the relevant drug law, also can affect the frequency of harmful settlements, but it is a blunt instrument.

In my earlier discussion of problems from overlapping IP rights I optimistically asserted that the IP rent-seeking problems could be addressed within IP law. That is fortunate, because competition law is cumbersome and creates its own hazard of unleashing unproductive rent-seeking. But competition law is probably the best tool for addressing reverse payment settlements. Sophisticated oversight requires public enforcement agencies and competition law courts to delve into patent law questions. Thus, these cases are difficult, but the stakes are high enough to warrant the effort.

the market contexts and cases in which tying is observed. We focus in this chapter on the role of intellectual property in relation to tying, although the general theory of tying incentives is essential to an understanding of the issues when intellectual property (IP) is involved. In this introduction, we also set out the criteria that we use to discuss an optimal competition policy towards tying.

The concept of tying can be refined along three dimensions. The first important distinction is requirements tying versus bundling. Requirements tying is the restriction imposed by a seller that to buy one of its products, A, a buyer must purchase all of its requirements of another product, B, from the seller. In other words, the right to purchase product A carries with it an obligation not to purchase the product B (or close substitutes) from any other seller. This restriction is one of exclusivity. Examples of requirements contracting include the restriction that a franchisee purchase its inputs only from the franchisor; the classic example of the restriction imposed by IBM that buyers of IBM adding machines buy all of their requirements of punch cards from IBM; and the restriction that buyers of photocopiers purchase all toner or service from the same company.

A bundling restriction, on the other hand, requires a buyer to purchase two goods, A and B, in fixed proportions (for example, one unit of B must be purchased with each unit of A). Along with this strategy of "pure bundling" is the strategy of "mixed bundling" in which buyers can purchase individual products separately but also have an option to purchase them together. Pure bundling is observed when left and right shoes are sold together, when cars are sold only with tires, or (an obviously more contentious example) when purchasers of Microsoft's operating system obtain the Microsoft's Windows Media Player (an obviously more contentious example) when purchasers of software obtain the Microsoft's Windows Media Player (an obviously more contentious example) when purchasers of software are sold together. Mix bundling is practised by McDonald's restaurants in offering the option of meal packages that are priced lower than the sum of individual components of the packages.

In requirements contracting, the primary good is often referred to as the "tying good," and the good whose purchase from other firms is restricted as the "tied good." In mixed bundling strategies where a good B is offered alone as an option, but must be purchased by all buyers of good A, good A is called the tying product and good B the tied product.

The second important dimension in defining tying strategies is in technological tying versus contractual tying. Technological tying occurs in the bundling context when two products that could feasibly be offered as separate products are bundled together in a way that makes it technologically impossible for consumers to purchase one component but not the other. Software is again a source of examples of this type of tying. In the requirements tying context, as opposed to bundling, technological tying refers to the design of a primary good (e.g., an inkjet printer) for which the only compatible variable inputs (the toners) are those produced by the seller. Contractual tying occurs when a firm bundles two distinct products together in the package sold to consumers, or where a firm prohibits the purchase of a variable input from another seller as a condition of the purchase of a piece of equipment.

The distinction between technological tying and contractual tying is important in two respects. First, as a policy matter contractual tying may be easy to prohibit, whereas the prohibition of technological tying in any particular case may require the feasibility of disassembling an integrated product. Second, technological tying may in some circumstances be invoked by a dominant seller as a commitment against "undoing" the strategy, whereas such a commitment is more difficult with contractual tying. This commitment may be needed when tying is used as a strategy to deter entry. A well-established principle in economics is that the credibility of entry-deterrence strategies depends on commitment of the incumbent. And the commitment may be important not just in affecting a potential entrant's actions but also vis-à-vis the policy-maker, who may be able to undo a contractual tie but not a technological tie.

The third dimension along which tying strategies may vary is the size of the price discount offered to the buyer accepting tying. A strategy of offering buyers a 25 percent discount on the primary product if they agree to the exclusive purchase of the complementary product, or a (mixed bundling) strategy of offering a discount of 25 percent on a bundle if it is purchased as a bundle, is a weaker form of tying than

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2 See for example, Siegel v. Chicken Delight, 448 F.2d 43 (9th Cir. 1971) (Chicken Delight).
3 See for example, Director of Investigation and Research v. Xerox (Canada) Inc., CT-1989-004.
absolute insistence on the tying restraint. Our analysis of tying will apply to this form of tying as well.

2) The Policy Issue
When is tying anti-competitive? When should tying be prohibited? These two questions may appear to be the same, they are not. Consider a dominant firm in a market with rapidly changing technology (the kind of market in which intellectual property is likely to be prominent). It may be true as a matter of theory that the market would be more competitive if the dominant firm could be forced to maintain the separate development of some individual products, being allowed to integrate products into bundles only when such bundling is efficient. But this policy of prohibiting inefficient bundling might well be impossible to enforce in that it would require nearly as much information and continual involvement in the market by the policy-maker as by the firm itself. Another policy, imposing fines or other penalties when a dominant firm is found to have tied inefficiently may be feasible, but may impose too much uncertainty in the market. A finding that tying is anti-competitive is only one step, albeit an important first step, towards the design of a feasible and appropriate remedy. This finding is necessary but not sufficient to justify policy intervention in the market.

3) The Policy Criterion
In our search for policy conclusions grounded in the economic analysis of tying, we adopt the criterion of economic efficiency: the maximization of total gains from a market, whether these gains are achieved by consumers (in the form of consumer surplus) or by shareholders of firms in the market. A remedy is preferred when it increases total efficiency. This objective incorporates the feasibility and cost of policy alternatives. In adopting this goal, we reject the notion that the competitiveness of a market is an appropriate policy objective but accept market competitiveness as a means of achieving greater efficiency where appropriate.

4) Positive versus Normative Analysis of Tying
The heart of our survey is the delineation of the incentives to adopt tying strategies. Why would a firm adopt tying in a particular set of circumstances? This positive question must be answered before any normative or policy analysis can be offered. The necessity of a positive theory may seem obvious, but it describes a difference between an economic approach to competition policy in this area and some legal decisions. In Chicken Delight, for example, the court rejected a quality-assurance defence of tying franchise inputs on the basis that less restrictive means of achieving this assurance were available to the franchisor. This approach fails to ask specifically why a franchisor would adopt tying and then to spell out the welfare consequences of the most persuasive explanation, adopting instead a dubious theory that policy should redirect franchisors’ strategies towards those that appear less restrictive of competition.

Traditionally, exclusivity restrictions such as tying were viewed by courts as anti-competitive on their face. When a monopoly in the tying good uses tying the effect can be a second monopoly in the tied-good market, and the impact of the practice — it is argued — is therefore to reduce competition. The Chicago School responded to this argument by noting that a monopolist can extract monopoly profit only once: if tying were a restriction that served to extract additional profits, the monopolist would do better by instead raising the price of the principal product. Post-Chicago economists, especially Michael Whinston, showed that tying can in some circumstances be used profitably to extend market power from one market to another. Many prominent competition economists, however, have come to the conclusion that post-Chicago economics provides relatively weak guidance for policymakers. Michael Whinston concluded that, with respect to the appropriate competition policy in the Microsoft case, the most striking aspect of the state of economic knowledge about tying is how little we know. Ken Hylton and Michael Salinger (the current Director of the
Bureau of Economics at the Federal Trade Commission in the US) concluded that the post-Chicago literature had established the theoretical possibility of abuse through tying by a dominant firm, but that using this literature to justify antitrust hostility towards tying is problematic. Our review supports a conservative approach towards government intervention in the area of tying. The complexity of tying cases in circumstances where the practice is potentially anti-competitive presents a severe challenge to the design of appropriate intervention. Economic theory can offer, at best, a guide towards case facts that tend to favour a hands-off approach versus a more interventionist approach, but it is an inescapable conclusion that simple policy prescriptions or rules are unavailable.

The remainder of our paper proceeds as follows. Section B reviews a variety of prominent theories of tying, showing that tying can be efficient in some cases and inefficient in others. Throughout Section B we describe how intellectual property rights relate to the different theories of tying. We stress the relationship between IP and tying further in Section C, which describes and analyzes three tying cases that centrally involved IP rights. Section D sets out our views on optimal policy towards tying generally, and towards IP and tying in particular.

B. GENERAL THEORIES OF TYING

1) Cost-efficient Tying

Tying is ubiquitous. Gloves are sold in pairs, cars are sold with wheels, and hamburgers are sold as a beef patty and a bun. These examples of course raise no competition policy objections. Tying is used in these transactions because it minimizes the sum of production and transactions costs. It would be more costly for a consumer to buy tires and a car separately than for a car manufacturer to install the tires (due to the economies of scale and production efficiencies) and the market provides the obvious solution. Where cost efficiencies dictate, products will be tied (sold in packages) whether the market is competitive, monopolistic, or anything in between.

Because the cost efficiency explanation of tying is so dominant empirically it is worth elaborating upon. Evans and Salinger offer an extensive analysis of cost efficiencies in tying. These authors point out that in the last case in which the US Supreme Court considered tying, Jefferson Parish, an efficiency explanation was offered by the defendants and the district court was persuaded of the efficiencies of the practice in this case.

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

See also, L. Kaplow, “Extension of Monopoly Power through Leverage” (1985) 85 Colum. L. Rev. 515 [Kaplow].

sions of sellers as not being in their own interests. The Court is in a much weaker informational position than sellers. The first step towards an assessment of tying in any particular case must be a positive economic theory of why sellers, acting correctly in their own interest, would adopt the practice.

Evans and Salinger note that pure bundling can arise in a competitive or monopolistically competitive market because of costs. Where there are substantial costs (on the part of either the producer or the consumer) to the production and sale of separate components, or moderate costs but little demand for one or more of the components, then the market might offer only the pure bundle. With sufficient heterogeneity in consumer tastes in addition to the costs of offering separate products, the market will yield mixed bundling, with the bundle at a discount relative to the costs of separate products. Evans and Salinger illustrate the cost-based theory of tying with a number of markets, including the market for cold remedies. In this market, both bundles (pills with a variety of medicinal ingredients and separate products (individual drug remedies) are offered. The discount for the bundle is so large that Evans and Salinger suggest that it reflects not differences in demand elasticities (as in the price discrimination theory of bundling, discussed below) but simply the fact that the cost of offering a bundle is only slightly more than the cost of offering individual components. Most costs for cold remedies are in the packaging, distribution, and marketing.

While the competitive market cases that Evans and Salinger discuss do not involve contentious legal cases, the demonstration that cost efficiencies can explain bundling clearly extends to situations with market power. It must be considered as an alternative hypothesis to any monopoly-power based theory of tying.

2) Bundling as Price Discrimination

If there were no cost advantage to bundling over the offer of separate products, then a competitive market would yield separate products, not bundling. A firm with market power, however, may be induced to implement bundling as a means of extracting more surplus from consumers. Consider, for example, a monopolist producing at zero cost two products, A and B, and facing two types of consumers (ten consumers of each type). Half of the consumers value product A highly and product B less highly: these consumers would be willing to pay $10 for one unit of product A and $4 for one unit of product B. The other half of the consumers have the opposite preferences, with a higher value for product B.

Consider the three possible strategies: sell each good separately at $4; sell each good separately at $10 dollars; or, sell a bundle of the goods at $14. The profits generated by these three strategies are $160; $200; and $280. Pure bundling dominates the other two strategies (or any other strategy) because it extracts the full surplus from consumers. Under our criterion of economic efficiency (total surplus maximization), pure bundling is not only the privately efficient strategy among these three strategies, it is also the unique, socially efficient strategy. Prohibiting bundling would decrease total surplus because those individuals valuing a good at $4 are allocated the good in the tying optimum, but not without tying. Indeed, in this example bundling is Pareto improving in that it increases the welfare of some agents (the shareholders) while harming none (since in no scenario is there positive consumer surplus).

The classic references on bundling as price discrimination are Stigler and Adams and Yellin. Adams and Yellin develop the intuition suggested by our example that bundling can extract greater surplus when the valuations for two different products are negatively correlated across products. Mixed bundling may be profitable as well

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12 Evans and Salinger, above note 8 at 52, adopt a model of monopolistic competition in which positive profits are ruled out by a contestability assumption.
14 *Ibid.* at 70.
15 It is easily argued that no other strategy can be profitable.
when there are a sufficient number of consumers with extreme preferences (a very high value for a particular product and a very low value for the other product).

