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# Resolving the Patent-Antitrust Paradox Through Tripartite Innovation[*]

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**Forthcoming - Vanderbilt Law Review**



The issues presented by the intersection of the patent system and the antitrust laws have never been so pressing. The number of issued patents is skyrocketing. Companies are more frequently entering into arrangements with competitors not only to recover their investment from creating patented products but also to avoid the patent landmines that line the path of innovation. They form patent pools for laser eye surgery, MPEG-2 video compression technology, and DVD formatting; enter into alliances, mergers, and settlements in the biopharmaceutical industry;

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I would like to thank Mark Lemley and participants in the Second Annual Intellectual Property Scholars Conference

refuse to license their patented products; and cross-license their patents in the semiconductor industry.

But the need for collaborative and exclusionary conduct under the patent system is matched by the heightened suspicion of the antitrust laws. Antitrust looks at the above activities and sees competing firms conspiring to limit competition. It sees increased price, reduced output, and lessened competition. And it pays scant attention to the benefits of the activity in promoting innovation or the justification for the activity based on the patent system.

Thus, the patent-antitrust paradox. Stated on its simplest level, the patent and antitrust systems promote welfare in different, often conflicting, ways: the patent system is based on exclusion, while antitrust law focuses on competition. Since exclusion-based acts often restrict competition, courts are left to reconcile two systems for promoting welfare without any compass to guide them. One need not look far to stumble upon their wayward path, as revealed by judicial analyses based on the defendant's intent, the scope of the patent, the presence of an essential facility, and the effect of the activity on competitors.

This Article offers a paradigm to resolve the patent-antitrust paradox.[1] Three steps comprise the paradigm. First, the Article proposes innovation as the common denominator of the patent and antitrust laws. Second, it proposes a new explanation that firms can offer in defense of the challenged activity: that it is *reasonably necessary to attain tripartite innovation*. Tripartite innovation denotes the three temporal stages of innovation: the creation of the

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and the Rutgers Junior Faculty Colloquium for helpful comments, and Wenfang Chen, Claire Evans, and Rob Hyman for valuable research assistance.

[1] A portion of the analysis in the Article was introduced in Michael A. Carrier, *Unraveling the Patent-Antitrust Paradox*, 150 U. PA. L. REV. 761 (2002), which offered a test to determine whether a defendant's patent-based conduct constituted monopolization. This Article develops the building blocks introduced by its predecessor – namely, an industry-specific approach focused on innovation – while introducing a justification based on tripartite

product, the recovery of the investment incurred in creating the product, and the circumvention of patent bottlenecks that block the path of innovation.

Third, the Article recommends a greater role for the justification than that currently accorded to other explanations in antitrust analysis. Specifically, a showing of reasonable necessity for tripartite innovation should receive (1) immunity from a charge of monopolization, (2) heightened consideration in the review of mergers, and (3) greater weight in an asymmetric balance against anticompetitive effects in the analysis of agreements.

The Article is constructed as follows. Part I sketches the conflict between the patent system and the antitrust laws, and illustrates the range of approaches that courts and the federal antitrust enforcement agencies recently have applied to the intersection. Part II proposes innovation as the common denominator allowing the reconciliation of the patent and antitrust laws. This Part relies in various parts on the relevant statutes, legislative history of the laws, courts' jurisprudence, and economic theory.

Part III introduces and develops the test of reasonable necessity to achieve tripartite innovation. It explains the selection of the standard of reasonable necessity and the three temporal components of innovation. It then explores each of the three stages, fleshing out the test and facilitating courts' analysis by providing examples of activity that satisfies (and that fails to satisfy) the test. Part IV concludes by locating the finding on reasonable necessity in the context of the three primary antitrust analyses of monopolization, agreements, and mergers.

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innovation and expanding the scope of inquiry from monopolization to the entirety of antitrust conduct, including licensing agreements and combinations between competitors such as joint ventures and mergers.

## I. The Patent-Antitrust Conflict

Although the patent and antitrust systems both attempt to increase total societal welfare,[2] they pursue this goal through divergent paths. The foundation of the patent system is the right to exclude. Such an incentive is necessary, at least in theory, because of the "public good" nature of patented inventions, which are nonrival (consumption by one does not leave any less of the good to be consumed by others) and nonexclusive (others cannot be excluded from consuming them).[3] As a result of these characteristics, "free riders" are tempted to imitate the invention after it has been developed,[4] which would deter future inventors and investors, and lead to a suboptimal level of innovation.[5] To prevent this, the patent laws promise inventors a right to exclude for a period of twenty years, a right that permits them to charge prices higher than their postinvention costs, which allows them to recover profits in excess of the value of their front-end investments.[6] The right to exclude is designed to increase appropriability and, consequently, the level of innovation in society.[7]

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[2] *See* Sherman Antitrust Act, 15 U.S.C. §§ 1-7 (1994) (prohibiting trusts in restraint of trade and monopolies); Patent Act of 1790, ch. 7, § 1, 1 Stat. 109 (codified as amended at 35 U.S.C. §§ 100-376 (1994)) (granting patents to inventors and discoverers of new and useful processes, machines, manufactures, or compositions of matter); *see also* WARD S. BOWMAN, JR., PATENT AND ANTITRUST LAW: A LEGAL AND ECONOMIC APPRAISAL 1 (1973) ("Both antitrust law and patent law have a common central economic goal: to maximize wealth by producing what consumers want at the lowest cost." (emphasis omitted)). For a discussion of the distinction between total welfare and consumer welfare, and an explanation of the superiority of total welfare to noneconomic objectives as the goal of the antitrust system, see Carrier, *supra* note 1, at 763-64 n.2.

[3] *See* Yochai Benkler, *A Political Economy of the Public Domain: Markets in Information Goods versus the Marketplace of Ideas*, *in* EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 270-71 n.9 (Rochelle Cooper Dreyfuss et al. eds., 2001) [hereinafter EXPANDING BOUNDARIES]; DONALD S. CHISUM ET AL., PRINCIPLES OF PATENT LAW 58-59 (1998); Tracy R. Lewis & Dennis A. Yao, *Some Reflections on the Antitrust Treatment of Intellectual Property*, 63 ANTITRUST L.J. 603, 606 (1995).

[4] *See* CHISUM ET AL., PRINCIPLES OF PATENT LAW, *supra* note 3, at 59; Nancy T. Gallini & Michael J. Trebilcock, *Intellectual Property Rights and Competition Policy: A Framework for the Analysis of Economic and Legal Issues*, *in* COMPETITION POLICY AND INTELLECTUAL PROPERTY RIGHTS IN THE KNOWLEDGE-BASED ECONOMY 17 (Robert D. Anderson & Nancy T. Gallini eds., 1998) [hereinafter Gallini & Trebilcock].

[5] Kenneth W. Dam, *The Economic Underpinnings of Patent Law*, 23 J. LEGAL. STUD. 247, 247 (1994).

The very exclusion that forms the foundation of the patent system nonetheless may be punished under the antitrust laws. The antitrust laws scrutinize activity that restricts competition on the presumption that competition leads to lower prices, higher output, and more innovation, and that certain agreements between competitors or conduct by monopolists prevents consumers from enjoying these benefits.[8] Because, for example, monopolists lack the constraints provided by competitive markets, they often reduce output, raise prices, limit innovation (so as not to introduce products that might dislodge their market position), or fail to allocate resources to the uses most highly valued by consumers.[9]

Similarly, agreements between patentees and licensees restrict competition *by their very operation*. For example, patentees may impose quantity restrictions, royalty payments, grantbacks,[10] territorial restrictions,[11] or field of use restrictions[12] on licensees. Most of these

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6 *See* F. M. SCHERER & DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 622 (3d ed. 1990).

7 The justification advanced in the text is the standard "utilitarian" justification that most courts and commentators have articulated and that the Constitution contemplates. *See* U.S. CONST. art. I, § 8, cl. 8 (granting Congress the power "[t]o 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"); *see also, e.g.*, SCHERER, *supra* note 6, at 621-24 (discussing the logic of granting protection from competition with patents). Other less-frequently voiced potential justifications for the intellectual property system (though not the patent system) include the "moral rights" approach, *see* Martin A. Roeder, *The Doctrine of Moral Right: A Study in the Law of Artists, Authors, and Creators*, 53 HARV. L. REV. 554, 557 (1940) (describing a creative act as an extension of an individual's identity); the related "natural rights" approach, *see* JOHN LOCKE, TWO TREATISES OF GOVERNMENT (Peter Laskett ed., Cambridge Univ. Press 1988) (1690) (stating that individuals are entitled to the fruits of their labor, as long as others are not worse off as a result of the privatization); and the "personhood perspective," *see* Margaret Jane Radin, *Property and Personhood*, 34 STAN. L. REV. 957, 957 (1982) (stating that an individual needs control over resources in the external environment that take the form of property rights).

8 *See* BOWMAN, *supra* note 2, at 1; William F. Baxter, *Legal Restrictions on Exploitation of the Patent Monopoly: An Economic Analysis*, 76 YALE L.J. 267, 305 (1966).

9 *See* BOWMAN, *supra* note 2, at 1; HAL R. VARIAN, INTERMEDIATE MICROECONOMICS: A MODERN APPROACH 420-24 (5th ed. 1999); Baxter, *supra* note 8, at 305; *but see* JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM, AND DEMOCRACY (3d ed. 1950).

10 Grantbacks are arrangements by which a licensee agrees to extend to the licensor of intellectual property the right to use the licensee's improvements to the licensed technology. *See* United States Department of Justice & Federal Trade Commission, *Antitrust Guidelines for the Licensing of Intellectual Property* ¶ 5.6 (Apr. 9, 1995) [hereinafter *Guidelines*].

agreements (at a minimum, those with exclusive provisions) limit the amount of competition that would otherwise occur in the market. On a larger scale, several patentees could share their patents in a "patent pool" that excludes competitors or that jointly sets royalties for patents contained in the pool.[13] Patents also could form the basis for a more permanent combination of the participants' market power through joint ventures and mergers.

This broad range of activities may make perfect sense from the standpoint of dispersing or exploiting the patented innovation. Patentees may not be the most efficient actors to exploit their invention, or their patents may block the products of other patentees, thus necessitating cross-licenses or patent pools. The danger is that the greater need for cooperation and coordination from the perspective of the patent system often will trigger the heightened suspicion of the antitrust authorities.[14]

Courts have offered an array of analyses when confronted with patent-based activity. And even those courts that have recognized the procompetitive benefits of the patent system have made no attempt to determine the degree of deference that would be appropriate. Approaches that they have adopted include[15]:

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[11] The patent statute permits the exclusive licensing of a patent to "the whole or any specified part of the United States." 35 U.S.C. § 261 (1994).

[12] Such a restriction limits the licensee's use of the patented invention to one or more specified fields. *See, e.g.*, General Talking Pictures Corp. v. Western Elec. Co., 304 U.S. 175, 179-82 (1938).

[13] *See Guidelines* ¶ 5.5; *infra* Subsection III.E.2.b.

[14] The systems also differ in (1) their divergent focal points (with intellectual property emphasizing quality and investment while antitrust looks to quantity and price) and (2) the timing of review, where "the optimal IP policy generally is optimal in expectation (ex ante)," as contrasted with the antitrust system, "which is optimal in every case (ex post)." Jonathan D. Putnam, *Intellectual Property and Competition Policies* 5 (2002) (emphases omitted) (on file with author).

[15] Commentators have offered additional approaches that have not resolved the patent-antitrust intersection. For a critique of the most sophisticated of the approaches, offered by William Baxter, Ward Bowman, and Louis Kaplow, see Carrier, *supra* note 1, at 795-800.

- Antitrust immunity for patent-based activity unless the challenged conduct involves tying patented and unpatented products, fraudulently obtaining a patent, or engaging in sham litigation[16]

- Immunity for activity taken within – and punishment for activity outside – the "scope" of the patent[17]

- A presumption that a monopolist's reliance on its intellectual property-protected products is lawful but can be rebutted based on evidence of pretext[18]

- Acceptance (by the government agencies) of patent pools for which the involved patents are complements, and challenges to pools composed of substitute patents[19]

- Challenges to royalty-free licenses in industries containing blocking patents and where parties deny access to previously available technology[20]

- Punishment of a party's modification that improves the original product but that leads to less compatibility with complementary assets produced by competitors[21]

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[16] In re Independent Serv. Org. Antitrust Litig. ("Xerox"), 203 F.3d 1322 (Fed. Cir. 2000); *see also* Townshend v. Rockwell International Corp., 2000 U.S. Dist. LEXIS 5070, at *26 (N.D. Cal. Mar. 28, 2000) ("Because a patent owner has the legal right to refuse to license his or her patent on any terms, the existence of a predicate condition to a license agreement cannot violate the antitrust laws.").

