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**The Conflict Over Vertical Foreclosure  
In Competition Policy And  
Intellectual Property Law**

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**THE CONFLICT OVER VERTICAL FORECLOSURE IN COMPETITION  
POLICY AND INTELLECTUAL PROPERTY LAW**

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*Abstract*

Although competition law and intellectual property have overlapping economic rationales, they frequently conflict. One area of conflict is vertical leveraging. This paper analyzes recent legislation and court decisions dealing with vertical leveraging. The main conclusion is that two policy changes – granting patent rights to fundamental knowledge and extending the life of copyrights – increased the cost of permitting refusals to deal by rights holders, so that vertical leveraging of IP ought to be subject to a rule of reason test that weighs the benefits of innovation inducement against the costs of extended monopoly.

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**THE CONFLICT OVER VERTICAL FORECLOSURE IN COMPETITION  
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Antitrust and intellectual property policies frequently conflict, especially with respect to vertical foreclosure. Competition policy generally disapproves of actions that leverage market power in one market to reduce competition in a related market, while intellectual property law generally allows rights-holders to refuse to sell or license their protected products. Although some forms of vertical foreclosure are *per se* antitrust violations, most forms are subject to the “rule of reason” test, in which case they do not violate antitrust law if they provide offsetting consumer benefits and are plausibly the least anticompetitive means for obtaining those benefits. Likewise, the right to refuse to license intellectual property or to sell products that embody it has limits, as illustrated in the antitrust cases against Microsoft. Nevertheless, intellectual property usually is treated differently than other property with respect to vertical leveraging.

Despite the conflict, antitrust and intellectual property have common intellectual heritage. Both policies address two conflicting objectives: creating financial incentives to

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innovate, and eliminating market failures. This essay uses these commonalities to explore the application of the antitrust concept of vertical leveraging when the up-stream “product” is intellectual property.

### *1 The Common Framework*

This essay adopts two conventions that, while uncontroversial among economists, discomfort some lawyers and technologists. The first is that intellectual property can be studied productively as a general category of property, rather than separately analyzing its several distinct categories. The second is that the purpose of intellectual property law is to maximize long-term social welfare, rather than the welfare of creators or some other normative goal.

The law pertaining to patents, copyrights and other intellectual property has evolved differently, and law varies within each category (plant patents, product patents, process patents, and business methods patents, or prose copyrights, movie copyrights, and software copyrights). These distinctions are largely ignored here to develop an overall conceptual framework for understanding the connections between antitrust and intellectual property policies.

The conceptual framework pursued here is distinctly economic, and so more compatible with the utilitarian Anglo-American approach to intellectual property than the “natural law” approach that is more influential in continental Europe. The latter approach attaches more significance to the idea that a creative product is an extension of the persona of the creator, which implies that creators should be given stronger rights than necessarily would flow from an analysis of the rights regime that generates the highest net social benefits. In some cases the natural rights approach implies inalienability – the owner of the property is not entitled to sell all rights to a creation – and so can lead to rights regimes that do not maximize the wealth of

creators. Nevertheless, even in “natural law” systems creators do not have unlimited rights, and utilitarian analysis is relevant in debates about the proper scope of IP. Article 52 of the European Patent Convention states that a condition of patentability in the European Union is that an invention is “susceptible of industrial application,” implying a role for utilitarian analysis.

### *1.1 U.S. IP Enforcement*

The common framework of IP and antitrust is difficult to discern from U.S. legal precedents. In the United States, a specialized court of appeals, the Federal Circuit, has jurisdiction over cases involving patent rights, including cases in which patent rights are offered as a defense to an antitrust claim (96 Stat. 25).<sup>1</sup> In *Atari Games Corp. v. Nintendo* [1992] (henceforth *Atari*), the Federal Circuit asserted the right to review a copyright defense to an antitrust claim if the case also involves an issue of patent law, even if patent issues are not part of the appeal.<sup>2</sup> Later in *In Re Independent Service Organizations* [2000] (henceforth *Xerox*) the Federal Circuit reviewed vertical foreclosure precedents for copyright in the Second and Ninth Circuits, ultimately rejecting the latter and adopting a revised version of the former.

The Federal Circuit and other appeals courts of appeals have unresolved conflicts over both jurisdiction for appeals of complex cases that involve patents and precedents regarding the trade-off between IP and antitrust. The case for Federal Circuit jurisdiction is that one purpose

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<sup>1</sup>. The Federal Circuit replaced the U. S. Court of Customs and Patent Appeals, which in 1929 was given authority to here appeals in patent cases (45 Stat. 1475).

<sup>2</sup>. This appeal dealt with a preliminary injunction on the copyright claim, and made no reference to any patent claim.

of this court is to bring uniformity to the enforcement of patent law. The case for jurisdiction in other appeals courts is that the Federal Circuit lacks experience and expertise in other areas, and in some complex cases the patent issues are trivial or are not related to the other claims.