Bundling, like price discrimination generally, may increase welfare (as in the above example) or decrease welfare, depending on the circumstances in the market. A policy that would ban tying where it facilitates price discrimination has no economic foundation.

3) Tying in Aftermarkets

A variety of tying theories arise in the context of a durable good and complementary goods used in conjunction with the durable good. Sellers often tie the complementary goods, sometimes referred to as "aftermarket products," to the tying good. Examples of such tying, including antitrust cases on the matter, abound. As mentioned above, IBM tied sales of punch cards to the purchase of an IBM computer.\(^\text{19}\) International Salt tied sales of salt to its patented salt injecting machines.\(^\text{20}\) Franchisors may tie the sales of inputs necessary for a franchisee's business to the initial sale of a franchise; franchisees are contractually committed to buying the franchisor's inputs.\(^\text{21}\) Printer manufacturers may tie the sale of ink to printers.\(^\text{22}\) Sellers of a durable piece of machinery may effectively tie the purchase of service on the machine to the machine by refusing to sell replacement parts to independent service operators.\(^\text{23}\)

In this section, we review a number of explanations associated with tying in aftermarkets, including discussion of the welfare effects of each theory. We highlight the importance of intellectual property to these theories. IP is important in two ways. First, IP laws may be instrumental in enforcing the tying arrangement. For example, a ma-

19 See IBM Corp. v. United States, 298 U.S. 131 (1936) [IBM].
21 See for example, Chicken Delight, above note 2, where a chicken restaurant franchisor ties sales of paper buckets to sale of franchise.
23 See for example, Eastman Kodak Co. v. Image Technical Services Inc., 504 U.S. 451 (1992) [Kodak]; Canada (Director of Investigation and Research) v. Xerox Canada Inc. (1990), 33 C.P.R. (3d) 83 (Comp. Trib.) [Xerox].
24 For an early exposition of tying as metering, see W. Bowman, "Tying Arrangements and the Leverage Problem" (1957) 67 Yale L.J. 19.
since these demanders purchase more aftermarket products. The amount of aftermarket purchases acts as a signal, or meter, for the buyer's value of the product and is "taxed" accordingly with a price in excess of marginal cost. Tying is necessary for the metering strategy because in its absence buyers could source aftermarket products in a competitive market, and the seller would be unable to charge a super-competitive price.

A numerical example illustrates the metering properties of tying in aftermarket. Suppose that there are two kinds of customers, one that values the machine at $10 and 2 units of service at $10 per unit, and another that values the machine at $10 and 3 units of service at $10 per unit. Suppose that a unit of service costs $5 to provide, while a machine costs $10. A non-tying, single-price seller of the machine cannot fully extract surplus from the high demander without alienating low demanders. That is, if the seller allowed competition in service and charged $25 for the machine, it would realize profits of $15 each from high demanders but would not sell to low demanders who would, if they purchased, realize negative surplus at a price of $25. In contrast, if the seller ties, charges $10 for the machine and $10 per unit of service, it sells both to high and low demanders and extracts all surplus from each. Variation in demand across customers for a variable input into the operation of the durable thus gives rise to the potential for profitable price discrimination.

Like other kinds of price discrimination, the practice of metering reflects some degree of market power, since a seller in a purely competitive market has no leeway to charge super-competitive prices. But this does not imply that tying in this context is or should be treated as suspect. The fact that price discrimination reflects market power does not imply that price discrimination enhances market power to the detriment of society. Rather, price discrimination is often efficient in that it increases the quantity sold of a product. In the preceding example, tying as price discrimination ensures that both low and high demanders buy the machine-service package, while the inability to tie could result in prices that exclude low demanders from market. The correct comparison when evaluating the effects of price discrimination is not between the discriminatory pricing strategy and competitive pricing, but rather between discriminatory pricing and a single-price strategy that reflects the seller's market power and would be adopted if price discrimination were restricted. On balance, economists tend to view price discrimination, and thus tying as metering, as often market-expanding and therefore efficient.

The metering theory is probably the most important explanation of tying in aftermarket. Metering is a plausible explanation in each of the cases discussed above. Tying ink to printers, salt to canning machines, punch cards to computers, service to machines, and toner fluid or paper to photocopier machines could all result from a metering incentive. Franchisors tying inputs to franchise sales could also result from price discrimination, since more profitable franchises will purchase more inputs than less profitable franchises.

Intellectual property is often essential in establishing tying. First, tying for price discrimination requires some degree of market power. Such market power in the tying-good market may be protected in part by intellectual property. The machine sellers in International Salt and Independent Ink, for example, had IP rights in their machines, which may have conferred the requisite market power to impose price discrimination. Similarly, the franchise brand in franchising cases can confer some market power on franchisors.

In addition, sellers rely on intellectual property rights to enforce the tying arrangement. For example, printer manufacturers rely on

27 See B. Klein and L. Saft, "The Law and Economics of Franchise Tying Contracts" (1986) 28:2 J.L. & Econ. 345. Not that price discrimination is most plausible where the buyer knows its valuation better than the seller and metering is required to induce the buyer to reveal its valuation. In the franchise setting, however, it is often plausible that franchisors know the value of a franchise better than franchisees: see E. Iacobucci, "Revisiting the Law and Economics of Franchise Tying Contracts" (2007) (unpublished). In such a setting, signaling, discussed below at Section B(3)(b), may be a more plausible explanation of tying than metering.

28 The question of how much market power was conferred on sellers by a patent was the subject of the recent appeal in Independent Ink, above note 22, in which the US Supreme Court held unanimously that a patent does not necessarily confer market power for the purposes of antitrust law.

29 See Chicken Delight, above note 2.
A modern example of a tying arrangement that may serve as a meter and relies on IP rights for enforcement can be found in a set of allegations by an American plaintiff concerning Apple's marketing of its iPod music and video players.\(^{30}\) Apple sells iPods and also sells online music and videos at its iTunes website. A US plaintiff recently accused Apple of tying in that, through proprietary Digital Rights Management (DRM) technologies and other factors, the songs at iTunes can be played only on iPods, and iPod users cannot easily purchase from Apple's rival online music and video sellers.\(^{31}\) The United States District Court for the Northern District of California refused to dismiss on summary judgment the plaintiff's complaint about unlawful tying. We will return to this example at different points in our analysis, but we note here that the arrangement could well reflect metering. According to the plaintiff's allegations, iPod buyers who seek to download online music or video are induced to buy from Apple. High-value demanders of the iPod–iTune bundle are high-quantity demanders, or intensive demanders, of iTunes. Apple can thus extract greater surplus from high demanders for the package by raising the price of iTunes songs and videos above marginal cost. The quantity of iTunes demanded by a consumer meters (or signals) the buyer's value of the package.

Tying in the metering context does not enhance the social value of intellectual property itself, though it does result in a greater share of the social value being realized by the seller. Thus, to the extent that metering enhances the private profits of the tying-good producer, metering will have an effect on innovation. For example, some commentators have suggested that franchise tying arrangements will induce greater creativity in franchise-system innovation.\(^{32}\) Even outside the intellectual property context, there is no compelling basis for prohibiting tying when the role of the strategy is to allow metering. In the intellectual property context, the additional value of higher profits in stimulating innovation creates a further argument against government intervention in prohibiting the practice.

b) Tying as a Response to Asymmetric Information about Quality: \(\textit{Ex Post Informational Asymmetry}\)

For a variety of reasons, tying in aftermarket may respond to asymmetric information about the tying good's quality. Tying may address concerns about preserving the tying good's reputation for quality after the products have been used. Tying may also signal the good's quality before the products have been purchased. We analyze the use of tying as a means of conveying information about quality below, dividing the theories into \(\textit{ex ante}\) and \(\textit{ex post}\) asymmetric information problems.

By definition, aftermarket products are used in conjunction with the durable good. The quality of the aftermarket product can affect the operation of the durable good, but buyers may not be able to discern the cause of poor performance between an inferior tying or aftermarket good. Several defendants, from IBM\(^{36}\) to International Salt\(^{36}\) to Kodak,\(^{37}\) have argued that they have required customers to buy their high-quality aftermarket products in order to preserve or enhance the tying good's reputation for quality. Courts have on occasion accepted the argument that tying is a response to such quality control concerns.\(^{38}\) In \textit{Jerrold Electronics}, the court accepted that a seller of novel television antennae required buyers to use its service in order to ensure that high-quality service was performed, and that buyers would not blame Jerrold's equipment for poor performance resulting from poor service.\(^{39}\) Rather than engaging in the costly and possibly fruitless exercise of attempting to specify minimum levels of service quality in contracts with its customers, Jerrold simply tied to preserve its reputation.

30 See Independent Ink, above note 22.
31 See Kodak, above note 23.
33 Ibid.
35 See IBM, above note 19.
37 See Kodak, above note 33.
39 Ibid.
The lack of information on the part of buyers about quality is not a sufficient condition for tying, however. Buyers who cannot discern responsibility for poor performance ex post may nevertheless be capable of realizing that independent aftermarket providers do not have the same stake in the reputation of the durable as the durable manufacturer, and that therefore independent providers do not have the same incentives to provide high-quality aftermarket products. Buyers concerned with quality will tend to avoid purchasing from independent providers, and if they do purchase from independents will attribute, with high probability, the lack of quality to the service provider.

If a buyer, however, is willing to accept greater risk of inferior aftermarket products, then there is a potential externality between buyer and seller that tying might address: the buyer does not internalize any potential reputational harms to the seller from the buyer's use of inferior aftermarket products that flow from observation by other buyers of quality problems (or word-of-mouth). But even where this externality is significant, tying may not be necessary. The use of predictably inferior third-party aftermarket products could conceivably enhance the reputation of the durable. This would arise where third-party aftermarket products are used, but the durable nevertheless performs well. In such circumstances, outside observers would upgrade their view of the product even more than they would where the durable supplier's aftermarket products were used. Only where there are buyers that are relatively indifferent to aftermarket quality, and where the use of predictably poor-quality aftermarket is likely on net to hurt the seller's reputation, is it plausible that tying remedies the buyer-seller quality control externality. In these circumstances, tying can play a quality control role.

Tying as quality control is socially beneficial. Innovators who have developed a high-quality product are able to protect consumers from confusion about the product's quality. This enhances the private and social value of the seller's trade-mark and other intellectual property that it has in the tying good. Jerrold's antenae, for example, proved to be successful, resulting in profits for Jerrold, but also in gains for buyers. Protecting the investment in a brand, patent, or other intellectual property typically provides the motivation for tying in the quality control context. In addition, just as in the price discrimination setting, tying for quality control may in part rely on IP rights for enforcement, as where a seller of a durable good would refuse to supply third parties with proprietary parts in order to prevent them from providing inferior service.

The theory of ex post quality control just reviewed depends upon confusion on the part of the buyer about the effect of inferior aftermarket products on the performance of the durable aftermarket package. There is another kind of ex post quality control explanation that does not rely on the buyer's confusion. The explanation is particularly plausible in the franchise context. Franchisees may knowingly purchase inferior inputs, and may explicitly recognize the effects of inferior inputs, but may do so because of a free-rider problem among franchisees: franchisees realize the full benefits of cheaper inputs, while sharing the reputational costs to the franchise brand from low-quality inputs with the franchisor and other franchisees. In this setting, and in other settings where the buyer shares the direct cost of performance with the seller (as where there is a warranty, for example), the seller has an interest in committing the buyer to purchasing high-quality aftermarket products. The franchisor internalizes more of the franchise brand's value than the franchisee and may impose tying as a means of protecting the brand. Anticipating the free-rider problem, franchisees would be willing ex ante to accept the tying arrangement as value-maximizing the contractual term, though ex post franchisees may prefer to void the tying arrangements.

As in the distinct, but similar, case where tying addresses potential confusion over attribution of blame for poor performance, tying to preserve the franchise's reputation for quality is socially desirable. Tying in this manner allows franchise systems to maintain their reputations for quality, which in turn helps preserve franchisors' incentives to innovate in developing high-quality franchise systems. Tying enhances the franchise trade-mark's private and social value. IP concerns help explain why tying is adopted in the franchise setting.