[17] *See, e.g.*, Zenith Radio Corp. v. Hazeltine Research, Inc., 395 U.S. 100, 136 (1969); Ethyl Gasoline Corp. v. United States, 309 U.S. 436, 456 (1940); Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502, 510 (1917); *Xerox*, 203 F.3d 1322; United States v. Studiengesellschaft Kohle, m.b.h., 670 F.2d 1122, 1135 (D.C. Cir. 1981); United States v. Westinghouse Electric Corp., 648 F.2d 642, 647 (9th Cir. 1981); SCM Corp. v. Xerox Corp., 645 F.2d 1195, 1206 (2d Cir. 1981).

For a critique of the test based on the scope of the patent, see Carrier, *supra* note 1, at 788-91 (contending that test elevates patent over antitrust, ignores industry-specific variations in achieving welfare, begs the question of what conduct lies within the scope of the patent, and can be used to rationalize particular market definitions).

[18] Image Technical Services, Inc. v. Eastman Kodak Co. ("Kodak II"), 125 F.3d 1195 (9th Cir. 1997). For a critique of analysis based on a party's subjective intent, see Carrier, *supra* note 1, at 793-94 (contending that intent tests prove too much in antitrust law since the purpose of competition is to defeat one's competitors, that this result is particularly dangerous in penalizing a defendant for its intention in refusing to deal when the purpose of the patent laws is to exclude others from the patented product, and that numerous obstacles lie in the path of determining a company's intent).

[19] *See* Letter from Joel I. Klein to Gerrard R. Beeney (Dec. 16, 1998), *available at* http://www.usdoj.gov/atr/public/busreview/2121.htm (Sony DVD pool); Letter from Joel I. Klein to Gerrard R. Beeney (June 26, 1997), *available at* http://www.usdoj.gov/atr/public/busreview/1170.htm (MPEG-2 pool); *In re Summit Technology, Inc. and VISX, Inc.*, FTC Dkt. No. 9286, *available at* http://www.ftc.gov/os/1998/9803/summit.cmp.htm (eye surgery laser pool).

[20] Intel Corp., FTC Dkt. No. 9288 (June 8, 1998).

- Failure to accord any deference to intellectual property.[22]

Most of these approaches have not promoted the purposes underlying the patent and antitrust laws. Some – like antitrust immunity and deference to activities occurring within the scope of the patent – defer excessively to the patentee. Others – focusing on the defendant's intent, the reason for product improvements, and the effect on competitors – do not sufficiently recognize the purposes of the patent system.

The antitrust enforcement agencies' treatment of patent pools, in their focus on the relationship between the involved patents, promises a more nuanced analysis. How can the foundation of this approach be extrapolated to the entirety of antitrust conduct? More generally, how should antitrust courts consider patent-based activity? The first step in the creation of a new approach, which is developed in the next Part, involves the selection of a common denominator that allows courts to compare the patent and antitrust laws.

## II. The Common Denominator of Innovation

Courts generally have pursued disparate objectives for the patent and antitrust systems, focusing on innovation as the goal of the patent system while emphasizing price or output effects under antitrust law. What the patent-antitrust intersection calls for is a common denominator – a means by which courts can weigh antitrust against patent on a new scale with equivalent

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[21] C.R. Bard, Inc. v. M3 Systems, Inc., 157 F.3d 1340, 1382 (Fed. Cir. 1998). The *Bard* court dismissed the defendant's argument that the change constituted an improvement, instead emphasizing subjective evidence – that the "real reasons" for the modification were to harm competitors. *Id.*

[22] United States v. Microsoft, 253 F.3d 34, 63 (D.C. Cir. 2001) (dismissing "as frivolous" Microsoft's copyright argument and stating that "intellectual property rights do not confer a privilege to violate the antitrust laws").

measures on both sides. I have elsewhere proposed innovation as this common denominator.[23] This Article provides an abridged version of the argument.

Innovation is the goal of the patent laws and one of several important (and becoming ever more so) goals of the antitrust laws. Innovation consists of the search for and the discovery, development, improvement, adoption, and commercialization of new processes, products, and organizational structures and procedures.[24] Innovation thus differs from invention in including not just the initial discovery or the creation of potential new products or processes,[25] but also their subsequent development and commercialization.

The patent system and competition are two primary catalysts to innovation.[26] Not surprisingly, innovation is at least a critical objective of both the patent and antitrust laws.[27]

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[23] *See* Carrier, *supra* note 1, at 800-15.

[24] Thomas M. Jorde & David J. Teece, *Innovation, Cooperation, and Antitrust*, *in* ANTITRUST, INNOVATION, AND COMPETITIVENESS 48 (Thomas M. Jorde & David J. Teece eds., 1992); *see also* C.T. TAYLOR & Z.A. SILBERSTON, THE ECONOMIC IMPACT OF THE PATENT SYSTEM: A STUDY OF THE BRITISH EXPERIENCE 27 (1973) (innovation refers to the "process of converting inventions into full-scale productive operations").

[25] *See* TAYLOR & SILBERSTON, *supra* note 24, at 27.

[26] Innovation typically requires the presence of other factors, such as

> the availability of a labor force with the requisite technical skills; decentralized economic structures that permit considerable autonomy and entrepreneurship; economic systems that permit and encourage a variety of approaches to technological and market opportunities; access to "venture" capital . . . ; good relationships between the scientific community . . . and the technological community, and between users and developers of technology.

Thomas M. Jorde & David J. Teece, *Introduction*, in ANTITRUST, INNOVATION, AND COMPETITIVENESS, *supra* note 24, at 6.

[27] Despite the different routes the patent and antitrust laws take to achieve innovation, the end result is the same: new and improved products and processes. These types of advances are consistent with both the statutory requirements of the patent system and competition-based incentives such as the race to arrive first in a market.

### A. Patent laws

Ever since the Framers of the Constitution authorized Congress to "promote Progress in the useful Arts,"[28] invention and innovation have been the primary goals of the patent laws.[29] The first patent statute enacted by Congress, the Patent Act of 1790,[30] offered "the sole and exclusive right and liberty of making, constructing, using and vending"[31] an invention to anyone who "invented or discovered any useful art, manufacture, engine, machine, or device, or any improvement therein not before known or used"[32] that the patent board considered "sufficiently useful and important."[33] The inventor also was required to provide "a specification in writing . . . [that shall] distinguish the invention or discovery from other things before known and used, [and] also to enable . . . [someone] skilled in the art or manufacture . . . to make, construct, or use the [invention]."[34] The Patent Act of 1793[35] offered defenses against claims of patent infringement in circumstances in which the patentee did not contribute to innovation – *i.e.*, where

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28 U.S. CONST. art. I, § 8, cl. 8.

29 *See* Baxter, *supra* note 8, at 312; Richard Gilbert & Carl Shapiro, *Optimal Patent Length and Breadth*, 21 RAND J. ECON. 106, 106 (1990); E. Thomas Sullivan, *The Confluence of Antitrust and Intellectual Property at the New Century*, 1 MINN. INTELL. PROP. REV. 1, 1 (2000). Even if the system is viewed more as rewarding the initial invention than the subsequent commercialization of the product, *see* Robert P. Merges, *Commercial Success and Patent Standards: Economic Perspectives on Innovation*, 76 CAL. L. REV. 803 (1988), this distinction is not significant for our purposes, since inventors typically will consider innovation to be the closely-related (and desired) successor to invention. *See, e.g.*, R. NELSON & S. WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE 263 (1982) (firms consider both business and technical risks in pursuing research and development).

30 Patent Act of 1790 § 1, Ch. 7, 1 Stat. 109 (Apr. 10, 1790).

31 *Id*.

32 *Id*.

33 *Id*.

34 *Id.* § 2.

35 Patent Act of 1793, Ch. 11, 1 Stat. 318 (Feb. 21, 1793).

the invention "was not originally discovered by the patentee, but had been in use, or had been described in some public work anterior to the supposed discovery of the patentee."[36]

Throughout the past two centuries, the patent system's requirements of novelty, usefulness, nonobviousness, and disclosure have played critical roles in fostering innovation. The requirement of novelty ensures that the invention is not "known or used by others."[37] The prerequisite of utility guarantees that the product is useful.[38] Nonobviousness ensures that the invention actually contributes to technological progress, since the subject matter of the patent must not be "obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains."[39] Finally, the inventor must describe the invention so that a person skilled in the art could make and use it, thereby disseminating to the public the benefits of the invention.[40] Each of these requirements ensures that the patent system cultivates innovation – that future inventors learn how the patented product was discovered, and that new, useful, and nonobvious products are invented, developed, and brought to market.[41]

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36 *Id.*

37 *See* 35 U.S.C. § 102 (1994).

38 *See* 35 U.S.C. § 101 (1994) ("Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.").

39 *See* 35 U.S.C. § 103(a) (Supp. 2000).

40 *See* 35 U.S.C. § 112 (1994) ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.").

41 For a discussion of how the legislative history of the patent statutes and courts' decisions confirm the centrality of innovation to the patent system, see Carrier, *supra* note 1, at 805-06 & 806-07 n.201.

## B. Antitrust laws

In contrast to the patent laws, there is no universally accepted goal animating the antitrust laws. Fostering innovation, nonetheless, is one important objective, which is becoming ever more critical in the "new economy" of the twenty-first century.

### 1. Statutes/legislative history

The text of the Sherman Act fails to provide guidance on the role of innovation – or in fact, any other efficiency or noneconomic factor – as a goal of the antitrust laws.[42] Section 1 outlaws "every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade."[43] Section 2 prohibits parties from "monopoliz[ing], [] attempt[ing] to monopolize, or combin[ing] or conspir[ing] . . . to monopolize"[44] any part of interstate or foreign commerce. Section 7 of the Clayton Act prohibits a merger or acquisition whose effect "may be substantially

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[42] The constitutional grant of authority for the antitrust laws is the Commerce Clause. *See* U.S. CONST. art. I, § 8, cl. 3; City of Lafayette v. Louisiana Power & Light Co., 435 U.S. 389, 398 (1978); Atlantic Cleaners & Dyers v. United States, 286 U.S. 427, 434 (1932).

[43] 15 U.S.C. § 1 (Supp. 1997). In full, Section 1 provides:

> Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations, is hereby declared to be illegal. Every person who shall make any contract or engage in any combination or conspiracy hereby declared to be illegal shall be deemed guilty of a felony, and, on conviction thereof, shall be punished by fine not exceeding $10,000,000 if a corporation, or, if any other person, $350,000, or by imprisonment not exceeding three years, or by both said punishments, in the discretion of the court.

[44] 15 U.S.C. § 2 (Supp. 1997). Section 2 states:

> Every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall be deemed guilty of a felony, and, on conviction thereof, shall be punished by fine not exceeding $10,000,000 if a corporation, or, if any other person, $350,000, or by imprisonment not exceeding three years, or by both said punishments, in the discretion of the court.

to lessen competition, or tend to create a monopoly."[45] The vague language of the statutes does not shed light on the objectives thereby to be served.

Nor does the legislative history prove insightful, as it reveals support for several potential goals: consumer welfare, the protection of small businesses, the process of competition, and economic fairness.[46] The one issue on which the legislative history of the Sherman Act is crystal clear is Congress's intention that the courts would play the primary role in the development of antitrust jurisprudence. Courts were to turn to the "old and well recognized principles of the common law"[47] in fleshing out gaps in the Sherman Act.[48] The indeterminacy of the text and

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[45] 15 U.S.C. § 18 (Supp. 1997). Section 7 provides:

> No person engaged in commerce or in any activity affecting commerce shall acquire, directly or indirectly, the whole or any part of the stock or other share capital and no person subject to the jurisdiction of the Federal Trade Commission shall acquire the whole or any part of the assets of another person engaged also in commerce or in any activity affecting commerce, where in any line of commerce or in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly.

Other somewhat-less-relevant provisions are Section 3 of the Clayton Act, which prohibits exclusive dealing and tying agreements where the effect of such agreements "may be to substantially lessen competition or tend to create a monopoly in any line of commerce," 15 U.S.C. § 14, and Section 5 of the Federal Trade Commission Act, which protects against "[u]nfair methods of competition." 15 U.S.C. § 45. This Article will not focus directly on these provisions, which do not play a significant role in the patent-antitrust intersection.

[46] *See* Robert H. Bork, *The Role of Courts in Applying Economics*, 54 ANTITRUST L.J. 21 (1985) ("In looking to the legislative history, one discerns repeated concern for the welfare of consumers and also for the welfare of small businesses and for various other values – a potpourri of other values. So far as I'm aware, Congress, in enacting these statutes, never faced the problem of what to do when values come into conflict in specific cases.").