Granting primacy to intellectual property law in these cases breeds inconsistency in other areas of law. Based on the record, the critics are correct: uniformity in patent and other IP law has been purchased at the cost of making other law, including antitrust, less coherent.

The Federal Circuit's clearest statement of the boundary between antitrust and intellectual property is in *Xerox*. While affirming that "[i]ntellectual property rights do not confer a privilege to violate antitrust laws," the opinion states that patent holders are "exempt from the antitrust laws... unless the infringement defendant proves one of two conditions." These conditions are: "the patent was obtained through knowing and willful fraud," and "the infringement suit was a mere sham to cover... an attempt to interfere directly with the business relationships of a competitor." The *Xerox* decision acknowledges the "undisputed premise that the patent holder can not use his statutory right to refuse to sell patented parts to gain a monopoly in a market beyond the scope of the patent," but goes on to restrict illegal behavior to the case of tying. "In the absence of illegal tying, fraud in the Patent and Trademark Office, or sham litigation, the patent holder may enforce the statutory right to exclude others from making, using, or selling the claimed invention free from liability under the antitrust laws." In *Xerox* the Federal Circuit also states that copyright holders are entitled to refuse to let others use copyrighted products in any circumstance.

### *1.2 The Economics of IP Law*

The Federal Circuit's opinions conflict with the economics of antitrust and intellectual property, which is based on the principle of organizing markets to maximize net social benefits. In this framework, individual willingness to pay is the standard measure of both benefits and costs. In the absence of externalities, the benefit of a unit of output is the maximum amount that the buyer is willing to pay for it, and the cost is the willingness to pay for the most valuable other products that could be produced with the resources that were used to produce that output.

The economics of intellectual property focuses on using IP law to induce creativity and technological progress for the benefit of society. For IP law to affect creativity, the rights it confers must correspond to the motives of creators. If creators seek only fame, IP laws that require appropriate citation by duplicators would suffice to induce creative effort. Academic science, notwithstanding the increased attention by universities to commercializing intellectual property from faculty research, is a process in which competitors seek recognition as innovators (Stephen [1996]). For this process to work well, creative products must be circulated quickly to as wide an audience as possible and the origin of new knowledge must be accurately attributed. A rights regime that requires citation, prohibits plagiarism, but allows extensive duplication and follow-on innovation serves this purpose, and so induces maximal creative effort.

The premise of modern IP law is that economic gain, not personal fame, motivates creativity. The rise of industrial laboratories and corporate production of copyrighted works is strong evidence that most contemporary creative activity is motivated by economic gain. For IP law to induce corporate creativity, it must increase the expected profits of creative products.

The problem that IP rights overcome is the "public good" feature of information. All information products, whether artistic works or inventions, have the characteristics that the "first

copy cost” – the time, effort and resources that are used to produce something new – is substantially greater than the cost of duplicating it (Noll [1993]). If a product embodying creative effort can be duplicated cheaply without the permission of its creator and if buyers do not care whether the creator has authorized the copy, creators can lose control of their products, especially those with great value. A creative product that can be sold at a price substantially in excess of the incremental cost of duplication will attract others to sell duplicates, and competition will drive the price of the product to the incremental cost of duplication. After price is driven to marginal cost, a creator will no longer capture revenues in excess of duplication cost and so may be unable to recover the first copy cost. If creators are financially motivated and anticipate intense competition from unauthorized duplicates of successful creative products, they will be disinclined to invest the time, effort and resources in creative work. Indeed, if the potential market success of a creative product is uncertain, the possibility of unauthorized, royalty-free sales reduces the upper tail of the distribution of possible outcomes and hence the expected profitability of creation.

IP laws deal with this problem by giving creators exclusive rights to their creative products. Creators can retain the exclusive right to sell products that embody their creative work or can allow others to produce such products for a fee. In either case, the creator can set a monopoly price, thereby maximizing profits from the products embodying the creative work. From an economic efficiency perspective, the choice between licensing and producing depends purely on the organizational capabilities of innovators and potential licensees. Because the final product embodies a fixed quantity of knowledge, a license royalty need not create an input distortion in production or a greater output distortion than monopoly own-production by the

rights holder. The profit-maximizing non-exclusive license fee is identical to the monopoly profit-maximizing mark-up over marginal cost. Thus, the optimal make or license decision depends on the relative capabilities of the creator and licensees in using the intellectual property.

The economic advantages of non-exclusive licensing are that the most efficient producer may not be the rights holder and that competition among producers creates rivalry in cost minimization. Exclusive licensing can lead to inefficiencies of double marginalization if the product that embodies the IP enjoys market power; however, this problem can be overcome by structuring the royalty so that no fee is charged for the marginal unit of production.

