one specialized sort of printer is hardly likely to be a big share of all ink.⁶⁶ Instead, the Court remanded under instructions that made clear liability turned on proving tying market power, thus confirming that power effects suffice.⁶⁷

The Supreme Court's conclusion that the power effects are anticompetitive indicates it is actually a misnomer to refer to current tying doctrine as a quasi-per se rule. Given its conclusion that the power effects are anticompetitive, the focus on tying market power and tied dollar amount does not mean that the doctrine fails to require evidence of anticompetitive effects. That focus instead means that tying doctrine correctly requires proof of the elements necessary to achieve anticompetitive effects. Perhaps references to a quasi-per se rule were meant to reflect a notion in older cases that ties lacked any procompetitive justifications. But the Court has always considered procompetitive justifications before rejecting them, and *Illinois Tool Works* affirmatively states that the Court now accepts the view that ties can have procompetitive justifications.⁶⁸ It thus now seems likely that a tie can be justified by evidence that the tie is the least restrictive way to achieve efficiencies large enough to offset the anticompetitive effects.

Accordingly, today it is more accurate to read Supreme Court caselaw on tying as embracing a rule of reason, where anticompetitive effects must be shown or inferred and procompetitive justifications are admissible. The significance of this

⁶⁵ *Illinois Tool Works v. Independent Ink*, 547 U.S. 28, 42-43 (2006).

⁶⁶ Although the printheads used a specially-formulated ink, the plaintiff conceded that other ink makers could switch to making that type of ink, thus putting all ink makers in the relevant market because of supply substitutability. *Independent Ink, Inc. v. Trident, Inc.*, 210 F.Supp.2d 1155, 1175-77 (C.D.Cal.2002).

⁶⁷ 547 U.S. at 46.

⁶⁸ *Id.* at 36; ELHAUGE, U.S. ANTITRUST, *supra* note, at 359.

caselaw lies instead in its holdings that the three power effects (1) count as anticompetitive effects that must be considered in the rule of reason and (2) are properly inferred from tying market power. In contrast, foreclosure share effects would be inferred from a substantial foreclosure share, as they are for exclusive dealing and loyalty discounts.

But is the caselaw correct to hold that such power effects should be deemed anticompetitive? It is that issue that we cover next.

IV. SHOULD THE POWER EFFECTS BE DEEMED ANTICOMPETITIVE?

Chicago School theorists who promoted the single monopoly profit theory have long conceded that it did not apply when tying increased price discrimination, but they generally argued that such price discrimination should not be deemed anticompetitive.⁶⁹ So have some Harvard School scholars who criticize tying law.⁷⁰ They partly argued that banning tying-created price discrimination was futile, but this argument fails because direct price discrimination is often unfeasible and when feasible is generally more efficient. They also made a welfare claim that tying that creates intra-product price discrimination has ambiguous effects on consumer welfare but usually increases ex post total welfare. (Ex post total welfare compares total welfare with and without the tying, ignoring any ex ante effects on efforts to obtain market power.) They casually assumed this welfare claim would also extend to the two other power effects.⁷¹ More recently, some tying law critics have taken the different tack of arguing that tying that increases monopoly profits is desirable, even if it reduces ex post total welfare, because it increases investment in the innovation that creates market power, which they claim necessarily increases ex ante total welfare.⁷² (Ex ante total welfare includes ex ante effects but does not ignore ex post effects, and thus is the same as overall total welfare.)

⁶⁹ See BORK, *supra* note , at 376-378, 381, 395-401; POSNER, *supra* note , at 199-207; Bowman, *supra* note , at 23-24, 33; Director & Levi, *supra* note , at 291-92, 294; Klein, *supra* note , at 632-34; Posner, *The Chicago School*, *supra* note, at 926; see also POSNER & EASTERBROOK, *supra* note , at 803-808 (finding it more ambiguous whether such price discrimination should be deemed anticompetitive). The Chicago school theorists also conceded that tying might be used to evade price regulation, but for this article I will assume no such price regulation exists.

⁷⁰ IX AREEDA & HOVENKAMP, *supra* note, ¶¶ 1710a&c4, 1711b, 1729i1.

⁷¹ See BORK, *supra* note , at 375-378; POSNER, ANTITRUST LAW, *supra* note , at 200 n.15, 235; IX AREEDA & HOVENKAMP, *supra* note, ¶1711 & n.2.

⁷² Dennis W. Carlton & Ken Heyer, *Extraction v. Extension, The Basis for Formulating Antitrust Policy Towards Single-Firm Conduct*, 4 COMPET. POL'Y INT'L 285, 285, 290-292 (2008).

These welfare claims by tying law critics fail on several, entirely independent, grounds. (1) Imperfect intra-product price discrimination actually reduces ex post total welfare by misallocating output, unless that inefficiency is offset by an output-increasing efficiency. We thus have no reason to believe that intra-product price discrimination usually increases ex post total welfare in cases condemned by the quasi-per se rule, which does not prohibit ties that have an offsetting efficiency. (2) Even if the claim that intra-product price discrimination usually increases ex post total welfare were valid, it clearly does not apply to the other two power effects. (3) Even if tying-induced price discrimination usually increases ex post total welfare, it generally reduces consumer welfare, and the relevant antitrust standard is consumer welfare, not total welfare. (4) Even if the critics were right that all tying-induced price discrimination usually increases ex post total welfare *and* that the relevant antitrust standard were total welfare, tying would still usually violate the total welfare standard because conduct that converts consumer welfare into monopoly profits will, even if it increases ex post total welfare, generally reduce ex ante total welfare. The reason is that firms competing to obtain market power will incur ex ante costs that dissipate their expected ex post monopoly profits. Thus, overall total welfare effects are, ironically, more accurately indicated by ex post consumer welfare effects than by ex post total welfare effects.

The policy arguments of tying law critics are thus mistaken, and certainly not compelling enough to meet their burden to justify overruling decades of tying precedent.

A. Direct Price Discrimination as a Substitute.

1. Intra-Product Price Discrimination. -- Critics of tying doctrine have argued that prohibiting tying because it produces intra-product price discrimination is generally futile because firms will instead substitute less efficient forms of direct price discrimination.⁷³ But the Supreme Court's contrary premise that firms generally cannot achieve the same results with direct price discrimination seems at least equally plausible. Direct price discrimination requires ascertaining buyer valuation and preventing resale from buyers who get low prices to buyers who do not.⁷⁴ Tying the product to a consumable sold at a supracompetitive profit neatly

⁷³ See POSNER, *supra* note , at 203-204; IX AREEDA & HOVENKAMP, *supra* note, ¶1710c4, ¶1711b&e.

⁷⁴ See Kathleen Carroll and Dennis Coates, *Teaching Price Discrimination: Some Clarification*, 66 SOUTHERN

avoids these problems. Charging per use could conceivably accomplish similar price discrimination, but it may be much harder to monitor actual usage than to monitor purchases of some consumable. Usage fees may also be less profitable than tying because the market rate for the tied product might itself be supracompetitive. Moreover, some forms of direct price discrimination are in fact illegal under the Robinson-Patman Act.

Moreover, if feasible, direct price discrimination would generally be more, not less, efficient because tying adds the inefficiency of inducing suboptimal usage of the tied product by inflating its price above its marginal cost. Firms are likely to be willing to incur that additional inefficiency only when tying creates profitable price discrimination that they could not equally achieve directly.

Others argue it would be arbitrary to condemn tying that produces price discrimination because direct price discrimination is legal unless it satisfies the test prescribed by the Robinson-Patman Act.⁷⁵ But there are all sorts of reasons not to subject simple price differences to judicial scrutiny that do not apply to condemning tying that achieves price discrimination. Among other things, setting prices is unavoidable. Thus, a general review of all price discrimination would raise serious administrability problems and impede routine procompetitive price changes, especially because it can be difficult to determine when price differences reflect real price discrimination. In contrast, tying agreements that worsen price discrimination are avoidable, can easily be banned without reaching other conduct, and sometimes also produce adverse foreclosure share effects that are hard to prove. Moreover, direct price discrimination by firms lacking market power can efficiently increase output without increasing supracompetitive profits or harming consumer welfare.⁷⁶ Further, allowing direct pricing that achieves price discrimination does not imply legal approval of agreements that restrain trade to enhance price discrimination. Indeed, the law might permit most direct price discrimination precisely because it is usually hard to maintain, given difficulties in ascertaining buyer valuations or preventing resales among them. Tying that enhances price discrimination might evade those ordinary limits and justify a different result.

2. Inter-Product Price Discrimination. -- Inter-product price discrimination is even

ECON. J. 466, 471 (1999).

⁷⁵ See Bowman, *supra* note , at 33.

⁷⁶ Elhauge, *Why Above-Cost Price Cuts to Drive out Entrants Do Not Signal Predation or Even Market Power – and the Implications for Defining Costs*, 112 YALE L.J. 681, 732-743 (2003).

less likely to be achievable without tying. As long as the products lack strong positive demand correlation, tying will neatly achieve inter-product price discrimination even when difficulties in observing individual buyer demand and preventing resales would make direct discrimination in both products unfeasible.⁷⁷ Indeed, that is the whole point of tying to achieve inter-product price discrimination: it avoids any need to know buyer valuation or prevent resale in either product. Nor need firms know the precise degree of demand correlation; they can simply experiment with bundling to see whether it increases profits, which will mean the demand correlation was not excessively positive. The ability to use bundling to achieve price discrimination across two products with hardly any information or any monitoring is quite remarkable. Thus, tying to achieve inter-product price discrimination will clearly be feasible in many cases where direct price discrimination is not.

Moreover, if direct price discrimination were feasible, it could reduce the inefficiencies that result when bundling allocates output to buyers who value one product at less than its cost.⁷⁸ Thus, even if the tying prohibition led firms to substitute direct price discrimination, that substitution would be desirable.

3. Extracting Individual Consumer Surplus. Likewise, extracting individual consumer surplus is less likely to be achievable through direct discrimination. The most likely type of direct discrimination would be two-tier pricing: charging a lump sum for the right to buy the tying product at some per unit price. Where available, this could extract individual consumer surplus. However, we cannot justifiably assume that two-tier pricing can always extract all individual consumer surplus. It may be difficult to get buyers to pay the lump sum because of financing costs or the risk that changing market conditions may lessen buyer demand for the tying product. Tying agreements can avoid this problem because sellers would have to adjust future prices if, say, their tying market power declines. Seller uncertainty about buyer demand can also make a separate two-part tariff less effective than tying at extracting individual consumer surplus.⁷⁹ Two-tier pricing may also be difficult to maintain if the firm cannot prevent resale of the tying product from a buyer paying the fee to another buyer who doesn't. In at least some cases, tying will be a feasible strategy for extracting individual consumer surplus that two-tier pricing cannot reach.

⁷⁷ Adams & Yellen, *supra* note, at 476.

⁷⁸ *Id.* at 482-483, 491-492.

⁷⁹ See Greenlee, et al., *supra* note, at 1136, 1138, 1143-44.

Indeed, although two-tier pricing is available in theory, it is less prevalent in actual practice than charging different prices to buyers of the same product.⁸⁰ It also seems to be a feasible substitute for tying less often. One often observes a firm charging different prices to different buyers before it starts to tie. It is rarer to see a firm engage in two-tier pricing before it begins to tie. If two-tier pricing *were* feasible, firms would be likely to use it (rather than tying) to extract individual consumer surplus because two-tier pricing would be more profitable, for two reasons. One is that the lump sum charged would not be restricted by the monopoly price for the tied good, and thus could fully extract all consumer surplus at the tying monopoly price. The other is that the marginal price for the tying good could be lowered to marginal cost, thus allowing the firm to extract the larger consumer surplus that would have existed at competitive tying prices. If firms are tempted to use tying despite those factors, it must be because it provides a more feasible means of extraction than two-tier pricing could.

Finally, two-tier pricing reduces the allocative inefficiencies that result because ties create subcompetitive consumption in the tying and tied markets. Thus, if the tying prohibition does sometimes lead firms to substitute two-tier pricing, we need not cry about it: such substitution is a social boon, not a downside.

B. The Ex Post Welfare Effects

1. Tying that Creates Intra-Product Price Discrimination. The claim by tying law critics that ex post total welfare is usually increased by tying that creates imperfect intra-product price discrimination rests on an argument by analogy: that because perfect price discrimination increases ex post total welfare, imperfect price discrimination is likely to do so as well.⁸¹ This analogical claim is wrong because the economic literature proves that imperfect price discrimination reduces ex post total welfare by misallocating output among buyers, unless that inefficiency is offset by an output-increasing efficiency. Further, the quasi-per se rule prohibits ties only when a defendant with market power cannot prove an offsetting efficiency, in which case tying that achieves intra-product price discrimination should decrease ex post total welfare.

⁸⁰ See Varian, *supra* note , at 600, 617 (noting that third-degree price discrimination is probably the most common form of price discrimination).

⁸¹ See IX AREEDA & HOVENKAMP, *supra* note, ¶¶1710a&c4, 1711, 1729i1; BORK, *supra* note , at 381, 395-401; Klein, *supra* note , at 633-34.

When tying achieves intra-product price discrimination, it does so imperfectly by categorizing tying product buyers into different groups (based on their number of tied product purchases) and charging each group a different effective price for the same tying product (by inflating tied product prices). Such price discrimination is imperfect because tied product usage provides only a rough guide to buyer valuation of the tying product. Some buyers may use only one unit of the tied product but value the tying product enormously because they employ it for highly-valuable purposes. Others may use many units of the tied product but value the tying product less because they use it for less-valuable purposes. Moreover, even if we avoided the problem that some buyers who use more of the tied product may actually value the tying product less, each category would remain relatively crude because any set of buyers who use X units of the tied product will have a range of valuations for the tying product.

Economic analysis of such imperfect price discrimination is well-developed. It proves that, with linear demand, imperfect price discrimination reduces ex post total welfare, unless there is a category of buyers who would buy none of the product at a uniform monopoly price but would at a discriminatory price.⁸² The reason is that in such cases imperfect price discrimination does not alter the profit-maximizing output, but reallocates some output from high-value buyers to low-value buyers. The subcompetitive output thus remains the same, but reallocating output from high-value buyers to low-value buyers decreases consumer surplus and thus reduces total welfare. The same proposition applies without linear demand, as long as one adopts the balanced assumption that the demand curves are

⁸² This is true whether we categorize the intra-product price discrimination created by tying as a form of second-degree or third-degree price discrimination. For example, Professor Tirole characterizes tying as second-degree price discrimination, but finds that tying reduces ex post total welfare unless it expands the categories of buyers who would buy. See JEAN TIROLE, *THE THEORY OF INDUSTRIAL ORGANIZATION* 147-48 (MIT Press 1988). This is the same conclusion others have reached about third-degree price discrimination. See Stephen K. Layson, *Third-Degree Price Discrimination with Interdependent Demands*, 46 *J. INDUS. ECON.* 511, 512, 520 (1998); Richard Schmalensee, *Output and Welfare Implications of Monopolistic Third-degree Price Discrimination*, 71 *AMER. ECON. REV.* 242, 242 & n.1 (1981); Varian, *supra* note , at 621-622. (Because all this literature does not consider ex ante effects on investments to obtain market power, all its conclusions concern ex post total welfare.) The categorization is a bit ambiguous because while tying does present all buyers with the same price schedule (like second-degree price discrimination), it also effectively charges buyers higher prices for the tying product if they likely value it more (like third-degree price discrimination). I myself find the third-degree categorization more helpful in conceptualizing and modeling the issue. Further, the key proposition that imperfect price discrimination reduces ex post total welfare unless it expands the number of groups served is true for tying-induced price discrimination and classic third-degree price discrimination but, as Professor Tirole himself observes, not true for classic second-degree price discrimination. See Tirole, *supra*, at 147. In any event, nothing in my analysis turns on these semantics.

as likely to be concave as convex.⁸³ In such cases, imperfect price discrimination is likely to increase ex post total welfare only if we make the unbalanced assumption that high demand buyers have more concave curves and low demand buyers have more convex curves.⁸⁴

Whatever the shape of the demand curves, the economic literature proves that price discrimination always decreases ex post total welfare unless it affirmatively increases output.⁸⁵ Further, increasing output is necessary, but not sufficient, for price discrimination to increase ex post total welfare. Price discrimination that increases output does not increase ex post total welfare unless the welfare gains from the output increase (among categories of buyers who would not buy absent price discrimination) are large enough to exceed the welfare loss from the output misallocation (among categories of buyers who would buy at uniform or discriminatory prices). Further, even when tying-induced price discrimination does not alter output of the tying product, reallocating the tying product to buyers who use fewer tied products tends to inefficiently reduce output of the tied product.⁸⁶

Consider the following example. A firm has a printer monopoly but faces a competitive cartridge market and (just to simplify the math) printers and cartridges each cost \$0 to make. There are three buyer groups – those who at competitive cartridge prices would use 1, 2, or 3 cartridges. Each buyer group has 200 members whose valuations of per cartridge printing range linearly from 0 to \$199. At the competitive cartridge price of zero, each group will determine the effective per-cartridge price by dividing the printer price by the number of cartridges they will use. Thus, for example, if printers were priced at \$300, the 2-cartridge group would view the effective per-cartridge price as \$150 and only 50 of them would buy printers, whereas the 3-cartridge group would view the effective per-cartridge price as \$100, and half of them would buy printers. Accordingly, the three groups' respective demand functions for printers will be $200 - P_p$, $200 - P_p/2$, and $200 - P_p/3$, where P_p is the printer price.