The legislative history of the Clayton Act provides a more unified theme: the fear of the "rising tide of economic concentration in the American economy." Brown Shoe Co. v. United States, 370 U.S. 294 (1962); *see also* Derek Bok, *Section 7 of the Clayton Act and the Merging of Law and Economics*, 74 HARV. L. REV. 226, 234 (1960) (discussing the "singleness of mind with which most proponents of the bill defended their handiwork"). Nonetheless, the paucity of remarks addressing the effects of concentration on price, innovation, and efficiency renders the legislative history unhelpful, particularly in ascertaining the intended role of innovation. *See id.* at 237.

[47] 21 CONG. REC. 2456 (1890) (statement of Sen. Sherman); *see also id.* at 2457 ("It is the unlawful combination, tested by the rules of common law and human experience, that is aimed at by this bill, and not the lawful and useful combination."); *id.* at 3152 (statement of Sen. Hoar) ("The great thing that this bill does . . . is to extend the common-law principles, which protected fair competition in trade in old times in England, to international and interstate commerce in the United States."); *id.* at 3149 (statement of Sen. Morgan) (noting the use in the debate of "common-law terms" and "common-law definitions").

legislative history, together with Congress's delegation to the courts[49] of the authority to develop antitrust jurisprudence and courts' full-fledged utilization of that delegation, requires analysis of the caselaw in determining the propriety of innovation as an objective of the antitrust laws.

2. Antitrust jurisprudence and economic efficiencies

Throughout the past century, courts have played a versatile role in developing antitrust law, which "has demonstrated tremendous flexibility and has been highly responsive to changes in economic thinking and policy."[50] The courts have loosely interpreted antitrust statutes and have treated antitrust legislation as "organic,"[51] allowing economic theory to inform the development of the law.[52] While the modes of analysis (and attention given to economic reasoning[53]) have varied throughout the period, the goal of maximizing economic efficiency[54]

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[48] *See also id*. at 2460 (statement of Sen. Sherman) ("I admit that it is difficult to define in legal language the precise line between lawful and unlawful combinations. This must be left for the courts to determine in each particular case. All that we, as lawmakers, can do is to declare general principles, and we can be assured that the courts will apply them so as to carry out the meaning of the law, as the courts of England and the United States have done for centuries."); *see also id*. at 2456 (statement of Sen. Sherman) (the courts "will distinguish between lawful combinations in aid of production and unlawful combinations to prevent competition and in restraint of trade"); *id*. at 4089 (statement of Rep. Culberson) ("Now, just what contracts, what combinations in the form of trusts, or what conspiracies will be in restraint of the trade or commerce mentioned in the bill will not be known until the courts have construed and interpreted this provision.").

[49] *See* National Soc'y of Prof'l Eng'rs v. United States, 435 U.S. 679, 688 (1978) ("The legislative history makes it perfectly clear that [Congress] expected the courts to give shape to the [Sherman Act's] broad mandate by drawing on common-law tradition.") (footnote omitted); McNally v. United States, 483 U.S. 350, 372-73 (1987) (Stevens, J., dissenting) ("Statutes like the Sherman Act . . . were written in broad general language on the understanding that the courts would have wide latitude in construing them to achieve the remedial purposes that Congress had identified. The wide open spaces in statutes such as these are most appropriately interpreted as implicit delegations of authority to the courts to fill in the gaps in the common-law tradition of case-by-case adjudication."); William F. Baxter, *Separation of Powers, Prosecutorial Discretion, and the "Common Law" Nature of Antitrust Law*, 60 TEX. L. REV. 661, 663 (1982) ("By adopting a common-law approach [to antitrust law], Congress in effect delegated much of its lawmaking power to the judicial branch.").

[50] Peter J. Hammer, *Antitrust Beyond Competition: Market Failures, Total Welfare, and the Challenge of Intramarket Second-Best Tradeoffs*, 98 MICH. L. REV. 849, 907 (2000).

[51] *Id*. at 913. For a compilation of commentators embracing such an approach, see *id*. at 906 n.151.

[52] *Id*.

has been the nearly unanimously accepted goal for at least the past two decades. Courts today begin and end their antitrust examination with economic analysis.[55]

Of the economic efficiencies, courts have focused primarily on allocative efficiency – the optimal allocation of goods and services to consumers, typically through equating price with marginal cost – and thus have analyzed the effect of challenged practices on price or output in the relevant markets. But courts also have analyzed innovative efficiencies.[56] In *United States v. United Shoe Machinery Corp.*,[57] for example, the court explained that the antitrust laws permit "the process of invention and innovation . . . [as conduct] which a competitive society must foster."[58] Courts have upheld under Section 2 monopolists' alterations of products that affect complementary products,[59] introductions of new products that have the effect of injuring

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53 Economic objectives were one goal before the 1970s, but not to the exclusion of noneconomic factors. *See, e.g.*, United States v. Topco Assocs., Inc., 405 U.S. 596, 610 (1972); United States v. Von's Grocery Co., 384 U.S. 270, 278 & n.14 (1966); United States v. Philadelphia Nat'l Bank, 374 U.S. 321, 360 n.37 (1963); Klor's, Inc. v. Broadway-Hale Stores, Inc., 359 U.S. 207, 213 (1959); Fashion Originators' Guild v. Federal Trade Comm'n, 312 U.S. 457, 465-66 (1941).

54 Economic efficiencies are "decision[s] or event[s] that increase[] the total value of all economically measurable assets in the society or total wealth." Joseph F. Brodley, *The Economic Goals of Antitrust: Efficiency, Consumer Welfare, and Technological Progress*, 62 N.Y.U. L. REV. 1020, 1025 (1987).

Antitrust courts have considered three types of efficiencies: (1) allocative efficiency, which refers to the allocation of goods and services to buyers who value them most, (2) productive efficiency, which denotes the production of goods in the most cost-effective manner, and (3) innovative efficiency, which signifies gains through the invention, development, and diffusion of new products and production processes that increase social wealth. *See id*. (citation omitted); PHILLIP AREEDA & LOUIS KAPLOW, ANTITRUST ANALYSIS 7 (5th ed. 1997).

55 *See, e.g.*, State Oil Co. v. Khan, 522 U.S. 3 (1997); Brooke Group, Ltd. v. Brown & Williamson Tobacco Corp., 509 U.S. 209 (1993); Business Elecs. Corp. v. Sharp Elecs. Corp., 485 U.S. 717 (1988).

56 *See, e.g.*, John J. Flynn, *Antitrust Policy, Innovation Efficiencies, and the Suppression of Technology*, 66 ANTITRUST L.J. 487, 497 (1998) ("[I]nnovation and production efficiencies have in fact been a central concern of antitrust policy since the beginning, and have been a principal reason for instituting some of antitrust's most doctrinally significant and successful cases.").

57 110 F. Supp. 295 (D. Mass. 1953), *aff'd per curiam*, 347 U.S. 521 (1954).

58 *Id*. at 344.

59 *See, e.g.*, Berkey Photo, Inc. v. Eastman Kodak Co., 603 F.2d 263, 286 (2d Cir. 1979) ("it would be difficult to fault Kodak for attempting to design a [new] film that could provide better results" than the old film); *but see C.R. Bard*, 157 F.3d 1340.

competitors,[60] and failures to "predisclose" their products to competitors.[61] Even the district court in the *Microsoft* case declared a Section 2 violation on the grounds that Microsoft's acts "trammeled the competitive process through which the computer software industry generally stimulates innovation and conduces to the optimum benefit of consumers."[62] Finally, innovation efficiencies and "innovation markets" have played a role in merger analysis.[63]

In determining the relative significance of various types of efficiencies, the findings of economists obviously are essential. The consensus among economists since Schumpeter[64] is that the gains achieved from innovative efficiencies dwarf those derived from maximizing allocative

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[60] *See, e.g.*, California Computer Prods. v. IBM, 613 F.2d 727, 744 (9th Cir. 1979) (IBM could "redesign its products to make them more attractive to buyers . . . [It] need not have . . . constricted its product development so as to facilitate sales of rival products."); ILC Peripherals Leasing Corp. v. IBM, 458 F. Supp. 423, 440-41 (N.D. Cal. 1978) (upholding modification by IBM of a plug device as a justifiable innovation even though it prevented the operation of interfaces with competitors' peripheral devices), *aff'd sub nom.*, Memorex Corp. v. IBM, 636 F.2d 1188 (9th Cir. 1980).

[61] *See, e.g.*, *Berkey Photo*, 603 F.2d at 281 ("If a firm that has engaged in the risks and expenses of research and development were required in all circumstances to share with its rivals the benefits of those endeavors, this incentive [to innovate] would very likely be vitiated. Withholding from others advance knowledge of one's new products, therefore, ordinarily constitutes valid competitive conduct.").

[62] United States v. Microsoft Corp., 87 F. Supp. 2d 30, 44 (D.D.C. 2000) ("Microsoft Conclusions of Law"), *aff'd in part and rev'd in part*, 253 F.3d 34 (D.C. Cir. 2001); *see also* United States v. Microsoft Corp., 147 F.3d 935, 948 (D.C. Cir. 1998) ("any dampening of technological innovation would be at cross-purposes with antitrust law"); United States v. Microsoft Corp., 84 F. Supp. 2d 9, 69 (D.D.C. 2000) ("Microsoft Findings of Fact") (Microsoft "stifled innovation" by computer manufacturers); *id*. at 111-12 (actions Microsoft took against Netscape "hobbled a form of innovation that had shown the potential to depress the applications barrier to entry sufficiently to enable other firms to compete effectively against Microsoft in the market for Intel-compatible PC operating systems"); *id*. at 112 (Microsoft restricted innovation by making it more difficult for developers to write cross-platform Java applications).

[63] *See, e.g.*, Federal Trade Comm. v. H.J. Heinz Co. & Milnot Holding Corp., 246 F.3d 708, 723 (D.C. Cir. 2001) (rejecting claim of Heinz and Beech-Nut, firms with the second and third highest market shares in the market for baby food, that the merger was necessary to enable them to launch new products to compete with market leader Gerber because they lack a sufficient shelf presence and product volume in retail stores). "Innovation markets" consist of "research and development directed to particular new or improved goods or processes, and the close substitutes for that research and development. The close substitutes are research and development efforts, technologies, and goods that significantly constrain the exercise of market power with respect to the relevant research and development." *Guidelines* ¶ 3.2.3. *See infra* notes 286-88 and accompanying text.

[64] SCHUMPETER, *supra* note 9 (innovation leads to greater improvements in consumer welfare than competitive pricing).

efficiency, and that innovation is the most important factor in the growth of the economy.[65] Economic studies have revealed that at least 50 percent of the increase in U.S. output from the late 1920s to the late 1960s was due solely to technological and scientific progress[66] and that declines in innovation contributed to a reduction in the growth of business-sector productivity by roughly 65 percent from the 1947-73 to the 1973-87 periods.[67] In contrast, the loss from monopolistic pricing is substantially less than one percent of the gross national product.[68]

Buttressing these conclusions, innovation is more important than ever in today's high-tech economy. The currency of the economy today is new information and new technologies, not lower prices. Fierce competition often is accompanied by major paradigm shifts that "cause incumbents' positions to be completely overturned."[69] And the tools that courts have

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[65] *See, e.g.*, Phillip Areeda, *Antitrust Law as Industrial Policy: Should Judges and Juries Make It?*, *in* ANTITRUST, INNOVATION, AND COMPETITIVENESS, *supra* note 24, at 31 ("At least since Schumpeter wrote nearly fifty years ago, innovation has been thought to contribute far more to our well-being than keeping prices closer to costs through competition."); Brodley, *Economic Goals of Antitrust*, *supra* note 54, at 1026 ("Innovation efficiency or technological progress is the single most important factor in the growth of real output in the United States and the rest of the industrialized world."); Frank H. Easterbrook, *Ignorance and Antitrust*, *in* ANTITRUST, INNOVATION, AND COMPETITIVENESS, *supra* note 24, at 122-23 ("An antitrust policy that reduced prices by 5 percent today at the expense of reducing by 1 percent the annual rate at which innovation lowers the costs of production would be a calamity."); F. M. Scherer, *Antitrust, Efficiency, and Progress*, 62 N.Y.U. L. REV. 998, 1011 (1987) (productive efficiency is "much more important quantitatively" than allocative efficiency and long-run technological efficiency "is almost surely even more important"); Donald F. Turner, *Basic Principles in Formulating Antitrust and Misuse Constraints on the Exploitation of Intellectual Property Rights*, 53 ANTITRUST L. J. 485, 485 (1985) (citation omitted) (in the long run, technological progress "contributes far more to consumer welfare than does the elimination of allocative inefficiencies caused by non-competitive pricing").