The conflict between IP law and antitrust policy arises from the fact that the former creates market power while antitrust policy seeks to reduce market power with some circumstances. The economics of antitrust focuses on promoting competition by eliminating inefficient sources of market power. Antitrust policy distinguishes between legitimate and illegitimate market power in that it does not apply to market power that arises from “superior foresight and efficiency” due to either economies of scale or unique capabilities. If a production process exhibits economies of scale, perfect competition is not feasible, for the competitive price (equal to marginal cost) would not recover all costs. This case is similar to the “public goods” aspect of innovation, in which the first-copy cost is a form of economies of scale (average cost declines as output increases). The difference arises because in the latter case the fixed input – new knowledge – can be copied at little or no cost by others to compete with its creator.

### *1.3 The Duration of IP Rights*

The conflict between IP and competition policy is apparent in defining the breadth and duration of IP rights. As the strength of IP rights grows, the ability of the innovator to extract

excess profits increases. Theoretically, the effect on social welfare is ambiguous. Stronger IP rights create a greater incentive to invest in creativity – the inducement effect. But stronger IP rights also have three costs. First, IP rights cause “dead-weight loss” – excluding some buyers who value a product between its price and its marginal cost. Second, IP rights create transactions costs in litigating infringement and negotiating licenses. Third, IP rights increase the cost of innovations that build on or make use of products that are protected by IP.

The economically optimal IP policy is easy to describe, but difficult to implement. In the optimal IP system, the last increment to the strength of rights must induce incremental creativity that has a social value exactly equal to the social cost of the additional dead-weight loss, transactions costs, and blocking effects that it creates among the portfolio of creative products. To take a concrete example, in the 1990s the United States increased the duration of patents and copyrights. Patent duration was extended three years in 1994, but this extension was partly offset by starting the clock at the time a patent was filed. In the past, the clock began at the time the patent was issued. In 1998, copyrights were extended for twenty years – from life plus fifty years to life plus seventy years for individuals, and from 75 to 95 years for corporations.

The value of rights to creators rose by the present value of the expected excess profits. If  $\mathbf{A}_t$  is the incremental profit in year  $t$  from an extension of the right, and if  $r$  is the appropriate risk-adjusted opportunity cost of capital, then the maximum value of the patent extension to the creator is:

$$V_p = \mathbf{A}_{18}(1+r)^{-18} + \mathbf{A}_{19}(1+r)^{-19} + \mathbf{A}_{20}(1+r)^{-20}$$

and the value of the copyright extension is:

$$Vc = \sum_{t=76}^{\infty} \frac{A_t}{(1+r)^t}$$

To illustrate the rough magnitude of these effects, assume that the opportunity cost of capital is ten percent, the excess profit of the creative product is  $A_0$  for every year that the IP right is in force (which vastly overstates the profitability of nearly all copyrighted works, even quite successful ones),<sup>3</sup> and patents are issued immediately after it is filed. Then the present value of the creative works under the old and new regimes are as follows:

**Table 1: The Effect of Rights Duration on Value**

	Patent	Copyright
Old Duration	$8.21A_0$	$9.99929A_0$
New Duration	$8.65A_0$	$9.99988A_0$
Gain	$.44A_0$	$.00059A_0$

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<sup>3</sup>. Both assumptions are conservative. If investment in creative activity is more risky than ordinary capital investments, the appropriate discount rate is higher, in which case the incremental value of the patent and copyright extensions is lower and the inducement effect correspondingly smaller. Likewise, while patents on commercially successful products probably do have a useful life of twenty years or more, the vast majority of copyrighted material pertains to news and popular culture that has almost no value after a few years. Thus, the previous copyright extension in 1976 also had virtually no incremental value at the moment of copyright for the vast majority of works, and hence could not plausibly have had an inducement effect.

% Gain	5.36	.0059
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Thus, patent term extension increased the value of creative products by at most five percent, while the copyright term extension increased the value of covered works infinitesimally.

The latter point gives substance to the Constitutional challenge to the Sonny Bono Copyright Extension Act in *Eldred* [2003]. The U.S. Constitution grants Congress the authority “To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries” (Article 1, Section 8, Clause 8). From an economic perspective, the term of copyrights is equivalent to a perpetual right. Using the formula and assumptions described above, the creator already had the right to 99.993% of the monopoly value of a work at the moment of copyright. Increasing this value to 99.999% could not plausibly have a substantial inducement effect, so that its costs from blocking secondary innovation, generating transactions costs, and creating dead-weight loss are virtually certain to exceed its benefits.

The effect of the patent extension is not as clear. Whereas the inducement effect from extending patent life from 17 to 20 years may or may not justify the cost, term extension does not give all of the present value of an invention to the inventor – in the example, 16.4% of the discounted present value of perpetual monopoly profits remains after expiration – and it does start the timing of the right earlier. Moreover, the increase in the value of the patent, while small, plausibly could have an inducement effect, unlike the case with the copyright extension.