Without tying or price discrimination, we can add the three groups demand functions to get aggregate printer demand of $600 - (11/6)P_p$. This would result in a printer price of \$163.54, printer output of 300, cartridge output of 709, profits of

⁸³ Schmalensee, *Output and Welfare*, *supra* note , at 246.

⁸⁴ Layson, *supra* note , at 512, 522-23; Varian, *supra* note , at 621-623.

⁸⁵ See Schmalensee, *Output and Welfare*, *supra* note , at 241-42, 245-246; Varian, *supra* note , at 621.

⁸⁶ See Tirole, *supra* note , at 147-48.

\$49,090, and total consumer welfare of \$46,363.⁸⁷ Now suppose the printer monopolist price discriminated. Then it would charge 1-cartridge buyers \$100, 2-cartridge buyers \$200, and 3-cartridge buyers \$300. It could do so with tying by selling printers at \$0 and requiring printer buyers to purchase cartridges from it at \$100 each. Then half of each group would get printers, making printer output 300, the same as without tying. But total cartridge use would drop to 600, profits would rise to \$60,000, and consumer welfare would drop to \$30,000. Thus, tying-induced price discrimination would lower consumer welfare by over 35% and reduce ex post total welfare over 5%, from \$95,454 to \$90,000. The reason for this decline in ex post total welfare (and cartridge output) is that, although total printer output has remained constant, tying-induced price discrimination reallocates some printer output from buyers who value printers from \$163.64 to \$300 (and use 2-3 cartridges) to buyers who value printers from \$100 to 163.64 (who use 1 cartridge).

In this example, imperfect price discrimination did not alter printer output because the uniform untied printer price resulted in sales to all groups given that some 1-cartridge users would buy printers at \$163.54. If the uniform untied printer price were \$200 or more, then *no* 1-cartridge users would buy printers and price discrimination would increase printer output to that group. Assuming equally-sized groups with linear per-cartridge valuations that have the same range for each cartridge, the Appendix proves that intra-product price discrimination produced by tying increases printer output when the number of tied units is 4 or higher. However, it also usually reduces cartridge output, which is the more relevant output measure because it tracks the quantity of actual printing. Tying-induced price discrimination lowers ex post total welfare for 2 or 3 tied units, but increases it for 4 or more units. In contrast, it always lowers consumer welfare. Further, even when tying-induced price discrimination increases ex post total welfare, the gains are relatively small, ranging from 0.4% to 9% and converging on 4.85% for large numbers of tied units, whereas the percentage loss in consumer welfare is substantial, ranging from 10% to 35% and converging on a loss of 18.85% for large numbers of tied units.

⁸⁷ With zero costs, the profits for any demand function $Q = A - BP$ will be $Q \cdot P = (A - BP)(P) = AP - BP^2$. Taking the derivative shows these profits are maximized when $P = A/2B$. Plugging the printer price into each group's demand function gives its printer quantity, which multiplied by the number of cartridges each group member buys, gives that group's cartridge quantity. Total printer and cartridge output are obtained by summing across all groups. Profits equal printer price times total printer output. Consumer welfare for each group is $(1/2)(200n - P)(Q_n)$, where n is the number of cartridges that group buys and Q_n is the number of printers it buys. Summing them gives total consumer welfare.

The analysis thus provides no support for the claim by critics of tying law that the consumer welfare effects are ambiguous or less clear than the total welfare effect. To the contrary, the decline in consumer welfare is clear and strong, while the ex post total welfare effect is mixed and weak. Given that the additional monopoly profits will to some extent be dissipated by ex ante effects (see Section D), the net effect is very likely a reduction in overall total welfare. Further, if one attaches any significantly greater distributive weight to consumer welfare loss than to producer profits (see Section C), then the tradeoff is clearly negative. Nor does the analysis support the critics' claim that tying-induced price discrimination generally increases output. To the contrary, it almost always reduces cartridge output and thus the quantity of actual printing.

In any event, in those cases where tying-induced price discrimination does increase ex post total welfare, the defendant should be able to prove an output-increasing efficiency that offsets any adverse effects, which would make quasi-per se rule condemnation inapplicable. The quasi-per se rule condemns ties only when a defendant with market power cannot show an offsetting efficiency, and the economic literature proves that, absent an output-increasing efficiency that offsets the misallocation inefficiencies, imperfect price discrimination lowers total welfare. Thus, whatever the usual effects of all ties, there is no reason to think that the subset of ties condemned by the quasi-per se rule generally increases ex post total welfare.

The above analysis assumes buyers who are final consumers. The welfare effects are even worse if we instead assume buyers are intermediaries who resell to consumers. In such cases, the economic literature shows that imperfect price discrimination reduces output and total welfare, other than in the extreme case when it induces inefficient integration.⁸⁸ The reason is that the intermediary paying a higher price will resell at a higher price that tends to drive consumers to the intermediary that pays the lower price, which will tend to drive up the profits of the latter and allow increased prices to it as well. Because most tying cases involve intermediary buyers, this only strengthens the case for concluding that tying that creates intra-product price discrimination usually harms total welfare.

2. Ex Post Welfare Effects for the Other Two Power Effect Theories. The critics' claim that price discrimination has ambiguous effects on consumer welfare but

⁸⁸ Michael L. Katz, *The Welfare Effects of Third-Degree Price Discrimination in Intermediate Goods Markets*, 77 AMER. ECON. REV. 154, 161-162 (1987).

likely increases total welfare is even more clearly wrong for the other two power effects. For tying that creates inter-product price discrimination, this claim has matters precisely backwards. There consumer welfare clearly is harmed, and the ex post total welfare effects are mixed, with tying decreasing ex post total welfare unless allocation inefficiencies are offset by output-increasing efficiencies.⁸⁹ Because the quasi-per se rule applies only when no offsetting efficiency is shown, such tying reduces ex post total welfare in all cases prohibited by the quasi-per se rule.

Likewise, using tying to extract individual consumer surplus unambiguously reduces consumer welfare. When two-tier pricing is not a feasible alternative, such tying will definitely harm consumer welfare by extracting individual consumer surplus.⁹⁰ The consumer welfare effects are less mixed than with enhancing inter-buyer price discrimination because extracting individual consumer surplus does not harm some consumers and benefit others. Further, unlike with inter-buyer price discrimination, the effects do not depend on buyers differing in their preferences. Tying to extract individual consumer surplus will also decrease total welfare whenever the tied buyers' purchases or valuations of the tying product are significantly larger than for the tied product, which is typically true in actual tying cases.

Finally, tying to extract individual consumer surplus also has more negative distributive effects. Extracting individual consumer surplus simply transfers wealth from buyers to the tying producer. This is likely to be unattractive on distributive grounds because the average buyer generally has less income than the average shareholder. Inter-buyer price discrimination has that effect as well, but also tends to shift consumer surplus from buyers who are not price sensitive to buyers who are. Because the latter will tend to have lower income, this is more likely to have desirable distributive effects.

C. The Antitrust Standard Is Consumer Welfare, Not Total Welfare

Even if the critics' analogical claim were valid, the same analogical logic means that because perfect price discrimination definitely decreases consumer welfare, tying that achieves imperfect price discrimination is likely to decrease consumer

⁸⁹ See *supra* II.B.

⁹⁰ See Burstein, *supra* note , at 68–69; Mathewson & Winter, *supra* note , at 567–69; discussion above at ____.

welfare as well. Critics cannot have it both ways by accepting the analogy to perfect price discrimination for total welfare effects but ignoring the analogy for consumer welfare effects.⁹¹

Thus, even if their analogical reasoning were correct, the critics must ultimately rest on the claim that antitrust law does or should protect total welfare rather than consumer welfare. However, antitrust law clearly protects the latter when the two are in conflict. The Supreme Court has never embraced a total welfare standard, but has repeatedly stated that “Congress designed the Sherman Act as a ‘consumer welfare prescription.’”⁹² *Jefferson Parish* itself stressed that “the consumer” was the one “whose interests the [Sherman Act] was especially intended to serve.”⁹³ The recent *Leegin* opinion equated an “anticompetitive effect” with being “harmful to the consumer” and “stimulating competition” with being “in the consumer’s best interest.”⁹⁴ Most telling, in *Brooke* and *Weyerhaeuser*, the Court expressly held that antitrust law allows below-cost pricing or overbidding when recoupment is implausible because, although such pricing is inefficient (and thus reduces total welfare), it enhances “consumer welfare.”⁹⁵ This cannot be dismissed as dicta because the proposition that consumer welfare trumps total welfare was necessary to hold that antitrust law allows inefficient below-cost pricing that benefits consumer welfare. Further, if the critics were right that tying’s power effects likely increase total welfare, then the tying cases also provide binding authority that antitrust favors consumer welfare over total welfare when they conflict, because the tying cases do condemn tying based on power effects without foreclosure share effects.

Likewise, countless lower court decisions have stated that the antitrust laws are designed to protect consumer surplus from being transferred to producers.⁹⁶ Further, the lower courts have held that antitrust law does not allow efficiencies to

⁹¹ Indeed, although his tying critique argues that price discrimination has ambiguous effects on consumer welfare but likely benefits total welfare, *see supra* note , Professor Hovenkamp concludes the opposite elsewhere, stating that “[a]ll forms of persistent price discrimination transfer wealth away from consumers and toward sellers,” but that the total welfare effects of imperfect price discrimination are ambiguous. HOVENKAMP, FEDERAL ANTITRUST POLICY 576-77 (3rd ed. 2005).

⁹² *NCAA v. Board of Regents*, 468 U.S. 85, 107 (1984); *Arizona v. Maricopa County Med. Soc’y*, 457 U.S. 332, 367 (1982); *Reiter v. Sonotone Corp.*, 442 U.S. 330, 343 (1979).

⁹³ 466 U.S. at 15.

⁹⁴ *Leegin Creative Leather Products, Inc. v. PSKS, Inc.*, 127 S.Ct. 2705, 2713 (2007).

⁹⁵ *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 224 (1993); *Weyerhaeuser Co. v. Ross-Simmons Hardwood Lumber*, 549 U.S. 312, 324 (2007).

⁹⁶ John B. Kirkwood & Robert H. Lande, *The Fundamental Goal of Antitrust: Protecting Consumers, Not Increasing Efficiency*, 84 NOTRE DAME L. REV. 214, 219-224 (2008).

justify a merger that would increase prices, even though such a merger might increase total welfare by creating cost-savings for the merging firm that exceed the price increase to consumers. Instead, the courts, and the merger guidelines, require proof that any cost-savings would be sufficiently passed on to consumers such that the merger would result in a net price reduction that benefits consumer welfare.⁹⁷ Again, this is not dicta because the proposition that consumer welfare trumps total welfare was necessary to hold that antitrust law prohibits efficient mergers that harm consumer welfare.

The legislative history also indicates that Congress wanted to protect consumer welfare.⁹⁸ To be sure, Judge Bork argued that this legislative history supported a total welfare standard. But what he actually showed for the first 109 pages of his famous book was that the antitrust laws embody a “consumer welfare” standard,

⁹⁷ See *id.* at 224-227; U.S. DOJ/FTC, Horizontal Merger Guidelines §4 (1992, revised 1997). Some argue that antitrust law protects not consumer welfare, but the “competitive process.” See Gregory J. Werden, *Competition, Consumer Welfare, & the Sherman Act*, 9 SEDONA CONF. J. 87 (2008). But what does the “competitive process” mean? It cannot turn on whether the process involves more competitors or more competitive behavior among them, for antitrust law allows mergers that reduce the number of competitors and joint ventures that limit competitive behavior if they benefit consumer welfare, and prohibits tying that harms consumer welfare even when it produces no substantial foreclosure share that could reduce the number or competitiveness of rivals. Nor can it turn on a combination of those factors and conduct efficiency, for antitrust law allows inefficient below-cost pricing that reduces the number of rivals but benefits consumer welfare and prohibits efficient mergers that reduce the number of rivals but harm consumer welfare. Instead, as this legal pattern shows, courts judge whether conduct worsens the competitive process by whether it produces a process that is likely to harm consumer welfare. See, e.g., *Grappone, Inc. v. Subaru of New England, Inc.*, 858 F.2d 792, 794 (1st Cir. 1988) (Breyer, J.) (“the antitrust laws protect the competitive process in order to help individual consumers”); *Geneva Pharmaceuticals Technology Corp. v. Barr Laboratories Inc.*, 386 F.3d 485 (2d Cir. 2004) (“The antitrust laws ... safeguard consumers by protecting the competitive process.”); *Brunswick Corp. v. Reigel Textile Corp.*, 752 F.2d 261, 266 (7th Cir. 1984) (“[t]he purpose of the antitrust laws ... is to preserve the health of the competitive process – which means ... to discourage practices that make it hard for consumers to buy at competitive prices”).

This does not mean that courts must assess consumer welfare effects on a case by case basis. Often they use rules, like the quasi-per se rule, that identify conduct likely to harm consumer welfare. It just means that consumer welfare is the ultimate metric used to design antitrust laws, whether they take the form of rules or standards. See Stephen Bundy & Einer Elhauge, *Knowledge About Legal Sanctions*, 92 MICH. L. REV. 261, 267-79 (1993) (explaining the tradeoffs in determining whether rules or standards best advance social goals). Nor does a consumer welfare standard mean that antitrust law allows inefficient conduct that harms firms or upstream sellers unless one proves downstream harm to consumers. Antitrust law condemns anticompetitive agreements that boycott single firms or create buyer market power in local upstream markets, even when it would be hard to prove any effect on downstream consumers, See ELHAUGE, U.S. ANTITRUST, *supra* note, at 94, 664 & n.27. Condemnation in such cases is perfectly consistent with a consumer welfare standard because, if such conduct affects consumer welfare at all, the effect can only be negative. Allowing the anticompetitive elimination of one firm or creation of upstream market power could only reduce output and market choices in the downstream consumer market not only currently, but also in the future by making firms less willing to enter such markets.

⁹⁸ Lande, *Wealth Transfers as the Original and Primary Concern of Antitrust: The Efficiency Interpretation Challenged*, 34 HASTINGS L.J. 65, 74-77, 82-106, 142-51 (1982); HOVENKAMP, *supra* note, at 76 (“the legislative history of the Sherman Act shows a great deal of concern for the fact that monopolists transfer wealth away from consumers, but no concern at all for any articulated concept of efficiency.”)

which on page 110 he converted into a total welfare standard with the logic that “the monopoly and its owners . . . are also consumers,” so that conduct that provides benefits to a monopolist that exceed the harm to traditional consumers is “merely a shift in income between two classes of consumers.”⁹⁹ Bork offered no evidence that Congress ever shared his rather specialized understanding of what a “consumer” meant.¹⁰⁰

Sound policy reasons also counsel against replacing the current consumer welfare standard with a total welfare standard. First, any additional monopoly profits reaped by tying will be dissipated by the costs of competing to obtain market power.¹⁰¹ Because a total welfare standard does not discount the additional monopoly profits by these ex ante costs, it will generally produce inefficient results compared to a consumer welfare standard. Indeed, as Judge Posner showed, the fact that monopoly profits will be dissipated by the costs of obtaining market power means that: “Even when price discrimination is perfect, so that the deadweight loss of monopoly is zero, the total social costs of a discriminating monopoly are greater than those of a single-price monopoly.”¹⁰²

Second, if conduct really enhances total welfare, a firm can usually structure that conduct in a way that passes on enough of its gain to convert a total welfare gain into a consumer welfare gain. A consumer welfare standard can thus force firms to put their money where their mouth is. If a firm really believes it will reap the size of efficiency gains it claims, it can generally use those gains to fund a consumer welfare trust or some other mechanism to lower prices enough to give consumers a net benefit.¹⁰³

Third, it is much easier to coordinate international antitrust regulation around a consumer welfare standard.¹⁰⁴ In a world of concurrent antitrust jurisdiction, the decisive regulator will be the most aggressive nation, and the nations likely to regulate most aggressively are the importing nations harmed by the conduct.

⁹⁹ See BORK, *supra* note , at 110.

¹⁰⁰ See Herbert Hovenkamp, *Antitrust Policy After Chicago*, 84 MICH. L. REV. 213, 250 (“Bork’s work has been called into question by subsequent scholarship showing that in 1890 Congress had no real concept of efficiency and was really concerned with protecting consumers from unfavorable wealth transfers.”); Philip Areeda, *Introduction to Antitrust Economics*, 52 ANTITRUST L.J. 523, 536 (1983) (antitrust law and legislative history embraces consumer welfare standard rather than total welfare).

¹⁰¹ See Richard A. Posner, *The Social Costs of Monopoly and Regulation*, 83 J. POL. ECON. 807, 807-809, 822 (1975).

¹⁰² *Id.* at 822.

¹⁰³ ELHAUGE, U.S. ANTITRUST, *supra* note, at 638-39.

¹⁰⁴ ELHAUGE & GERADIN, *supra* note, at 1102-1103.

Under a consumer welfare standard, this effective allocation of regulatory authority works well because importing nations have incentives to apply a consumer welfare standard correctly. In contrast, importing nations would have incentives to misapply a total welfare standard by underweighing producer benefits and overweighing consumer harms.

Fourth, the redistributive effects of allowing conduct that increases monopoly profits more than it harms consumer welfare are likely to be undesirable because shareholders of monopoly firms generally have higher income than consumers. True, some argue for allowing any efficient conduct because we can tax the profits and redistribute them to anyone harmed. But that argument depends on the premise that the tax system would be a more efficient means of redistribution. The validity of that premise is unclear here because taxes clearly deter efficient behavior, whereas tying with power effects has at best mixed efficiency effects. Further, such tying can be hard to disentangle from tying which decreases total welfare because of other effects.