[66] EDWARD F. DENISON, ACCOUNTING FOR U.S. ECONOMIC GROWTH, 1929-1969, at 131-37 (1974). *See also* Thomas M. Jorde & David J. Teece, *Rule of Reason Analysis of Horizontal Arrangements: Agreements Designed to Advance Innovation and Commercialize Technology*, at http://www.ftc.gov/opp/global/jorde2.htm(last visited Jan. 15, 2002) [hereinafter Jorde & Teece, *Rule of Reason Analysis*]. If anything, the percentage of economic growth resulting from innovation has increased in the past generation.

[67] ECONOMIC REPORT OF THE PRESIDENT, H.R. DOC. NO. 100-154, at 300 (1988). Moreover, the impact of innovation on consumer welfare likely is understated by productivity statistics due to difficulties in measuring the superiority of new consumer goods. *See* SCHERER, *supra* note 6, at 614.

[68] EDWARD F. DENISON, THE SOURCES OF ECONOMIC GROWTH IN THE UNITED STATES AND THE ALTERNATIVES BEFORE US 194, 199 (1962).

[69] David J. Teece & Mary Coleman, *The Meaning of Monopoly: Antitrust Analysis in High-Tech Industries*, 1998 ANTITRUST BULL. 801, 804; *see also* David S. Evans, *Antitrust and the New Economy*, SF63 ALI-ABA 41, 52

traditionally applied to analyze allocative efficiency – such as comparing price with the marginal cost of producing the item – will often not be helpful today. New-economy firms usually have high fixed costs, because of significant research and development ("R&D") investments or the need to invest in networks, but low marginal costs, because the cost of producing an additional unit is insignificant.[70] Today's firms innovate on the belief that the (at least temporary) market power they foresee will allow them to charge prices exceeding marginal costs enough to compensate them for their high fixed costs.[71]

In short, the text and legislative history of the Sherman Act are indeterminate on the goals of antitrust law,[72] but the legislative history reveals that Congress intended that the courts would play the primary role in developing antitrust jurisprudence. For at least the past generation, courts have emphasized economic efficiencies to the exclusion of noneconomic objectives. And because innovation contributes more to economic growth than any other type of efficiency, positing it as the goal of the antitrust laws is well-supported.

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(2000) (in the initial race, new economy companies "invest heavily to develop a product that creates a new category"; in subsequent races, firms "invest heavily to displace the leader by leapfrogging the leader's technology"); Richard A. Posner, *Antitrust in the New Economy*, SF63 ALI-ABA 115, 121 (2000) [hereinafter Posner, *New Economy*] (noting that network monopolists "do not seem particularly secure against competition" because of very high rates of innovation, large amounts of investment capital, and the rapidity with which electronic networks can be activated).

[70] *See* Evans, *supra* note 69, at 49. Similarly, much of the intellectual property at the heart of the new economy has significant fixed costs but de minimis marginal costs, as the cost of creating the product is high but the cost of making an additional copy of the product is trivial. *See* Posner, *New Economy*, *supra* note 69, at 118.

[71] *See* Evans, *supra* note 69, at 55; *see also* KEVIN G. RIVETTE & DAVID KLINE, REMBRANDTS IN THE ATTIC: UNLOCKING THE HIDDEN VALUE OF PATENTS 1-2 (2000) ("The old industrial era has been supplanted by a new knowledge-based economy in which ideas and innovation rather than land or natural resources have become the principal wellsprings of economic growth and competitive business advantage.").

[72] Again, even though the objectives of the Clayton Act are more apparent, the role to be played by innovation is not. *See supra* note 46.

## III. The New Justification Based on Tripartite Innovation

The selection of innovation as the primary objective of the two systems removes one hurdle confronting the reconciliation of the patent and antitrust laws. The next question is more complex. How should courts factor into the antitrust equation patent-based activity[73] that promotes innovation? The first subinquiry involves the stage of analysis where such consideration is to take place.

With the exception of per se analysis (which applies to activity that generally[74] has only an anticompetitive effect), all antitrust proceedings involve the consideration of the anticompetitive and procompetitive effects of the relevant practice. Typical anticompetitive effects include an increase in price, a reduction in output, or diminished innovation.[75] Examining the patent-based justifications for the challenged activity is not relevant to this inquiry. The justifications often will explain the effects, as increased price or decreased output are the expected consequences of the patent system, whose right to exclude allows patentees to

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[73] As a preliminary matter, in order to receive deference, the challenged activity must actually be based on a valid patent. Such activity would not encompass patents obtained by fraud or the filing of sham litigation. *See* Walker Process Equip., Inc. v. Food Machinery & Chemical Corp., 382 U.S. 172 (1965); Handgards, Inc. v. Ethicon, Inc., 601 F.2d 986 (9th Cir. 1979).

Also not included would be activity that transparently is a cover for horizontal price fixing, market allocation, or collusion. Such illegal activity could take place through horizontal market division agreements among competitors (such as settlement agreements between manufacturers of branded pharmaceuticals and generics), output or price restraints implemented through patent pools, vertical price restrictions imposed at the behest of powerful dealers, or standard-setting organizations that facilitate collusion or raise price. *See* HERBERT HOVENKAMP ET AL., IP AND ANTITRUST: AN ANALYSIS OF ANTITRUST PRINCIPLES APPLIED TO INTELLECTUAL PROPERTY LAW § 24.2a, at 24-19, § 33.2, at 33-10 to 33-12, § 34.4b, at 34-20 to 34-21, § 35.2a, at 35-8 to 35-9 (2002). Of course, this caveat will only cover activity for which the transparency is apparent, that is, activity for which the *only* use of the patent is to hide naked anticompetitive agreements. It is not to be applied where it appears that the anticompetitive effects of the arrangement outweigh the procompetitive effects.

[74] "Tying" offenses, though often per se in name, receive more complex treatment in actual analysis. *See* Eastman Kodak Co. v. Image Technical Servs., Inc., 504 U.S. 451, 461-62 (1992) (describing the elements of a tying claim as including (1) two separate products, (2) coercion, (3) market power in the tying product market, and (4) a not insubstantial amount of commerce in the tied product market); Fortner Enter., Inc. v. U.S. Steel Corp., 394 U.S. 495, 498-99 (1969).

raise price and reduce output in order to recover their initial expenditures. But even an explanation of the anticompetitive effects cannot affect their existence or chart their magnitude. In other words, the amount by which price increases or output decreases (or innovation is reduced) constitutes the anticompetitive effect and is not informed by the purposes of the patent system or the need for the challenged activity.

The patent-based nature of the defendant's activity can best be analyzed at the stage of the defendant's justifications for the conduct.[76] Like the other justifications recognized by courts, reliance on a patent typically will explain the existence of, and provide a reason for, the anticompetitive effect. Acknowledged justifications include limiting free-riding,[77] encouraging dealer investment,[78] fostering market penetration,[79] allowing a new product to be developed,[80] fostering quality,[81] and advancing other procompetitive objectives.[82] In the context of

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75 *See supra* notes 8-13 and accompanying text.

76 To be clear, activity that is a cover for horizontal collusion will not receive deference as a patent-based justification. For example, courts have applied per se treatment to settlement agreements between manufacturers of branded drugs and generics, activity that represents "an agreement between horizontal competitors to minimize generic competition" and to allocate the market for a pharmaceutical to the branded drug manufacturer. *In re* Cardizem CD Antitrust Litigation, 105 F. Supp. 2d 682, 699 (E.D. Mich. 2000); *see also In re* Terazosin Hydrochloride Antitrust Litigation, 164 F. Supp. 2d 1340, 1348-49 (S.D. Fla. 2000) (generic drug manufacturers "forswore competing with" branded drug manufacturer "and promised to take steps to forestall others from entering that market for the life of their respective agreements in exchange for millions of dollars in monthly or quarterly payments").

77 *See, e.g.*, SCFC ILC, Inc. v. Visa USA, Inc., 36 F.3d 958, 969, 972 (10th Cir. 1994); Western Trails, Inc. v. Camp Coast to Coast, Inc., Civ. A. No. 90-2063 (HHG), 1994 WL 773361 (D.D.C. Jun. 16, 1994); Gemini Concerts, Inc. v. Triple-A Baseball Club Assocs., 664 F. Supp. 24, 27 (D. Me. 1987); Net Realty Holding Trust v. Franconia Properties, Inc., No. 82-0318-A, 1983 WL 1786, at *7 (E.D. Va. Jan. 20, 1983).

78 *See, e.g.*, New York v. Anheuser-Busch, Inc., 811 F. Supp. 848, 876 (E.D.N.Y. 1993).

79 *See, e.g.*, Newberry v. Washington Post Co., 438 F. Supp. 470, 475 (D.D.C. 1977).

80 *See, e.g.*, Broadcast Music, Inc. v. Columbia Broadcasting System ("BMI"), 441 U.S. 1 (1979); National Bancard Corp. v. Visa U.S.A., Inc., 779 F.2d 592, 605 (11th Cir. 1986); Southtrust Corp. v. Plus Sys., Inc., 913 F. Supp. 1517, 1524 (N.D. Ala. 1995); National Bank of Canada v. Interbank Card Ass'n, 507 F. Supp. 1113, 1123 (S.D.N.Y. 1980).

81 *See, e.g.*, Smith v. NCAA, 139 F.3d 180, 187 (3d Cir. 1998); Servicetrends, Inc. v. Siemens Med. Sys., Inc., 870 F. Supp. 1042, 1066 (N.D. Ga. 1994); Robinson v. Magovern, 521 F. Supp. 842, 919 (W.D. Pa. 1981).

intellectual property, the federal antitrust enforcement agencies have recognized that licensing "can facilitate integration of the licensed property with complementary factors of production," which "can lead to more efficient exploitation of the intellectual property."[83] In particular, cross-licensing and patent pools may "integrat[e] complementary technologies, reduc[e] transaction costs, clear[] blocking positions, [] avoid[] costly infringement litigation, . . . and promot[e] the dissemination of technology."[84]

Because of either the importance of the patent system in promoting innovation in certain industries or the danger of patents in forestalling innovation in other settings, the defendant that relies on its patented product typically will have an innovation-based justification for the conduct. In certain industries, such as biotechnology, pharmaceuticals, and chemicals, patents are the critical catalyst to innovation.[85] Patent-based activity in these industries should count as a procompetitive justification in order to encourage innovation. But even in other industries, such as computer software and hardware, the Internet, and semiconductors, where factors such as network effects and first-mover advantages are more important than patents in achieving innovation, patent-based collaboration will frequently be helpful for other reasons, such as circumventing patent bottlenecks. The clearing of patent roadblocks in these situations allows innovation to proceed.

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82 *See, e.g.*, Grappone, Inc. v. Subaru, 858 F.2d 792, 799 (1st Cir. 1998) (preventing parts shortages); Northeastern Educ. Television v. Educational Television Ass'n, 758 F. Supp. 1568, 1578 (N.D. Ohio 1990) (increasing diversity of output); Net Realty Holding Trust v. Franconia Properties, Inc., No. 82-0318-A, 1983 WL 1786, at *8 (E.D. Va. Jan. 20, 1983) (promoting comparison shopping); Jetro Cash and Carry Enters., Inc. v. Food Distrib. Ctr., 569 F. Supp. 1404, 1416 (E.D. Pa. 1983) (same); Gunter Harz Sports, Inc. v. United States Tennis Ass'n, 511 F. Supp. 1103, 1117 (D. Neb. 1981) (preserving integrity of game).

83 *Guidelines* ¶ 2.3.

84 *Id.* ¶ 5.5.

85 *See infra* notes 111-19 and accompanying text.

Because of the overriding importance of innovation for economic growth, the most crucial justification a defendant can offer is that the challenged activity promotes innovation. Other justifications are legitimate, of course, but none can be as important as the one that is tied to the greatest effect on economic growth and that promotes the purposes of not only the antitrust but also the patent system. Nonetheless, more than the defendant's claim that the activity promotes innovation is necessary. The next Section forges the required link by which the challenged activity is tied to innovation.[86]

### A. Reasonable Necessity

Not every activity based on a patent automatically promotes innovation. One can imagine, for example, competitors forming a patent pool and contributing primarily patents that are market substitutes, thereby limiting competition that would have occurred in the absence of the pool without any countervailing benefit. Or a patentee might license its product only on the condition that the licensee refuses to deal with its competitors or purchases nonpatented products from the patentee. Or a patentee could utilize territorial divisions that restrict where unpatented goods can be produced[87] or could enter into settlement agreements that only have the effect of restricting competition.[88] The range of potential activities that are nominally based on a patent

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[86] The requirement of a link should not diminish the incentives underlying innovation. The only activity that will not be entitled to deference will be patent-based conduct that is not reasonably necessary for innovation, a finite category that does not play a significant role in promoting the purposes of the patent system. The numerous examples offered in this Article of activity that is reasonably necessary to promote innovation will cabin the universe of actions that will not be analogous to covered protected activity and will not receive deference. Moreover, to the extent that parties adjust or justify their conduct in response to courts' analysis, the modification of conduct to promote innovation (or at least the justification of it in those terms) would have a salutary effect. Of course, a chilling effect theoretically could result from potential antitrust liability for patentees, but such an (unlikely) effect is the inevitable consequence of allowing the antitrust laws to play a role where patented products are involved.