In most cases applying the calculus of net benefit analysis to changes in IP law is next to impossible for two reasons. First, the same laws apply to a variety of products, and the both the

difficulty of copying an innovation and the protection offered by IP rights varies by technology. Second, the inducement elasticity, which also varies across product categories, has not been reliably estimated for most technologies, although economics research has produced some evidence that inducement elasticities are not large.

The first empirical study of copyright extension confirms the theoretical expectation that copyright term extension had no effect on the production of motion pictures (Kai-Lung Hui and I. P. L. Png [2002]). Similarly, survey research by Levin, Klevorick, Nelson and Winter [1987] and by Cohen, Nelson and Walsh [2000] concludes that most industries do not regard patent protection as particularly important for protecting innovations (exceptions are pharmaceuticals and biotechnology). If patents are not an important means to protect creative products, a change in patent law can not have much of an inducement effect.

U. S. patent intensity – the propensity to seek patents – has substantially increased during the past twenty years, which could be interpreted as indicating an inducement effect because patent laws were strengthened during this period and the Federal Circuit, after its creation in 1982, strengthened patent rights and broadened the antitrust exemption for intellectual property. A thorough study of why patent intensity increased in semiconductors found that stronger patent laws increased the strategic necessity of owning a patent portfolio to protect against infringement lawsuits by others and to act as leverage for cross-licensing of bundles of patents (Ziedonis and Hall [2001]). Thus, increased patent activity was a means for reducing the transactions costs of the IP system and increasing barriers to entry against firms that lack a patent portfolio, not the result of more innovative activity due to stronger patent laws. This interpretation is consistent with the increase in patent intensity in Europe (European Patent Office [2002]), which has not

similarly increased the strength of patent laws. Thus, the fragmentary research evidence casts serious doubt on whether strengthening current IP protection induces more creativity.

Notwithstanding these doubts, a rigorous benefit-cost analysis of recent changes in IP law requires estimating the inducement elasticity for many products, but few such estimates exist. Current knowledge is best summarized as providing no evidence for a significant inducement effect except in drugs, and in some cases, as with copyright extension, providing evidence that IP has been strengthened far beyond the interesting range of debate regarding its net social benefits.

## *2 Vertical Leveraging and IP Law*

In *Xerox*, the Federal Circuit rejected an antitrust claim that Xerox had monopolized a relevant market for repair and maintenance service in photocopiers by refusing to sell patented parts and diagnostic software to its service competitors. The plaintiffs claimed, as in the similar *Kodak* [1992] case, that Xerox should be required to sell parts and software to anyone, not just self-service owners of Xerox equipment. Apparently if Xerox had tied parts to service the Federal Circuit would have regarded Xerox's behavior as an antitrust violation; however, because Xerox permitted customers to buy parts and software to repair their own equipment, there was no tie.

Tying is not the only way that an upstream monopolist can extend its market power into a downstream market. Other examples include a refusal to deal (e.g., selling only to one's affiliate or only to firms that agree not to compete), technical discrimination (providing an inferior product to competitors), and a price squeeze (charging a wholesale price that is so near the retail

price of the monopolist's affiliate that competitors can not recover the efficient costs of production at the going market price).

The significance of the *Xerox* decision is that it differentiates IP from other forms of property with respect to the applicability of the antitrust laws to vertical leveraging. While owners of ordinary property generally are not required to grant use of their property to others (notably, their competitors in downstream markets) at any price, they can be required to do so if refusing to serve downstream competitors destroys competition in that market.

In the U.S., beginning with *Terminal Railroads* [1912], vertically integrated firms with monopoly power in a product that is a necessary input to the production of another product generally have been prohibited from refusing to deal with, or otherwise to discriminate against, their competitors in the downstream market. In *Otter Tail Power* [1973], the courts required that an electric utility grant another distribution utility access to its regional transmission network monopoly. The settlement agreement in *U.S. v. AT&T* [1982] required that AT&T's local access affiliates grant competing long distance carriers "equal access" their local distribution monopolies. Even football stadiums that are the only facility suitable for professional games can not have exclusive contracts with a single team (Hecht [1977]).

### *2.1 Justifications for Vertical Leveraging of IP*

Allowing IP rights holders to engage in vertical leveraging has two possible economic justifications: to enable firms to protect their intellectual property and to increase the incentives for innovation. The first explanation rarely applies because the application of IP in producing a product typically exposes it to reverse engineering, inventing around or unauthorized copying. IP law does not prevent a service competitor from buying a product, taking it apart, and

attempting to reverse engineer the components. The second presumes that vertical leveraging is profit-enhancing, and so has an inducement effect on innovation.

Vertical leveraging can increase profits in several ways. Most of the effects of vertical integration have ambiguous effects on customers.