D. Given Ex Ante Effects, Overall Total Welfare Turns More on Consumer Welfare Than on Ex Post Total Welfare

More recently, some have offered a more radical claim: that any vertical conduct (including tying) that increases the monopoly profits extracted from market power should be deemed desirable – even if it reduces ex post total welfare – because the increased profits will induce more investment in the innovation that creates market power.¹⁰⁵ Because they apply their claim only to increased profit extraction, and not to conduct that extends market power, their claim would here mean that the law should stop treating the power effects as anticompetitive, but still treat the foreclosure share effects that way. This new claim usefully gives up the ghost on the single monopoly profit theory, and acknowledges that even the power effects

¹⁰⁵ See, e.g., Carlton & Heyer, *supra* note , at 285, 290-292. Although the authors refer to the relevant conduct as “single-firm” conduct, they explicitly extend their analysis to tying and bundled discounts, exclusive dealing and loyalty discounts, and resale price maintenance. *Id.* at 290. Because all those practices involve multi-firm agreements, where the buyer agrees to abide by some seller condition restricting buyer choice, it is more accurate to say the authors are arguing for a test applicable to all vertical practices and agreements. True single-firm conduct, like merely setting unconditioned prices or deciding with whom to deal, can be challenged as monopolization or attempted monopolization only if it is reasonably capable of making a significant causal contribution to the acquisition or maintenance of monopoly, which means that monopolization claims do require extension and do not cover pure extraction. See ELHAUGE, U.S. ANTITRUST, *supra* note, at 302-04; Elhauge, *Defining Better*, *supra* note , at 331-34. But the legal standards applicable to agreements are not limited to extension.

from tying and bundled discounts can reduce total welfare.¹⁰⁶ It clarifies that the real claim is that increasing monopoly profits is likely to create beneficial ex ante effects that offset any harmful welfare effects that flow after the tie is imposed.

However, this new claim rests on a mistaken premise. That premise is that ex ante investment will be suboptimal whenever firms “capture less than the total surplus created by their innovations.”¹⁰⁷ This premise is false because it ignores the fact that firms compete to obtain the patents or other property rights that give them market power. This process will lead to competitive investments that dissipate those monopoly profits. Thus, the patent race literature proves that firms will make socially excessive (and often duplicative) investments if they capture all the total surplus created by their innovations. The basic reason is that firms do not stop investing in efforts to create patents when marginal investment cost equals the *marginal* social gain, but continue investing until it equals the *average* gain from such an investment. For example, a firm would invest \$1 million to be the hundredth research team with a 1/100 chance of becoming the first discoverer of an innovation that will generate \$100 million in profits, even if having a hundredth team does not meaningfully increase the marginal odds that someone will discover the innovation. Indeed, this literature proves that investments will be excessive whenever firms capture more than a certain fraction of total surplus.¹⁰⁸ What keeps that fraction from being exceeded is precisely the fact that part of the total surplus is instead enjoyed by consumers, as the consumer surplus they earn at a uniform monopoly price.

True, one could imagine maintaining the same fraction by shortening the patent term to adjust for the fact that the critics’ proposed legal change would allow firms to extract all the consumer surplus during their patent term. But this approach raises several problems. First, in fact patent terms have been set based on current law, which does not allow a patent holder to extract greater monopoly profits through tying. Instead, current law not only subjects patent holders to the same quasi-per se tying rule as everyone else, but affirmatively treats such ties as a patent misuse.¹⁰⁹ Patent holders are entitled to the normal monopoly profits they

¹⁰⁶ Carlton & Heyer, *supra* note , at 292-293.

¹⁰⁷ *Id.* at 291 n.12.

¹⁰⁸ SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 100-103 (MIT Press 2005); Tandon, *Rivalry and the Excessive Allocation of Resources to Research*, 14 BELL JOURNAL OF ECONOMICS 152, 152, 156-57 (1983); Dasgupta & Stiglitz, *Uncertainty, Industrial Structure, and the Speed of R&D*, 11 BELL JOURNAL OF ECONOMICS 1, 18 (1980).

¹⁰⁹ *Illinois Tool Works v. Independent Ink*, 547 U.S. 28, 33-34, 40-43 (2006)

make by selling their patented goods, but are not currently entitled to extract more than those profits through tying. Thus, one would have to change tying doctrine and the patent terms simultaneously to effectuate the proposed change without causing excessive investment incentives.

Second, not all patent holders can equally extract consumer surplus through tying. It would be unsound policy to adopt a legal change that awards greater returns to those with greater extraction ability, even though their innovations are no more valuable, because that would inefficiently distort research toward less valuable innovations.

Third, if the fraction is unchanged, this legal change would have no real benefit because it would not increase total or consumer welfare. It would simply transfer consumer surplus, lowering current consumers' share of total surplus to 0% in order to increase future consumers' share to 100%, which is distributionally unattractive.

Fourth, varying the patent term would not provide the necessary offsetting adjustment for all the other property rights that protect market power. Copyright terms are too long for marginal changes in them to meaningfully alter the present value of expected profits, trade secrets last as long as the secret can be held, and regular property rights have infinite terms. They all protect market power, and it would be implausible and disruptive to adjust them all in order to offset the effects of a legal change allowing firms to extract more monopoly profits from that market power.

The last point is important because this patent race literature in effect formalizes a more general insight by Judge Posner: that competition to obtain market power dissipates the resulting monopoly profits regardless of the source of that market power.¹¹⁰ As he pointed out, firms will find it profitable to incur costs to obtain market power up until those costs equal the expected monopoly profits. If the costs were lower than expected monopoly profits, then more firms would incur those costs to try to obtain the market power position, until the two equilibrated. Thus, if one properly includes the costs of those who *failed* to obtain the market power position, the total firm costs of obtaining market power will dissipate the resulting monopoly profits.¹¹¹ Accordingly, considering ex ante effects does not

¹¹⁰ See Posner, *The Social Costs of Monopoly*, *supra* note , at 807-809.

¹¹¹ *Id.* at 812.

support allowing additional exploitation of market power. To the contrary, considering ex ante costs *increases* the social loss from such exploitation, and means that even perfect price discrimination actually reduces social efficiency, even though it increases ex post total welfare.¹¹²

Judge Posner's claim that 100% of the monopoly profits will be dissipated has been disputed by Professor Fisher, who made two points.¹¹³ First, sometimes firms luck into unearned monopolies or happen to have advantages in obtaining them. But we have even less reason to give such firms a larger share of social surplus because doing so is unnecessary to incentivize them. Second, if one assumes rising marginal costs in obtaining market power, then not all producer surplus will be dissipated when the expected profit gain equals marginal costs. But Judge Posner's contrary assumption of constant costs also seems reasonable and consistent with the usual economic assumption that costs are constant in the long run.¹¹⁴

In any event, even Professor Fisher acknowledges that some of the monopoly profits will be dissipated by ex ante acquisition costs: he disputes only that all or nearly all will be.¹¹⁵ There are thus two possible cases. In cases where Judge Posner is right that 100% of monopoly profits are dissipated, then any ex post increase in monopoly profits effectively washes out ex ante, which means that the consumer welfare effects actually determine the overall total welfare effects. To the extent tying's power effects decrease consumer welfare, they would also decrease overall total welfare, even if they increased ex post total welfare by producing an increase in monopoly profits that exceeded the consumer welfare harm, because those profits would be eaten up by ex ante costs. In cases where Professor Fisher is right, then some share less than 100% of monopoly profits are dissipated, which still means that tying that increases ex post total welfare will often decrease overall total welfare. It will do so whenever the consumer welfare harm exceeds the non-dissipated share of the monopoly profit gain. In short, either Posner is right, and consumer welfare actually determine total welfare effects, or Fisher is right, and consumer welfare indicates total welfare better than ex post total welfare does unless the ex post total welfare increase is much greater than the consumer welfare decrease.

¹¹² *Id.* at 822.

¹¹³ Franklin M. Fisher, *The Social Costs of Monopoly and Regulation: Posner Reconsidered*, 93 J. POL. ECON. 410 (1985).

¹¹⁴ See Posner, *The Social Costs of Monopoly*, *supra* note , at 810-811.

¹¹⁵ See Fisher, *supra* note , at 416.

Ex ante effects thus eliminate the main argument for an ex post total welfare test, and strengthen the case for applying a consumer welfare standard. Ironically, total welfare is probably measured better by consumer welfare than by ex post total welfare. Ex ante effects thus strengthen the grounds for thinking that tying's power effects likely reduce total welfare. Even in the subset of cases where power effects increase ex post total welfare, they will usually decrease overall total welfare even under the Fisher analysis, given that the negative consumer welfare effects are generally larger than any positive ex post total welfare effects, and almost always will decrease total welfare under the Posner analysis.

V. HOW THIS ANALYSIS HELPS LIMIT AND ILLUMINATE THE RULE AND CASES

A. The Cases and Proper Limits to the Quasi-Per Se Rule

While the power effects generally justify the quasi-per se rule, they cannot justify that rule when market conditions make power effects impossible. Under such market conditions, a substantial tied foreclosure share is necessary for anticompetitive effects. If the products are used or bought in a fixed ratio, that knocks out both intra-product price discrimination and extracting individual consumer surplus, both of which require varying purchases of one of the products. Inter-product price discrimination is barred by a strong positive demand correlation, which can generally be inferred when the products lack separate utility, because that indicates that demand for each product will reflect demand for their joint functionality. Thus, the quasi-per se rule should have an exception when the products both (1) are used or bundled in a fixed ratio, *and* (2) lack separate utility. Such ties should instead be governed by a traditional rule of reason that requires a substantial foreclosure share or effect.

Consistent with my analysis, Supreme Court tying opinions have been most divided when some Justices held empirical premises that matched those two conditions. Thus, understanding the power effects helps not only to explain the doctrine, but also to predict its fault lines.

Jefferson Parish involved a tie of anesthesiology to hospital services.¹¹⁶ Obviously, these are services that are far more useful with each other, so it seems

¹¹⁶ *Jefferson Parish v. Hyde*, 466 U.S. 2 (1984).

likely that demand for them would have a strong positive correlation. If we also assume that medical need fixes the ratio of anesthesiology to hospital services, then this could well represent the atypical case where market conditions negate power effects. Indeed, the Court and concurrence assumed that part of the ratio was fixed, concluding that medical need dictates the amount of anesthesiology services (the tied product) for each surgery.¹¹⁷

However, the Court and concurrence did not focus on whether fixed ratios and positive demand correlation negated power effects in a way that justified an exception to the quasi-per se rule that might apply to the case at hand. Instead, the issues were framed around whether, as the concurring Justices argued, the Court should: (1) completely repeal the quasi-per se rule in all cases, or (2) deem two items a single product, incapable of being tied, in any case when the tied product lacks any separate utility without the tying product.¹¹⁸

Because the concurrence's, first claim, that the quasi-per se rule should be repealed, encompassed all tying cases, the Court focused on the fact that the quasi-per se rule made sense when market conditions did not negate power effects.¹¹⁹ Given the scope of the claim, the Court thus had little trouble rejecting it. But the fact that application of the quasi-per se rule was questionable on the facts of the particular case, given the plausible existence of a fixed ratio and positive demand correlation, probably fueled the concurrence's skepticism and helps explain why this case produced such a divided opinion.

The concurrence's single-product claim came closer to the relevant issue, but was overbroad in two ways. First, without fixed ratios, a lack of separate utility would not negate power effects and thus cannot alone justify an exception to the quasi-per se rule. In rejecting this claim, the Court explicitly recognized this point, pointing out that: "In fact, in some situations the functional link between the two items may

¹¹⁷ *Id.* at 28 n.47; *id.* at 36 n.4, 43 (Justice O'Connor, joined by Burger, C.J., and Powell & Rehnquist, JJ, concurring in the judgment.) This factual premise is actually debatable. For example, anesthesiologists might vary in how often they visit a pregnant woman in labor, how much they monitor post-operation recovery, and whether they provide 24-hour coverage, while hospitals might vary in the extent to which they use highly-trained anesthesiologists for particular procedures. Further, while the factual premise, if true, would make tying to enhance intra-product price discrimination implausible, it would not mean a fixed ratio because the number or intensity of hospital days (the tying product) probably does vary, especially given modern managed care where insurers actively make consumption decisions. This variation in tying product consumption could conceivably permit extracting individual consumer surplus.

¹¹⁸ *Id.* at 35, 38-40, 43, 46 (Justice O'Connor, joined by Burger, C.J., and Powell & Rehnquist, JJ, concurring in the judgment.)

¹¹⁹ *Id.* at 12-18.

enable the seller to maximize its monopoly return on the tying item as a means of charging a higher rent or purchase price to a larger user of the tying item. See n. 23, *supra*.¹²⁰ And the note 23 to which the Court referred was precisely the footnote pointing out that scholarship by Bowman, Burstein, and Stigler showed that tying can allow a tying firm to extract greater monopoly profits.¹²¹

Second, deeming two items a single product would generally oust not only the quasi-per se rule, but also ordinary rule-of-reason inquiry even when a substantial tied foreclosure share did exist, because it would mean the case just involves the sale of a single product.¹²² This result would be unjustified because a lack of separate utility does not eliminate the possibility that a substantial tied foreclosure share might increase tying market power. Nor would a lack of separate utility eliminate the plausibility of adverse foreclosure share effects within the tied market absent the additional factor of fixed ratios. To the contrary, the absence of alternative uses for the tied product would indicate that the tie is more likely to achieve a substantial tied foreclosure share that could lead to the two foreclosure share effects. Thus, the Court was right to reject the argument that two items should be considered a single product when they are functionally related or separately useless.¹²³

The *Kodak* dissenters came much closer to the mark. There the dissenters argued that the tied parts and service should be deemed either a single product or outside the quasi-per se rule because parts and service (1) were used in fixed ratios and (2) lacked any separate utility.¹²⁴ These two factors, the dissenters argued, meant that any incremental monopoly profit gained from tying parts to service could equally be achieved by simply raising parts prices. Leaving aside possible price discrimination between those subject to the tie and those not, those factors would (if true) indeed negate power effects. Those two factors would also eliminate the possibility that foreclosing a substantial share of the tied service market could create tied market power that the defendant could exploit against tied product purchases that otherwise would not have been subject to its tying market power in parts.

¹²⁰ *Id.* at 19 n.30.

¹²¹ *Id.* at 15 n.23.

¹²² In the actual case, there was an exclusive dealing agreement that made the arrangement independently reviewable, but that will not always be the case.

¹²³ *Id.* at 19 & n.30.

¹²⁴ *Eastman Kodak v. Image Technical Servs.*, 504 U.S. 451, 494 n.2, 498-499 (1992) (Scalia, J., joined by O'Connor & Thomas, JJ., dissenting).

Those two factors thus (if true) would come close to knocking out four of the five possible anticompetitive effects from tying. However, they would not eliminate the fifth possibility: that tied market foreclosure might enhance tying market power. Suppose, though, we add a third premise, which the dissent probably implicitly assumed: that Kodak had patents over parts for its own machines, which presumably is how Kodak prevented others from making those parts. If so, the patents probably would bar rivals from entering the parts market even without any tie, so that the tie was unlikely to reduce rival entry into the parts market, and thus unlikely to increase tying market power. True, even without affecting parts entry, foreclosing rival service providers might enhance tying market power if service were a partial substitute for parts. But partial substitutability would be inconsistent with the *Kodak* dissenters' factual premise that parts and services are used in fixed ratios: partial substitutes by definition can be used in varying ratios. Thus, given the dissenters' factual premises, it is not surprising that the facts of this case produced a divided opinion.

However, one might reasonably doubt the dissent's factual premises on separate utility and fixed ratios. As the Court pointed out, service is sometimes purchased without parts, and those who self-service buy parts without buying service.¹²⁵ Thus, the ratio of usage also varies. This variability reintroduces all the possible anticompetitive effects. It also seems quite likely that service is a partial substitute for parts. After all, firms that use more service to maintain their machines tend to have them break down less often, and thus need fewer parts. Further, firms can sometimes use additional service to repair existing parts without replacing them. This partial substitutability means that foreclosing service could increase tying power over parts.

Moreover, while the usual price discrimination issue with tying involves price discrimination among buyers subject to the tie, this case raised the distinct issue of discrimination between those buyers and buyers who were *not* subject to the tie. The reason is that the tie did not apply to buyers who supplied their own service, which the Court noted could permit a form of price discrimination between self-service buyers and service-purchasing buyers.¹²⁶ If the need to buy service is a good proxy for buyer unsophistication or willingness to pay more for parts, then a tie can aid price discrimination in parts by helping to sort out buyers even if the

¹²⁵ *Kodak*, 504 U.S. at 483 & n.7.

¹²⁶ *Id.* at 475-76.

ratios are fixed. The *Kodak* dissenters dismissed this claim with the observation that Kodak could have achieved the same price discrimination by simply charging more for parts sold to those who buy service.¹²⁷ But such direct price discrimination might have been hard to maintain because those who do self-service may resell parts or misrepresent the buyer's identity. These problems are avoided by charging all buyers the same price for parts, but tying those parts to high service prices, which would naturally affect only buyers who could not self-service. A tie here might thus have allowed price discrimination that was not otherwise possible.

In any event, the cases in which many Justices expressed skepticism about applying the quasi-per se rule map well onto cases in which those Justices plausibly thought the products had a fixed ratio and lack of separate utility, which would negate power effects. Thus, power effects not only explain the quasi-per se rule, but also help explain doctrinal fault lines by predicting when the rule's applicability is most likely to be contested.