[87] *See* HOVENKAMP ET AL., *supra* note 73, § 33.6b.

[88] *See infra* note 128 and accompanying text.

but that do not promote innovation recommends the demonstration of a link between the activity and innovation in order for the defendant to claim the innovation-based justification.[89]

This link must have teeth. "Plausible" justifications for which a post hoc rationale could be unearthed after the fact will not suffice. At a low enough level of scrutiny, any activity remotely related to a patent would satisfy a test of plausibility.[90] The combination of a plausible rationale with the range of possible activities related to the patent system would lead to immunity for an overwhelming array of activity.

On the other hand, the nexus cannot be impossible to prove, as a matter of theory or practice. One variant of such a test would require the activity to be "absolutely necessary" or "essential" to achieve innovation. The multiplicity and variety of possible business practices preclude a confident conclusion that any particular activity is required for innovation. The path between a firm's activity and innovation cannot be laid out with mathematical precision, and there may be many ways (for example, merger, joint venture, patent pool, or license) to achieve innovation. Therefore, the requirement of absolute necessity is too strict to constitute the link.

Another variant, although less foreboding in theory, is not in reality. The less-restrictive-alternatives analysis innocuously asks whether "a reasonable, less restrictive alternative to the

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[89] The more such activity resembles a naked price-fixing or market-allocation scheme, the more likely it is not patent-based activity. *See supra* note 73. But where such conduct is less axiomatically a cover for horizontal conspiracies, a fuller analysis will be necessary.

Of course, certain activity is expressly authorized by the patent laws. *See, e.g.*, 35 U.S.C. § 261 (1994) (a patentee may "grant and convey an exclusive right under his application for patent, or patents, to the whole or any specified part of the United States"). But allowing such an authorization as an absolute defense to the antitrust laws would leave no legitimate role for antitrust to play in the attainment of innovation. Rather, such an authorization should be considered, but should not distract from the ultimate focus, which targets the link between the activity and the attainment of innovation.

[90] *Cf.* Ronald A. Cass & Keith N. Hylton, *Antitrust Intent*, 74 S. CAL. L. REV. 657, 677 (2001) (noting that "[p]lausible efficiency justifications are, after all, easy to generate" and that the test for specific intent to undermine

[defendant's restraint] exists that would provide the same benefits as the . . . restraint."[91] Stated in this manner, who could be against such a test?

But for two primary reasons, courts cannot practically apply the test.[92] First, courts' focus turns naturally to whether less restrictive alternatives *exist*, rather than whether such alternatives would achieve all of the defendant's objectives. The former inquiry is possible, and given the benefits of hindsight, tempts courts to tweak the activity so it appears a little less restrictive.[93] The latter inquiry, in contrast, is unworkable. Who can know whether a different path could have led to the same result? Not firms that consider the broad array of business options and must suffer the consequences of the choice, and certainly not courts far removed from such real-world pressures. Speculation and hypothetical scenarios are the order of the day where the inquiry involves conjectural alternatives that cannot be tried, proved, or disproved.

Second, the search for less restrictive alternatives can always uncover such an option. For the only activity that does not have such an alternative is the least restrictive alternative. So, for example, a court can opine that a merger could have been replaced by a joint venture, that an exclusive license could have been replaced with a nonexclusive license, or that a substitute patent could have been left out of a patent pool. But such options may not be practical alternatives: a license might not occur in the absence of a merger, for example, because of transaction costs, strategic or irrational behavior, or divergent views about the value of

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competition "cannot be whether any plausible efficiency justification can be conceived; for if that were the test, defendants almost never would lose").

91 *E.g.*, Sullivan v. NFL, 34 F.3d 1091, 1103 (1st Cir. 1994); *see also, e.g.*, Los Angeles Memorial Coliseum Commission v. NFL, 726 F.2d 1381 (9th Cir. 1984).

92 For additional arguments against the less-restrictive-alternatives analysis, see Michael A. Carrier, *The Real Rule of Reason: Bridging the Disconnect*, 1999 B.Y.U. L. REV. 1265, 1336-38.

93 *See infra* note 94 and accompanying text.

improvements.[94] Again, the timing of the actors' decisions is telling: a company decides in advance whether a particular activity will achieve its objectives; a court looks backward after the fact and after the success (or lack) of the activity is apparent. But penalizing defendants for not using a less restrictive alternative – which, again, would be present in each case in which the defendant did not use the least restrictive alternative – is not appropriate. In short, the less-restrictive-alternatives analysis cannot effectively forge the link between the challenged activity and innovation.

A nexus that requires more than mere plausibility while not leading to stringent post hoc second guessing is reasonable necessity. *Reasonable* necessity ensures that the activity is needed for innovation, but not that it is *absolutely* required, a showing that would prove too difficult. Reasonableness connotes activity that is "not extreme or excessive" but rather "moderate or fair."[95] In other words, it asks whether the activity fairly or sensibly would be necessary to achieve innovation. Moreover, such a standard is workable, as courts have applied similar analysis in many other areas of law. They have, for example, looked to the reasonable person to set the standard for the duty of care in negligence actions,[96] to determine whether there has been a seizure under the Fourth Amendment,[97] and to ascertain whether a work has value for purposes of obscenity law,[98] among many other tests.[99] And in antitrust law, courts have successfully

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[94] *See* Mark A. Lemley, *roundtable discussion at* Hearings on Competition and IP Law (Feb. 25, 2002).

[95] Merriam-Webster's Collegiate Dictionary, *available at* http://www.m-w.com/cgi-bin/dictionary (last visited July 19, 2002).

[96] *See, e.g.*, Nelson v. Freeland, 507 S.E.2d 882, 883 (N.C. 1998) (reasonable person standard defines duty of care in negligence action).

[97] *See, e.g.*, United States v. Drayton, 122 S. Ct. 2105, 2110 (2002) (providing that Fourth Amendment seizure does not take place "[i]f a reasonable person would feel free to terminate the encounter").

applied the standard of whether the defendant's activity is reasonably necessary to achieve a procompetitive objective.[100]

*Necessity* is important to underscore the gravity of the link between the activity and innovation. Even though the inquiry involves reasonableness, the foundation is necessity: that the challenged activity is needed for innovation. "Reasonable link," "reasonable nexus," or "reasonably useful" does not provide the strength of connection provided by necessity. Although the adjective "reasonable" ensures a flexible analysis, the noun "necessity" forges a potent link between the activity and innovation.

The proposed test thus asks whether the activity is *reasonably necessary* to attain tripartite innovation. Having justified reasonable necessity, the Article next turns to *tripartite innovation*, with the following Section introducing its three temporal stages.

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98 *See, e.g.*, Ashcroft v. ACLU, 122 S. Ct. 1700, 1710 (2002) (relevant question in determining value of work for purposes of obscenity law includes "whether a reasonable person would find . . . value in the material, taken as a whole").

99 *See, e.g.*, Fed. R. Evid. 804(b)(3) (providing exception to hearsay rule for admission of a statement "which was at the time of its making so far contrary to the declarant's pecuniary or proprietary interest, or so far tended to subject the declarant to civil or criminal liability . . . that a reasonable person in the declarant's position would not have made the statement unless believing it to be true"); Harlow v. Fitzgerald, 457 U.S. 800, 818 (1982) ("government officials performing discretionary functions generally are shielded from liability for civil damages insofar as their conduct does not violate clearly established statutory or constitutional rights of which a reasonable person would have known"); Faragher v. City of Boca Raton, 524 U.S. 775, 787 (1998) ("to be actionable under [Title VII], a sexually objectionable environment must be both objectively and subjectively offensive, one that a reasonable person would find hostile or abusive, and one that the victim in fact did perceive to be so").

100 *See, e.g.*, SCFC ILC, Inc. v. Visa USA, Inc., 36 F.3d 958 (10th Cir. 1994); Broadcast Music, Inc. v. Moor-Law, Inc., 527 F. Supp. 758 (D. Del. 1981) (both courts finding restraints to be reasonably necessary where they created product that would not otherwise have been available); Newberry v. Washington Post Co., 438 F. Supp. 470 (D.D.C. 1977) (test met where restraint increased market penetration and improved service to customers); Gunter Harz Sports, Inc. v. United States Tennis Ass'n, 511 F. Supp. 1103 (D. Neb. 1981); Justice v. NCAA, 577 F. Supp. 356 (D. Ariz. 1983) (both courts finding test to be satisfied where agreement furthered professional or amateur athletic endeavors).

### B. Tripartite Innovation

Innovation occurs throughout time and at different stages in relation to a particular patent. The first stage precedes the patent, the second succeeds it, and the third takes place in the context of multiple patents.

The first stage involves the creation of the product. Absent the invention, development, and commercialization of the product, there is no innovation. This stage of innovation is most consistent with popular understandings of the term, traced all the way back to the first patent granted, for Samuel Hopkins' discovery of a method for making potash from wood soap.[101] Product creation is often difficult and expensive, and so firms may enter into collaborations for the purpose of facilitating such creation. Because this activity is the necessary first step in the path of innovation, it must be encouraged. Antitrust condemnation of such activity would threaten innovation and would plant hesitation into the mind of patentees who might refrain from entering into arrangements facilitating the creation of products.

The second stage involves the recovery of investment expended in creating the product. Through its provision of a right to exclude, the patent system offers to the patentee a twenty-year period in which it can recover its initial investment in the product by raising price, entering into licensing agreements, or otherwise exploiting its invention.[102] Accordingly, activities that do just

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[101] *See* ROBERT PATRICK MERGES, PATENT LAW AND POLICY: CASES AND MATERIALS 9 (2d ed. 1997). Potash is potassium carbonate, which was valuable in making glass and soap.

[102] Admittedly, a period lasting twenty years does not necessarily lead to "optimal" incentives for innovation. In fact, such an ideal system is beyond the reach of current economic theory. *See* F. Machlup, An Economic Review of the Patent System, Study No. 15 of the Subcomm. on Patents, Trademarks, and Copyrights of the Senate Comm. on the Judiciary, 85th Cong., 2d Sess. 65 (Comm. Print 1958) at 9-10 (noting that the reason for the length of patent terms "is probably more political than economic"); *id*. at 79-80 ("No economist, on the basis of present knowledge, could possibly state with certainty that the patent system, as it now operates, confers a net benefit or a net loss upon society."); J. JEWKES, D. SAWERS, & R. STILLERMAN, THE SOURCES OF INVENTION 253 (1958) ("It is almost impossible to conceive of any existing social institution so faulty in so many ways. It survives only because there

that – even though they might tempt antitrust scrutiny with their heightened prices or reduced output – constitute the second protected stage of innovation. It is important to recognize this second, less apparent stage of innovation so that a role for deference in the antitrust analysis is carved out for essential activity whose patent-related purpose might not otherwise be recognized.

The setting for the third stage is not the individual patent at issue but the overall path of innovation. In many industries, innovation is cumulative, with one generation's patented invention based on those of previous generations. In these cases, activity that encourages such post-patent innovation, such as licensing between the initial inventor and follow-on innovator, should be encouraged, since the path of innovation might not continue absent such agreement. Collaboration also could resolve "bottlenecks" by which patents block innovation in the same or later generations of products. For example, patent "thickets" in the semiconductor industry are made up of hundreds, if not thousands, of patents that read onto one product. In this setting, cross-licensing agreements and patent pools are necessary to resolve the bottlenecks and should be encouraged.

The test only requires that *one* of the three stages apply. Each stage is important to the path of innovation. Even if activity does not contribute to the other two stages, its critical role in creating a product, recovering investment, or circumventing bottlenecks is essential for innovation and should be encouraged. Moreover, the independence of the three stages and their different positions on the timeline of innovation frequently will result in only one of the stages being satisfied.

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seems to be nothing better."). Nonetheless, even if the shape of the optimal exclusion is uncertain, the concept of a patentee's recovery of its investment through exclusion still applies.