Vertical leveraging can enable the firm to eliminate double-marginalization that arises if the downstream market also is not competitive. In a vertically integrated monopoly, the firm will maximize profits if it behaves as if the price of the upstream product were equal to marginal cost for the purpose of setting profit-maximizing prices in the downstream market. Interestingly, when this proposition is applied to IP, the marginal cost of embodying the IP in a product is zero, so a vertically integrated firm that makes use of its own IP should price downstream products as if the royalty on the IP were zero.

Vertical integration also can enable a firm to implement price discrimination. To borrow an example from *Kodak* and *Xerox*, suppose there are two types of customers, say law firms and law schools, for a product, say photocopiers. The first has a near-inelastic demand for photocopier service because it must meet strict deadlines for serving multiple copies of legal documents. The second has a higher elasticity and less intense demand, partly because professors do not have the same kind of deadlines as lawyers and partly because law schools have tighter budget constraints than law firms. In a competitive service industry firms can not price discriminate against law firms because competition will lead to a uniform price equal to marginal cost. If the IP rights holder refuses to sell patented replacement parts to service competitors, the latter can not compete and the service affiliate of the parts monopolist can price discriminate against law firms.

Vertical integration also can enable a firm to exercise monopsony power over another input to the downstream product. Suppose Product A uses both IP and Product X, and that the latter product is sold in a market of three firms, each of which produces a different version of the same product that is covered by different IP rights. If Product A is produced by the IP rights holder or by a firm that has an exclusive license to practice the underlying IP, this firm can offer each of the three producers of X an all or nothing bargain to be the exclusive supplier for producing A. In this case, the likely outcome is that X is sold at or slightly above its marginal cost, with little or no implicit royalty for the IP underlying Product X, rather than at the higher price one would expect in a three-firm oligopoly. In the short run, prices closer to marginal cost are efficient; however, the monopolization of A production reduces the incentive to invest in improving X, and so may lead to less innovation and higher costs in the long run.

The preceding example is one of several ways in which vertical integration can protect against backward innovation by a downstream firm that threatens an upstream monopoly. Vertical integration can serve the same purpose as bundling products or IP rights, requiring that firms pay for all or none (Nalebuff [1999]). This strategy forces potential competitors to invent substitutes for all of the IP that is held by a firm, rather than compete against only one. Vertical integration raises entry barriers by requiring new competitors to create two new, non-infringing products instead of one, thereby reducing innovative competition in both markets.

Vertical integration also may be an effective way to overcome problems associated with dedicated investments. If a firm must commit to specific long-term investments having no comparably valuable use in order to engage in a vertical relationship, once the investment is made the vertical partner has an incentive to threaten withdrawal of the relationship for the

purpose of effectively exploiting the other party's committed investment (Williamson [1975]).

A similar problem arises from the externalities associated with point-of-sale service in a downstream market (Mathewson and Winter [1984]). The classic case is one in which customers need experience and education to make informed purchases, and these services can be most efficiently undertaken by retailers. If some firms offer these services and cover their costs in their retail prices, but other retailers do not offer such services and so can operate profitably at lower prices, downstream competition may drive the former firms from the market.

In general, vertical integration has theoretically ambiguous effects, which argues against broad legal standards and *per se* rules and in favor of the rule of reason (Winston [1990]). Only the elimination of double marginalization is unambiguously efficiency-enhancing and beneficial to consumers. A few examples illustrate the ambiguity of the theoretical effects. (1) Reductions in "inventing around" can either increase or reduce efficiency, depending on the novelty and first-copy cost of secondary innovations. (2) Price discrimination has the benefit of bringing relative prices closer to the "second-best" optimum by making the departure of price from marginal cost inversely proportional to the elasticity of demand, but the disadvantage of transferring wealth to producers and eliminating innovative competition. (3) "Point of sale" services benefit buyers who are uninformed, but raise the price to customers who have sufficient information to make an informed purchase. Thus, as a practical matter, whether vertical leveraging is socially harmful is a fact-based inquiry into the extent of market power in at least two markets and a "rule-of-reason" test. But according to the Federal Circuit, in cases involving IP vertical leveraging is *per se* legal in all but one circumstance – tying.

## 2.2 The Legal Basis for Per Se Legality

The Federal Circuit bases its vertical foreclosure decisions on the Patent Act, which sets forth five conditions under which a patent holder is not “guilty of misuse or illegal extension” (35 U.S.C. 271(d)). These safe havens include actions that if done by others without permission would be regarded as contributory infringement, actions to enforce the patent against infringement, refusal to license or to use a patent, and licenses that condition rights to the patent on the acquisition of other patent rights or other products unless the patent holder has market power in the relevant market for IP licenses or the patented product.

Contributory infringement is the theme of many patent and copyright lawsuits from *Betamax* (*Sony v. Universal Studios* [1984]) to Hollywood’s continuing battle against web sites such as Napster (*A&M Records* [2001] and *Napster* [2002] ) that facilitate the digital distribution of audio and video recordings. The statutes state that an IP rights holder can monopolize a product that otherwise would lead to a verdict of contributory infringement.