The above analysis also helps explain *Microsoft*, in which the D.C. Circuit held the quasi-per se rule inapplicable but upheld a tying claim under a monopolization rule-of-reason standard.¹²⁸ The court reasoned that Microsoft's tie was unlike ties considered in past cases that invoked the quasi-per se rule because Microsoft's tie involved physical integration and claimed justifications. Justifications seem irrelevant to whether the quasi-per se rule should apply if, as now seems clear, that rule admits justifications.¹²⁹ But the physical integration indicated a fixed ratio, and at the time browsers lacked any separate utility without an operating system. Those two factors negated the three power effects, making the quasi-per se rule inappropriate. Indeed, those same factors also meant the tie was unlikely to create additional market power against buyers of the tied product. This left the fifth possibility: that the tie might help preserve tying market power. This was the one the court relied upon for its holding sustaining the tying claim on monopolization rule-of-reason grounds, reasoning that Microsoft feared that future browsers could run applications in competition with its operating system.

Interestingly, the European Commission, in its own claim that Microsoft tied its media player to its operating system, also declined to rely on the EU's own quasi-per se tying rule, and instead required evidence of a substantial tied foreclosure

¹²⁷ *Id.* at 499 n.3 (Scalia, J., joined by O'Connor & Thomas, JJ., dissenting).

¹²⁸ *United States v. Microsoft Corp.*, 253 F.3d 34, 84 (D.C. Cir. 2001) (en banc).

¹²⁹ *See supra* Part III.

share.¹³⁰ This parallel analysis indicates tribunals on both sides of the Atlantic share the intuition that the quasi-per se rule should not apply in cases where market conditions negate power effects.

My recommended exception correlates with, but differs from, the claim that technological tying should not be treated like contractual tying.¹³¹ Many technological ties likely involve products with fixed ratios that lack separate utility, and if they do, an exception for them would be consistent with the claim here. But sometimes a technological tie may permit the tying product to work with only one consumable whose usage is variable. Other times usage of the tying product may vary in a technological tie. Technology can also tie products that otherwise would have separate utility and lack a strong positive demand correlation. A technological tying exception to the quasi-per se rule would thus be overinclusive. It would also be underinclusive because there are many nontechnological ties that involve fixed ratios and a lack of separate utility.

To be sure, technological tying may often have procompetitive justifications. However, one cannot assume that is so, because firms may integrate technologies to achieve anticompetitive effects. Indeed, adopting a legal exception for technological tying would predictably induce more anticompetitive technological integration. This observation is particularly true for technologies like software, because their plasticity makes the costs of integration low. So one should not judge the desirability of a technological tying exception by looking at how often technological integration today is procompetitive, because current practices reflect the lack of such an exception. Further, many nontechnological ties involve procompetitive justifications. Thus, a technological tying exception is both overinclusive and underinclusive if it is meant to target cases in which procompetitive justifications exist. It is better to focus directly on the elements that do bear on the existence of both procompetitive justifications and anticompetitive effects.

B. Other Doctrinal Issues

Understanding the five theories of anticompetitive effects that animate current tying law also illuminates other doctrinal issues. *First*, it shows that damages

¹³⁰ Case T-201/04, Microsoft Corp. v. Commission ¶¶ 977-984, 1031-1036 (CFI 2007).

¹³¹ See Bush DOJ Single Firm Conduct Report, *supra* note , at 87-89 (collecting sources).

should generally be available to buyers in tying cases. Some have mistakenly stated that “a buyer can be forced to pay an above-market price for the tied product only if the seller reduces the price of the tying product by the same amount.”¹³² But this statement adopts the mistaken single monopoly profit theory, which unfortunately has persuaded some courts to hold that buyers presumptively cannot prove damages.¹³³ As shown in Part II, even without a substantial tied foreclosure share, tying by a firm with market power generally harms buyers absent offsetting efficiencies, and either requires no reduction in the tying price or one too small to offset the tied price increase. If tying causes a substantial tied foreclosure share, it can also increase tied or tying market power, which further injures buyers.

The same logic disproves the related claim that buyers who reject a tie cannot be harmed because they “cannot be made to pay more than the market price for the combination.”¹³⁴ Even without a substantial tied foreclosure share, buyers who reject a tie receive only the consumer surplus from buying the tied product at market prices, when absent the tie they would have enjoyed that surplus plus the additional consumer surplus from buying the tying product at the monopoly price. If the tie does cause a substantial tied foreclosure share, it can also elevate tied and tying market prices above but-for levels, thus forcing all buyers to pay more than they would have paid without the tie.

Another frequent claim is that “any time there is an overcharge on the tied good, there must be an undercharge on the tying good.”¹³⁵ This claim is more modest because it does not assert that the overcharge must equal the undercharge. However, it is also incorrect because section II.C shows that, even without a substantial foreclosure share, tying can create a tied product overcharge without any tying product undercharge, and generally does so if the covered buyers’ spending or valuation for the tying product is sharply higher than for the tied product. Further, Sections II.D-E show that, with a substantial tied foreclosure share, tying can increase both tied and tying market power, and thus create overcharges in both the tying and tied markets.

Second, the relevant effects explain why, although the Supreme Court has talked about tying’s “forcing” effect, it has rejected the argument that tying should not be condemned if buyers would have bought the tied product from the defendant

¹³² See II AREEDA, BLAIR & HOVENKAMP, ANTITRUST LAW ¶358b, at 464 (2d ed. 2000).

¹³³ *Id.* at 464-465.

¹³⁴ *Id.* at 465.

¹³⁵ *Id.* ¶394, at 549.

anyway.¹³⁶ This rejection makes sense because a buyer's willingness to buy the tied product from the defendant even without a tie would not prevent any of the power effects from increasing the prices buyers would pay for the combination of tying and tied products. Buyers who would have bought the same product from the defendant would also still suffer from any foreclosure share effects because, absent that foreclosure, they would have been able to buy the defendant's product at a lower price. The rejection also makes factual sense because rational firms would not bother having a tying agreement unless they expected it to alter buyer choices.

Third, the relevant effects have implications for what should count as antitrust injury. Some have argued that tying that covers a small share of an intermediary market does not create antitrust injury, because raising prices (or imposing price discrimination) on intermediary buyers does not lessen competition unless the elevated prices are passed on to downstream consumers.¹³⁷ But increased prices or price discrimination are precisely the power effects deemed anticompetitive under Supreme Court case law. Antitrust injury doctrine should not be manipulated to circumvent substantive antitrust law about what constitutes an anticompetitive effect, nor to effectively impose a substantial foreclosure share requirement that the quasi-per se rule rejected. Nor is it true that conduct that raises prices to intermediaries constitutes antitrust injury only if the plaintiff proves the price increase was passed on to downstream consumers, as one can readily see by considering how courts would treat horizontal price-fixing to intermediaries. Requiring affirmative proof of such a pass-through also seems inconsistent with the *Illinois Brick* rule that concentrates antitrust claims in direct purchasers to avoid difficult inquires into the degree of pass-through.¹³⁸

Fourth, as noted above, the relevant market definitions differ for power and foreclosure share effects.¹³⁹ If the claimed injury involves power effects, the relevant market is the market to which tying product buyers can reasonably turn. If the claimed injury involves foreclosure share effects, the relevant market is the market to which tied product rivals could reasonably turn.

¹³⁶ *United Shoe Machinery v. United States*, 258 U.S. 451, 462 (1922); X AREEDA, ELHAUGE & HOVENKAMP, ANTITRUST LAW ¶1753c (2d ed. 2004) (collecting cases).

¹³⁷ See II AREEDA, BLAIR & HOVENKAMP, *supra* note, ¶358b, at 465-466.

¹³⁸ *Illinois Brick v. Illinois*, 431 U.S. 720 (1977).

¹³⁹ See *supra* Part III.

VI. BUNDLED DISCOUNTS

The most important thing to get straight about bundled discounts is that they need not reflect true discounts at all. Unfortunately, the rhetoric of the word “discounts” has beguiled many into mistakenly assuming that bundled discounts must lower prices to buyers and thus should be deemed “presumptively procompetitive.”¹⁴⁰ However, all a bundled “discount” means is that the defendant charges higher prices to buyers who won’t comply with a bundling condition than to buyers who will. Because the defendant can set the noncompliant prices at whatever level it wishes, those noncompliant prices can exceed the prices that would have prevailed “but for” the bundling. There is no warrant for presuming that noncompliant prices equal but-for prices, and thus no justifiable grounds for assuming that “discounts” from noncompliant prices reflect true discounts from but-for levels. If the unbundled price charged to noncompliant buyers exceeds the but-for level, then the program in fact imposes a price *penalty* on buyers who refuse the bundle.

Proper analysis must thus not prejudge the merits by assuming that bundled discounts reflect real discounts from but-for prices. Instead, we need to assess whether unbundled prices are greater or lower than but-for levels, and then analyze the effects under both possibilities. Because part of the question will be when bundled discounts have similar effects to tying, I will refer to the products not as tying or tied, but as “linking” and “linked,” where the linking product means the one over which the defendant has market power.

As the analysis will show, if the unbundled price for the linking product exceeds its but-for price, then bundled discounts can produce all the same power effects as tying. Indeed, one can think of tying as simply a special case of bundled discounts, where the unbundled price on the linking product is set at infinity. Thus, if those power effects merit condemnation, as Supreme Court tying cases clearly hold, then so do bundled discounts whenever the unbundled price on the linking product exceeds the but-for level. When the unbundled price for the linking product equals the but-for level, then the same power effects are not possible.

¹⁴⁰ See Daniel A. Crane, *Mixed Bundling, Profit Sacrifice, and Consumer Welfare*, 55 EMORY L.J. 423, 465 (2006); Hovenkamp, *Discounts and Exclusion*, 2006 UTAH L. REV. 841, 844; Thomas A. Lambert, *Evaluating Bundled Discounts*, 89 MINN. L. REV. 1688, 1726 (2005). All the points made in Professor Hovenkamp’s article about bundled and loyalty discounts reappear in IIIA AREEDA & HOVENKAMP, ANTITRUST LAW ¶749 (2008), but none of these points can fairly be attributed to Professor Areeda given that they were written over a decade after his unfortunate demise. I will thus cite only to Professor Hovenkamp’s article for these points.

Whether or not the unbundled price on the linking product exceeds the but-for price, bundled discounts that cover a substantial share of the linked market can also produce adverse foreclosure share effects. In addition, bundled loyalty discounts can discourage price competition in a way that tying cannot, but this effect also generally requires substantial foreclosure.

This analysis thus supports the following legal test. When the unbundled price for the linking product exceeds its but-for price, bundled discounts should be equated with tying. In such cases, bundled discounts should be condemned based on linking market power absent offsetting efficiencies, unless the products have a fixed ratio and lack separate utility. When the unbundled price does not exceed the but-for price, then bundled discounts should not be equated with tying, but rather should be condemned only when a substantial foreclosure share or effect is proven and offsetting efficiencies are not shown.

The analysis below shows that bundled discounts can raise prices even if the bundled or effective price is above cost. Thus, the cost-based tests adopted by some courts and commissions are not only mistaken, but perversely immunize the most anticompetitive form of bundled discounts: those that inflate prices far above costs. I also show that the relevant anticompetitive effects are not well-captured by alternative tests that focus on the proportion of buyers who accept the bundle or on whether unbundled prices exceed pre-bundle prices.

A. The Same Power Effects as Tying Are Possible If and Only If the Unbundled Price For the Linking Product Exceeds the But-For Level

The analysis below will generally assume bundled loyalty discounts, which are discounts on the linking product that require buyers to buy all or a high share of the linked product from the defendant. Unit-to-unit bundled discounts would negate two of the power effects, for the same reasons that fixed ratio ties would.

1. Extracting Individual Consumer Surplus. Assume buyers buy varying amounts of a linking product over which the defendant has market power, the two products are not used in a fixed ratio, and the bundle does not cover a substantial share of a competitive linked market. Then the economic literature proves that bundled loyalty discounts produce precisely the same extracting of individual consumer

surplus as requirements tying.¹⁴¹ In fact, it proves that the bundling firm would maximize profits by setting an unbundled price for the linking product that chokes off unbundled purchases. To illustrate, consider the hypotheticals discussed in Section II.C, only now assume that, instead of tying, the defendant offers an unbundled printer price that equals or exceeds the Y-intercept of \$1000, with the printer price discounted to a lower level for buyers who agree to buy scanners from the defendant. Then precisely the same conclusions that were elaborated in Section II.C would still follow.

If the sum of the consumer surpluses at monopoly prices in the linking and linked markets ($CSM_{\text{linking}} + CSM_{\text{linked}}$) exceeds the consumer surplus at competitive prices in the linked market (CSC_{linked}), then the defendant will maximize profits by setting the “discounted” prices for both the linking and linked products to equal their monopoly prices.¹⁴² When demand is linear, this condition will be met whenever the covered buyers’ consumer surplus at monopoly or competitive prices would be more than three times larger for the linking product than for the linked product, which will generally be true if the covered buyers’ purchases or valuations are sharply higher for the linking product than for the linked product.¹⁴³ Clearly these nominal bundled “discounts” do not reflect any discount from but-for prices at all. To the contrary, the “discounted” linking price equals its but-for price and the “discounted” linked price exceeds it, so that the overall bundled discount price exceeds but-for levels. The bundled discount here also worsens allocative efficiency by resulting in monopoly prices in both markets rather than just one, and excludes equally-efficient rivals in the linked market who price at cost.¹⁴⁴

If instead $CSM_{\text{linking}} + CSM_{\text{linked}} < CSC_{\text{linked}}$, then the bundled price for the linking product will be lower than its but-for monopoly price.¹⁴⁵ However, the price for the linked product will exceed its but-for price, and the combined bundled price will result in lower consumer welfare than in the but-for world without bundled discounts, where buyers would have bought the linking product at the monopoly price and the linked product at the competitive price.¹⁴⁶ Thus, here again, the overall bundled discount price leaves buyers worse off than they would have been

¹⁴¹ See Greenlee, et al., *supra* note , at 1137; Nalebuff, *Bundling as a Way to Leverage Monopoly*, *supra* note , at 2-4.

¹⁴² See Greenlee, et al., *supra* note , at 1137.

¹⁴³ *Id.*; see *supra* Section II.C.

¹⁴⁴ See Greenlee, et al., *supra* note , at 1137.

¹⁴⁵ *Id.*

¹⁴⁶ *Id.*

under but-for prices and excludes equally-efficient rivals pricing at cost. It also worsens allocative efficiency (assuming linear demand) whenever the covered buyers' consumer surplus at monopoly or competitive prices for the linking product would be more than 16/9ths of the same surplus for the linked product.¹⁴⁷ Thus, as with requirements tying, bundled loyalty discounts are (when the unbundled linked price exceeds the but-for price) likely to harm ex post total welfare in the typical case where the covered buyers purchase or value the linking product at significantly higher levels than the linked product.

The same effects would not follow if the unbundled price for the linking product equaled its but-for price. Then the price with the bundled discount on the linking product would necessarily be lower than its but-for price. Further, because the alternative to accepting the bundled discount would be buying both products at but-for prices (given that here we assume no substantial foreclosure share affecting market prices in the linked market), consumer welfare cannot be lowered. Instead, the economic literature shows that, if the unbundled linked price equals the but-for price and there is no substantial foreclosure share, a bundling firm will set prices so that consumer welfare with the bundled discount equals consumer welfare without it.¹⁴⁸ Ex post total welfare would increase (because the bundling firm earns higher profits), but the bundled discount would still foreclose an equally-efficient producer of the linked product who was pricing at cost.¹⁴⁹

However, unless antitrust law *requires* bundling firms to set unbundled prices equal to but-for levels, it would not be profit-maximizing for firms to do so when the linked market is competitive. Instead, they would always make more profits by setting unbundled prices that exceed but-for levels, and would maximize profits by setting the unbundled price for the linking product to equal the price that chokes off unbundled purchases.¹⁵⁰ The latter would thus be the predictable result in a regime that allowed bundled discounts that were above cost. Such a regime would accordingly produce bundled discounts that would clearly harm consumer welfare, and also would harm ex post total welfare in the typical case where the covered buyers purchase or value the linking product at significantly higher levels than the linked product.

¹⁴⁷ *Id.*; see *supra* Section II.C.

¹⁴⁸ Greenlee, et al., *supra* note , at 1136.

¹⁴⁹ *Id.*

¹⁵⁰ *Id.* at 1137. In actual cases, there will likely be enough variation in buyer demand that we see them make some unbundled purchases from the defendant even when it tries to maximize profits in this way.

A firm might also set the unbundled price for the linking product above but-for levels but not quite at the choke price that eliminates all demand. Such a bundled discount could not extract *all* the consumer surplus that buyers would get at monopoly prices for the linking product, because buyers could always get some of that consumer surplus by rejecting the bundle. However, such a bundled discount could extract all of the difference between the consumer surplus obtainable by buying the linking product at monopoly prices and the consumer surplus obtainable by buying the linking product at the higher unbundled price. As long as that consumer surplus difference exceeds the consumer surplus buyers would lose from buying the linked product at elevated prices, buyers will accept the bundled discount. The linking firm thus would set the bundled price for the linked product to extract the whole difference, and all buyers would suffer lower consumer welfare.