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41 Iacobucci, ibid., shows that the technological interaction between the tied and tying goods is essential to determining whether inferior tied goods will predictably enhance or hurt the tying good's reputation.

c) Tying as a Response to Asymmetric Information about Quality:

Ex Ante Information Asymmetry

Tying in aftermarkets may also remedy difficulties for buyers in determining the quality of the durable good prior to purchase. Tying can signal quality. For example, suppose that the quality of a durable is given by its longevity: it may last for one, two, or three periods. It costs more to produce a durable that lasts longer. Without a means of signaling that the durable is high quality, there may be attenuated incentives for the seller to sell a durable that lasts three periods, given that buyers cannot determine quality ex ante and therefore will be reluctant to pay for the additional costs associated with a high-quality durable.

Aftermarket tying could help the seller signal quality. Suppose that the buyer requires one unit of an aftermarket product in each period of the durable's use, from one to three periods. The high-quality seller could charge a relatively low price for the durable but could tie aftermarket products and charge super-competitive prices for the tied goods in each of the three periods. Such a pricing strategy could allow the high-quality seller to recoup the opportunity costs of a low durable price since it sells three tied goods, but might not allow a low-quality seller to recoup, given that the latter would sell only one tied good.

This explanation may be applicable where there is a correlation between the demand for aftermarket goods and the quality of the durable. This may not always be plausible. Expenditures on service, for example, may be greater the lower the quality of the durable. But there are settings where this correlation is plausible. The franchise setting provides a good example of where the signalling theory might apply. Franchisors seeking to signal to prospective franchisees that a particular franchise opportunity will be profitable may rely in part on tying arrangements. The more successful the franchise is, the more inputs it will require. By tying and charging a super-competitive price for inputs, the franchisor signals quality.

Again, there is a clear relationship between IP and tying. The seller's reputation for quality affects the value of either its trade-mark or whatever intellectual property, such as a patent, that it relies on in producing the durable. By allowing high-quality sellers to signal the quality of their brand or durable, tying can enhance the value of IP, which in turn enhances the incentives to invest in high-quality IP. IP helps explain the motivation for tying. And, again, IP may be useful in enforcing the tie, such as where the aftermarket tying is enforced in part by relying on IP rights to exclude independent suppliers of the aftermarket product from the market.

d) Ex Ante Uncertainty and Risk-sharing

Suppose that neither the buyer nor the seller has a perfect prediction of the value of a particular durable good over time. The value is inherently uncertain and both parties may share the same expectation distribution as to the future value. Tying can then address risk-aversion on the part of the buyer. Suppose that the durable can last one, two, or three periods, and suppose now that the buyer and seller accurately believe each outcome to be equally probable. And, suppose that one unit of an aftermarket product is required per period.

In the case where the seller simply sells the durable good and the aftermarket product is supplied competitively, the buyer bears all the risk of the durable's longevity. It may be mutually beneficial for the buyer and seller to agree to share the risk by selling the durable at a lower price and tying the aftermarket product to the durable. The seller can charge a supra-competitive price that results in greater profits for it the better the machine performs, which shifts some of the risk of the durable's performance from the buyer to the seller.

Again, the franchise setting is suitable for this tying motivation. Franchisees are often small business-people who may be risk-averse, while franchisors may have diversified investors and also can diversify across a portfolio of franchises. It is therefore often efficient for franchisors to bear some of the risk of the franchise's performance. Selling the franchise opportunity at a lower price but charging super-competitive prices for tied inputs shifts risk efficiently.

A related theory, which we also group under risk-sharing recognizes that franchisees are of limited wealth and, therefore, that—simply because of this wealth constraint—even a risk-neutral franchisee can-

44 See Iacobucci, "Revisiting the Law and Economics of Franchise Tying Contracts," above note 27.
not purchase the franchise for the expected present value of the flow of profits. The optimal contract then allocates some future rents to the franchisor, through tying and a positive markup on the input, balancing at the margin (for the franchisor) the cost of the inefficiency induced by the positive markup with the rents left with the franchisee.46

Unlike the other information-based explanations of tying, risk-sharing tying does not enhance the perception of the durable's IP, such as its brand or patents. Rather, risk-sharing simply represents an efficient method of selling the durable. IP may, however, be relevant in enforcing the tie, such as where proprietary parts are sold as aftermarket products.

e) Aftermarket Tying as a Lack of Commitment

This theory of tying in aftermarkets is quite unlike the others in that tying is inefficient, reflecting a lack of commitment on the part of the seller. To this point, our surveyed explanations of tying have been based on efficiency or price discrimination.

At any point in time after they have begun selling the durable good, sellers have an "installed base" of past customers that must purchase aftermarket products specific to the durable, including parts and service, or buy a new durable at whatever the durable costs. Once this installed base exists, there is a temptation for sellers, regardless of past policies in aftermarkets, to impose a tie in the aftermarket and charge super-competitive prices that exploit the installed base's switching costs.47 Even in competitive markets, there is a risk that the seller will change aftermarket policies once the durable has been sold; durable markets are competitive at the time of the sale, but the installed base is to some extent dependent on brand-specific aftermarket products.

While the seller realizes profits ex post from exploiting the installed base, buyers will anticipate such exploitation when purchasing the machine. Indeed, in competitive markets sellers would be compelled to lower their durable prices below cost to the point where they make zero profits overall. Social inefficiencies nevertheless result because durable prices fall below cost and aftermarket prices are above cost.

Under this lack of commitment theory, the seller and buyer would jointly be better off if the seller could credibly commit not to impose a tie on aftermarket products in the future. But such a commitment may be difficult or impossible to achieve. Buyers and sellers cannot enter into complete, fully contingent contracts over the life of the durable that specify aftermarket prices in all future states of the world. And committing to competitive markets in aftermarkets may not be easy to achieve because of intellectual property matters. In Kodak48 in the US, and Xerox49 in Canada, for example, sellers of copiers decided to stop supplying independent service providers with their proprietary parts, which effectively required their installed base to purchase service from Kodak and Xerox. Kodak and Xerox could have avoided this risk only by relinquishing IP rights over components for their photocopiers, otherwise they would retain the right in the future to exclude third-party suppliers and raise prices in aftermarkets. Abandoning IP rights, however, would likely undermine their incentives to have invested in the IP in the first place.

While extra-contractual mechanisms, like a reputation for not exploiting the installed base, may limit the dangers from inefficient commitment, it is reasonable to conclude that sellers often will have leeway ex post to impose a tie in aftermarkets.50

46 The classic reference for this type of model is D. Sappington, "Limited Liability Contracts between Principal and Agent" (1983) 29 Journal of Economic Theory 1–21.
50 In a rational-expectations world, it may be that a seller will initially sell the durable at a loss while tying in aftermarkets. Anticipating opportunistic tying ex post, Iacobucci shows that the seller may also tie in the first period when selling the durable in order to limit inefficiencies from discounted prices: by bundling a good valued more by inelastic demanders with the durable, the seller can sell at an effective discount while screening out inefficient sales to elastic demanders who do not value the durable at cost. See E. Iacobucci, "A Switching Costs Explanation of Tying and Warranties" (2008) 37 J. Legal Stud. 431 [Iacobucci, "Switching Costs"].
4. Tying as Leverage of Monopoly Power

a) The Traditional View and the Chicago Response

A traditional view of tying is that it is profitable because it allows a monopolist in one market to achieve a monopoly position in another. Two monopolies are better than one. Suppose that a firm has a monopoly position for product A; product A is only used in conjunction with a second product, B, and the market for product B is competitive. If the monopolist imposes tied sales, requiring consumers to purchase all of their requirements of B as a condition of purchasing A, then the theory goes—the firm will have achieved monopolies in two markets instead of just in market one. Two monopolies are more profitable than one and tying is thus a means of leveraging one monopoly into two.

The Chicago School showed this argument to be wrong. Suppose, to take a very simple example, that a firm had a monopoly on jars but that the lids for the jars were competitively supplied. Suppose that the cost of producing either product is $10 and that each consumer values a jar and lid together at $40. (To set aside price discrimination arguments for tying, we assume that all consumers are identical.) In the absence of tying, the lids are available at the competitive price (equal to the cost of production) of $10, leaving the monopolist free to charge $30 for the jars. The monopolist earns a profit of $20 per jar. If the monopolist required consumers to purchase only pairs of lids and jars together (i.e., engaged in bundling), then the monopolist would produce the bundle for $20, sell it for $40, and again make $20 profit. The monopolist, in other words, can "collect its monopoly profit only once." A monopoly over two perfectly complementary goods is no more profitable than a monopoly over one of the goods.51

The prediction, that tying is not always profitable as a means of leveraging market power from one market into two, is strengthened with examples in which the strategy would achieve two monopolies but strictly reduce expected profit. Suppose, for example, that the cost of production of right-footed shoes by competitors is random, and the monopolist commits to tying before knowing this cost. If the cost turns out to be lower than the monopolist's cost of production, then the monopolist would have lost profits from the commitment to tie. In spite of the gain in the extent of monopoly from one market to two, the monopoly's profits fall with tying. This is because the buyer-monopoly pair is not procuring right-footed shoes at the lowest cost; and the monopolist bears the entire cost of this inefficiency because, whatever the realization of costs, it is extracting all surplus in the transaction.

To take a second example in which tying can reduce profits, suppose that all users of product A need one unit of product B, but there is some variation in tastes across consumers as to the brand of product B. The monopolist and one rival compete in the market for product B. Some consumers prefer the monopolist's brand; some prefer the rival's brand. Whinston shows in this case that the monopolist loses if it adopts the strategy of tying.52 The total surplus in the market suffers from the failure of consumers to all purchase their preferred product, and the monopolist, being forced to extract a share of a smaller "pie," may lose as a result. The two examples in which tying reduces profit are similar in that the tying strategy leads the monopolist to produce and sell a product for which it is not the most efficient producer.

The Chicago School was, in short, correct in its critique of the traditional position that tying is profitable and anti-competitive whenever it allows a firm to extend a monopoly from one market into a monopoly in two markets.

b) The Whinston Theory

The Chicago School was incorrect, however, in arguing that leverage of market power from one market to two is never profitable. Whinston showed that tying can be a profitable means of leveraging market power.53 There are three key assumptions in Whinston's theory: (i) the entrant incurs a fixed cost in the market for the tied good; (ii) some buyers of the tied good do not purchase the tying good; and (iii) a monopolist selling the tying good can commit to tying (e.g., the tie is technological).

We start with a numerical example. Consider a pair of markets for the two goods in question (A and B) that departs from the previ-

51 The argument is easily extended to the case where a variable amount of the complementary good is used. In this case, the optimal price for the monopolist to charge for the complementary good is the competitive price, in the absence of any incentive for price discrimination.

52 Whinston, above note 6.

ous theory in three ways. First, purchasers of good B are of two types. "Joint" consumers always purchase A and B together. If these were the only consumers, the previous analysis would continue to apply and tying would not be profitable. "Separate" consumers purchase B only. Suppose that there are 100 consumers of each type.

Second, the market for B is not perfectly competitive but instead is served by two firms: (i) the monopolist from market A and (ii) a rival firm that produces only product B. In the absence of tying, the two firms split market B equally, each selling to fifty consumers of each type, or 100 consumers each in total.

Finally, suppose that the rival firm faces some fixed costs (e.g., costs of developing its version of product B) in order to sell in the market. And suppose that to cover the fixed costs in this market, the rival firm needs to sell to at least seventy-five consumers. In the absence of tying, the rival firm is able to cover the fixed cost because it services 100 consumers and therefore profitably competes in the market.54

The purpose of tying into market B by the monopolist in A will be to garner profits, not by monopolizing sales to joint consumers (the maximum profit from the joint consumers could be obtained by setting the price of the complementary good A appropriately) but from the monopolization of separate consumers. When the monopolist ties goods A and B together, it captures all joint consumers in market B. It splits the separate consumers with its rival (if the rival chooses to enter the market), thus leaving the rival with only fifty consumers. This is not enough to cover the fixed costs, and the rival will not enter the market when the monopolist commits to tying—or, if it has entered the market, it will not renew the fixed-cost investment to remain in the market.