The next three Sections will examine each of these three stages of innovation, and will ascertain whether various activities are reasonably necessary to attain the innovation signified in the stages.

### C. Stage One: Product Creation

The first stage of innovation involves the creation of the patented product.[103] One straightforward example of activity that is reasonably necessary for this stage occurs where the product *could not have been created* absent the activity. For example, two small firms that do not have the capability for research and development on the scale necessary to discover a product can collaborate to pool their R&D resources or can merge.[104] In the biotechnology industry, for example, many mergers combine small firms that otherwise would not be able to create particular products.[105]

Similarly, where the activity makes it *significantly easier* to create the product, the test of reasonable necessity would be satisfied, as the material difference in the likelihood that the product would be created renders the activity reasonably necessary to create the product. Again turning to the field of biotechnology, no single entity can "build a sufficiently strong research base to cover all the therapeutic areas and technical advances,"[106] and, as a consequence, the participants in the field "have turned to all manner of joint ventures, research partnerships,

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[103] In referring to the creation of a "product," the reader should consider not just downstream commercialized products but also upstream research tools or even processes.

[104] *See* Robert P. Merges, *Antitrust Review of Patent Acquisitions: Property Rights, Firm Boundaries, and Organization*, *in* GALLINI & TREBILCOCK, *supra* note 4, at 124 (noting significant role played by intellectual property in joint ventures, "especially those with an R&D component").

[105] *See* Walter W. Powell, *Networks of Learning in Biotechnology: Opportunities and Constraints Associated with Relational Contracting in a Knowledge-Intensive Field*, *in* EXPANDING BOUNDARIES, *supra* note 3, at 263.

[106] *Id*. at 252.

strategic alliances, minority equity investments, and licensing arrangements to speed the process of drug development and to compensate for their lack of internal capabilities."[107] Significantly reducing the time to market is particularly critical in the pharmaceutical context, where new drugs "sometimes assume life-and-death importance."[108]

The test is not satisfied, however, where the activity only makes it *any easier* to create the product: savings and efficiencies can be found in nearly any collaboration, and this facilitation does not rise to the level of reasonable necessity.[109] So moderate synergies and savings resulting from the combination of two complementary research, production, or manufacturing facilities would not suffice. For example, even if savings resulting from mergers in the pharmaceutical

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[107] *Id.* at 253. The field consists of "product-focused companies work[ing] on recombinant protein therapeutics and small molecule therapeutics, as well as gene, antisense, and cell therapeutics" and "[t]echnology-focused companies offer[ing] such novel enabling methodologies as genomics, combinational chemistry, high-throughput screening, and bioinformatics." *Id.* at 252; *see also* Josh Lerner & Robert P. Merges, *The Control of Technology Alliances: An Empirical Analysis of the Biotechnology Industry*, XLVI J. INDUS. ECON. 125, 126 (1998) (because, in many cases, "young firms lack complementary assets such as sales forces and manufacturing know-how, which may take many years to develop[,] . . . small, research-intensive firms frequently rely on alliances with larger corporations"); David J. Mugford, *Licensing of Biotechnology: Introduction to the New Decade*, *in* TECHNOLOGY LICENSING AND LITIGATION 1990 at 431, 445 (P.L.I. Patents, Copyrights, Trademarks, and Literary Prop. Course, Handbook Series No. 287, 1990) ("[M]ore and more companies are voluntarily seeking codeveloping partners and joint venturers who 'bring something to the table,' e.g., marketing strength, development and regulatory expertise, etc., to share [high] development and regulatory costs.").

[108] Sheila F. Anthony, *Riddles and Lessons from the Prescription Drug Wars: Antitrust Implications of Certain Types of Agreements Involving Intellectual Property*, Remarks at the ABA "Antitrust and Intellectual Property: The Crossroads" Program (June 1, 2000).

Reasonable necessity applies not only to the invention, but also to the development and commercialization, of the product. In the pharmaceutical area, the most costly and time-consuming stage involves the downstream testing and development of a product whose molecular structure has already been discovered. *See infra* notes 113-18 and accompanying text. Collaborations that would bring products to market significantly faster should be found to be reasonably necessary for innovation.

[109] An alternative version of the test would lower the threshold of reasonable necessity, allowing the activity described in the text to suffice, while simultaneously reducing the significance in the overall antitrust analysis of a finding of reasonable necessity. This Article employs a higher threshold of reasonable necessity, which unequivocally ensures that the activity has a powerful innovation-based justification, one that deserves greater deference in the global antitrust analysis and, in particular, more weight in the calculus than adverse effects on price or output.

industry between firms with the highest market shares or the products closest to market may be a cognizable efficiency, they do not satisfy the test of reasonable necessity for innovation.[110]

The analysis of whether the activity is reasonably necessary for the creation of the product naturally takes place against the backdrop of the relevant industry. The difficulty and expense of creating products and, relatedly, the need for patents varies widely across industries. Certain industries require the expenditure of significant resources and time for the creation of the product. In the fields of pharmaceuticals, chemicals, biotechnology (at least for downstream innovation[111]), and agricultural products, the search for the next breakthrough can be prohibitive.[112]

Biopharmaceutical companies[113] often spend hundreds of millions of dollars and take ten to twelve years to bring new drugs to market.[114] These companies must pass through multiple

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110 *See infra* notes 129-36 and accompanying text.

111 *See infra* Subsection III.E.1.b.

112 *See* Richard C. Levin, Alvin K. Klevorick, Richard R. Nelson, & Sidney G. Winter, *Appropriating the Returns from Industrial Research and Development*, BROOKINGS PAPERS ON ECONOMIC ACTIVITY 809 (1987); W. KIP VISCUSI ET AL., ECONOMICS OF REGULATION AND ANTITRUST 831 (2d ed. 1995); FEDERAL TRADE COMMISSION, ANTICIPATING THE 21ST CENTURY: COMPETITION POLICY IN THE NEW HIGH-TECH, GLOBAL MARKETPLACE [hereinafter FTC REPORT ], Chapter 8 ("Intellectual Property and Antitrust Policy for New Technologies") at 6; SCHERER AND ROSS, *supra* note 6, at 627.

113 As the biotechnology and pharmaceutical industries have converged in recent years, they have often been collectively referred to as the biopharmaceutical industry.

114 *See* PHARM. RESEARCH AND MFRS. OF AM. (PHRMA), PHARMACEUTICAL INDUSTRY PROFILE 2001, at ch. 9, *at* http://www.phrma.org/publications/publications/profile01/chapter9.phtml (2002) ("On average, it takes 14.2 years and costs $500 million to develop a new medicine."); Rebecca S. Eisenberg, *Bargaining Over the Transfer of Proprietary Research Tools: Is this Market Failing or Emerging?*, *in* EXPANDING BOUNDARIES, *supra* note 3, at 253 (it costs $175 to $300 million to develop a new biotechnology medicine and $300 to $500 million to develop a new pharmaceutical drug); Joan Hamilton, *Biotech: An Industry Crowded with Players Faces an Ugly Reckoning*, BUSINESS WEEK, Sept. 26, 1994, at 84, 87.

Due to recent and potential future advances, conclusions relating to the biopharmaceutical industry may need to be revisited. For example, the cost of locating a gene fragment of unknown function is now an insignificant – estimated by one CEO of a bioinformatics company to be one percent – part of the cost of determining its function. *See* Arti K. Rai, *The Information Revolution Reaches Pharmaceuticals: Balancing Innovation Incentives, Cost, and Access in the Post-Genomics Era*, 2001 ILL. L. REV. 173, 192 n.88 [hereinafter Rai, *Information*

stages of innovation, such as discovering the relevant molecules with therapeutic effects, undertaking thorough clinical testing, undergoing significant FDA review, and developing, manufacturing, and marketing the drug.[115] Only one out of every four thousand discovered compounds tested in industry laboratories passes through each of the stages and reaches the marketplace.[116] Moreover, biopharmaceutical products "arise out of living systems, and are typically intended to interact with other human or non-human living systems,"[117] with the result that the functionality of biotechnology products "is always unforeseeable, and always involves a high degree of uncertainty and risk."[118] Similarly, R&D for new chemical products is uncertain and subject to much experimentation, since it is difficult to predict the exact chemical structure that will achieve a given end and since there often are unanticipated effects of using a new chemical substance in a particular way.[119]

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*Revolution*]. Even the more difficult commercialization stage might be simplified in the future by an expanded application of information technology to genome data (*i.e.*, genomics). *See id*. at 174-75.

115 Rai, *Information Revolution*, *supra* note 114, at 181 (noting that prescription drug manufacturers must provide preclinical testing on animals, file a drug application with the FDA, undertake three stages of clinical/human testing, and undergo final FDA review); Daniel Rodriguez, *Decisions of Pharmaceutical Firms for New Product Development*, at 19 (Sept. 14, 1998) (on file with author); SCHERER AND ROSS, *supra* note 6, at 626; TAYLOR & SILBERSTON, *supra* note 24, at 231 (concluding, based on a study of the importance of patents in Great Britain in the 1960s, that "[t]he pharmaceutical industry stands alone in the extent of its involvement with the patent system"); W. KIP VISCUSI ET AL., ECONOMICS OF REGULATION AND ANTITRUST 848 (3d ed. 2000) (after completion of the three testing stages, application is filed that covers clinical trials of more than 3,000 patients and that contains 90,000 pages; after two and a half more years, FDA gives its decision).

116 Alan M. Fisch, *Compulsory Licensing of Pharmaceutical Patents: An Unreasonable Solution to an Unfortunate Problem*, 34 JURIMETRICS J. 295, 303 (1994).

117 Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific?* 57 (2001) (copy on file with author).

118 *Id.* Burk and Lemley reference the Centocor sepsis antibody, a "highly promising biotechnology treatment" that "succeeded in passing many years of costly trials" but failed in the final phase of FDA approval. *Id.* at 57 n.174.

119 Robert P. Merges & Richard R. Nelson, *Market Structure and Technical Advance: The Role of Patent Scope Decisions*, *in* ANTITRUST, INNOVATION, AND COMPETITIVENESS, *supra* note 24, at 209 [hereinafter Merges & Nelson, *Market Structure*]. Again, this uncertainty applies to the chemical compounds in the pharmaceutical area. *See supra* notes 113-18 and accompanying text; TAYLOR & SILBERSTON, *supra* note 24, at 252.

On the other hand, the creation of products is not as difficult in many industries. Internet business methods – as symbolized in Amazon's "one-click"[120] patent – are usually simple ideas easily conceived.[121] Products are relatively easy to create in the civilian aircraft, semiconductor, office equipment, motor vehicles, rubber products, textiles, primary metals, instruments, food, printing/publishing, steel, and electric components industries.[122] In these industries, in which firms do not consider patents to be effective appropriability mechanisms,[123] there is a reduced likelihood of firms needing to enter into arrangements to create products.

Therefore, in the biopharmaceutical, chemical, and agricultural products industries, courts should be more likely to find that the challenged activity is reasonably necessary to create the product. Because it is so difficult to create products, more collaboration is to be expected and is needed for innovation. The biotechnology field, again, is characterized by a broad array

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120 Stated most simply, "one-click ordering" involves the server system "remembering" information from the client system such as the customer's address and credit card number, and automatically recalling the information during the customer's subsequent order. *See* U.S. Patent No. 5,960,411 (issued Sept. 28, 1999); Linda R. Cohen & Roger G. Noll, *Intellectual Property, Antitrust, and the New Economy*, 62 PITT. L. REV. 453, 468 (2001).

121 In fact, many such methods had already been utilized outside the Internet before being patented.

122 *See* Wesley M. Cohen et al., Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not) Table 1 (Nat'l Bureau of Econ. Research, Working Paper No. 7552, 2000); J. R. TILTON, INTERNATIONAL DIFFUSION OF TECHNOLOGY: THE CASE OF SEMICONDUCTORS (1971); Richard C. Levin, *The Semiconductor Industry*, *in* GOVERNMENT AND TECHNOLOGICAL PROGRESS: A CROSS-INDUSTRY ANALYSIS (1982); A. PHILLIPS, TECHNOLOGY AND MARKET STRUCTURE: A STUDY OF THE AIRCRAFT INDUSTRY (1971).