Finally, all the same effects follow even if the bundled loyalty discounts require less than 100% loyalty. With a lower loyalty percentage, the defendant would simply set a higher linked price to extract the same consumer surplus on the linking product.¹⁵¹

2. Intra-Product Price Discrimination. Now assume buyers use varying amounts of the linked product with the linking product and demand for them is positively correlated. For example, suppose buyers each buy one printer, and the amount of cartridges they use with it correlates well with how much they value the printer. Suppose further that (if tying were legal) a firm with monopoly power over printers could price discriminate by tying printers to cartridges, with the printer sold at marginal cost and the cartridges sold at a supracompetitive price. Then (if bundled discounts were legal) a firm could achieve precisely the same effect by setting the unbundled price for printers to equal or exceed the choke price, but offering printers at a bundled discount that makes the printer price equal marginal cost to buyers who agree to buy their cartridge needs from the firm at elevated prices.

The firm could not achieve the same harmful effect on consumer welfare if the unbundled printer price equaled its but-for monopoly price, because then all the buyers who value the printer at more than its monopoly price would reject the bundled discount to buy at the but-for (unbundled) price. Those buyers thus would not lose consumer surplus from the bundling, and the new buyers could only gain consumer surplus. However, the firm could still price discriminate in a way that

¹⁵¹ *Id.* at 1135 n.18.

harms consumer welfare by setting an unbundled price for the linking product that exceeds its but-for monopoly price but is not quite as high as the choke price. Such a bundled discount would not price discriminate as perfectly as setting unbundled prices to equal the choke price, because it cannot price discriminate among buyers who value the linking product more than the unbundled price, but it can achieve the same price discrimination as tying among buyers who value the linking product below the unbundled price. Thus, this power effect also requires an unbundled price that exceeds the but-for price.

The same effects follow when the loyalty condition is less than 100%. The linking firm would just have to increase the linked price to compensate for the fact that buyer usage of the linked product produces somewhat fewer sales of that product by the firm. Suppose, for example, a printer monopolist required buyers to purchase 90% of cartridges from it to get a discount on printers. With such a 90% loyalty condition, the monopolist could simply raise the cartridge price by 11% above the price it would have charged with a 100% loyalty condition, and accomplish the same price discrimination.

3. Inter-Product Price Discrimination. Consider next a case where buyer demand for the linking and linked products has no strong positive correlation. Then, bundled discounts could not only achieve the same inter-product price discrimination as tying, but do so more profitably.¹⁵² Bundled discounts are more profitable because they can set the unbundled price for each product to equal the bundled price for both products minus the cost of making the other product. With that pricing, the firm will make as much money whether buyers take the bundle or just one of the products. But it would sell to more buyers than with tying because it will add sales (that wouldn't be made with straight tying) of one product to some buyers who valued the other product at less than its production cost. Further, although using tying to achieve inter-product price discrimination requires market power in both products, bundled discounts can achieve the same effect with market power in only one product.¹⁵³

With market power in both products, firms maximize profits by setting unbundled prices for both products that exceed but-for prices.¹⁵⁴ With market power in only one product, firms maximize profits by setting the unbundled price for that product

¹⁵² See McAfee, *supra* note, at 374, 377; Adams & Yellen, *supra* note, at 478-488.

¹⁵³ See Richard Schmalensee, *Commodity Bundling by Single-Product Monopolies*, *supra* note, at 67-71.

¹⁵⁴ See McAfee, *supra* note, at 375; Adams & Yellen, *supra* note, at 486-87.

above its but-for price.¹⁵⁵ If a firm were constrained not to charge unbundled prices that exceeded but-for levels, the firm might still be able to make (somewhat less) profits by using bundled discounts to achieve inter-product price discrimination.¹⁵⁶ But then the firm would be offering buyers a Pareto improvement because buyers would take the bundle only if they preferred the bundle to unbundled prices that (by hypothesis) equaled but-for prices.¹⁵⁷ Thus, under this theory, power effects harmful to consumer welfare are possible only when unbundled prices exceed but-for prices.

B. Foreclosure Share effects Are Possible Whether or Not Unbundled Prices for the Linking Product Exceed But-For Levels

1. Impairing Linked Rival Competitiveness. Bundled discounts that foreclose a substantial share of the linked market can impair rival competitiveness in that market. This is obviously true when the unbundled price for the linking product equals or exceeds the choke price, for then bundled discounts are economically indistinguishable from tying. But it is equally true when the unbundled price for the linking product is only slightly above the but-for price, and even when the unbundled price equals the but-for price so that the bundled discount gives some real discount on the linking product.

The reason is that externality problems give buyers an incentive to agree to anticompetitive foreclosing agreements that produce large marketwide price increases in exchange for a nominal individual discount, even if the result of all of them agreeing is that the monopolist's rivals are impaired and the buyers then pay higher prices than they otherwise would have paid.¹⁵⁸ For example, if there are

¹⁵⁵ See Schmalensee, *supra* note , at 69-70.

¹⁵⁶ See Nalebuff, *Bundling as a Way to Leverage Monopoly*, *supra* note , at 5.

¹⁵⁷ See *id.*

¹⁵⁸ See Farrell, *Deconstructing Chicago on Exclusive Dealing*, 50 ANTITRUST BULLETIN 465, 476 (2005); Elhauge, *How Loyalty Discounts*, *supra* note , at 190, 217-219; Elhauge, *Defining Better*, *supra* note , at 284-92; Segal & Whinston, *Naked Exclusion: Comment*, 90 AM. ECON. REV. 296 (2000); MICHAEL D. WHINSTON, LECTURES ON ANTITRUST ECONOMICS 144-47, 166 (2006); Kaplow & Shapiro, *Antitrust*, in 2 HANDBOOK OF LAW & ECONOMICS 1073, 1203-1210 (eds. Polinsky & Shavell, 2007); Rasmusen, et al., *supra* note ; ELHAUGE, U.S. ANTITRUST, *supra* note , at 406-410. Although many of these models focus on the simple case of excluding an entrant, the results are equally applicable when the exclusionary commitments prevent small rivals from achieving economies of scale. WHINSTON, *supra*, at 147; Kaplow & Shapiro, *supra*, at 1206; Elhauge *Defining Better*, *supra*, at 320-23; ELHAUGE, U.S. ANTITRUST, *supra*, at 316-17, 408 .

¹⁵⁸ See Simpson & Wickelgren, *Naked Exclusion, Efficient Breach, and Downstream Competition*, 97 AM. ECON. REV. 1305, 1306 (2007); Farrell, *supra* note , at 475-477; Christodoulos Stefanadis, *Selective Contracts, Foreclosure, and the Chicago School View*, 41 J.L. & ECON. 429 (1998); Jose Miguel Abito & Julian Wright,

10,000 buyers of a product, any individual buyer's agreement to an exclusionary commitment that contributes to a marketwide price increase externalizes 99.99% of the harm caused by that buyer's contribution to the market price increase. Each buyer would thus agree in exchange for any individual discount (or avoided price penalty) that exceeded 0.01% of that buyer's contribution to the marketwide price increase.

The externality problems are even worse when the relevant buyers are not consumers, but intermediaries who resell to others. Such intermediate buyers externalize an even higher percentage of the harm by passing much or all of the price increase on to downstream buyers. Intermediate buyers are thus even more likely to agree to anticompetitive foreclosing commitments.¹⁵⁹

However, the same legal exception that should apply to tying that allegedly increases tied market power should also apply to bundled discounts that allegedly increase linked market power. In particular, bundled discounts cannot increase monopoly profits by diminishing linked market competitiveness for products with a fixed ratio that lack separate utility.¹⁶⁰ Even in such cases, though, bundled discounts might increase linking market power, for reasons discussed in the next section.

It does not matter if bundled discount contracts periodically come up for termination because the same externalities that give buyers incentives to agree (despite the collective marketwide harm) also give buyers incentives not to terminate the contracts. Nor does it matter whether buyers agreed to the bundled discounts voluntarily – or even initiated a request for a bundled discount contract – because agreeing to anticompetitive bundled discounts is individually profit-maximizing for buyers even though it collectively harms all buyers in the market. Buyers face a collective action problem that requires a collective action solution through antitrust law.

Bundled loyalty discounts can also create foreclosure share effects even if the

Exclusive Dealing With Imperfect Downstream Competition, 26 INT'L J. INDUS. ORG. 227 (2008); Elhauge, *Defining Better*, *supra* note , at 288-292.

¹⁵⁹ **Error! Main Document Only.** See Simpson & Wickelgren, *Naked Exclusion, Efficient Breach, and Downstream Competition*, 97 AM. ECON. REV. 1305, 1306 (2007); Farrell, *supra* note , at 475-477; Christodoulos Stefanadis, *Selective Contracts, Foreclosure, and the Chicago School View*, 41 J.L. & ECON. 429 (1998); Jose Miguel Abito & Julian Wright, *Exclusive Dealing With Imperfect Downstream Competition*, 26 INT'L J. INDUS. ORG. 227 (2008); Elhauge, *Defining Better*, *supra* note , at 288-292.

¹⁶⁰ See *supra* II.D, IV.

loyalty commitment in the linked product is less than 100%.¹⁶¹ The foreclosure share effects flow from the market foreclosure share, not the share of individual buyer purchases foreclosed. For example, if bundled loyalty discounts foreclosed 90% of linked sales to 80% of buyers, then they would foreclose 72% of the linked market, which is even more anticompetitive than 100% foreclosure of 70% of linked buyers.

To illustrate the above analysis, suppose the following case. A firm is both a monopolist in product *A*, for which it charges \$1000, and has market power in product *B*, for which it charges \$200 and has a per-unit cost of \$100. There are thousands of buyers of *B*, 80% of whom also buy *A*. Other firms stand poised to enter market *B* or expand in it until they achieve economies of scale that would also give them a cost of \$100, in which case competition would drive *B* prices down to the but-for price of \$100. To prevent this competitive result from occurring, the monopolist announces that it will charge unbundled buyers \$1010 for product *A*, but will give buyers a bundled “discount” of \$10 on product *A* if they commit to buy 90% of their needs of product *B* from the monopolist. All the buyers of product *A* agree because their individual decision to agree gets them all of the nominal \$10 “discount” but externalizes the vast bulk of their marginal contribution to marketwide foreclosure onto the rest of the market. The result is a 72% foreclosure share that prevents rivals in *B* from entering or expanding enough to achieve economies of scale, so that product *B* continues to get sold at \$200, double its but-for price. The price for *A* with the nominal “discount” would remain at its monopoly price of \$1000.¹⁶² Thus, here the bundled “discount” would clearly harm consumer welfare and efficiency because product *B* would be sold well above cost.

To illustrate the case where the unbundled price for the linking product equals its but-for price, take the hypothetical above, but now instead assume the firm maintains the unbundled price for *A* at \$1000, giving a \$10 discount (to \$990) to buyers of *A* who commit to buy *B* from it. Buyers will benefit from the \$10 discount on product *A*, but will be harmed by paying \$100 more for *B* than they would have paid without the bundled discount. They can thus still suffer a net loss of consumer welfare, assuming the consumer welfare they lose from paying \$100

¹⁶¹ See Kaplow & Shapiro, *Antitrust*, *supra* note 2, at 1203 n.198, 1206 n.207; Willard K. Tom, David A. Balto & Neil W. Averitt, *Anticompetitive Aspects of Market-Share Discounts and Other Incentives to Exclusive Dealing*, 67 ANTITRUST L.J. 615, 615, 623-24, 627 (2000); Elhaug, *How Loyalty Discounts*, *supra* note , at 213, 219; ELHAUGE, U.S. ANTITRUST, *supra* note 1, at 407-408.

¹⁶² This assumes *A* and *B* are not used in fixed ratios.

more for *B* exceeds the consumer welfare they gain from paying \$10 less for *A*. Allocative efficiency can also decrease, assuming the additional inefficiency in *B* from paying 100% above its but-for price exceeds the additional efficiency they get in *A* from paying 1% below its but-for price.

2. Increasing Linking Market Power. Bundled discounts might also increase linking market power, again whether or not the unbundled price exceeds the but-for level. The same externality problems give buyers incentives to agree to the bundled discount, even when doing so contributes to an eventual marketwide price increase. To illustrate the case where the unbundled price exceeds the but-for level, take the hypothetical above where the unbundled price for *A* is set to \$1010. Add to it the proposition that, if rivals can enter and achieve economies of scale in *B*, they are also likely to enter market *A*, and drive the price of *A* down to its per-unit cost of \$500. The bundled discount would then cause the additional harm of keeping the price for *A* at \$1000, double its but-for price. Similarly, even if the unbundled price for *A* initially equals its but-for price of \$1000, the bundled discount to \$990 results in a price below initial but-for levels but \$490 above the ultimate but-for price.

3. Neither Foreclosure Share Effect Requires Short-Term Profit Sacrifice or Commitment. Even though power effects harmful to consumer welfare are not possible when the unbundled linked price equals its but-for price, such bundled discounts are still profitable to the bundler without foreclosure.¹⁶³ Thus, whether or not unbundled prices exceed but-for levels, bundled discounts need not require any short-term profit sacrifice or commitment by the bundler to achieve foreclosure share effects.¹⁶⁴

C. When Bundled Loyalty Discounts Perversely Discourage Discounting

Bundled loyalty discounts can also affirmatively discourage price competition in a way that tying cannot. This is true whether or not the unbundled price on the linking product exceeds its but-for price. However, the bundled loyalty discount must involve a seller commitment to charge loyal buyers a discount from any future price it charges to disloyal buyers on at least one of the products.¹⁶⁵ If so,

¹⁶³ See Nalebuff, *Bundling as a Way to Leverage Monopoly*, *supra* note , at 11.

¹⁶⁴ See *id.* at 11.

¹⁶⁵ See Elhauge, *How Loyalty Discounts*, *supra* note , at 191-92, 195.

loyalty discounts can perversely discourage discounting because the firms using them know that they cannot cut prices to compete for disloyal buyers without also cutting prices for loyal buyers.¹⁶⁶ As a result, there will be some price that rivals can charge disloyal buyers that is above cost, but low enough that the firm using loyalty discounts would find the gains from matching it lower than the losses from charging lower prices to loyal buyers.

When the discount for loyalty is high enough (considering the foreclosure share) and the firm has just one rival that has achieved economies of scale in the unforeclosed market, both the rival price and the price with the loyalty discount will equal the monopoly price, even though rival efficiency is not impaired.¹⁶⁷ For example, if the foreclosure share were 50%, then (assuming linear demand) both firms will sell at monopoly prices if the loyalty discount exceeds the per unit profit at the monopoly price. The higher the foreclosure share, the lower the loyalty discount needs to be to produce monopoly prices for both firms. If the foreclosure share were 80%, then the loyalty discount would have to be at least half the per unit monopoly profit. If the foreclosure share were 20%, the loyalty discount would have to be double the per unit monopoly profit. Because the loyalty discount is just the difference between loyal and disloyal prices, nothing prevents it from exceeding the per unit monopoly profit.¹⁶⁸

Even when the loyalty discount is somewhat lower, the rival price and the price with the loyalty discount will still exceed costs and but-for levels. This conclusion holds whether the loyalty condition requires a buyer commitment or can be abandoned by the buyer at will.¹⁶⁹ However, buyer commitments produce somewhat higher prices. For example, suppose demand is linear, the foreclosure share is 50%, the monopoly price is \$100, the constant marginal cost is \$20, and the loyalty discount is \$20. Then, a loyalty discount with buyer commitment leads

¹⁶⁶ *Id.* at 193.

¹⁶⁷ If d is the loyalty discount, P_m is the monopoly price, C is a constant marginal cost, and θ is the foreclosure share, then with linear demand both prices will be at the monopoly level if

$d \geq (P_m - C) \sqrt{(1 - \theta) / \theta}$. This is true for loyalty discounts with buyer commitments under all conditions, *see id.* at Lemmas 1a, 1b, 1c, and without buyer commitments if rivals pick prices first, *see id.* at Lemma 4a.

¹⁶⁸ *Id.* at 203 n.19.

¹⁶⁹ With buyer commitments and constant marginal costs, and assuming linear demand, the rival price and the price with the loyalty discount will be at least $P_m + \theta d - \sqrt{(1 - \theta)((P_m - C)^2 - \theta d^2)}$. Prices can range from that level up to the monopoly price. *Id.* at Lemmas 1a, 1b, 1c. Without buyer commitments and constant marginal costs, the price formulas are somewhat lower, but are still all above both cost and but-for levels. *See id.* at Lemmas 4a, 4b, 4c.

to prices of at least \$54.32, whereas without buyer commitment it leads to prices of at least \$40.¹⁷⁰

On the other hand, without a high foreclosure share, buyer loyalty commitments will lead to rival prices that are lower than the price with the loyalty discount, which makes buyers unlikely to agree to anticompetitive loyalty commitments.¹⁷¹ Without buyer commitments, a low foreclosure share does not make buyers unlikely to agree to loyalty conditions because agreeing buyers can always later switch to a rival that prices lower, but the share of buyers who accept loyalty conditions will affect the size of anticompetitive effects. For example, if we lower the foreclosure share in the last hypothetical to 10%, then without buyer commitment the rival price and the price with the loyalty discount would instead be \$22.47.¹⁷² The above analysis, coupled with other factors, suggest that this theory should require proof of a substantial foreclosure share.¹⁷³

The analysis above applies to single-product loyalty discounts, but is equally true if the loyalty discount is bundled with a discount on another product. Indeed, bundling makes it easier to procure and enforce buyer agreements to loyalty discounts that discourage discounting.¹⁷⁴

The above conclusions also still apply if the loyalty discount requires less than 100% loyalty.¹⁷⁵ Indeed, less than 100% loyalty does not alter the price effects of loyalty discounts without buyer commitments. With buyer commitments, less than 100% loyalty leads to prices that are lower than they would be with 100% loyalty, but higher than they would be without buyer commitment.