In short, the monopolist in A is able to gain the monopoly over separate consumers in B by depriving the rival firm of a share of the joint consumers. Monopolizing the joint consumers is profitable not because of the returns earned from these consumers directly, but because of the entry-deterrence (or exit-inducing) effect the monopolization has on the rival firm, and the monopolization of the separate consumers that this entry deterrence allows. Without its share of the joint consumers, the rival firm cannot compete for the separate consumers. The incumbent monopolist garners full monopoly profits from the separate consumers, which it could not do without the strategy of tying.

The following illustration of Whinston's theory is offered by Carlton and Heyer (and attributed to Rob Gertner):

Consider the case of a hypothetical island on which there is a monopoly hotel serving many tourists. Natives live on the island. The hotel operates a restaurant, which competes for diners, both tourists and natives, in competition with local restaurants. By tying meals to lodging, the hotel can so diminish the number of tourists dining at local restaurants that, in the extreme, lack of scale prevents any local restaurants from surviving. The hotel thus acquires a monopoly over natives in the provision of restaurant services.55

Whinston's theory shows that market power in one market can be profitably extended to market power in two markets provided that (i) not all consumers in the second market use the product in the two markets jointly; (ii) in the absence of tying, there is some market power, for example a duopoly, in the second market; and (iii) a rival or rivals incur some fixed costs, such as costs of product development or continual product updating, in the second market.

The theory is potentially applicable to the various charges of anti-competitive tying against Microsoft in the US56 and European cases.57 One can describe these cases generally (and very crudely) as based on allegations that Microsoft ties its operating system for personal computers, Windows, to applications such as its Internet browser, the Windows Media Player, and (in earlier cases and allegations) word-processing and spreadsheet programs. This is done not so much through contractual tying as through the integration of code into the operating system that replicates the functions of some applications.

56 U.S. v. Microsoft, Civil Action No. 98-1323 (CKK), 6 November 2001 [Microsoft].
57 European Commission Case No. COM/3/C-3/37-792/Microsoft, March 2004 [European Microsoft Case].
and facilitates the Microsoft version of other applications—or even hampers the functionality of rivals’ applications.

In terms of our explanation of the Whinston theory, market A is the operating system market, in which Microsoft is dominant, and market B is any applications market. The three conditions of the Whinston theory are met. In every applications market there is market power: software is produced with very low marginal cost and substantial markup of price over marginal cost. Fixed costs arise in the development and continual upgrading of software. Network effects, which can substitute for fixed costs in supporting the predictions of the Whinston model, are also present in that the value of an application to any consumer is increasing in the number of consumers adopting the application. And because Microsoft does not have a complete monopoly in the operating system market with the development of substitute operating systems such as Linux and the more prominent MacIntosh operating system, there are consumers in the applications market who demand the applications but not the Windows operating system. By tying its operating system to applications, Microsoft is able to collect monopoly profits not only from consumers who use its own operating system, but also from consumers who use applications such as Microsoft Word or Excel on MacIntosh computers or on Linux operating systems.

The Whinston theory as we have described it captures the basic incentive for a firm to leverage market power from one market into market power in a related market. While it can capture the profitability of tying as deterring entry into the secondary market, it does not capture the full dynamics of tying incentives. We complete this section of the paper with a description of three dynamic extensions of the Whinston theory. Taken together, these extensions strengthen the conclusion that a monopolist in one market can profitably use tying strategically to exclude rivals in a second market, thus extending or leveraging its monopoly power.

Microsoft’s incentive to tie its applications should be stronger the less secure its current monopoly is in the operating system market. Establishing a monopoly in an applications market ensures that even if Microsoft were to lose its monopoly in the operating system market it would be left with at least one monopoly in the set of complementary goods consisting of the operating system and each application. As the jar and lid example demonstrates above, achieving a monopoly in either of a pair of complementary markets is as profitable as ensuring monopoly in both markets.

c) Dynamic Extension: Insuring a Monopoly

The first dynamic extension of the leverage theory, which we label “insuring a monopoly theory,” expands on this point.\(^5\) Consider a monopolist in market A, which competes in market B but faces perfect competition in market B. (Unlike the Whinston theory, there is no market power in market B.) The monopolist gains full monopoly profits currently and would gain nothing in terms of current profits from tying. However, we introduce innovation by supposing that production will take place in the future as well, and that with some probability there is an innovation in each market. More specifically, suppose that there are two periods of production. The monopolist operating in either market in the first period has a probability \(p_H\) of achieving a “drastic” innovation in that market that can be used in the second period (a drastic innovation being one that assures an unconstrained monopoly in a market if no other firm achieves the same innovation). Similarly, there is a probability \(p_H\) of a successful innovation in market B for use in period two by competitive producers in that market—but if such a competitive innovation occurs it is experienced by all competitors or potential competitors in the market. Finally, if competitors are excluded from market B in the first period, then these firms experience an innovation with probability \(p_L < p_H\) (and, again, for simplicity assume that the innovation is achieved by all firms or by none at all). The probability of innovating while outside the market is naturally lower, because successful innovation benefits from market experience via a learning-by-doing effect. Similarly, the rivals achieve an innovation with probability \(p_L\) in the primary market from which they are, by assumption, excluded currently.

While the monopolist’s current profits are independent of whether it captures a monopoly in one market or in both, it can use the tying strategy to exclude competitive rivals from the second market currently so as to reduce the probability of the rivals successfully innov-

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ating in market B. The monopolist's expected future profits depend only on the probability that it achieves a monopoly position in at least one of the two markets—and this probability is higher if competitive rivals are forced into an innovation success rate of \( p_L \) instead of \( p_H \) in the market in which they compete and innovate. Tying does not protect a future monopoly with certainty, but it increases the chance that a monopoly will be preserved in at least one of the two markets.

In this dynamic theory, market power is not necessary in the second market for tying to be profitable. If one considers as endogenous the resources that competitive rivals put into innovation, the anticompetitive impact of tying is strengthened: with a lower chance of success, competitive rivals will invest less in innovation than they otherwise would and the exclusionary impact of tying, in reducing the probability of the monopolist being bumped out of a monopoly position in at least one of the markets, is magnified.

d) Dynamic Extension: The Barrier to "Browser-based Entry"
The US Microsoft case involving the tying of Microsoft's Internet browser to its operating system created what could be called "a barrier to browser-based entry into the operating system market." This theory involves three concepts. The first is the concept of a network barrier to entry into the operating system market. The network barrier to entry (also called the "applications barrier to entry") refers to the fact that any new entrant into the operating system market must attract enough demand that applications programmers will be induced to write to the system—but unless applications programmers are willing to write to the system, the demand for the system will not emerge. The simultaneous emergence of demand for the system and applications writing to the system is necessary for success.

The second concept that is important for this theory is the notion of "middleware." Middleware refers to a program, such as Java, that interfaces between an operating system and an application. Suppose that Java or another middleware program became established in the market. Then applications programmers could write their code to Java. This means that any new entrant into the operating system would no longer need to attract applications to program the interface with its new operating system. It would simply need an interface with Java or another middleware. The network barrier to entry into the operating system market would disappear.

The final ingredient in this theory is the fact that independent browsers, as an alternative to Internet Explorer, facilitate the development of middleware. Java as a middleware is used for applications on browsers and, at least at times in the past, has been seen as potentially interfacing between all applications and any operating system. Microsoft, by inhibiting the development of Java (and even introducing its own version of Java in an effort to disrupt the universality of the middleware), has, according to this theory, strengthened the network barrier to entry into operating systems.

e) Dynamic Extension: The Carlton-Waldman Theory
The final dynamic extension of the leverage theory of tying has been offered recently by Carlton and Waldman. In the simplest version of the Carlton-Waldman model, a monopolist competes in two periods with a potential rival, in two markets—the market for a primary good and the market for a complementary good. The rival can enter the complementary market in either period but can only enter the primary market in the second period because, as of the first period, the rival has not yet developed a primary product. The rival faces entry costs for entering either market. Finally, the rival's primary product is identical to the monopolist's primary product, if the rival enters this market, but the rival's complementary product is assumed to be superior (so as to emphasize the fact that tying can exclude a superior firm). Note that entry into the primary market by the rival has a payoff in terms of sales of the combined (superior) products in the second period.

The outcome of this model is that the monopolist, by tying in the first period, can prevent the entrant from selling at all in that period. The reduced set of markets in which the entrant can compete restricts the set of sales that the entrant can use to cover its fixed costs of entry into both markets. The failure of the entrant to produce in the comple-

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59 Above note 56.

mentary market means that the profitability of entering the primary market is reduced, possibly to the point where this entry is not worthwhile. It thus can deter entry of the rival.

The Carlton-Waldman theory is similar to the Whinston theory in that tying deters entry by restricting the set of transactions that a potential entrant can use to cover fixed costs. But the Carlton-Waldman theory points out that entry is deterred into the primary market as well, whereas in the Whinston theory the outcome of tying is the deterrence of entry in the complementary good market. The theory is similar as well to our second dynamic extension of the leverage theory, in which the entry into the primary market is deterred by preventing browser-facilitated entry (via middleware); but the Carlton-Waldman theory shows that simply limiting the size of the combined markets that the rival can capture is enough to deter entry into both.

5) Tying and Optimal Second-best Pricing: Tying Patented with Non-patented Products

Our final theory of the incentives for and the welfare consequences of tying fits squarely into the intellectual property context. Should a firm with a monopoly on one product, as a result of a patent, be allowed to tie the product to a non-patented product? If a firm has been granted a patent on product A, should it be allowed to condition the sale of A to the condition that it supply all requirements of B as well. An example that comes close to fitting the model is the plaintiff’s allegations, discussed above, concerning Apple’s strategy of tying iPod and iTunes. Apple could allow other suppliers freely to compete to sell

the objective of achieving maximum welfare; what rule would emerge as to the legality of tying an unpatented product, B, to the patented product, A? The key in this approach is to understand how tying affects the well-known trade-off between innovation incentives and static market efficiency that is at the core of optimal patent policy.61

To reduce the theory to its starkest form, consider a firm that is investing research dollars to develop a new product, A. The demand for A is already known, but the event of discovering a means of producing A is random. The probability of this event is a function of the amount of investment by the firm, and the optimal amount of investment by the firm depends of course on the intellectual property protection that the firm can expect if it does succeed in discovering the product. We assume that this protection takes the form of a patent that will last for “t” years, after which the market becomes perfectly competitive. This is the classic Nordhaus model.62

In the Nordhaus model, the optimal patent length, t, balances at the margin the social benefits from increased incentive to innovate, and increased probability of discovering the product and achieving the gains to trade (or “total surplus”) in the market, with the inefficiency from monopolization over the patent period. We introduce into this model a second product, B, which is available in a competitive market. The producer of A is in a position, if it so desires, to tie the sale of A to the condition that it supply all requirements of B as well. An example that comes close to fitting the model is the plaintiff’s allegations, discussed above, concerning Apple’s strategy of tying iPod and iTunes.63

61 One might argue that the joint optimality of patent policy and competition policy is the wrong starting point to understand the policy towards tying— one should instead take current patent policy as given and that current patent policy assumes that tying is illegal. We reject the notion that competition policy should be designed to circumvent any inefficiencies or inadequacies in patent policy. Competition authorities are not in a position to fine-tune the incentives provided by patent policy. The implication is that the design of policy towards a practice such as tying patented and non-patented goods together should be understood as an aspect of the joint optimality of patent and competition policy.


63 Tucker, above note 32.
songs for iPods. Instead, the plaintiff in Tucker alleges that Apple creates technological obstacles that impede rival sellers from attempting to sell to iPod users. That is, Apple allegedly ties songs to its patented digital player.64

The proposition that we wish to establish is that any patent policy (patent life, t) combined with a competition policy that prohibits tying is Pareto dominated by some patent policy and a competition policy that allows tying. The key is an insight offered by Meyer Burstein.65 Tying a competitive good to a monopolized good allows a monopolist to achieve a pair of prices across two goods that is preferred by both consumers and itself to the pair of prices consisting of the monopoly price for good A and the competitive price for good B.

In the context of the simple model sketched above, suppose that "Pm" is the monopoly price of good A (and also, for simplicity, the monopoly price of good B) and that both goods can be produced at constant cost "c." For convenience, assume that demand for the two products is generated by identical consumers.