123 *See, e.g.*, Cohen et al., *supra* note 122, at 10 (managers consider secrecy and lead time to be two most effective appropriability mechanisms); Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 1987 BROOKINGS PAPERS ON ECON. ACTIVITY 793, 796 (survey demonstrated that managers in only the chemical and petroleum refining industries believed that process patents were important, and managers in only the chemical and steel mills industries thought that product patents were important, in their companies' R&D); Merges & Nelson, *Market Structure*, *supra* note 119, at 217 ("in most industries advantages associated with a head start, including establishment of production and distribution facilities, and moving rapidly down a learning curve, were judged significantly more effective than patents in enabling a firm to reap returns from innovation"); F. M. Scherer, *First-Mover Advantages from Pioneering New Markets: Comment*, 9 REV. INDUS. ORG. 173, 175 (1994) (in most corporations' R&D decisions, patents played "a minor role" and "the necessity of maintaining competitive leadership" and "profits resulting from customer belief in the company's technological leadership" were more critical).

of collaborations[124] with fluid arrangements among participants and competitors on one project becoming partners on another.[125] The result is an innovating field, with "external alliances accelerat[ing] the pace of drug discovery far more rapidly than a company establishing research capabilities solely in-house."[126] At a minimum, it would be much more difficult to create products in the biopharmaceutical industry absent collaboration.[127]

That is not to say that *every* collaboration in these industries would satisfy the test. For example, settlements between manufacturers of brand-name pharamaceuticals and makers of generics by which the former pay the latter to delay entering the market would not be reasonably necessary for innovation.[128] Moreover, courts should skeptically view combinations (especially

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[124] *See supra* notes 105-07 and accompanying text; *see also* Rai, *supra* note 114, at 817-18 (discussing vertical integration, strategic alliances, and mergers). The high frequency of unsuccessful projects has led to difficulty in the biotechnology industry in attracting investment, further justifying the need for collaboration. *See* Josh Lerner, *The Returns to Investments in Innovative Activities: An Overview and an Analysis of the Software Industry* (Harv. Bus. School & NBER, Working Paper draft, 1998) (copy on file with author); *see also* John M. Golden, *Biotechnology, Technology Policy, and Patentability: Natural Products and Invention in the American System*, 50 EMORY L.J. 101, 167-72 (2001) (describing purpose of patent system as means of attracting investment capital for small biotechnology companies).

[125] Powell, *supra* note 105, at 259 ("the playing field resembles less a horse race and more a rugby match, in which the players frequently change their uniforms").

[126] *Id*. at 266. Licensing is typical in the industry, with biotechnology companies using the activity to receive funding, to "improve credibility and create public recognition in advance of [an] IPO[, and to] access expertise needed for clinical testing, regulatory approval and marketing," and pharmaceutical companies licensing to receive income, unblock cross-licenses, avoid litigation, and because the product does not fit with the firm's marketing focus. Diane Furman, *Pharmaceutical and Biotechnology Licensing and the Patent/Regulatory Background*, *in* TECHNOLOGY LICENSING AND LITIGATION 1998: PROTECTING YOUR CLIENTS' RIGHTS 7, 23-24 (P.L.I. Patents, Copyrights, Trademarks, and Literary Prop. Course, Handbook Series No. 514, 1998). *See supra* notes 105-07 and accompanying text.

[127] An example of collaboration necessary for product creation involved Lilly and Sepracor. Lilly, the manufacturer of the drug Prozac, sought an exclusive license from Sepracor for the rights to a follow-on and allegedly superior product to Prozac. As former FTC Chairman Pitofsky explained: "It was uncertain whether the follow-on drug would be approved by the FDA, how soon it would come to market, whether and to what extent Lilly's patent on Prozac would have blocked marketing of the follow-on drug, and whether it represented a meaningful advance over Prozac." Robert Pitofsky, *Antitrust and Intellectual Property: Unresolved Issues at the Heart of the New Economy*, 16 BERK. TECH. L.J. 535, 552 (2001). Further, Prozac faced other competitors, there was a range of generic manufacturers ready to challenge Prozac when it went off patent, and "Lilly's distribution resources and scientific expertise made it likely that Lilly would bring this new drug to the market much more promptly than would otherwise be the case." *Id.*

mergers) between the only two (or two of only a few) firms in the market for certain products or technologies, especially where such firms likely would create the product or technology in the near future even absent the merger. Such a view conforms to the enforcement agencies' actions in imposing conditions on merging parties[129] that possessed significant market power in highly concentrated markets and that were expected shortly to bring their product to market, namely the mergers between Glaxo and Wellcome,[130] Upjohn and Pharmacia,[131] Baxter and Immuno,[132]

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[128] Such settlements have occurred under the Drug Price Competition and Patent Term Restoration Act of 1984 (commonly known as the Hatch-Waxman Act Amendments), which provides expedited Food and Drug Administration ("FDA") approval for generic drugs. *See* II ABA SECTION OF ANTITRUST LAW, ANTITRUST LAW DEVELOPMENTS (FIFTH) 1085-86 (2002). Under the Act, the generic challenger receives the right to market its version of the drug without competition from other generics, and the brand-name manufacturer can obtain a 30-month stay on FDA approval of the generic drug by filing an infringement action against the potential generic entrant. *Id.* at 1086.

For example, Abbott paid Geneva $4.5 million per month (significantly more than the $1 to $1.5 million Geneva expected from entering the market) to delay entering the market for terazosin hydrochloride, which treats hypertension and benign prostatic hyperplasia (enlarged prostate). *See* David A. Balto, *Pharmaceutical Patent Settlements: The Antitrust Risks*, 55 FOOD & DRUG L.J. 321, 332-33 (2000). The FTC also challenged Hoechst and Andrx, and Schering-Plough, Upsher-Smith, and American Home Products for similar types of agreements. *In re* Hoechst Marion Roussel, Inc., No. C-9293 (complaint), 2000 FTC LEXIS 16 (2000); *In re* Schering-Plough Corp., No. C-9297 (complaint), 2001 FTC LEXIS 39 (2001).

[129] Reasonable necessity is determined with respect to a particular challenged product. Of course, a merger between two competitors often will combine market power over a range of other products. Such an expansive consequence of the activity raises the likelihood of anticompetitive effects, and is considered below. *See infra* Section IV.C.

[130] *In re* Glaxo plc, 119 F.T.C. 815, 816-17 (1995) (imposing condition on merger between Glaxo plc and Wellcome plc requiring that Wellcome divest its worldwide R&D assets for noninjectable drugs where the two firms were the furthest along in developing an oral drug for migraine attacks and Glaxo would have had an incentive to reduce its R&D because the merged firm would not face competition to introduce an oral drug until a third firm completed the FDA approval process many years later); *see also* William J. Baer, *Antitrust Enforcement and High-Technology Markets*, Address Before the ABA Sections of Business Law, Litigation, and Tort and Insurance Practice (Nov. 12, 1998), *available at* http://www.ftc.gov/speeches/other/ipat6.htm; Press Release, *FTC, Glaxo To Settle FTC Charges, Will Divest Wellcome Assets To Consummate Merger* (Mar. 16, 1995), *available at* http://www.ftc.gov/opa/predawn/F95/glaxo-wellcome.htm.

[131] *In re* Upjohn Co., 121 F.T.C. 44, 46 (1996) (imposing condition on merger between Upjohn and Pharmacia requiring Pharmacia to divest its inhibitor drug for the treatment of colorectal cancer where the firms are "two of only a very small number of firms currently in the advanced stages of developing topoisomerase I inhibitors for the treatment of colorectal cancer" and where Upjohn's product was expected to be the first inhibitor on the market and Pharmacia planned to seek FDA approval within the next few years).

[132] *FTC Decision in Baxter/Immuno Acquisition To Preserve Competition in Two Markets for Plasma Products Ensuring Lower Prices for Consumers and Continued Research and Development*, 1996 WL 727106 (Dec. 19, 1996) (imposing condition on merger between Immuno International and Baxter International requiring Baxter to divest its Factor VIII inhibitor (which helps to overcome hemophiliacs' immune responses to treatment) and to

American Home Products and Cyanamid,[133] Ciba-Geigy and Sandoz,[134] and Pfizer and Warner-Lambert.[135] The recently-announced merger between Pfizer and Pharmacia, which would make the largest pharmaceutical company in the world (Pfizer) even larger also warrants scrutiny.[136]

On the other side, certain activity in industries in which it is not costly to create products might be found to be reasonably necessary to attain innovation. Small companies, or those with limited research and production capacities, will be more likely to need collaborative activity in

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license Immuno's fibrin sealant (products used to stop bleeding and to promote wound healing) where the firms "are the only two companies marketing products in the United States to treat hemophiliacs with Factor VIII inhibitors" and are "two of only a few companies seeking [FDA] approval to market fibrin sealants in the United States").

[133] *In re* American Home Products Corp., 119 F.T.C. 217 (1995) (imposing condition on merger between American Home Products ("AHP") and Cyanamid requiring AHP to divest its tetanus and diphtheria vaccine business because the firms were actual competitors in the "highly concentrated" markets of (1) the manufacture and sale of combined tetanus and diphtheria vaccine for use by adults and children at least seven years old; (2) the manufacture and sale of combined tetanus and diphtheria vaccine for children between the ages of seven months and two years; (3) the manufacture and sale of tetanus toxoid; and (4) the research and development of a Rotavirus vaccine; and that Cyanamid was an existing seller and AHP was a potential competitor in (5) the highly concentrated market for cytokines for white blood cell and platelet restoration. *Id.* at 219-20.

[134] *In re* Ciba-Geigy Ltd., No. 961-0055, 1996 F.T.C. LEXIS 701 (Dec. 15, 1996) (imposing condition on merger between Ciba-Geigy and Sandoz requiring licensing of package of gene therapy technology, know-how, and patent rights to third party where firms are "the two leading commercial developers of gene therapy products" and were "engaged in rival research, development and testing efforts that were [shortly] expected to yield significant improvements in the treatment of cancer and other diseases and medical conditions"); *see also* David A. Balto & James F. Mongoven, *Antitrust Enforcement in Pharmaceutical Industry Mergers*, 54 FOOD & DRUG L.J. 255, 268 (1999) ("The firms' combined position in gene therapy research was so dominant that other firms doing research in this area needed to enter into joint ventures, or contract with either Ciba-Geigy or Sandoz, to have any hope of commercializing their own research efforts.").

[135] *See* Pfizer, Inc. & Warner-Lambert Co., C-3957 (June 17, 2000) (merger would "increase . . . the likelihood that the merged entity would unilaterally delay, deter or eliminate competing programs to research and develop EGFr-tk inhibitors for the treatment of cancer, potentially reducing the number of drugs reaching the market and thus resulting in higher prices for consumers"), *cited in* Susan DeSanti & William Cohen, *Competition To Innovate: Strategies for Proper Antitrust Assessments*, *in* EXPANDING BOUNDARIES, *supra* note 3, at 330 n.75.

In the pharmaceutical industry, "a regulatory approval process limits the ability of late-comers to catch up with competitors already engaged in the R&D . . . [since] the FDA approval process requires a series of clinical trial periods, data collection and analysis from those clinical trials, and expenditures of significant resources over a period of many years," preventing an entrant from "'leap-frog[ging]' into the drug product market or significantly catching up with merging innovation efforts." *Id.* at 335.

[136] Even though the combined company would have twelve products having an annual revenue exceeding $1 billion (including Celebrex and Bextra (arthritis painkilling medications), Lipitor (cholesterol), Zoloft (depression), Viagra (sexual dysfunction), and Rogaine (baldness-treatment medication)), it would have few overlapping products and only an eleven percent market share. *See, e.g.*, Nicholas Kulish, *Pharmaceuticals Firms' Pact Raises Few*

order to create products. But the likelihood that activity is reasonably necessary to create a product in most industries will be significantly less than in the areas of biotechnology, pharmaceuticals, chemicals, and agricultural products.

In short, the activity at issue, capabilities and market positions of the participants, and relevant industry will inform the determination of whether the challenged action is reasonably necessary to create the product.

### D. Stage Two: Recovery of Investment

If innovation consisted of only the initial creation of the product, and patentees were able effortlessly to recover their investment in the product, then activities by which the patentee sought to exploit its creation would not be entitled to heightened deference. But such recovery often is far from certain. Although not as apparent as product creation, a patentee's recovery of its investment from the invention, development, and commercialization of the product is just as important since without the promise of such recovery, future innovation would be less likely.[137]

Moreover, it usually is more efficient for the patentee to enter into licensing agreements with parties that own complementary assets or capabilities.[138] As the Intellectual Property Guidelines explain, intellectual property "typically is one component among many in a production process" which "derives value from its combination with complementary factors [such as] manufacturing and distribution facilities, workforces, and other items of intellectual

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*Antitrust Concerns*, ASIAN WALL ST. J. A4 (July 17, 2002); Bill Brubaker, *Pfizer Buys Rival Pharmacia for $60 Billion; Top Drugmaker Does Not Expect Antitrust Problems*, WASH. POST E01 (July 16, 2002).