D. Implications for Possible Legal Tests

1. Cost-Based Tests. Some advocate condemning bundled discounts only if the cost of making both products exceeds the combined bundled price.¹⁷⁶ This test

¹⁷⁰ The solution without buyer commitment assumes the rival picks prices first. *See id.* at Lemma 4a. If the firm using loyalty discounts picks price first or both pick prices simultaneously, then other formulas apply that also lead to prices that exceed costs and but-for levels. *See id.* at Lemmas 4b,c.

¹⁷¹ *Id.* at 203-04, 218.

¹⁷² This again assumes the rival picks price first. *See supra* note .

¹⁷³ *See* Elhauge, *How Loyalty Discounts*, *supra* note , at 218.

¹⁷⁴ *Id.* at 205-06.

¹⁷⁵ *Id.* at 213, 219.

¹⁷⁶ *See* Timothy J. Muris & Vernon L. Smith, *Antitrust and Bundled Discounts: An Experimental Analysis*, 75

would be unwise because none of the anticompetitive effects demonstrated above depended on the cost of the bundle exceeding its price. To the contrary, in all the illustrations above, power and foreclosure share effects harmful to consumer and total welfare resulted even though the bundled price was well above the bundled cost.

Advocates for this cost-based test rely on experiments that they say show bundled discounts usually do not harm consumer welfare.¹⁷⁷ But those experiments allowed only fixed ratio bundles, and thus precluded two of the relevant power effects.¹⁷⁸ Nowhere did those experiments consider bundled loyalty discounts. Further, those experiments assumed a perfect positive demand correlation for the explicit purpose of preventing inter-product price discrimination, because they wanted to “isolate” the exclusionary effect.¹⁷⁹ Having taken all three power effects off the table, these experiments cannot assess whether bundled discounts cause power effects that harm consumer welfare. Indeed, their experimental design nicely matches my recommended exception to any legal rule that focuses on the power effects from bundling.

In addition, those experiments prohibited linked market firms from entering the linking market, thus barring the possible foreclosure share effect that bundling might increase linking power.¹⁸⁰ The experiments also assumed the linked market had recurring fixed costs, but constant marginal costs, zero entry costs, and infinite rival supply elasticity up to a capacity limit.¹⁸¹ This made the remaining foreclosure share effect much less likely by barring any anticompetitive effect from lowering rival share, and instead requiring complete rival exit for foreclosure share effects.¹⁸² Making the remaining foreclosure share effect even less likely was their assumption of a fixed ratio and perfect positive demand correlation. The fixed ratio meant that buyers who bought both products would experience any increase in the linked product price as an increase in the linking product price.¹⁸³ The perfect positive demand correlation meant there would be few buyers who bought

ANTITRUST L.J. 399, 425 (2008).

¹⁷⁷ See *id.* at 402-03.

¹⁷⁸ Caliskan, et al., *Exclusionary Bundling and the Effects of a Competitive Fringe*, 163 J. INSTIT. & THEORETICAL ECON. 109, 114 (2007).

¹⁷⁹ Caliskan, et al., *Exclusionary Bundling and the Effects of a Competitive Fringe*, 163 J. INSTIT. & THEORETICAL ECON. 109, 114 (2007).

¹⁸⁰ See Muris & Smith, *supra* note , at 412.

¹⁸¹ Caliskan, et al., *supra* note , at 112, 116.

¹⁸² See *supra* II.D.

¹⁸³ See *supra* II.D.

the linked product without the linking product. In short, their experimental design precluded four of the five possible anticompetitive effects and made the remaining one very unlikely. It is not surprising that such experiments would find little harm to consumer welfare, but that tells us little about whether actual bundled discounts would cause such harm.

Further, these experiments not only excluded bundled loyalty discounts, but also included all unit-to-unit bundled discounts even when they neither (a) had unbundled prices that exceeded but-for prices nor (b) created substantial foreclosure that impaired rival competitiveness. Such experiments cannot provide a useful guide for assessing legal rules that condemn only bundled discounts meeting such tests. A similar problem besets the proponents' reliance on a general observation that in real life most bundled discounts are desirable.¹⁸⁴ This observation is often made but irrelevant. The relevant policy question is whether the subset of bundled discounts that would be prohibited by the proposed legal tests are usually undesirable, as is the case for the tests I propose. The proponent's argument makes no more sense than saying that, because driving is generally desirable, we should legalize driving by drunks.

Others have concluded that bundled discounts should not be illegal unless attributing all of the bundled discount to the linked product would result in an *effective* price that is lower than the defendant's costs of making that product.¹⁸⁵ But the above analysis shows that bundled discounts can produce anticompetitive foreclosure that impairs rival efficiency even though the effective price for the linked product exceeds the defendant's costs, and indeed even though the discount amount is small. The rival cannot match that effective price precisely because the bundled discount forecloses enough of the market to prevent it from achieving the same costs as the defendant. Nor does a cost-based test even focus on the worst bundled discounts. Instead, a cost-based test would perversely exempt the *most* worrisome form of bundled discounts: those that charge penalty prices to get

¹⁸⁴ See Muris & Smith, *supra* note , at 399, 425.

¹⁸⁵ See ANTITRUST MODERNIZATION COMMISSION, REPORT AND RECOMMENDATIONS 12, 82, 99-100 (2007) [hereinafter "AMC Report"]; *Cascade Health Solutions v. PeaceHealth*, 502 F.3d 895 (9th Cir. 2007); Bush DOJ Single Firm Conduct Report, *supra* note , at 101-102; Crane, *Mixed Bundling*, *supra* note , at 474-475; Hovenkamp, *Discounts and Exclusion*, *supra* note __, at 852-854; Nalebuff, *Exclusionary Bundling*, *supra* note , at 328-343. The *Ortho* standard instead compares the effective price to the rivals' costs, but achieves much the same effect by also requiring that rival costs be no higher than the bundler's costs. *Ortho Diagnostic Systems v. Abbott Laboratories*, 920 F.Supp. 455 (S.D.N.Y. 1996). The AMC Report also adds a recoupment element, but this element makes little sense because bundled discounts are generally profitable and thus incur no losses that have to be recouped. *Accord Dennis W. Carlton, et al., Assessing the Anticompetitive Effects of Multiproduct Pricing*, 53 ANTITRUST BULLETIN 587, 609 (2008).

buyers to agree to bundles at prices that are above but-for levels, and thus necessarily above cost.¹⁸⁶

Proponents of cost-based tests generally rely on the argument, first put forth by Judge Posner, that antitrust law should deem conduct exclusionary only if it could exclude an equally-efficient rival.¹⁸⁷ But Judge Posner himself has acknowledged that his equally-efficient rival test does not justify immunizing a bundled or loyalty discount that exceeds cost but has worsened rival efficiency by denying it economies of scale.¹⁸⁸ More generally, the equally-efficient rival test reaches the wrong result whenever the exclusionary conduct *prevented* the rival from achieving equal efficiency, which disables the test from assessing the usual theory of foreclosure share effects. It also reaches the wrong result when, without impairing rival efficiency, bundled loyalty discounts impair the competitiveness of equally-efficient rivals by decreasing their aggressiveness or expandability or by affirmatively discouraging discounts.¹⁸⁹ In such cases, bundled loyalty discounts harm consumer and total welfare even though effective prices are well above cost and rivals “could” defeat the bundled discount by cutting prices to some above-cost level, because the bundled loyalty discount eliminates the rival incentive to do so by making it more profitable not to cut prices.

Even for the set of rivals who could never be equally efficient, there is no good reason to allow foreclosures of less-efficient rivals that harm consumer and total welfare. Suppose the linked product monopoly price is \$200, and the per-unit cost is \$100 for the defendant and \$150 for the less efficient rival. In that case, allowing the defendant to use bundled discounts to exclude the less efficient rival will raise prices from \$150 to \$200, harming both consumer welfare and efficiency. Why should antitrust law tolerate inefficient conduct that harms consumers, merely because another harmed party is less efficient than the defendant? The equally-efficient rival test seems oddly focused on the competitive virtue of the rival, rather than on the effects of the defendant’s conduct on consumer welfare and efficiency.¹⁹⁰ The focus seems even odder given that, when

¹⁸⁶ This same logic shows the error in claiming that single-product loyalty discounts should be immunized when the discounted price exceeds cost. See Hovenkamp, *Discounts and Exclusion*, *supra* note __, at 844-849; Lambert, *supra* note __, at 1712-1714. When loyalty discounts/penalties procure loyalty commitments that raise rivals’ costs and market prices, it would perversely exempt their most anticompetitive type to immunize them when the price with the loyalty condition exceeds cost. This claim also conflicts with Supreme Court caselaw. See *infra* at __.

¹⁸⁷ See RICHARD POSNER, *ANTITRUST LAW* 184-96 (1976); POSNER, *supra* note __, at 194-95.

¹⁸⁸ See Posner, *Vertical Restraints*, *supra* note __, at 240.

¹⁸⁹ See *supra* II.D; VI.C.

¹⁹⁰ Pure above-cost pricing should be allowed, but that is not because excluding less efficient rivals cannot be

foreclosure share effects are proven, the defendant's conduct itself is what tarnishes that virtue by rendering rivals less efficient.

There is also a profound conceptual problem with using the equally-efficient rival test to judge bundled discounts. Consider a rival that is equally efficient at making the linked product, but less efficient at making the linking product. The equally-efficient rival test would allow excluding this rival because it is less efficient at making the combination of products. If the same rival cannot make the linking product at all, the test would prohibit exclusion because now the rival is equally efficient at making the one product it makes. But isn't the rival less efficient in the latter case than in the first one?

In any event, a cost-based test for bundled discounts would be inconsistent with tying caselaw. To begin with, a cost-based test would allow precisely the anticompetitive effects condemned by tying caselaw. Further, *International Salt and Northern Pacific* prohibited tying conditions that allowed buyers to purchase the tied product from a rival whenever the defendant wouldn't match the rival price.¹⁹¹ A cost-based test would instead conclude that, because the rival could defeat these tying conditions by offering a price one penny below the defendant's tied product price, these tying conditions were effectively bundled discounts of half a penny. Because a cost-based test would not find such trivial bundled discounts to be foreclosing, it would allow these tying conditions, which is directly contrary to this binding Supreme Court authority that holds these conditions to be both foreclosing and illegal.

Some might object that this Supreme Court precedent is simply wrong. But these cases are justified on the ground that such a tying condition eliminates any incentive for rivals to try to undercut the defendant's price, because the rivals know that no matter what above-cost price they offer, the defendant can always win all sales by matching it. Any bundled discount has this same effect because even equally-efficient rivals know that no matter what above-cost price they might offer on the linked product, the defendant can always win sales by matching that linked

anticompetitive. Rather, it is because a firm cannot avoid setting some price and the systematic effects of banning above-cost price cuts that exclude less-efficient rivals would harm consumers and efficiency. See Elhauge, *Why Above-Cost Price Cuts*, *supra* note ___. The same analysis does not extend to exclusionary conditions that lack any redeeming justification and are thus eminently avoidable and can be banned without systematic ill-effects. *Id.* at 698 n.53. For other reasons to distinguish above-cost price cutting, see *infra* at ___.

¹⁹¹ See *International Salt v. United States*, 332 U.S. 392, 396–397 (1947); *Northern Pacific Railway v. United States*, 356 U.S. 1, 9, 11–12 (1958);

product price because of the bundled discount on the linking product. Thus, even if a rival *could* undercut a bundled discount with a price cut, considering the strategic response of the defendant can eliminate any incentive for the rival to do so. It might as well focus on the more limited set of buyers who are not covered by the bundle. This points to another problem with a cost-based test: it depends on the assumption that rivals will offer price cuts that they may have no incentive to offer, given the bundled discount.¹⁹²

Any cost-based test also seems inconsistent with various other Supreme Court cases. In *United Shoe*, the Court condemned bundled discounts that (along with other contractual clauses) had the “practical effect” of a tie, without requiring any evidence that they resulted in a bundled or effective price that was below cost.¹⁹³ In *Loew’s*, the Court held that an injunction against a firm that engaged in illegal bundling should prohibit bundled discounts that either had the effect of imposing a tying condition or exceeded any efficiency gains created by the bundling, without requiring any evidence that the bundled discounts resulted in a bundled or effective price that was below cost.¹⁹⁴ Although injunctive remedies can extend beyond illegal conduct, the Court would have designed its remedy to avoid interfering with any bundled discounts it deemed procompetitive. *Loew’s* thus implicitly holds that not all bundled discounts that result in bundled or effective prices above costs are procompetitive or merit safe harbor. This holding conflicts with the logic of the cost-based tests, which conclude precisely the opposite.

Other Supreme Court decisions have held that single-product loyalty discounts violate antitrust law without imposing any requirement of proving they are below cost. These holdings *a fortiori* suggest that no cost-based test should apply to bundled loyalty discounts given that they are, if anything, even more anticompetitive than single-product loyalty discounts. For example, exclusive dealing agreements procured by loyalty discounts were held illegal in *Standard Fashion* without any evidence that the resulting price was below cost.¹⁹⁵ Likewise, single-product loyalty discounts were held illegal in *FTC v. Brown Shoe*, even though they were terminable at will and required only 75% loyalty, and no evidence suggested that they resulted in below-cost prices.¹⁹⁶

¹⁹² See ELHAUGE, U.S. ANTITRUST, *supra* note, at 412-413; see also Greenlee, et al., *supra* note, at 1139 (noting that a cost-based test assumes disequilibrium behavior).

¹⁹³ *United Shoe Machinery v. U.S.*, 258 U.S. 451, 464 (1922).

¹⁹⁴ *United States v. Loew’s Inc.*, 371 U.S. 38, 54-55 (1962).

¹⁹⁵ *Standard Fashion v. Magrane-Houston*, 258 U.S. 346 (1922).

¹⁹⁶ 384 U.S. 316, 318-319 & n.2 (1966).

Linkline is not to the contrary. *Linkline* held that a price squeeze was not illegal when the downstream price for a finished product exceeded cost unless the high upstream price amounted to a constructive refusal to deal and the other conditions for a duty to deal were met.¹⁹⁷ I reached the same conclusion in my own work prior to the opinion.¹⁹⁸ One might wrongly try to conflate price squeezes with bundled discounts by characterizing bundles as finished products and arguing that bundled discounts thus constitute a price squeeze between the high unbundled price for the linking product and the low price for the bundle, making the bundled discount legal under *Linkline* as long as the price of the bundle exceeds the cost of making the bundle. But this is an old issue in antitrust, raised previously by parallel efforts to mistakenly conflate refusals to deal with a tie between the upstream and downstream products.¹⁹⁹ The distinction made between those doctrines is equally applicable here. Refusals to deal and price squeezes involve cases where no one claims that, absent the conduct, the defendant's buyers would buy the upstream product separately, but rather the rival seeks to obtain the upstream product from the defendant to use as an input in order to make and sell the same finished product as the defendant. In contrast, ties and bundled discounts involve cases where the defendant's buyers would, absent the conduct, buy the tying/linking product separately from the tied/linked one, and the plaintiffs seek to end the conduct that bundles the products rather than requiring the defendant to sell either product to anyone. Thus, two items are a finished product limited to refusal to deal and price squeeze law only if the defendant's buyers would not buy the items separately even without the conduct, and the rival seeks to compel the defendant to sell an item to the rival so that it can make the same finished product.²⁰⁰ If the defendant's buyers would buy the items separately absent the

¹⁹⁷ *Pacific Bell Telephone v. Linkline Communications*, 129 S.Ct. 1109, 1119-20 (2009). In implicitly holding that an unduly high price could constitute a constructive refusal to deal, *Linkline* confirmed prior cases which established that offering unfavorable terms could amount to an illegal refusal to deal, at least when the terms were worse than the defendant voluntarily offered previously or was willing to charge nonrivals. See *Aspen Skiing Co. v. Aspen Highlands Skiing Corp.*, 472 U.S. 585 (1985); *Verizon Communications v. Law Offices of Curtis V. Trinko*, 540 U.S. 398, 404-05, 409 (2004).

¹⁹⁸ See ELHAUGE, U.S. ANTITRUST, *supra* note, at 287-88.

¹⁹⁹ See X AREEDA, ELHAUGE & HOVENKAMP, *supra* note, ¶1748.

²⁰⁰ See *id.*; ELHAUGE, U.S. ANTITRUST, *supra* note, at 359-60. In *Doe v. Abbott Laboratories*, the court acknowledged a distinction between price squeezes and bundled discounts, declining to hold that *Linkline* overruled the Ninth Circuit's different test for bundled discounts. 571 F.3d 930, 935 (9th Cir. 2009). However, the court seemed to wrongly assume the two drugs in that case were a finished product simply because the defendant put them in the same pill, and thus held that *Linkline* governed. *Id.* at 935. This is not the proper test because, if it were, defendants could always evade tying and bundling law by simply putting two products in a common package without changing the economic substance of their conduct. Instead, the proper test is whether (absent the conduct) buyers would have bought the linking drug separately from the linked one, or whether instead the rival sought to

conduct, then the items are separate products subject to tying and bundled discount law.