Figure 1 below depicts the price paid (Pm, c) that is available to the consumers of goods A and B, during the patent period, if tying is prohibited. (After the patent period, both goods are available at price c.) Figure 1 also depicts iso-surplus (total surplus) curves and iso-profit lines. (These indifference curves are usual in that this is a space of prices. The total surplus corresponding to a given pair of prices, for example, is defined as the surplus that the pair would generate in the two markets.)

Two points should be noted. First, the efficient set of prices is the set on the envelope curve between the surplus-maximizing pair of prices (c, c) and the profit-maximizing pair of prices (Pm, Pm). These

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64 The Apple/iPod example may appear similar to the aftermarket cases, with the tunes being the variable input. This analogy is incorrect, however. The two products are complementary, of course, but a household purchases variable amounts of each product.


66 This assumption is not necessary but simplifies the exposition. With heterogenous consumers, the techniques of Mathewson and Winter, ibid., could be applied to extend the results.

are referred to as "Ramsey Prices."66 Second, the non-tying price pair (Pm, c) is not on the efficient price, or Ramsey Price, envelope. The implication is that starting from the non-tying pair of prices, a monopolist could move to a price pair that is better for consumers and therefore would not deter consumers from purchasing and is also more profitable. Both sides of the innovation incentive/static efficiency trade-off can be improved when tying is allowed. And if the monopolist moves to an efficient price pair that yields only higher profit (but not higher surplus), the policy-maker is free to reduce the patent length slightly, with the result that both profits and consumer surplus increase.68 In short, tying allows a move to efficient Ramsey Prices, with the result

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67 Where goods A and B are independent in demand (not the case for the real-world examples that we discuss), the Ramsey Prices satisfy (P_a - c) + P_a = k + E_A and (P_a - c) + P_B = k + E_B as k varies between 0 and 1. That is, Ramsey Prices are prices that are marked up across the two markets in proportion to the inverse-elasticity of demand.

68 This theory is simplified and incomplete, in that no explanation is offered for why all surplus is not extracted from the homogenous consumers by the monopolist via a fixed fee. The full analysis requires heterogeneity in consumers.
that innovation incentives and static efficiency improve, and both consumers and the monopolist's shareholders are better off.\textsuperscript{69}

The following table summarizes the various theories that we have outlined in this paper.

\textbf{Table 1: Description of Theories}

<table>
<thead>
<tr>
<th>Theory</th>
<th>Summary or Example</th>
<th>Potential Basis for Intervention to Prohibit Tying?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Cost-efficient Tying</td>
<td>Left shoes and right shoes; Jefferson Parish</td>
<td>No</td>
</tr>
<tr>
<td>2 Bundling as price discrimination</td>
<td>Movie distribution; McDonald's meal specials</td>
<td>No</td>
</tr>
<tr>
<td>Aftermarket's</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3a Tying as metering</td>
<td>Photocopiers and toner; IBM adding machines and cards</td>
<td>No</td>
</tr>
<tr>
<td>3b Response to asymmetric info on quality: \textit{Ex post} info problems</td>
<td>1. Tying protects supplier reputation by avoiding reputational spillovers 2. Tying protects franchise system against free-riding by franchisees through purchase of cheap inputs 3. Tying signals durability; tying is more advantageous for longer-lasting machine</td>
<td>No</td>
</tr>
<tr>
<td>3c Inefficient lack of commitment</td>
<td>Tying exploits the installed base of demand</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Under many of the theories outlined, the impact of tying is either pro-competitive or ambiguous. Under other theories, the impact of tying is anti-competitive. The key for policy, of course, is to determine how to distinguish the theories. If the distinction is difficult as an evidentiary matter, what is the optimal competition policy? We discuss this general issue in the context of cases in the next section and summarize the discussion in the conclusion to the chapter.

C. CASE STUDIES

1) \textit{US v. Microsoft}\textsuperscript{70} and the European Microsoft Case\textsuperscript{71}

\textit{US v. Microsoft} involved charges that Microsoft engaged in exclusionary behaviour in violation of US antitrust laws. Among other practices, Microsoft offered its Internet browser, Internet Explorer, as a bundle with its Windows operating system. Microsoft also entered into various exclusionary contracts with computer manufacturers, In-
ternet service providers, online services, such as America Online, and software vendors. In each of these contracts, Microsoft tied access to Windows to the obligation of preferential treatment for Internet Explorer. These methods included:  

i) requiring computer manufacturers who licensed Windows 95 for installation on new machines to also install Internet Explorer;  

ii) selling the products bundled together at retailers;  

iii) requiring that computer manufacturers not remove the Internet Explorer icon from the desktop and not place any icons on the desktop larger than the Microsoft icons;  

iv) prohibiting programs that launch during the boot sequence that give users an easy way to choose Navigator, the main competing product, over Internet Explorer;  

v) physically integrating Internet Explorer into Windows so that, after 1998, it could not even be removed with the "software uninstall" feature;  

vi) rewarding or pressuring some computer manufacturers for promoting Internet Explorer over Navigator;  

vii) instituting exclusionary contracts with each of fourteen of the largest Internet service providers whereby the providers would be placed in the Windows Internet Connection Wizard (easing connection with the provider) in return for accepting restrictions, including a promise not to offer other browsers or web links to other browsers to customers;  

viii) instituting exclusionary contracts with four online services, tying access to inclusion in the Windows Online Services Folder, which listed services whose access software was included in Windows, and to limits on promoting and distributing browsers other than Internet Explorer;  

ix) instituting exclusionary contracts with Internet content providers that tied placement in the Windows Channel Bar, which facilitated access to a content provider's website, to the choice of Internet Explorer as the provider's default or preferred browser; and  

x) instituting exclusionary contracts with software vendors, conditioning access to beta releases of Windows and technical information on the software's use of Internet Explorer as its default browser for any hypertext-based user interface as well as the adoption of Microsoft's "HTML Help" system, accessible only through Internet Explorer, to implement the software's help system.  

Some of these strategies are tying in the narrow sense that one product (Windows) is tied to the exclusive use of a complementary product. Others are financial inducements to tie. Broadly speaking, these are all attempts to tie the use or re-sale of Windows to the obligation to use or favour Internet Explorer. If there is a distinction to be drawn among Microsoft's practices, it is between the physical tie between the operating system and the browser and the contractual restrictions.  

A number of theories that we have reviewed fit various aspects of the Microsoft case. The theory that Microsoft tied its Internet browser to its operating system so as to prevent browser-based entry is of course a possible fit. The theory that Microsoft tied applications to its operating system, so as to increase the probability of retaining a future monopoly in at least one of the two classes of products (the "ensuring a monopoly") is also plausible. These are variations on the Whinston-based theory of leveraging monopoly. On the other side of the ledger, the argument is that Microsoft's integration of the browser and various applications into its operating system is cost-efficient both technically and in saving consumers' time spent shopping and integrating new applications into their personal computers.  

We do not take a position here on whether the myriad collection of incentives and potential consequences of tying in the various Microsoft cases justify a remedy such as that imposed by the European Commission. It is reasonable to conclude that Microsoft intended to exclude its rivals from the operating system market or the applications market, or at least that it benefited from the increased likelihood of such exclusion. Even a superficial assessment of this case, however, would
require a study longer than this entire survey. We again note the conclusion reached by Michael Whinston in his survey of the Microsoft tying matters. In reviewing what economic theory tells us about the net effects of tying in the case, Whinston concludes, “What is striking about the area of exclusive contracts and tying . . . is how little the current literature tells us about what these effects are likely to be.”

2) Canada (Director of Investigation and Research) v. Xerox Canada

a) Facts

The facts in Xerox, a case that turns on IP rights in tying and tied products, are as follows. Xerox Canada (Xerox) manufactured and sold and leased photocopy machines in Canada. It received a number of older photocopiers back from customers after the relevant leases were complete. Xerox either scrapped them, or refurbished them for resale. In 1982, however, it concluded that it had a surplus of used machines. Xerox and an employee, Terry Reid, decided that it would be mutually advantageous if Xerox sold some of the used machines to a company that Reid established and controlled, Exdos, and it would refurbish and resell the machines. Xerox also adopted a policy of supplying proprietary parts to Exdos. Exdos used the parts both to refurbish the second-hand machines and to provide post-sale service to its photocopier customers. Along with Exdos, other Independent Service Organizations (ISOs) grew in prominence in servicing Xerox photocopiers.

In 1987 Xerox US, the parent of Xerox Canada, adopted a policy of refusing to sell proprietary parts to ISOs. Instead it announced that it would only sell parts to end-users. Because of delays that would result from an end-user ordering parts in the event of a photocopier needing service, the decision not to sell parts to ISOs effectively barred ISOs from competing in the aftermarket service business. Exdos launched a complaint under the refusal to deal section of the Competition Act’s section 75, which the director of investigation and research took to the tribunal. The tribunal held that Xerox had substantially affected Exdos’ business, and that Exdos’ complaint met the other requirements of section 75 such that a remedy was appropriate. It ordered Xerox to supply Exdos on usual trade terms.

b) Analysis

Xerox is a classic aftermarket tying case, analogous to the well-known Kodak case in the United States. The supplier of a durable changed its parts supply policy and by doing so effectively imposed a tie, supported by intellectual property rights, on its customers: all buyers of Xerox photocopiers were effectively compelled to buy service only from Xerox itself. Intellectual property, patent in particular, is key in such circumstances since it prevents rival suppliers from manufacturing the relevant parts.

In order to evaluate the appropriate antitrust response to such a tying arrangement, it is helpful to consider two distinct situations. First, suppose that Xerox had market power in selling photocopiers. Second, suppose that Xerox did not have market power when initially selling the machines but realized situational market power in the supply of parts and service to past customers. Past customers, the “installed base,” faced significant switching costs in acquiring parts and service: if they wished to acquire something other than Xerox parts in response to a price increase, they would have to acquire a photocopier from a different manufacturer.

i) Xerox Has Market Power Ex Ante

Suppose that there was limited competition for photocopiers at the relevant time. The record in Xerox is not complete on this question, since market power was not, as the tribunal noted, a requirement under section 75 of the Competition Act. Ex ante market power (that is, market power when initially selling the machines) was not implausible: the tribunal observed that Xerox had a 90 percent share of the

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74 Whinston, above note 6 at 79.
75 Xerox, above note 23.
76 Competition Act, R.S.C. 1985, c. C-34.
The existence of market power in the tying good does not imply that a tying arrangement is anti-competitive. The question, now directly asked by the revised section 75 in the Competition Act, is whether the tie lessens competition. Tying can theoretically foreclose competition and leverage monopoly profitably. The foreclosure explanations, however, are not applicable in a case like Xerox. Xerox was not concerned about service from ISOs eventually displacing original equipment, in contrast to Microsoft, for example, which may reasonably have had concerns that tied goods, like Internet browsers, would eventually displace the tying good (i.e., the operating system). Moreover, it is also implausible that Xerox was attempting to raise entry barriers in either the service or original equipment market. ISOs did not take long to make significant inroads in Xerox aftermarket, which is consistent with the conclusion that there was little in the way of structural entry barriers, or economies of scale, that might have presented obstacles to new service providers. A prospective entrant to the photocopier industry would not suffer from the absence of an existing, developed ISO market.

Having said that, there is a possible connection between Xerox's (possible) market power and its tying strategy. Rather than expanding or preserving its market power, if it had market power, it is reasonable to surmise that Xerox adopted tying to better exploit its market power. In particular, the tying strategy allowed it to price discriminate: users of copiers with greater demand would require more in the way of parts and service. Tying permitted Xerox to charge a supra-competitive price on both parts and service, which in turn allowed Xerox to extract a greater surplus from high demanders than low demanders.

There is a subtlety to the basic metering argument in this context. Since Xerox had intellectual property rights in its parts, which allowed it to exclude ISOs by refusing to supply parts, it could have metered demand to a significant extent simply by charging ISOs high prices for parts. There was, however, reason for Xerox to have opted to exclude ISOs. Parts and service are to some extent substitutes. If service is supplied at competitive prices and parts are supplied at supra-competitive prices, there is an inefficient bias for copier customers in favour of acquiring service over parts. The price discrimination mechanism is more efficient without this bias. By tying both parts and service, Xerox could charge supra-competitive prices but could also charge efficient relative prices and avoid inefficient substitution by customers between parts and service.