The definition of contributory infringement is contested. The unresolved issues are the proportion of non-infringing use that immunizes its producer against contributory infringement and the extent to which its producer is required to take costly actions to prevent infringing uses. The decisions in *Betamax* and *Napster* express mutually inconsistent views on this issue. *Betamax* adopted the traditional position that a court should narrowly interpret Congressional exemptions from antitrust. In *Betamax*, the Court stated: “The sale of copying equipment, like the sale of other articles of commerce, does not constitute contributory infringement if the product is widely used for legitimate, unobjectionable purposes, or, indeed, is merely capable of substantial noninfringing uses” (p. 442). But Napster had noninfringing uses. The site indexed numerous public domain recordings and recordings for which it had a license to distribute the

product. Nevertheless, the courts ruled that the plaintiffs were sufficiently likely to win their contributory infringement claim that a preliminary injunction was warranted and, ultimately, the court closed the site when Napster, though eliminating the vast majority of infringing uses, found that eliminating all infringing uses was technically infeasible.

Contributory infringement is related to provisions in law that allow a firm to refuse to license IP, which is the basis for its relationship to vertical foreclosure. For example, a copyright holder can refuse to license a digital distribution system and stay out of this business itself. The record distribution companies pursued a different strategy, granting digital distribution licenses to two joint ventures, MusicNet and pressplay, and either offering only limited licenses or refusing to grant licenses to others. The issue is whether this strategy is legal. *Xerox* says it is.

The Federal Circuit cited the right to refuse to license in deciding *Xerox*, but its reading of the statute is debatable. The Act defines the safe haven from antitrust as arising if a rights holder “refused to license or use any rights to the patent,” which unambiguously refers to the *technology* market, or “intellectual property that is licensed” (U.S. Department of Justice and Federal Trade Commission [1992], Section 3.2.2). Such markets exist if a rights holder licenses IP. Firms are not obliged to create such a market, but may instead elect to be the exclusive producer of products that embody or use its intellectual property. The statute does not state that IP rights holders are immune from antitrust liability if they engage in exclusionary practices with respect to a product that embodies their IP (Patterson [2000]). The Patent Act states that a firm with market power in the market for either a license or a patented product is not immune from antitrust if it conditions either the sale of either a license or the embodying product on the acquisition of another license or product. The decision by Congress to phrase the illegal practice

as conditioning the sale, rather than tying, implies that Congress did not intend to limit illegal vertical foreclosure to tying. In *Xerox*, the sale of parts was conditioned on owning a Xerox photocopier (embodying patented parts and copyrighted software) and using purchased parts for self-service – not resale and not service provided by a competitor.

Once Hollywood licensed recordings for digital distribution, it created a technology market (e.g., the right to distribute digital audio and video files) as distinguished from the product that embeds the technology (e.g., the actual distribution of the music). The Federal Circuit, but no statute, states that Hollywood is exempt from antitrust if it engages in *selective* licensing of a right to engage in retail distribution of copyrighted material or products that contain protected material (whether CDs, video cassettes, or digital files). The alternative standard is that an owner of IP with market power in a rights market or a product that embodies the IP (CDs or other digital files) cannot engage in vertical leveraging to monopolize the next stage in the chain (here, retail sales) unless doing so is the most efficient way to combat piracy.

Regardless of the legal merits of existing policies, the economics of vertical foreclosure dictates that evaluating IP leveraging requires a situation-specific balancing of social costs and benefits. The Federal Circuit ruling in *Xerox* requires no such test, stating that a rights holder can refuse to license IP or sell the related product regardless of the consequences. In short, vertical foreclosure based on IP is *per se* legal unless it involves tying, which is the only form of conditional sale that the Federal Circuit will recognize as a potential antitrust violation.

### *3 Applications to Fundamental Research: Genomic Patents*

The Federal Circuit's vertical leveraging policy is especially problematic for IP rights in fundamental knowledge, such as human genome patents. In the U.S., genetic patents do not

require that the applicant identify a use for the gene. Such patents are not possible in Europe because the European Patent Convention (Article 23e Implementing Regulations) prohibits patents on the human genome and requires that a patent application identify a potential use. A U.S. genomic patent can be issued if its only use is in further research. Such patents contribute to economic welfare only through the complicated process of “cumulative innovation,” which refers to a circumstance in which early innovators create knowledge that is necessary to discover further knowledge (Gallini and Scotchmer [2001]).