2. The “Only Viable Option” Test. Without determining when bundled discounts might otherwise be illegal, some courts have held that they should be treated like ties only if taking the bundle is the “only viable option” for buyers.²⁰¹ Read literally, this test would indicate that bundled discounts should be treated like ties only when the linking product’s unbundled price is set at a choke price that prevents any separate sales of the linking product. Although the power effect theories indicate that a bundling firm would generally maximize profits by setting the unbundled price to equal the choke price, they also show that a firm can achieve similar (though somewhat smaller) power effects with an unbundled price that exceeds the but-for price, even though some buyers buy the linking product at the unbundled price.²⁰²

Other courts use a test that is similar to, but less extreme than, the only-viable-option test, treating bundled discounts like ties if users of the linked product buy only a low proportion (say 10% or less) of the linking product at its unbundled price.²⁰³ But this test wrongly applies the quasi-per se rule when unbundled prices equal but-for prices if the bundled discounts are attractive enough that no one buys the linking product at unbundled prices. This result is wrong because such bundled discounts cannot produce the harmful power effects that justify a quasi-per se rule. This test also erroneously fails to capture other bundled discounts that do produce power effects similar to those produced by tying. Suppose, for example, that 80% of buyers have the individual demand curve for printers described in Section II.C. The other 20% instead value printers at up to \$2000. A bundled discount that chooses an unbundled price of \$1000 would extract all consumer surplus from 80% of the buyers, which would harm consumer welfare and typically total welfare, even though the other 20% would buy the printers at the unbundled price.

3. Whether Unbundled Prices Exceed Pre-Program Prices. Some have advocated a test that would make bundled discounts legal if the linking product’s unbundled

obtain the linking drug to sell the same combined pill. The evidence indicated the former. *Id.* at 932-933. Thus, the drugs should have been deemed separate products subject to bundled discount law, rather than a finished product subject only to price squeeze law.

²⁰¹ X AREEDA, ELHAUGE & HOVENKAMP, *supra* note, ¶1758b, at 328.

²⁰² See Section VI.A.

²⁰³ *Id.* at 327-328.

price is less than or equal to its pre-bundle price.²⁰⁴ This test runs into several problems.

First, the power effects depend on unbundled prices exceeding but-for prices, not past prices. Pre-bundle prices may well be far higher than but-for prices during the period of bundling. This will be true if costs are declining, which is often the case in industries marked by technological progress. It will also be true if the defendant's market power is eroding, or would have eroded without the bundling, which is often the case because defendants are most likely to use exclusionary conduct in order to try to slow the erosion of waning market power.²⁰⁵ Thus, a pre-bundle price test would wrongly immunize many bundles whose unbundled prices were lower than pre-bundle prices, but exceeded but-for prices.

Second, as shown above, bundled discounts can create harmful foreclosure share effects even when the linking product's unbundled price exceeds neither but-for *nor* pre-bundle levels. Even if the unbundled price is below both levels, foreclosure can elevate prices for the linked product in ways that harm consumer welfare, and can ultimately elevate linking product prices too.

Finally, a test based on pre-program prices would create an obvious loophole. The defendant could simply raise its pre-program price to a high level before it institutes bundled discounts, so that the unbundled price is lower than the artificially raised pre-program price but still exceeds the but-for price.²⁰⁶ This strategy would comply with a pre-program price test but cause the same anticompetitive harm as any bundled discount whose unbundled price exceeded but-for levels.

4. The Appropriate Test. When the linking product's unbundled price exceeds its but-for price, bundled discounts have the same power effects as ties and thus should be treated like ties by applying a similar quasi-per se rule that bases liability on linking market power and an absence of offsetting efficiencies. The same exception should also apply for products used or bundled in a fixed ratio that lack separate utility, with such cases instead governed by a traditional rule of reason that requires proof of a substantial foreclosure share or effect.

²⁰⁴ See Greenlee, et al., *supra* note , at 1138.

²⁰⁵ See Elhauge, *Defining Better*, *supra* note , at 337-338.

²⁰⁶ See Greenlee, et al., *supra* note , at 1138 n.27 (acknowledging this problem with their pre-bundle test).

Although this test is conceptually clear, determining the but-for price can be difficult. However, internal documents are often revealing on this issue, showing that the business plan was to raise the unbundled price in order to induce agreement to the bundle. Other times, regression analysis or economic models may yield good results on the but-for price. Or one might rely on a presumption that unbundled prices that exceed pre-program prices also exceed but-for prices, rebuttable by some showing that costs have increased over time.

Alternatively, one might rely on a general presumption, rebuttable by the defendant, that the absence of any efficiency justification coupled with market power means the defendant likely set the unbundled price above but-for levels because, as the analysis above shows, doing so is profit-maximizing. Such a presumption would be consistent with the general economic assumption that firms are rational profit-maximizers. Even in cases where the presumption turned out to be overinclusive, capturing cases where unbundled prices did equal but-for levels and there was no substantial foreclosure, the above shows that firms in such cases have incentives to set bundled discounts that leave consumer welfare unchanged. Thus, even in the overinclusive cases, the presumption creates no real overdeterrence under a consumer welfare standard. In contrast, such a presumption does reduce the underdeterrence of power effects harmful to consumer welfare when unbundled prices exceed but-for levels in ways that are hard to prove, and reduces the underdeterrence of foreclosure share effects when they are hard to ascertain. Reducing underdeterrence without increasing overdeterrence is a desirable legal tradeoff. Given the posited lack of any efficiency justification, there is little reason to tolerate any underdeterrence to protect other cases where the conduct is at best neutral and perhaps harmful.

If the linking product's unbundled price does not exceed its but-for price, then power effects are impossible, so ordinary rule-of-reason review should apply. This rule of reason test requires that anticompetitive effects either be directly proven or inferred from a substantial foreclosure share in the linked market. Because the foreclosure share effects are the same as with exclusive dealing, it makes sense (when effects are not directly proven) to require the same 20-30% foreclosure share threshold that is required to infer anticompetitive effects from exclusive dealing.²⁰⁷ The foreclosure produced by bundled discounts should be aggregated

²⁰⁷ See *Twin City Sportservice, Inc. v. Charles O. Finley & Co., Inc.*, 676 F.2d 1291, 1298, 1304 (9th Cir. 1982) (24% enough); *Stop & Shop Supermarket Co. v. Blue Cross & Blue Shield of R.I.*, 373 F.3d 57, 68 (1st Cir. 2004) (generally at least 30–40%); IX AREEDA, *supra* note, ¶1729, at 377, 387 (1991) (20%); IX AREEDA & HOVENKAMP, *supra* note, ¶1729, at 328, 337 (30%); XI HOVENKAMP, ANTITRUST LAW ¶1821, at 152, 164-65 (1998) (20%); XI

with any foreclosure produced by other exclusionary agreements, such as tying, exclusive dealing, or loyalty discounts, because the effect on rival competitiveness depends on the overall market foreclosure share.²⁰⁸ If a few large sellers are using exclusionary agreements, their foreclosure shares should also be aggregated, for reasons discussed in the next section. The defendant can then introduce offsetting efficiencies that could not be achieved through less anticompetitive means.

Measuring a foreclosure share raises the issue of when to deem a bundled discount foreclosing. When, as typical, the bundled discount induces buyer commitments to buy the linked product from the defendant, all purchases under such commitments should count toward the foreclosure share, for the same reason that exclusive dealing cases measure foreclosure shares to include all purchases under exclusive dealing agreements. But when should the foreclosure share include purchases under a bundled discount that involves no buyer commitment, but just makes pricing conditional on what the buyer does at each moment?

Clearly a cost-based test should not be used to judge when a no-commitment bundled discount is foreclosing, both because a cost-based test correlates poorly to when bundled discounts are anticompetitive and because it conflicts with Supreme Court precedent. Indeed, because *International Salt* and *Northern Pacific* hold that a tie is foreclosing even when the tying condition requires only that the rival set a price at least one penny below the defendant, they suggest that any bundled discount above zero is legally foreclosing. This makes some sense because, as noted above, even a trivial discount can produce anticompetitive effects given buyer collective action problems and effects on rival incentives to cut prices. Further, the purpose of measuring the foreclosure share here is simply to determine whether anticompetitive effects are plausible enough to require the defendant to come forth with some procompetitive justification. If a firm charges a higher price to buyers who refuse to comply with its exclusionary condition than to buyers who comply, then it does create some clog on competition that seems unjustifiable absent some offsetting efficiency. Because the noncompliant price always exceeds the compliant price for a bundled discount, this approach suggests that the foreclosure share should include all purchases of the linked product that received a bundled discount, even without any buyer commitment.

This approach makes sense to the extent that the foreclosure share is being used

HOVENKAMP, ANTITRUST LAW ¶1821, at 167, 182 (2d ed. 2005) (20%); *id.* at 176, 182 (30%).

²⁰⁸ See IX AREEDA & HOVENKAMP, *supra* note, ¶1709, at 78, 87.

defensively, to rebut an argument that anticompetitive effects are impossible because the foreclosure share is too low. In that case, one should include all purchases under no-commitment bundled discounts in the foreclosure share, because economic theory shows that anticompetitive effects are indeed *possible* with a high foreclosure share despite a small discount. But if the bundled discount is trivial, one might hesitate to use the same foreclosure share offensively, in order to infer that anticompetitive effects are *likely*, because such a trivial bundled discount may have little impact on rival sales. Thus, for a small bundled discount without buyer commitments, any offensive inference from the foreclosure share should be confirmed by evidence that the bundled discounts actually had an adverse impact on rival competition. Such an adverse impact could, for example, be proven with evidence that buyers receiving bundled discounts bought significantly less from rivals than other buyers or by direct evidence that rival efficiency or competitiveness was impaired.

When the size of the bundled discount is significant compared to purchases of the linked product, so that buyers would incur a significant penalty if they were noncompliant, one can infer an adverse effect on rival competition from a substantial foreclosure share without the need for such confirmatory evidence. This makes the legal rule consistent with the fact that antitrust law infers such an effect when exclusive dealing covers a substantial market share, because the existence of an exclusive dealing agreement tells us only that there is some significant penalty for non-compliance: it doesn't tell us the size of the penalty, nor does it show that the penalty is large enough that it could not be offset by an equally-efficient rival pricing at cost. In fact, it would generally seem that an exclusive dealing agreement could be offset by an equally-efficient rival pricing at cost. After all, few contractual breaches result in suit, and here the contract might be deemed unenforceable because it unreasonably restrains trade. Even if the defendant were 100% likely to sue and win, expectation damages would generally equal lost profits per sale, which is the defendant price minus per-unit cost, multiplied by the quantity bought from the defendant. The breaching buyer who shifts to buying from a rival pricing at cost would gain the difference between the defendant price and per-unit cost, multiplied by the quantity it bought from the rival. The price-cost difference would be the same, and the breaching buyer would buy more quantity from the rival (because such a buyer purchases at a lower price), so it would seem that expectation damages could never deter a shift to a rival pricing at cost.²⁰⁹ In reality, such breaches would generally not occur, not only

²⁰⁹ See Simpson & Wickelgren, *supra* note .

because the foreclosure may itself prevent the rival from being equally efficient, but also because of reputational sanctions, links to other contractual duties, and lack of rival incentives to price at cost, which are just further problems with a cost-based test.²¹⁰ But the point here is that exclusive dealing doctrine indicates that courts should infer anticompetitive effects from a substantial foreclosure share whenever exclusionary agreements impose a significant penalty on buyers who shift purchases to rivals, whether or not those penalties are high enough to prevent shifts to a rival pricing at cost.

In short, the foreclosure share should in all cases be measured to include any purchases of the linked product that received a bundled discount. For bundled discounts with buyer commitments, a substantial foreclosure share suffices to infer anticompetitive effects. The same holds for bundled discounts without buyer commitments if the size of the discount is significant in relation to purchases of the linked product. For small bundled discounts without buyer commitments, a substantial foreclosure share suffices to show that anticompetitive effects are possible, but should not be used to infer likely anticompetitive effects unless confirmed by evidence of an adverse impact on rival competition.²¹¹ Whether anticompetitive effects are inferred or directly shown, bundled discounts should remain legal if the defendant can prove they were the least restrictive means of producing offsetting efficiencies that were passed on to consumers to an extent large enough to eliminate any harm to consumer welfare.

This analysis explains the holding in *LePage's*.²¹² *LePage's* involved bundled loyalty discounts on branded Scotch tape sold to retailers who agreed to buy private label tape from the defendant. The bundled discounts were significant in size, and were sometimes used to procure loyalty commitments.²¹³ Although the two types of tape were in a common tape market, demand for them differed in a way that made bundled discount analysis appropriate. The court ruled that the bundled discounts could be illegal even if above cost, rejecting a dissent claim that the effective price should have been compared to costs.²¹⁴ The court did not find the bundled discounts quasi-per se illegal based on defendant market power and the lack of offsetting efficiencies, nor did it reach any conclusion that the unbundled prices exceeded but-for levels in a way that might make such a quasi-per se

²¹⁰ See *supra* at ___; Elhauge, *How Loyalty Discounts*, *supra* note , at 205-06.

²¹¹ The conclusions of this paragraph also apply to single product loyalty discounts.

²¹² *LePage's Inc. v. 3M*, 324 F.3d 141 (3d Cir. 2003) (en banc).

²¹³ *Id.* at 145, 147, 154, 157-159.

²¹⁴ *Id.* at 147-152.

approach appropriate. Instead, the court found liability because the bundled discounts not only lacked any offsetting efficiencies, but were significant enough to foreclose major outlets and create adverse effects on rival competitiveness, which it found directly proven by evidence that the foreclosed rival lost economies of scale.²¹⁵

Although this case has been much criticized, it reflects a straightforward application of ordinary rule-of-reason analysis. To be sure, *LePage's* did not rely on proof of a substantial foreclosure *share*, but foreclosure shares are just one possible basis for inferring anticompetitive effects. When direct evidence of anticompetitive effects on rival competitiveness exists, it obviates the need to prove a market or foreclosure share.²¹⁶ Indeed, such direct evidence is far preferable because it directly establishes that the foreclosure share did produce the anticompetitive effect. Given directly-proven anticompetitive effects and the absence of any redeeming procompetitive efficiency, the rule of reason required condemnation.

The same rule-of-reason approach was used in *SmithKline*, which condemned bundled discounts on three antibiotics that involved no buyer commitment, without requiring any evidence that bundled discounts resulted in an effective price that was below cost.²¹⁷ Instead, the court relied on two points. First, the size of the bundled discount was significant in relation to purchases of the linked antibiotic because, although the discount was only 3%, the relative amounts of product purchases made the discount equal to 16% of linked product purchases. Second, the court concluded that, although the effective price was above cost, the bundled discount was likely to adversely impact rival competition by making the profits too low to make it worth promoting the rival antibiotic. This case is thus also consistent with my approach.

Professor Hovenkamp acknowledges that above-cost loyalty discounts can create anticompetitive effects, but argues that they should nonetheless be immunized because the above sort of approach would “make impossible information demands”

²¹⁵ *Id.* at 159-164.

²¹⁶ *FTC v. Indiana Federation of Dentists*, 476 U.S. 447, 460-61 (1986).

²¹⁷ See *SmithKline Corp. v. Eli Lilly & Co.*, 575 F.2d 1056 (3d Cir. 1978). Some argue that the district court in *SmithKline* required evidence that the effective price was below cost. See Bush DOJ Unilateral Conduct Report, *supra* note , at 92. However, the appellate court affirmed liability without ever comparing effective prices to cost, and thus held it was unnecessary. Moreover, the district court actually found that the effective price would have left an equally-efficient rival with a 4% return on sales, thus clearly indicating that the effective price was above incremental cost. 427 F. Supp. 1089, 1122-23 (E.D. Pa. 1976).

on courts by requiring courts to determine whether the foreclosure produced anticompetitive effects and whether those effects were offset by redeeming efficiencies.²¹⁸ This is an odd argument because the above approach not only reflects the sort of rule-of-reason analysis that courts apply all the time, and applied to bundled discounts in *LePage's* and *SmithKline* without difficulty, but also mirrors the same inquiry that Professor Hovenkamp advocates for tying and exclusive dealing.²¹⁹ It is hard to see how the recommended inquiry there could suddenly become inadministrable here. Indeed, the above approach involves the same rule-of-reason approach that Professor Hovenkamp himself says should apply to bundled discounts that flunk his cost-based test.²²⁰

Professor Hovenkamp and others further argue that the above sort of approach is misguided because rival competitiveness might also be harmed by above-cost price-cutting.²²¹ But, unlike bundled discounts, above-cost price-cutting always involves true discounts, benefits consumer welfare, harms rivals only if the monopolist has increased its own efficiency, and cannot be banned without systemic ill-effects.²²² As my discussion above shows, none of those factors is true for bundled discounts. Moreover, for bundled or loyalty discounts, what requires justification are the exclusionary conditions attached to the prices, not the pricing itself. My recommended approach imposes no limit at all on the ability of firms to lower prices to above-cost levels without attaching exclusionary conditions to those prices. Nor can one just assume that bundled discounts lower prices. Making that assumption commits the intellectual error of allowing oneself to get so beguiled by the rhetoric of “discounts” that one prejudices the issues of (1) whether the price difference really reflects an unbundled penalty rather than a true discount from but-for levels, and (2) whether any foreclosure increases market price baselines.

A case where a bundled discount was equated with tying was *Advance Business Systems*.²²³ In that case, the defendant offered its copier separately for \$4250 and in a bundle with other supplies and services for 3.5 cents a copy. The court held that such a bundled discount constituted a tie unless “the components are

²¹⁸ Hovenkamp, *Discounts and Exclusion*, *supra* note ___, at 843-844, 847.

²¹⁹ See IX AREEDA & HOVENKAMP, *supra* note, ¶1701, at 26, ¶1703d3, at 38; XI HOVENKAMP, *supra* note, ¶1820, at 145-151.