The price discrimination explanation of Xerox's behaviour does not invite antitrust intervention. Price discrimination can be inefficient, such as when policing the tying arrangement costs almost as much as the private profit realized by the seller: the profit represents a socially neutral transfer, while the costs of enforcement are real social costs. But price discrimination is frequently efficient. In this context, tying service as well as parts to the machine avoids inefficient relative prices between service and parts. Tying as price discrimination allows Xerox to exploit its market power in aftermarket more efficiently.

ii) Ex Post Market Power
Suppose now that Xerox did not have market power when it initially began selling photocopiers, but realized situational market power after having a sufficient number of past customers. This installed base would not purchase parts from another copier manufacturer in response to a significant price increase because it would also need to acquire a different brand of photocopier. While there is commentary and caselaw suggesting otherwise, imposing restrictions on tying in order to limit exploitation of situational market power is not sensible policy, as we explain.

The Kodak courts imposed restrictions on ex post exploitation of market power in part because of a lack of faith in the ability of customers ex ante to anticipate the effects of high prices. That is, the Supreme Court did not accept the theory that robust competition ex ante would necessarily discipline high prices ex post. Because of informational imperfections, customers might not fully anticipate high prices in the future, which in turn leaves them vulnerable to exploitation through tying of a kind observed in Kodak and Xerox.

Such an emphasis on market imperfections in ordering an antitrust remedy is misplaced. Setting aside the empirically contestable question of whether buyers are capable of accounting for aftermarket prices when making acquisitions, considerations that one would think

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80 Above note 23.
obvious to sophisticated purchasers of expensive photocopy equipment, tying law does not address these circumstances. Tying law is concerned about the preservation or enhancement of market power. If a legal response to informational imperfections were justified, it would make more sense for the law to address the problem (information imperfections) and not to deal instead with the alleged symptom of the problem, tying. Mandatory warranties, for example, or mandatory disclosure of maintenance costs, would be more appropriate than preventing tying, a practice that in this context does not appear to create or preserve market power, but rather may simply result in the more efficient exploitation of market power.

Another line of argument in support of orders like those in Xerox is that ex ante competition is not a perfect solution to ex post situational market power. As Borenstein, MacKie-Mason, and Netz suggest,81 ex ante competition may lead to discounted copier prices in order to compensate for ex post high prices from situational market power. Such an outcome in some sense protects customers from their own possible ignorance about future exploitation, in that anticipation of ex post exploitation by sellers results in lower copier prices ex ante. But a price pattern of low copier prices and high aftermarket prices creates its own inefficiencies. Low-demand buyers are priced into the machine market because of potentially below-cost pricing in the initial sale, while buyers purchase too little aftermarket service from a social perspective because of supra-competitive prices.

In our view, concern about a "bargain-rip-off" pricing pattern, a concern that arises generally in markets with switching costs,82 does not invite antitrust intervention.83 The social costs of such an outcome are not likely to be significant.84 Moreover, sellers have the incentive and a variety of means, including reputational bonds, to resist the temptation to indulge in bargain-rip-off pricing. Antitrust remedies against tying are a blunt and inappropriate instrument for dealing with an inefficient price path. This is particularly so when one considers the difficulties antitrust enforcement agencies would have in determining the reasons for a particular outcome in a particular case. Banning tying of the kind observed in Xerox could lead to inefficient deterrence of socially valuable price discrimination, since antitrust enforcers would have little basis for determining whether a tie was designed to price discriminate or to exploit past customers.

c) Conclusion

If Xerox had market power when it imposed the aftermarket tie, it is probable that it was engaging in price discrimination by refusing to sell proprietary parts to ISOs. Competition policy should not intervene in such a case. If, on the other hand, Xerox only had ex post situational market power, there were potential inefficiencies from the practice, but competition policy intervention is inappropriate: the potential social costs are small and the seller itself, unlike in most competition policy contexts, has itself an incentive to commit to not exploiting its customers.

3) Siegel v. Chicken Delight85

a) Facts

Chicken Delight was a business system franchisor that sold franchise opportunities. The franchises were fast food restaurants that used the “Chicken Delight” name. Chicken Delight did not charge franchises a fee or royalties, but rather, in exchange for the licence to use the Chicken Delight name and system, the franchisee would commit to purchasing certain inputs only from the franchisor. Franchisees were required to buy "a specified number of cookers and fryers and to purchase certain packaging supplies and mixes exclusively from Chicken Delight."86 The prices Chicken Delight charged for the tied goods exceeded market prices.

Several franchisees launched a class action against Chicken Delight seeking treble damages under US tying law. The argument was that Chicken Delight required buyers of the licence to use the Chicken

81 Above note 47.
85 See Chicken Delight, above note 2.
86 Ibid. at 47.
Delight name, the tying good, also to buy tied goods in the form of the branded ingredients and packaging. Given that Chicken Delight had market power in the tying good, the argument continued, the tie was per se illegal. Market power arose because of Chicken Delight's IP rights, specifically, its ownership of the valuable trade-marks associated with the franchise system. The trial court agreed, and the Ninth Circuit affirmed this conclusion.

b) Analysis
The difficulty in analyzing Chicken Delight is not in deciding whether the tying was anti-competitive, it was not, but rather in assessing what precisely explained the arrangement. First, we set out our reasons for concluding that the tying arrangement was not anti-competitive, and second, we turn to the more difficult question of explaining the arrangement.

i) The Absence of an Anti-competitive Explanation
There are two fundamental reasons why it is reasonable to conclude that the tying arrangement was not anti-competitive. First, Chicken Delight did not have market power. Second, there is no reasonable theory of how tying in this case could have foreclosed competition. On the matter of requisite market power, the Ninth Circuit Court agreed with the trial court that the possession of a valuable trade-mark conferred market power on Chicken Delight. There were several problems with the Ninth Circuit's analysis. First, it never precisely defined the market over which Chicken Delight was alleged to have power. Indeed, it is not unreasonable to argue that franchises are simply investment opportunities that must compete with millions of other investment opportunities. Even if the key input of the franchisee is labour, not capital, an entrepreneur presumably has a vast range of potential investments, including starting her own franchise system. But even if the market is defined more narrowly to include only franchises, there was no suggestion of a lack of competition in this market. Selling franchises is a competitive business.

It appears that the Ninth Circuit Court concluded that Chicken Delight had market power in selling fast food franchises. While no analysis of this market is in fact offered, in explaining its conclusion that a registered trade-mark conferred market power, the court observed that "It can hardly be denied that the Chicken Delight trade-mark is distinctive; that it possesses goodwill and public acceptance unique to it and not enjoyed by other fast food chains." Rather than closely examining the fast food franchise market, the court rested its analysis on a presumption of market power: "Just as the patent or copyright forecloses competitors from offering the distinctive product on the market, so the registered trade-mark presents a legal barrier against competition . . . . Accordingly we see no reason why the presumption that exists in the case of the patent and copyright does not equally apply to the trade-mark."

This analysis is unconvincing. Any business could adopt a registered trade-mark. This does not confer market power that gives rise to concern about the exclusionary nature of tying. Similarly, the possession of a patent for a product that nobody wants (which represents the vast majority of patents), or the possession of copyright in a work that nobody wants to read, does not confer market power. Recognizing these considerations in Independent Ink," the US Supreme Court recently rejected earlier doctrine that held that patents confer market power on their holders per se.

This is not to say that IP is irrelevant to an analysis of market power. To be sure, if there were indicia of actual market power, like a high market share for Chicken Delight in a thoughtfully identified market, then the existence of its trade-mark would contribute to an analysis of barriers to entry. Any entrant cannot free ride on Chicken Delight's past investment in its trade-mark, but rather must invest de novo in its own trade-mark. But, on its own, a trade-mark is not indicative of market power.

Even if there were market power, there is no evidence that tying in this case could have foreclosed competition. Imposing the tie could not have had an impact on entrants to the franchise-system market. Chicken Delight had no significance in the chicken ingredients or packaging markets, so requiring its franchisees to purchase supplies exclusively from Chicken Delight would not have created the slightest obstacle for entrants to the franchise-system market: there were plenty of options for rivals' franchisees to source ingredients. Similar-
ly, given their competitive structure, it is implausible to think that the tie could have affected competition in the tied-good markets. There was no antitrust reason to intervene in *Chicken Delight*.

ii) *Explaining the Tying Arrangement*

It is more difficult to identify the motivation for the tie precisely than to rule out an anti-competitive explanation. A common explanation of tying in the franchise setting is quality control.\(^9\) Each franchise bears only a fraction of the benefits of the system's reputation for quality, while it would realize fully the cost-saving benefits of using inferior inputs in providing its services. There is an externality among franchisees. One way of remedying the incentive to chisel on quality is to have the franchisor police quality by compelling franchises to purchase inputs only from the franchisor. Since the franchisor better internalizes the reputation of the franchise system than any given franchisee, tying can address quality control issues in franchises.

This explanation, while plausible in the abstract, fails to completely explain the tying arrangement in *Chicken Delight*, but not for the reasons the court gave in rejecting it. The court in *Chicken Delight* rejected the quality control explanation on the argument that a franchisor concerned about quality could contractually stipulate the quality of inputs that were necessary and allow franchisees to choose where to buy these inputs. The court did not appreciate, however, that contracts over quality may be difficult to write initially and may also be difficult to monitor. Tying contracts limit these contractual difficulties.

Rather, the plausibility of quality control is challenged more convincingly by the lack of evidence about the dangers of inferior inputs in this particular case. For example, it is not clear that the quality of the paper buckets that franchisees used would directly impact the system's reputation for quality. Indeed, as a matter of fact, the paper packaging that the franchisor sold its franchisees was virtually indistinguishable from other packaging that franchisees would acquire. To monitor the tying arrangement, Klein and Saft report that *Chicken Delight* took to marking its buckets with ink only detectable with ultraviolet light.\(^9\)

While the structure of the quality control argument generally fits the franchise context, the facts of *Chicken Delight* did not.

Another argument that is commonly advanced to explain franchise tying arrangements is that they are price discrimination devices: more profitable franchises require more inputs, and thus the tie results in greater surplus extraction from high-value franchises. While the argument is not entirely implausible, for it to apply the buyer must know more about the value of the franchise than the franchisor. If franchisor and franchisee are equally knowledgeable about the value of the franchise, the price of the franchise can be set accordingly. However, if the franchisee knows more about the value of the franchise, then tying as metering makes sense. The empirical question is whether it is reasonable to suppose that franchisees, who often are inexperienced business people, know more than franchisors about the franchise's value. In the majority of instances, we suggest, this informational assumption is not plausible.

There are two related explanations. If both parties are symmetrically informed about the franchise value, but this value is risky, then the tying arrangement could be an efficient risk-sharing device between the relatively risk-neutral franchisor with its portfolio of franchises and the risk-averse individual franchisee. Alternatively, a franchisor that is more confident in the value of the franchise than a franchisee may signal its confidence by lowering the fixed price on the franchise and instead take its returns from the sale on the performance of the franchise. Tying arrangements can signal quality.

To summarize, while the weight on various incentives for the tying arrangement is not crystal clear, it is plain that *Chicken Delight* was not behaving anti-competitively when it tied certain supplies to its trademark.

**D. CONCLUSION: OPTIMAL POLICY**

In this concluding section we summarize our review of the theories of tying and our case studies that focused on tying and IP rights, and then turn to the question of optimal (efficient) policy towards tying in

\(^{90}\) See for example, Klein and Saft, above note 42 at 345; Iacobucci, "Tying as Quality Control," above note 41.

\(^{91}\) *Ibid.* at 348.
the presence of IP rights. We review the Canadian law on tying, and then analyze the law based on our survey of the economics of tying and intellectual property. We also draw on US comparative experience in reaching our conclusions.

1) Summary

Without question, tying has exclusionary effects. By requiring or inducing purchasers of a product to buy a second product, the tie-in excludes sales of the second product by rival suppliers. But to conclude that the practice is exclusionary does not answer the efficiency-oriented policy inquiry. Our review of the theories shows that efficiency and exclusion are often related. For example, price discrimination is often efficient, but sometimes can only be implemented by a seller of a durable looking to charge a supra-competitive markup on an aftermarket product through the imposition of a tie that completely excludes competition in the aftermarket product. The relevant policy question is not whether tying excludes rival sellers, nor is it whether tying leads to a less competitive market structure, but whether the strategy has the consequence of reducing efficiency.