The logic of extending IP rights in first-stage innovation to subsequent innovations is that it creates an incentive for first-stage research. Holding constant the total economic gains from all stages of research, greater rewards to the first-stage innovator imply lesser rewards (and hence less incentive to innovate) in the later stages. Thus, whether stronger property rights in early stage research products are desirable depends on the relative proportions of creative effort that are allocated to developing potentially useful fundamental knowledge versus useful applications of this knowledge. Policy should strengthen early stage rights only if too few resources are being devoted to fundamental research and too many to developing applications.

### *3.1 Examples from Research Input Patents*

In the case of genomic patents, the preceding argument is not plausible. First, most of the fundamental research in genetics is sponsored by the federal government and non-profit foundations, neither of which are motivated by potential rights fees from discoveries. Second, the function of most patented genes was unknown when the patent was issued.

Two examples of genome patents that apparently inhibit, rather than encourage, innovation in drugs are discussed in the report of the British Commission on Intellectual

Property Rights [2002, p. 127-8]: CCR5 and MSP-1. CCR5 is a gene that makes a receptor protein that the HIV virus uses to gain access to a cell. A mutation of the gene prevents HIV access, and so could be the basis for new AIDS treatments. When the patent was issued, this property of the gene was unknown, yet the patent holder has the right to all uses of the gene. MSP-1 is a complex antigen that holds promise in developing treatments for malaria. The DNA sequences for the antigen are covered by 39 patents. Although some patents may be invalid, several patent holders may have sufficiently secure rights in elements of the antigen that each can claim rights to any malaria treatment that arises from it.

The barrier to research to find uses for patents is clear in the recent decision of the Federal Circuit in *Madey v. Duke* [2002]. *Madey* deals with a university's right to use equipment that was patented by a faculty member after he had been replaced as director of a laboratory. In deciding the case, the Federal Circuit went farther than necessary to resolve the dispute, stating that universities must obtain a license to do research that uses information in a patent. The issue of who can use equipment that was manufactured for a particular research activity is much narrower than the issue of who can pursue research that uses information in a patent. The Federal Circuit's decision makes no distinction between these concepts.

Duke had claimed that it was protected from infringement by the "experimental use" defense, which states that uses solely for research and experiment by a non-profit academic institution do not require a license. The experimental use defense to patent infringement applies to purely scientific research that is not likely to lead to a patentable innovation or a commercial product. Duke claimed that the purpose of its use of the equipment was to undertake scientific research without an anticipated practical use.

The Federal Circuit rejected Duke's claim on the ground that the non-profit status of universities and their focus on expanding scientific knowledge does not imply a non-commercial purpose. The Court concluded that universities, in seeking research grants and in acquiring and licensing intellectual property, do research for commercial purposes, and so are subject to the same liability for infringement as for-profit corporations.

The factual premise of the *Madey* decision is correct. Universities seek financial support for research, and acquire and commercialize intellectual property from this research. The interesting policy question is whether, and if so, how, IP rights should be granted in fundamental knowledge with no known use except as an input to further research. The policy that led to genomic patents and *Madey* is that IP protects information that has no known commercial use. Even if patent protection should extend to research on commercial products that might produce competing products (a doubtful proposition, given the utilitarian objective of the patent laws), it does not follow that protection should ban research to discover the first practical use of a patent on scientific knowledge (Eisenberg [1989]) or other unexploited technical information.

The irony of the *Madey* decision is delicious. It exposes universities to litigation that easily could lead to awards and litigation costs that total many times the commercial value of the intellectual property rights they have accumulated since their hard-won passage of the Bayh-Dole Act (35 U.S.C. 200-212) in 1980, which gave universities IP rights in the outputs from federally sponsored research projects. Notwithstanding this irony, the policy significance of *Madey* is that it raises the transactions costs, and hence reduces the amount, of university research, thereby reducing the creation of new knowledge and new products derived from it.

*Madey* also has important ramifications for vertical foreclosure arising from IP in research inputs that would reduce rather than encourage bringing research inputs to practice in commercial products. Although in neither of the genetic patent examples has a rights holder refused to license its patent, one can imagine a circumstance in which a rights holder refuses to permit all further research or applications or reserves all applications research for itself.

A decision to foreclose further research, perhaps motivated by religious or other non-economic purposes (a plausible circumstance in the case of AIDS), stops development of treatments based on the patented genetic information. This decision is fully protected under the “refusal to deal” immunity from antitrust in the Patent Act. A similar circumstance arises when the rights holder can not be located by a second-stage innovator who wishes to develop an application. Here the problem is not that the rights holder refuses to license the IP, but that the potential licensee can not find a licensor with whom to negotiate. This problem is especially acute in copyrights, because “life plus seventy years” can mean that the legal rights holders may be the great grand-children or distant indirect descendants of the creator who may be unaware that the work exists or that they own the rights to it.