²²⁰ Hovenkamp, *Discounts and Exclusion*, *supra* note ___, at 855.

²²¹ See Hovenkamp, *Discounts and Exclusion*, *supra* note ___, at 847-848; AMC Report, *supra* note ___, at 97 (collecting sources).

²²² See Elhauge, *Defining Better*, *supra* note ___, at 315-324.

²²³ See *Advance Business Systems v. SCM Corp.*, 415 F.2d 55 (4th Cir. 1969).

separately available to the customer on a basis as favorable as the tie-in arrangement.”²²⁴ Literally read, this test would wrongly mean that all bundled discounts constitute a tie because any bundled discount, by definition, offers the bundle on a basis more favorable than separate sale. However, the facts of the case suggest that the court was concerned that the separate price was set far above the but-for price, so far above it that no buyer ever wanted to buy the copier separately.²²⁵

Finally, consider again the holding in *Loew’s* that an injunctive remedy for bundling should ban bundled discounts that either have the effect of imposing a tying condition or exceed any efficiency gains.²²⁶ That holding is consistent with my suggested approach because an unbundled price that exceeds the but-for price and lacks offsetting efficiencies has the same effects as a tying condition and causes a discount that exceeds any efficiency gains.

5. Multiple Bundlers and Cumulative Foreclosure. Cases in which multiple firms engage in bundling create additional issues. Professor Hovenkamp has argued that if at least one significant rival could offer the same bundle, then the appropriate test would be to compare the combined bundled price to the cost of making the bundle.²²⁷ However, unless the rival’s existence eliminates all of the defendant’s linking market power, all three of the power effects remain possible despite prices set well above costs. The rival’s existence is relevant in assessing the degree of linking market power, but does not disprove power effects. Moreover, in a differentiated linking market, it is entirely possible that the two firms might have linking power over different sets of buyers, enabling both of them to inflict power effects.

As for foreclosure share effects, if two significant firms are engaged in bundling, then their cumulative foreclosure of the linked market is even greater, producing an even greater foreclosure share effect on other rivals.²²⁸ If those other rivals are driven from the market, bundling could create or preserve a duopoly where otherwise a competitive market could have existed. Indeed, Professor Hovenkamp

²²⁴ *See id.* at 62.

²²⁵ *Id.*

²²⁶ *United States v. Loew's Inc.*, 371 U.S. 38, 54-55 (1962).

²²⁷ *See Hovenkamp, Discounts and Exclusion*, *supra* note ___, at 844-845, 848-849; *see also* Bush DOJ Single Firm Conduct Report, *supra* note ___, at 101 (accepting Hovenkamp’s argument).

²²⁸ *See ELHAUGE, U.S. ANTITRUST*, *supra* note ___, at 335-337; Aaron Edlin & Daniel Rubinfeld, *Exclusion or Efficient Pricing?*, 72 ANTITRUST L.J. 119, 121, 152, 156 (2004); Joseph Lin, *The Dampening-of-Competition Effect of Exclusive Dealing*, 39 J. INDUS. ECON. 209, 209-210, 217 (1990).

himself acknowledges that if a seller and a few rivals engage in exclusionary agreements, courts should aggregate their foreclosure shares when assessing them under antitrust law.²²⁹

In addition, having two firms use bundled loyalty discounts only worsens the extent to which their cumulative effect can discourage discounting.²³⁰ Further, if the two markets are differentiated, then having multiple firms offer bundled discounts decreases social and consumer welfare by producing an inefficient product mix and excessive bundling, even though it also lowers both firms' profits.²³¹ This effect on firm profits makes it even worse policy to adopt the rule, suggested by some, that above-cost bundled discounts should be allowed if other firms *could* form a joint venture to offer the same bundle,²³² because the first bundled discount would generally make forming such a joint venture unprofitable and thus deter its formation.²³³

Even when the bundled discount does not itself deter rival bundling, permitting bundling because a rival could offer the same bundle could force other rivals who wish to remain in the market to engage in similar bundling. If the bundling lacks any efficiency justification, then forcing other rivals to engage in the same bundling forces them into less efficient arrangements, thus undermining market efficiency. Even if one thought that bundle-to-bundle competition between two firms that offer both products were procompetitive, there is a less restrictive alternative. The firms could offer ties or bundled discounts with full carveouts for purchases from rivals who do not offer both products. Bundles with such full carveouts could achieve any purported procompetitive benefits of bundle-to-bundle competition without foreclosing firms that do not make all the products in the bundle.²³⁴

²²⁹ See IX AREEDA & HOVENKAMP, *supra* note, ¶1709, at 78, 87, ¶1729, at 328, 337.

²³⁰ Elhauge, *How Loyalty Discounts*, *supra* note, at 194, 214-15, 220.

²³¹ See Gans & King, *Paying for Loyalty: Product Bundling in Oligopoly*, 54 J. INDUS. ECON. 43, 45-46 (2006); Matutes & Regibeau, *Compatibility and Bundling of Complementary Goods in a Duopoly*, 40 J. INDUS. ECON. 37, 37, 44, 46-47 (1992); Barry Nalebuff, *Competing Against Bundles*, in INCENTIVES, ORGANIZATION, AND PUBLIC ECONOMICS 323, 332 & n.19 (eds. Hammond & Myles 2000).

²³² See Crane, *Mixed Bundling*, *supra* note, at 480-481; Hovenkamp, *Discounts and Exclusion*, *supra* note __, at 855-856; Lambert, *supra* note, at 1741-1747.

²³³ Nalebuff, *Competing Against Bundles*, *supra* note, at 325, 331.

²³⁴ Avoiding any foreclosing effect requires a full carveout that makes purchases from a single-product rival satisfy any loyalty requirement to the same extent as purchases from the defendant. A limited carveout (which excludes purchases from a single-product rival from the denominator but does not make them count the same as purchases from the defendant) would not eliminate foreclosing effects. For example, suppose a buyer complied with a 90% loyalty condition by buying 90 units from the defendant and 10 from its two-product rival. With a limited carveout, the buyer would be foreclosed from shifting 10 units from the defendant to a single-product rival because such a

Finally, adopting a test that immunized above-cost foreclosing bundles when another significant firm also uses a foreclosing bundle would be inconsistent with Supreme Court precedent, which cumulates the foreclosure shares created by above-cost foreclosing agreements when they are used by a few large firms.²³⁵ In all these cases, the Court cumulated foreclosure shares without any finding or evidence of a conspiracy between the firms whose foreclosure shares were aggregated. Indeed, in one case, the Court cumulated foreclosure shares over the objections of a dissent arguing that such a horizontal conspiracy should be required.²³⁶

Although cumulative foreclosure is appropriate when exclusionary agreements (such as bundled discounts) are used by a few large firms, it obviously would be inappropriate if 100 small firms all engaged in the same exclusionary agreements, because in the latter situation the agreements would not produce any anticompetitive effect and must be motivated by efficiencies. Where is the dividing line? I would define the “few” and “large” conditions functionally, based on the relevant anticompetitive theory. “Few” should generally mean less than the number of firms deemed necessary to secure competition under the merger guidelines, because driving the number of efficient firms below that number is usually necessary to cause the sorts of foreclosure share effects that are usually claimed.²³⁷ “Large” should generally mean above minimum efficient scale. Cumulative foreclosure should generally not include exclusionary agreements used by firms below their minimum efficient scale because such agreements could not contribute to the usual claimed foreclosure share effect, which is preventing a greater number of firms from operating at the minimum efficient scale. Indeed, agreements by such small firms are likely to procompetitively help them achieve their own economies of scale.

shift would leave it only 72% (80/90) loyal.

²³⁵ *Standard Oil & Standard Stations v. United States*, 337 U.S. 293, 295, 309, 314 (1949); *FTC v. Motion Picture Advertising Service*, 344 U.S. 392, 395 (1953); *United States v. Philadelphia Nat'l Bank*, 374 U.S. 321, 365-66 (1963) (interpreting *Standard Stations* and *Motion Picture* to rest on cumulative foreclosure measures); *see also* “*Stop & Shop Supermarket v. Blue Cross*, 373 F.3d 57, 66 (1st Cir. 2004) (concluding that the relevant “extent of foreclosure” includes that resulting from defendant’s exclusionary contracts and “other existing foreclosures” such as by another seller’s exclusionary contracts.)

²³⁶ *Motion Picture*, 344 U.S. at 393-95 (holding that the cumulative foreclosure “falls within the prohibitions of the Sherman Act” and therefore violates the FTC Act); *id.* at 399-400 (dissent). The contrary decision in *Paddock Publ'ns. v. Chicago Tribune*, 103 F.3d 42 (7th Cir. 1996), was thus mistaken.

²³⁷ *See* ELHAUGE, U.S. ANTITRUST, *supra* note , at 336-37. This is consistent with the conclusion by Professors Areeda and Hovenkamp that “foreclosure should be presumed unreasonable when it reaches ... a total of 50 percent for five or fewer sellers.” *See* IX AREEDA & HOVENKAMP, *supra* note, ¶1729, at 328, 337.

VII. CONCLUSION

Stylized assumptions can produce the conclusion, contrary to intuition and precedent, that tying and bundled discounts cannot increase monopoly profits and thus must be explained by efficiencies. But under more realistic assumptions, economics shows that the opposite is true. With a substantial tied foreclosure share, tying can increase market power, prices, and profits in both the tied and tying markets. Even without a substantial foreclosure share, ties by firms with tying market power generally harm consumer and total welfare absent efficiencies. The quasi-per se rule thus correctly condemns ties based on tying market power absent offsetting efficiencies, even without substantial tied foreclosure. However, this rule should not apply to products that have a fixed ratio and lack separate utility because those conditions generally negate anticompetitive effects absent substantial tied foreclosure.

When the linking product's unbundled price exceeds its but-for price, bundled discounts can produce the same harmful power effects as tying, and thus should be condemned based on linking market power absent offsetting efficiencies, unless the products have a fixed ratio and lack separate utility. If not covered by such a quasi-per se rule, bundled discounts should be judged under ordinary rule-of-reason analysis that requires proof of substantial foreclosure or direct proof of anticompetitive effects.

**APPENDIX – EX POST EFFECTS OF METERING TIES
THAT CREATE INTRA-PRODUCT PRICE DISCRIMINATION**

Assume a firm has a monopoly in printers, which are used with cartridges that are produced in a competitive market. Both products cost zero to make. The competitive price for cartridges is thus zero. Suppose that at this price, printer buyers use from 1 to m cartridges, giving us m groups of buyers, each of which uses up to n cartridges each (where n goes from 1 to m), and that each group has A members. Suppose the range of value that buyers in each group derive from printing with a cartridge linearly ranges from 0 to A , so that the number of cartridges each group will buy = $(n)(A - P_c)$, where P_c is the cartridge price. Without a tie, the cartridge price is zero, and buyers in each group will buy n cartridges. Thus, the maximum value buyers in each group will put on a printer will be nA . At a printer price of nA , zero printers will be sold to group n , whereas at a printer price of 0, A printers will be sold to group n . Thus, the quantity of printers demanded by each group of buyers will be $A - (1/n)P_p$, where P_p is the printer price.

With tying, the seller will effectively be selling cartridge printing. Thus, a tying firm will maximize profits by selling the printer at zero tied to cartridges at $A/2$. Half of each group buys a printer and the cartridge quantity each group buys will be $n(A - A/2)$. Summing across all m groups:

$$\text{Tying printer output} = mA/2.$$

$$\text{Tying cartridge output} = (1/2)(m)(m+1)(A/2) = (1/4)(m)(m+1)A.$$

$$\text{Tying profits} = (1/8)(m)(m+1)A^2.$$

Tying consumer welfare within each group will be $nA^2/8$, thus across all m groups:

$$\text{Tying consumer welfare} = (1/16)(m)(m+1)A^2.$$

$$\text{Tying total welfare} = (3/16)(m)(m+1)A^2.$$

Without tying, the analysis will depend on how many groups are priced out. If no group was priced out, aggregate printer demand would be the sum from 1 to m of $A - (1/n)P_p$. This will be $Am - \sum(1/n)P_p$ as n goes from 1 to m , which is $Am - H_m P_p$, where H_m is the m th harmonic number. The profit maximizing price for any demand $Y - BP$ is $Y/2B$, so the printer price will be $(1/2)Am/H_m$. Total printer output would be $(1/2)Am$, and profits would be $(1/4)A^2m^2/H_m$. Cartridge output for each group is n times the printer quantity that group buyers, or $n[A - (1/n)P_p] = nA - (1/2)Am/H_m$. Thus, for all m groups, cartridge output = $(1/2)A[(m)(m+1) - m^2/H_m]$. Consumer welfare for each group n will be $(1/2)(nA - P_p)(A - P_p/n) =$

$(1/2)A^2(n - m/H_m + (1/4) m^2(1/n)(1/H_m))$. Summing over all m groups this comes to:

$$\text{Nontying consumer welfare} = A^2[(1/4)(m)(m+1) - (3/8)m^2/H_m].$$

$$\text{Nontying total welfare} = A^2[(1/4)(m)(m+1) - (1/8)m^2/H_m].$$

If x groups are priced out without tying, then aggregate printer demand will be the sum from $x+1$ to m of $A - (1/n)P_p$. This will be $Am - \sum(1/n)P_p$ as n goes from 1 to m , minus $Ax - \sum(1/x)P_p$ as n goes from 1 to x . Thus, the aggregate printer demand will be $A(m-x) - (H_m - H_x)P_p$. This makes the profit-maximizing printer price $(1/2)A(m-x)/(H_m - H_x)$, printer output $(1/2)A(m-x)$, and profits $(1/4)A^2(m-x)^2/(H_m - H_x)$. Cartridge output = $(1/2)A[m(m+1) - x(x+1) - (m^2 - 2mx + x^2)/(H_m - H_x)]$. Consumer welfare will be the sum from $x + 1$ to m of $(1/2)(nA - P_p)(A - P_p/n)$. Substituting the above printer price, this simplifies to:

$$\text{Nontying consumer welfare} =$$

$$A^2[(1/4)(m)(m+1) - (1/4)(x)(x+1) - (3/8)(m-x)^2/(H_m - H_x)].$$

$$\text{Nontying total welfare} =$$

$$A^2[(1/4)(m)(m+1) - (1/4)(x)(x+1) - (1/8)(m-x)^2/(H_m - H_x)].$$

The printer monopolist will set a price that prices out at least one group if the price based on the demand of all groups would exceed A , that is if $(1/2)Am/H_m \geq A$, or $m \geq 2H_m$, which is true for $m \geq 5$. It will also set a price that prices out one group if it could make more profit by pricing to exclude one group than it could by pricing to include all groups. This will be true if $(1/4)A^2(m-1)^2/(H_m - H_1) > (1/4)A^2m^2/H_m$. The first m for which this is true is 4. Thus, at least one group will be excluded if $m \geq 4$.

For m of 4 or more, the printer monopolist will set a price that prices out at least x groups if the price based on the demand of x groups would exceed xA , that is if $(1/2)A(m-x)/(H_m - H_x) > xA$. It will increase prices further to price out $x + 1$ groups if it could make more profits by doing so, which will be true if $(1/4)A^2(m-x-1)^2/(H_m - H_{x+1}) > (1/4)A^2(m-x)^2/(H_m - H_x)$, which is if $(H_m - H_x)/(H_m - H_{x+1}) > (m-x)^2/(m-x-1)^2$. Using this, we can derive x for each m . Based on x , we can then use the formulas above to calculate the percentage changes in ex post welfare and output caused by tying that induces intra-product price discrimination, which are summarized in the following table.

Ex Post Effects of Tying That Creates Intra-Product Price Discrimination					
m	x	Consumer Welfare Change	Total Welfare Change	Printer Output Change	Cartridge Output Change
1	0	0.00%	0.00%	0.00%	0.00%
2	0	-25.00%	-3.57%	0.00%	-10.00%
3	0	-35.29%	-5.71%	0.00%	-15.38%
4	1	-9.72%	8.33%	33.33%	3.17%
5	1	-19.34%	3.37%	25.00%	-3.43%
6	1	-25.73%	0.38%	20.00%	-7.73%
7	2	-10.75%	8.92%	40.00%	3.23%
8	2	-16.90%	5.43%	33.33%	-1.21%
9	2	-21.59%	2.95%	28.57%	-4.52%
10	2	-25.31%	1.10%	25.00%	-7.11%
11	3	-15.59%	6.42%	37.50%	-0.09%
12	3	-19.29%	4.36%	33.33%	-2.76%
13	3	-22.39%	2.73%	30.00%	-4.96%
14	4	-14.77%	7.00%	40.00%	0.57%
15	4	-17.84%	5.26%	36.36%	-1.65%
16	4	-20.48%	3.81%	33.33%	-3.55%
17	4	-22.79%	2.60%	30.77%	-5.20%
18	5	-16.83%	5.87%	38.46%	-0.89%
19	5	-19.14%	4.59%	35.71%	-2.56%
20	5	-21.19%	3.48%	33.33%	-4.03%
30	8	-19.70%	4.34%	36.36%	-2.93%
40	11	-18.93%	4.78%	37.93%	-2.36%
50	14	-18.46%	5.05%	38.89%	-2.02%
60	17	-18.15%	5.23%	39.53%	-1.78%
100	28	-19.01%	4.75%	38.89%	-2.40%
1,000	284	-18.90%	4.82%	39.66%	-2.32%
10,000	2846	-18.85%	4.84%	39.78%	-2.29%
100,000	28466	-18.85%	4.85%	39.79%	-2.29%
500,000	142333	-18.85%	4.85%	39.79%	-2.29%