Some instances of tying can be exclusionary and inefficient. Anticompetitive effects can result in either the tying-good market or the tied-good market. The seller of the tying good, for example, may wish to hinder entry into the tied-good market by imposing a tie, which prevents entrants into the tied-good market from achieving scale in that market. This can lessen competition in the tied-good market, and can also lessen competition in the tying-good market by compelling entrants to enter both tying- and tied-good markets. Alternatively, tying-good sellers may fear that producers of the tied good could eventually compete with the tying-good seller. Tying can deter future competition in the tying-good market by limiting competition in the tied-good market.

Tying can also be efficient. Indeed, given the prevalence of tying in competitive markets, it is reasonable to conclude that tying is efficient much more often than not. The most basic explanation of tying is that there are direct cost savings from selling two products together rather than apart. Selling two shoes together is a form of tying but is obviously explained by such efficiencies. Tying can facilitate efficient price discrimination, such as where a durable-good seller ties aftermarket products at a markup. Tying can efficiently share risk between a seller and a buyer, such as where a franchisor ties the franchisee’s inputs in order to share the profits from the franchisee’s operation. Tying can protect the seller’s reputation for quality. This quality control explanation is most plausible where there is some sharing of costs of poor performance between the tying-good seller and buyer. For example, franchise systems share the reputational costs of a franchisee’s poor performance, and thus there are incentives for the franchisor to tie quality inputs to the franchise. On a related note, tying can signal quality: where greater use of the tied good correlates with the quality of the tying good, tying and charging a lower price for the tying good and a higher price for the tied good can be efficient.

The theoretical diversity of tying is reflected in the case studies in this survey. Two cases relate to the common setting of a durable-good seller tying aftermarket to the durable. In Xerox,92 Xerox imposed a service tie on its machine buyers by refusing to sell proprietary parts to ISOs; in Chicken Delight,93 the franchisor required its franchisees to buy supplies from the franchisor alone. Xerox is plausibly explained by price discrimination. Chicken Delight could be explained by price discrimination, though that explanation depends on the franchisee having better information about the value of the franchise than the franchisor, which may be a dubious premise. Alternatively, it could be explained by risk-sharing, signalling, and/or quality control. Whatever the precise motivation for tying in Chicken Delight and Xerox, it is implausible that the sellers were seeking to lessen competition in either the aftermarket or the durable-good market itself. Competition authorities should therefore not intervene in such cases.

In contrast, it is reasonable to conclude that Microsoft intended to exclude rivals from producing Windows-compatible applications.94 This could be to protect Microsoft’s market power in applications in the event that its dominance in Windows diminishes, or it could conceivably be to help protect its Windows dominance by requiring operating system producers to innovate with respect to both operat-

92 Above note 23.
93 Above note 2.
94 See Microsoft, above note 56.
ing systems and applications. The strategy increased the ex ante probability of retaining a monopoly in particular applications, such as the browser market or media player market, regardless of whatever happened to the operating system market. Such instances of tying invite antitrust intervention. But the challenge, as we discuss below, is to craft a workable remedy.

2) Existing Canadian Competition Law on Tying

Three provisions in the Canadian Competition Act⁵⁹ potentially address tying. First, section 77 allows the Competition Tribunal to make an order in response to a "major supplier" in a market that requires or induces its customers to buy other products, when such a requirement has an exclusionary effect that has lessened or is likely to lessen competition substantially. Second, section 79 allows the tribunal to make an order where a dominant firm adopts a practice that substantially lessens competition; tying could be such a practice. Third, section 75 allows the tribunal to make an order against a supplier's refusal to supply a product where the refusal harms its customers because of insufficient competition in the supply of the product, and where such a refusal to supply would have an adverse effect on competition. Section 75 could have, and did have in the Xerox case, a direct application to aftermarkets tying: by refusing to supply ISOs with parts, Xerox established a tie in the service market.

Two important prerequisites to a finding that an order is appropriate emerge under these sections. First, the seller must have market power. Certainly, to be subject to an order under the abuse of dominance provision,⁶⁶ the seller must be dominant.⁷⁷ Similarly, under section 77, the seller must be a "major supplier," which requires a showing of market power.⁶⁸

The requirement of market power is somewhat murky in the case of section 75 of the Competition Act, though it is clear that the seller's refusal to supply must have an impact that relates to insufficient competition in the product. The confusion arises because of potential debate over the meaning of the "product." If the "product" in section 75 is narrowly understood to be the product sold by a holder of particular IP rights, such as a trade-mark or a patent, then the requirement that there be insufficient competition in the product is easy to meet. In Xerox,⁹⁹ for example, there were other suppliers of photocopier parts, but not of Xerox photocopier products. When Xerox was decided, section 75 did not require an adverse effect on competition generally, which may have led the tribunal to take a narrow view of "product," which in turn lessens the importance of market power. We return to the relationship between IP and market power in discussing optimal policy below.

Beyond market power, it is a requirement for application of a remedy to tying that there must be a lessening of competition. Both sections 77 and 79 of the Competition Act require a showing of a "substantial lessening of competition" for an order to be appropriate, while section 75 requires an "adverse effect" on competition. To show a substantial lessening of competition, cases establish that the practice in question must "preserve or add to" the seller's market power.¹⁰⁰ The requirement of a showing of competitive effects lessens the importance of the market power requirement, given that competitive markets produce neither sellers with market power nor sellers that can substantially lessen competition. That is, to show an adverse effect on competition, there must be a showing of market power as well. As we discuss below, however, even though a showing of a substantial lessening of competition is sufficient to show market power, it makes sense as a matter of policy to maintain market power as an independent requirement.

Another key element of the analysis concerns efficiency explanations for the practice. There is no efficiency defence per se in any of the tying provisions, though the Competition Act provides that the tribunal shall not make an order where tied selling "is reasonable having regard to the technological relationship between or among the products."¹⁰¹ Efficiencies are relevant to an examination of tying, however, in several ways. Most fundamentally, efficiency inevitably affects the basic ques-

⁵⁹ See Competition Act, ibid. at s. 79.
⁶⁶ See for example, Canada (Director of Investigation and Research) v. Nutra-Sweet Co. (1990), 32 C.P.R. (3d) 1 (Comp. Trib.) [Nutra-Sweet].
⁶⁷ See for example, Canada (Director of Investigation and Research) v. Tele-Direct Publications Inc. (1997), 73 C.P.R. (3d) 207 (Comp. Trib.) [Tele-Direct].
⁶⁸ Above note 76.
⁷⁷ Above note 23.
⁷⁸ See NutraSweet, above note 97.
⁷⁹ See Competition Act, above note 76 at s. 77(4)(b).
tion of whether a seller is tying two separate products, which is in effect the central concern of section 77(4)(b). In Tele-Direct, the tribunal held, following the US Supreme Court in Jefferson Parish,\(^\text{102}\) that the existence of two products turned on the existence of separate demand for the products.\(^\text{103}\) This inquiry in part turns on whether the separate provision of the products is efficient. The tribunal stated: “Assuming demand for separate products, if efficiency is proven to be the reason for bundling, there is one product. If not, there are two products.”\(^\text{104}\) Thus, when Evans and Salinger argue that the most common explanation for tying is the realization of cost efficiencies,\(^\text{105}\) it is open in at least some of these cases in Canada (as in the US) to argue that the arrangements do not involve tying at all—the efficiencies suggest a single product.

Efficiencies are also relevant under section 79, which requires a predatory, exclusionary, or disciplinary motivation for the impugned practice. As Trebilcock \textit{et al.} state, “If circumstances suggest a pro-competitive, or efficiency, motivation, the requisite predatory, exclusionary, or disciplinary intent will not be present and there is no anticompetitive effect.”\(^\text{106}\) Section 79(4) also appears to contemplate efficiency, stating that the tribunal should consider whether the impugned practice “is a result of superior competitive performance.”\(^\text{107}\) The wording is a bit odd, given that most efficiency explanations of a contractual practice run the other way around (i.e., superior competitive performance results from the practice). But it is arguable that section 79(4) allows another avenue for efficiency arguments to be introduced into an evaluation of tying. Given the potential for efficiencies associated with tying, we suggest that section 79(4) be interpreted liberally to provide a statutory basis for an efficiency defence.

3) \textbf{Optimal Law and Policy on Tying}

It is abundantly clear that tying can have a wide range of explanations. Tying can increase or decrease efficiency depending on the circumstances. Moreover, as the survey of the economic theory of tying suggests, no clear set of general evidentiary conditions has emerged that would allow the categorization of tying cases into those that increase efficiency and those that decrease efficiency. Antitrust authorities, we conclude, cannot rely on general rules of thumb in reaching conclusions that tying in a given case violates antitrust laws. Rather, they must instead rely on a case-by-case analysis.

The requirement of examining each case on its own merits does not, however, suggest that rules of thumb are irrelevant. There are necessary conditions for tying to be anti-competitive that allow the law to approach tying allegations in a systematic way. Most fundamentally, for tying to potentially have anti-competitive effects, there must be market power in the tying good. Of course, some degree of market power is common. In any differentiated goods market, the seller can raise price above marginal cost. The focus should therefore be on the potential for significant market power, not simply market power that reflects imperfect competition. Tying is potentially harmful where it has exclusionary effects in either the tying- or tied-good markets. If markets are robustly, even if not perfectly, competitive, such exclusionary effects are unlikely and antitrust authorities should not intervene.

The law in Canada, as in the US, aptly establishes this requirement. As reviewed, market power is a prerequisite for a finding that tying is anti-competitive. This requirement provides an efficient filter for antitrust authorities.

Market power, however, is not sufficient to conclude that tying is inefficient. Whether or not the seller has market power, tying can allow efficient signalling of quality, efficient risk-sharing, quality control, and so on. Special conditions, particularly dynamic considerations concerning the threat of entry in the tying- and tied-good markets over time, must be present for tying to be anti-competitive. Again, Canadian law is appropriate in this respect. Rather than following the US approach, which holds that tying is \textit{per se} illegal if the seller has market power, tying is not subject to an order under the \textit{Competition Act} unless the practice substantially lessens competition, or, in the case of refusals to supply that effectively result in a tie, has an adverse effect on competition. Given the range of explanations that apply to tying independent of the seller’s market power, such an approach is appropriate.

\(^{102}\) \textit{Jefferson Parish}, above note 9.
\(^{103}\) \textit{Tele-Direct}, above note 98.
\(^{104}\) \textit{Ibid.} at 115.
\(^{105}\) Evans and Salinger, above note 8.
\(^{106}\) M. Trebilcock \textit{et al.}, above note 25 at 527.
\(^{107}\) \textit{Competition Act}, above note 76 at s. 79(4).
The substantial lessening of competition test begs the question of whether the seller's market power ought to be treated as an independent requirement for the application of a remedy in a tying case. If it can be shown that the practice substantially lessens competition, it must be that the seller has market power. If the second requirement is a sufficient condition for the first, it might be suggested that the first requirement ought not to be separately considered. We disagree. The market-power requirement is useful in its own right because it is a useful initial screen for the authorities in evaluating potentially anti-competitive tying (and because the market-power test is invariably invoked as a prerequisite into any test for the substantial lessening of competition in any case). Rather than moving directly to a potentially complex analysis of the motivations and effects of a particular tying arrangement, the authorities can investigate the presence of market power by relying on relatively straightforward criteria (market shares, barriers to entry). If the analysis reveals the absence of market power, the more complicated step of identifying effects can be avoided.

The core of Canadian law on tying is the criterion of "substantial lessening of competition" under sections 77 or 79, or "adverse effect" on competition under section 75. And it is on the application of this criterion that economics theory must be brought to bear. Substantial lessening of competition cannot be applied to a single market alone, in particular to only the tied-good market, if the law is to be consistent with the economic theory of the efficiency effects of tying. In the tied-good market, there is often an apparent reduction in competition in the case of requirements tying, since firms other than the tying firm are excluded. But optimal tying often involves an increase in the price of the tied good in combination with a decrease in the price of the tying good. In the metering theory of tying, for example, a monopolist raises the price of the tied good while lowering the price of the tying good. The overall welfare effects are ambiguous, but a misguided focus on the tied sales market alone would lead to the conclusion that the strategy had lessened competition.