### *3.2 Applying the Economics of Cumulative Innovation to Research Inputs*

Under current law, rights holders may monopolize research on making practical use of first-stage knowledge. In R&D competition, different researchers often pursue different approaches to the same problem. Parallel R&D activities can be conceptualized as multiple draws from a random distribution of outcomes, with the probability of success increasing in the number of projects (see generally Cohen and Noll [1991]; for an application to photovoltaics research, see Pegram [1991]). For two reasons a research monopoly may do fewer projects than

would arise in a competitive R&D race. First, the skill mix in an R&D-performing organization may cause it to overlook promising lines of research. Second, the privately optimal amount of R&D for a monopolist may differ from the socially optimal amount.

A further problem with granting rights to fundamental knowledge is that it can block innovative competition against the first downstream applications. For example, in the drug industry a highly successful new drug often induces other companies to do research on variants of the chemical entity to develop substitutes or even better-performing drugs. If a pharmaceutical company acquires a license to do research on a gene and subsequently develops a new drug, Federal Circuit precedent implies that subsequent drugs need a license to interact with that gene even if the research that produced the second drug was based solely on legal reverse engineering of the first drug and made no direct use of the genetic patent. Facing the prospect of licensing requirements, follow-on innovators may be disinclined to pursue such innovations.

The trade-off involved in using IP rights to control follow-on research is between two aspects of the inducement effect: the incentive to create new information versus the incentive to use such information to develop subsequent useful applications. Prior to patents on genetic sequences, biological patents were granted in organisms with potential commercial value (crop seeds, garden flowers, etc.). IP rights were not issued for naturally occurring physical or biological forms, even if their discovery required considerable scientific skill. Thus, the Curies could win Nobel Prizes for discovering radiation, but could not patent radium or X-rays as either physical products or inputs to research on their uses.

Genomic patents represent a fundamental shift in IP policy. For these patents to be socially beneficial, patentability must generate more fundamental knowledge (the first-order

inducement effect) and lead to a wider array of commercially useful products (the second-order inducement effect). The first condition does not seem to be satisfied for the vast majority of basic research in science (including the human genome project), which is almost entirely financed by grants from either governments or non-profit foundations. The second condition is not satisfied if stronger rights in fundamental research increase the transactions costs of second-order R&D but do not increase first-order research.

The sufficient condition for genetic patents to be socially beneficial is that, in addition, the benefits of the new products exceed any increase in dead-weight loss that would arise from higher costs and prices on products that would have been invented anyway in the absence of these rights. Because of the double-marginalization and transactions costs effects arising from sequences of patents, passing the sufficiency test is unlikely to be trivial.

#### *4 Policy Conclusions*

The policy solutions to the set of problems described above are fairly straightforward.

Whereas granting IP rights to fundamental knowledge is a dubious policy, granting rights before the practical function of the discovery is known can lead to the worst form of vertical foreclosure – one that prevents a practical application and a downstream product from being developed. The conceptual model for genomic patents, if the practice is to continue, ought to be made more consistent with the rights granted by other IP. A genomic patent is for a gene or gene fragment, so the right that corresponds to other IP would be a monopoly in artificial replication of the gene or embodiment of the gene in a product.

Research on gene function should not be blocked by a patent. Most fundamentally, the production and use of these genes in a living organism ought to be unprotected prior art – IP law

should not prevent people from studying their own genes, or granting that right to others, because a prior researcher studied (and patented) the genes of another person. In addition, research on how the genome works ought to be protected reverse engineering. The Copyright Act (17 U.S.C. 107) grants a fair use exception to research on copyrighted products for the purpose of reverse engineering, as affirmed in *Atari*. Except for plant patents, which have a statutory research exemption (7 U.S.C. 2321), patent law does not explicitly protect reverse engineering, but the exemption is implied by the requirement of full disclosure in the patent application, which is a public document. Purchasers of a patented product are barred from duplicating it, but not from disassembling and studying it unless, in some cases, they have agreed contractually not to do so (Samuelson and Scotchmer [2002]).

Rights to reverse engineering and to undertake research to facilitate the development of uses for protected products should be clearly established. As long as IP law grants the right to profit from commercial uses of protected information, research need not be restricted. For patents, the 20-year life of the right further limits the effect of such refusals. The *de facto* perpetual copyright creates a more serious problem, especially for copyrights on commercial products such as software and, in Europe and proposed for the U.S., data bases. A partial solution that is recommended by Landes and Posner [2002] is to replace the uniform life of copyrights with a sequence of short renewable rights. Forcing copyrights to be renewed every few years would at least solve the problem of rights that are forgotten or regarded by the original rights holder as not worth commercializing.

Finally, whether by statute or a Supreme Court refinement of the Federal Circuit precedents, the list of vertical leveraging practices that are not exempt from antitrust by IP law

should be expanded beyond tying. There is no meaningful economic distinction between tying and other forms of vertical leveraging. A “rule of reason” test of vertical foreclosure that allows innovation inducement to be an efficiency defense for a challenged practice is superior to the Federal Circuit’s rule of *per se* legality.

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