Another way of considering this point is from the perspective of market definition. It may appear that the tied-good market is always a competition market. Sometimes, as in the "insuring a monopoly theory" this is valid. Under this theory, an operating system is bundled with an application in order to realize market power in at least one market (the application market or the operating system market). Often, however, the relevant market for requirements tying cases should be the market for the overall package of the basic product and the tied goods. This is where competitive discipline is brought to bear on any attempts to exercise market power, regardless of the state of availability of substitutes for the tied product. For example, we have shown in this chapter that a seller of a patented good may wish to tie a non-patented good in order to spread the distortions associated with supra-competitive pricing. In such a case, focusing only on the lessening of competition in the tied-good market would miss the benefits of lower prices in the tying-good market.

The emphasis on the competitive effects of the practice is appropriate in exempting from antitrust remedial orders tying that is motivated by price discrimination. Tying or bundling as a means of practising price discrimination should not be of concern to antitrust authorities. Price discrimination, while conceivably harmful, is often beneficial. It is not a useful expenditure of regulatory resources to attempt to micro-regulate strategies designed for price discrimination. By focusing on the competitive effects of the practice, particularly on the exclusionary, predatory, or disciplinary effects that abuse of dominance requires, the law in Canada appropriately steers clear of orders against tying or bundling based on price discrimination.

Finally, even in the absence of a full-blown efficiency defence, the emphasis on a showing of anti-competitive effects permits inquiry into the efficiency effects of tying in a given case, beyond those efficiency considerations that arise in inquiring into whether there are two products. As discussed in Tele-Direct, if the seller shows that there is an efficiency explanation for a practice, the requisite exclusionary, predatory, or disciplinary motivation is absent. Again, given the range of efficiency explanations for tying, allowing scope for these considerations is appropriate.

The structure of the test for anti-competitive tying in Canada makes sense. It sensibly sets out market power and a lessening of competition as independent requirements. As we discuss above, however, the lessening-of-competition test must be applied to the relevant market — in requirements tying cases this is the market for the over-

108 Above note 98.
all bundle of the product and tied goods. Our final comment on the structure of Canadian tying law generally concerns the presumptions that the authorities should make when inquiring into the lessening of competition. Antitrust authorities should take a cautious approach to their analysis. Because of the complexity of the issues and factual circumstances, the authorities and courts are unlikely to be able to identify precisely the effects of tying in a given case. Given the relative rarity of anti-competitive tying, the authorities should exercise modesty and require significant evidence of anti-competitive effects before seeking or making an order against tying. This is especially so given the fluctuations over time in the theory of tying. Taking a harsh approach to tying based on the intellectual fashions of the day could lead to inappropriate per se rules against tying, as they have in the US. A cautious approach to intervention in markets is more appropriate.

Aside from setting a "high hurdle" to a finding that tying in a particular case is anti-competitive, antitrust authorities ought also to be cautious in ordering remedies. Where tying is accomplished by contract, a remedy to anti-competitive tying is straightforward: the parties must cease relying on tying in their contracts. But tying is often achieved by product integration. The costs of ordering the disintegration of a product exceed the costs of ceasing to rely on a contractual practice. Given the costs of such interventionist remedies, and the almost inevitable residual doubts about the anti-competitive nature of the tie, authorities should be even more cautious than usual in making orders in the face of tying-by-integration. We recognize that excessive ex post deference to tying-by-integration leads directly to increasing ex ante incentives to rely on such tying. We would thus not recommend that the authorities never make an order against an integrated product. But, given that the costs to the seller of unbundling an integrated product exceed the costs of ceasing to rely on contractual tying, exercising relative restraint in making orders in integrated tying cases rather than contractual tying cases does not necessarily change the expected costs of each practice to the seller. Since sellers care about the costs of breaking up an integrated product, restraint in these cases does not necessarily create perverse incentives.

4) Special Issues Concerning Intellectual Property

Several important features of optimal tying law and policy are influenced by intellectual property considerations. Perhaps of greatest significance is the question of how IP rights affect the analysis of market power. Market power is appropriately considered a requirement for an order against tying. If the seller enjoys protection from competition because of intellectual property rights that it holds, should there be a presumption that the seller has market power?

The US caselaw has considered this matter expressly, as discussed in the Chicken Delight case study. In Chicken Delight itself, a trademark was found to confer market power. This is the high water-mark of overestimating the market impact of IP rights. Any seller could have a trade-mark. It is nonsensical to conclude that a trade-mark confers market power. While the court in Chicken Delight noted that the trade-mark was valuable given the franchisor's experience and reputation, it is the experience and reputation that is valuable, not the fact of trade-mark per se.

The conferral of patent, copyright, or trade-mark protection clearly protects the seller from some kinds of competition, but this, in itself, is no more significant for competition than the fact that a particular restaurant that occupies a physical space prevents rival restaurants from occupying the same space. Differentiation among products is the norm in a market economy. IP protection simply offers another mechanism for differentiation. In short, the presumption of market power because of IP is misplaced. The Canadian Competition Bureau's Intellectual Property Enforcement Guidelines, and recently the US Supreme Court case of Independent ink, appropriately rejected such a presumption.

Of course, IP is relevant to the market-power inquiry even though a presumption that market power flows from IP is inappropriate. For example, potential rivals to a seller of a patented product face a barrier to entry that would not exist absent the patent. But there is nothing peculiar about the nature of the inquiry: whenever market power is

112 Above note 22.
in question, it is appropriate to examine barriers to entry. IP rights may affect this inquiry, but IP rights do not obviate the need for the inquiry.

The link between IP rights and market power is also relevant to aftermarket cases. Aftermarket cases involving apparently opportunistic changes in policy, such as Xerox, hinge on the existence of IP rights. The reason that Xerox could be seen as controlling the market for its parts is that the parts were proprietary. Xerox could, of course, commit not to impose a tie ex post simply by relinquishing its IP rights in its parts, which in turn would permit competitive entry into the Xerox parts market. Because Xerox would want to protect the investment in developing its machines, however, it would be reluctant to relinquish these rights, and therefore the risk emerges of ex post expropriation of buyers' surplus through tying. When Borenstein et al. offer the justification for the Kodak decision that it helps sellers of durables commit not to exploit their installed base, one can think of their analysis as essentially protecting IP rights: without Kodak, the argument runs, sellers must either give up IP rights or face an inefficient incentive to exploit past customers.

Whether IP rights ought to be seen as conferring market power on the seller in opportunistic aftermarket cases depends entirely on whether an ex ante or ex post view of market power is appropriate. In Kodak itself, Kodak argued that it did not have market power because of ex ante competition in the photocopier market. Ex post, of course, Kodak was the only supplier of its proprietary parts. The US Supreme Court held that market imperfections, including naiveté on the part of Kodak's customers, may have allowed Kodak to exploit its ex post market power. Borenstein et al. further point out that even if there were perfect competition, ex post Kodak would have an incentive to exploit its situational market power because of an inability contractually to commit not to do so; any competition ex ante would simply drive down the price of the machines. Both Kodak and its customers would, under the Borenstein et al. theory, prefer a commitment not to raise prices ex post since drafting a fully contingent contract to address the problem is not feasible. (How, for example, would one perfectly account for fluctuating input costs in aftermarkets over time? How would one contractually specify aftermarket quality perfectly?)

Market and contractual imperfections, particularly in longer term contracts, are omnipresent. But this in itself does not invite antitrust intervention. The correct question is: What is the best legal instrument for addressing any inefficiency that might arise due to these imperfections? In our view, antitrust law is not suited to remedying contractual problems that the parties themselves have incentives to address. The parties can rely on a number of mechanisms to eliminate ex post situational market power resulting from IP rights, including reputations and contracts, such as a contractual commitment to "second sourcing" parts and service. While these mechanisms may be imperfect, competition law is not better equipped than the parties themselves to deal with contractual difficulties. Competition law should be invoked only when the parties, because of a lack of competition, do not themselves have the correct incentives to choose efficient contractual terms. The fact that IP rights sometimes confer the power to exploit past customers ex post because of contractual infirmities does not raise market-power issues that fall within the purview of antitrust authorities.

Another aftermarket tying motivation relevant to IP rights is price discrimination. Sellers may rely on their IP rights over aftermarket products in order to establish price discrimination. As we have discussed, price discrimination also is not an appropriate basis for intervention. Aftermarket tying, which often depends on IP, is not typically problematic from an antitrust viewpoint.

The most important relationship between tying and IP is indirect. As we have discussed, the anti-competitive explanations of tying arise in dynamic settings. Sellers anticipating change in either the tying- or tied-good market may tie in order to be better positioned in each market in the future. IP rights, particularly given the increasing im-

113 Above note 47.
114 Above note 23.
115 Borenstein et al., above note 47.
116 Even bundling itself can be a partial remedy; see Iacobucci, "Switching Costs," above note 50. By bundling products that are more valuable to high demanders when initially selling the durable, rather than simply discounting, a seller in an ex ante competitive market with ex post situational market power can offer, in effect, a steeper discount to those with high demand, thus avoiding the inefficient sales to low demanders that a straight discount invites.
The importance of high-technology industries in the economy, systematically arise in markets subject to rapid change. Concerns about exclusion and foreclosure may therefore arise more often with tying in markets in which IP rights are of prominent importance than with other kinds of tying.

What this implies for the optimal antitrust approach to tying is not immediately apparent. It would be simplistic and wrong to take the view that since IP and dynamic markets are related, and since tying is more likely to be problematic in dynamic contexts than static contexts, antitrust authorities should be more interventionist against tying in markets where IP is prominent. The counter-consideration is that dynamic and innovative markets, all other things being equal, are generally less subject to antitrust concern. If perfection in antitrust enforcement could be achieved without cost, then the authorities should intervene even in the face of ephemeral market power that inevitably will be disrupted by innovation. But of course such conditions do not exist. Instead, antitrust regulators should be wary of imposing intervention that is not only costly, but if incorrect could also undermine valuable gains from innovation in dynamic industries.

IP and tying tend to be more significant in dynamic, innovative industries. This makes tying of more serious concern, given that exclusionary theories of tying are dynamic. But it also makes identification of appropriate intervention more difficult, and erroneous antitrust intervention more costly. Antitrust authorities must undertake case-by-case analyses that are sensitive to these conflicting concerns.

Another aspect of the complex interrelationship among IP, tying, and technology is illustrated by the implications of DRM. DRM will likely have opposing effects on the likelihood of tying in the future. On the one hand, DRM facilitates tying by creating technological incompatibilities between differing companies' technologies. To return to an example discussed above, Apple is alleged to enforce an iPod–iTunes tie by relying in part on DRM. On the one hand, the combination of IP and technology that allows the seller to exert control over the future use of that IP will facilitate tying. On the other hand, DRM may diminish sellers' desire to tie. Suppose, for example, that Apple ties iTunes to the iPod in order to meter demand for the iPod. Rather than relying on online song purchases to meter demand, it may be that music publishing companies will license songs on a per-play basis by relying on DRM. This would result in good data on the use of digital music players like the iPod. In such a world, Apple could, in effect, piggyback on the DRM-facilitated monitoring of iPod use by copyright holders to meter use and therefore demand for the iPod, and music publishers and Apple should be able to arrive at a mutually agreeable arrangement that does not rely on iTunes (as it does at present). For example, Apple could require iPod users to upload their record of use of their players on a monthly basis and could collect royalties for copyright holders, as well as a surcharge.

In short, the relationship between IP and tying is already complex and is very likely to become even more complex in the future. Economic analysis of the type that we have outlined in this survey is invaluable to arrive at the correct outcome in any given case, and a rich set of theories are available to match to the evidence in each case. Often, many theories will be consistent with the evidence; and even where the exclusionary theories that we have outlined are the best fit, crafting a remedy that actually improves market performance presents an additional challenge. No succinct list of rules exists that summarizes optimal antitrust policy. Antitrust policy on tying can either be straightforward or intelligent, but not both.
COMPETITION POLICY AND INTELLECTUAL PROPERTY

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