[137] *Cf.* Pamela Samuelson & Suzanne Scotchmer, *The Law and Economics of Reverse Engineering*, 111 YALE L.J. 1575, 1582 (2002) ("If technological advances transform reverse engineering so that it becomes a very cheap and rapid way to make a competing product, innovators may not be able to recoup their R&D expenses"); Teece & Coleman, *supra* note 69, at 824 ("It is the quest for profits that encourages innovation in the first place.").

property."[139] In order to realize the commercial value of the patent, the patentee must collaborate with others.[140] In particular, licensing "can facilitate integration of the licensed property with complementary factors of production," which "can lead to more efficient exploitation of the intellectual property, benefiting consumers through the reduction of costs and the introduction of new products."[141] These arrangements also "increas[e] the expected returns from intellectual property," thus "promot[ing] greater investment in research and development."[142]

A patentee has a broad range of licenses it can utilize, including customer, territorial, and field-of-use restrictions and various types of royalties.[143] Field-of-use and geographic restrictions allow the patentee to offer rights to licensees that are "presumably rights tailored to the licensee's strengths," a highly efficient "matching of complementary assets."[144] The restrictions also may "protect[] the licensee against free-riding on the licensee's investments by other licensees or by the licensor" or may "increase the licensor's incentive to license, for example, by protecting the licensor from competition in the licensor's own technology in a market niche that it prefers to keep to itself."[145]

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138 *See, e.g.*, Patrick Rey & Ralph A. Winter, *Exclusivity Restrictions and Intellectual Property*; Gallini & Trebilcock, *supra* note 4, at 168.

139 *Guidelines* ¶ 2.3.

140 *Id.*

141 *Id.*

142 *Id.* This exploitation also can take the form of refusals to license the patented product to competitors where the patentee licenses the product itself.

143 *See supra* notes 10-12 and accompanying text.

144 Carl Shapiro, *Competition Policy and Innovation*, STI Working Paper 19 (OECD 2002) (on file with author).

145 *Guidelines* ¶ 2.3.

In determining whether the challenged activity is reasonably necessary to recover investment, courts need not ascertain whether the particular agreement chosen constitutes the most efficient utilization of the patentee's product. Nor need the court determine if a royalty, for example, is precisely correlated with the patentee's recovery of investment. All that the court must decide is whether the license generally seems appropriate for allowing the patentee to exploit and distribute its product. If the licensee offers complementary capabilities or a wider dissemination of the product, for example, the activity typically will be reasonably necessary to recover the patentee's investment.

Where, on the other hand, the license seems to be a means for competitors with similar capabilities to restrict competition[146]; where exclusive licenses with suppliers allow firms to increase price by extraordinary (e.g., 3200 percent) amounts[147]; and where brand-name pharamaceutical companies (a) improperly list patents in the FDA's "Orange Book" (a summary of drugs and patents) shortly before the expiration of the patent term, (b) file infringement lawsuits against generic drug firms ready to enter the market, and (c) receive an automatic 30-month stay on FDA approval of the generic drug,[148] the license will not be reasonably necessary for innovation.

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[146] A leading treatise indicates that collusion between patentee and licensee is easiest when "(1) a relatively small number of equal and equally efficient firms, (2) collectively dominate a properly defined antitrust market, (3) which is protected by high entry barriers, and (4) make a fungible product, (5) which is sold under terms that are readily observable by others." HOVENKAMP ET AL., *supra* note 73, § 30.4, at 30-13.

[147] *See Mylan, Nation's Second Largest Generic Drug Maker, Charged with Restraint of Trade, Conspiracy & Monopolization* (Dec. 21, 1998) <http:// www.ftc.gov/opa/1998/9812/mylanpv.htm> (contending that effect of exclusive licenses with specialty chemical manufacturers for active pharmaceutical ingredients (chemicals that allow drug to affect body) "was to prevent any other generic drug manufacturer from using that supplier's API to sell that drug in the United States"); Federal Trade Comm'n v. Mylan Lab., Inc., No. 1:98CV03114 (TFH) ¶ 29 (D.D.C. amended complaint filed under seal Feb. 8, 1999) <http:// www.ftc.gov/os/1999/9902/mylanamencmp .htm> [hereinafter Mylan Complaint] (alleging that a 500-count bottle of 7.5 mg clorazepate tablets increased in price more than 3200 percent, from approximately $11.36 to $377.00).

[148] Theresa Agovino, *Drug Patents Get Attention of Regulators*, PITT. POST-GAZETTE, Jan. 24, 2002, at E4.

In industries in which the patented product is easy to invent around, courts should be particularly sensitive to the patentee's need to recover its investment. The faster that a competitor can invent around the patent, the faster a patentee will lose market share to substitute products and, consequently, the shorter the period in which the patentee can recover its investment.[149] In industries such as chemical structures, fabricated metals, food processing, and simple machinery, where innovations are easy to imitate,[150] the patentee should receive greater leeway in recovering its investment.

On the other hand, the more difficult reverse engineering and imitation is, as in complicated mechanical engineering industries such as aircraft, guided missiles, and complex industrial machinery,[151] the less necessary the patent is, and the more skeptical a court can be that the patentee needs assistance in recovering its investment. While the patentee still can contract with licensees that offer efficient dissemination of the product, a more searching scrutiny might question borderline transactions.

The second stage of innovation is related to the first. In industries in which the cost of creating the product is significant, courts should afford more leeway to patentees to recover that

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[149] *Cf.* Samuelson & Scotchmer, *supra* note 137, at 1587 (noting that a reverse engineer "will generally spend less time and money to discern th[e] know-how [required to construct the innovator's product] than the initial innovator spent in developing it, in part because the reverse engineer is able to avoid wasteful expenditures investigating approaches that do not work, and in part because advances in technology typically reduce the costs of rediscovery over time").

[150] *See, e.g.*, SCHERER AND ROSS, *supra* note 6, at 626; VISCUSI ET AL., *supra* note 115, at 851; TAYLOR & SILBERSTON, *supra* note 24, at 251; Richard C. Levin, *Patents in Perspective*, 53 ANTITRUST L.J. 519, 521 (1985).

For example, for chemical structures, bulk manufacture and formulation methods can readily be imitated after the correct compound and processes are established. As a result, certain generic pharmaceutical firms copy brand-name products as soon as the brand product's patent expires. *See* TAYLOR & SILBERSTON, *supra* note 24, at 252; VISCUSI ET AL., *supra* note 115, at 851; Burk & Lemley, *supra* note 117, at 58 (noting that generics wishing to imitate an innovator's drug "face substantially lower costs and uncertainty than do innovators" in the industry because they confront "a substantially more streamlined" process, with the most significant hurdle being the demonstration of bioequivalence to the innovator's drug).

cost. But there is an independent role for the second stage, in particular in allowing the patentee to recover its modest investment in industries where there are not significant costs to create the product.

In short, the second stage carves out a role for courts to consider activity necessary to recover investment, a category of activity that otherwise could be viewed suspiciously, unlinked from its role in the process of innovation.

### E. Stage Three: Circumventing Bottlenecks

The context of the third stage of innovation expands from the patented product to the multipatented path of innovation. Where multiple patented inputs make up a product or access to earlier generations of products is required for innovation, the presence of potential obstacles increases significantly. This Article refers to such holdups or obstacles as "bottlenecks."[152]

Bottlenecks can take one of two forms. The first occurs in industries marked by cumulative innovation, where each product generation builds on its predecessor. In these industries, the earlier inventor can create a bottleneck by refusing to license its product, which is the necessary building block for subsequent innovation. This Article refers to such a setting as a bottleneck between generations, or "intergenerational bottleneck." The second type of bottleneck occurs where one product contains multiple patented components. Here, a refusal by one of the patentholders to license its component part will prevent the invention from being

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151 *See* Levin, *supra* note 150, at 521.

152 The term "bottleneck" has been used in connection with the "essential facility" doctrine, by which a monopolist must share with competitors facilities that are essential to compete in the market. *See, e.g.*, United States v. Terminal Railroad Ass'n, 224 U.S. 383 (1912); Otter Tail Power Co. v. United States, 410 U.S. 366 (1973); MCI Communications Corp. v. AT&T, 708 F.2d 1081 (7th Cir. 1982). The Article selects this phrase – as opposed to, for example, "essential facility," which the elasticity of language and judicial interpretation has expanded beyond true essentiality – to emphasize the actual impasse that can result from blocking patents.

practiced. This holdup will be referred to as a bottleneck within a generation, or "intragenerational bottleneck."

1. Intergenerational bottlenecks

Intergenerational bottlenecks naturally are important in industries marked by cumulative innovation. This Section will provide an overview of cumulative innovation, offer an example of an intergenerational bottleneck from the field of biotechnology, and discuss activity that circumvents bottlenecks.

a) Cumulative innovation

Cumulative innovation proceeds in a sequential fashion, with innovators "build[ing] on each other's discoveries."[153] Industries marked by this type of innovation require nuanced analysis: the optimal breadth of patents is unclear, since stronger patent protection helps the initial innovator but hurts subsequent (or "follow on") innovators, and licensing is critical to keep the path of innovation flowing.[154]

Cumulative innovation occurs in two primary contexts. In the first, "basic" upstream research is the building block for downstream product applications. The basic research, which has no commercial value by itself, creates gateways – often referred to as enabling technologies

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153 *See* Suzanne Scotchmer, *Cumulative Innovation in Theory and Practice*, GSPP Working Paper (1999) (on file with author); *see also* Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 J. ECON. PERSPECTIVES 29 (1991).

Some industries will not encounter the problem of cumulative innovation, and thus, by definition, will not suffer intergenerational bottlenecks. The toy, consumer goods packaging, and power hand tool industries are examples of industries with discrete inventions. *See* Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 880 (1990). Products in these industries do not incorporate numerous interrelated components and are not integral components of a larger product or system.

154 *See* Scotchmer, *Standing on the Shoulders of Giants*, *supra* note 153.

or research tools – to products.[155] The second context involves lengthy sequences of products, each of which improves on its predecessor, which are known as "quality ladders."[156]

Cumulative innovation occurs in industries as diverse as automobiles, aircraft, biotechnology, semiconductors, computer hardware, and computer software.[157] Computer software, for example, can be viewed as "a series of inventions piled on top of each other."[158] Incremental improvement in computer programs offers several advantages: enhancing interoperability, rendering programs more stable, and responding to hardware-based architectural constraints in the industry.[159] The chemical industry has attributes of both the discrete and cumulative models, as the complex relationship between chemical structure and function precludes cumulative development, but processes are improved in a cumulative fashion.[160] And

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[155] Scotchmer, *Cumulative Innovation*, *supra* note 153, at 10. Scotchmer notes that some of the gateways lack substitutes (such as gene sequences allowing pharmaceutical firms to search for targeted drugs), and others do not (as in multiple methods to insert foreign genetic material into a germplasm). *Id.*

[156] *Id.* at 10, 13. Quality ladders have appeared in the computer hardware (286, 386, and 486 chips), software (spreadsheets and word processors), and biotechnology (bioengineered insulin) industries. *Id.* at 13.

[157] Bronwyn H. Hall & Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995*, 32 RAND J. ECON. 101, 102 (2001); Jorde & Teece, *Innovation, Cooperation, and Antitrust*, *supra* note 24, at 48; Levin et al., *supra* note 123, at 788; Scotchmer, *Cumulative Innovation*, *supra* note 153, at 1. Also, molecular biologists consistently have relied on a technique for inserting genes into bacteria developed in the early 1970s, and drugs like insulin and antibiotics have been improved through successive innovations. *See* Scotchmer, *supra* note 153, at 29.

[158] FTC REPORT , *supra* note 112, Chapter 8, at 18; Scotchmer, *supra* note 153, at 29. Bessen and Maskin demonstrate that because of the sequential and complementary nature of innovation in the software industry, patent protection has reduced innovation and social welfare. They substantiate their hypotheses with observations of cross-licensing in the computer and semiconductor industries, the positive relationship between innovation and firm entry, and the correlation between the extension of patent protection to software in the 1980s and a relative decline in R&D activity. *See* James Bessen & Eric Maskin, *Sequential Innovation, Patents, and Imitation* (MIT, Working Paper No. 00-01, 2000).

[159] Burk & Lemley, *supra* note 117, at 52.

[160] *See* Merges & Nelson, *supra* note 153, at 882-83.

science-based technologies (such as biotechnology, lasers, and superconductors) also emphasize cumulative development, with R&D efforts seeking to exploit recent scientific advances.[161]

Across the entirety of industries marked by cumulative innovation, intergenerational bottlenecks can block the path of innovation, with the latest product generation held hostage to its predecessor. Such holdups are the inevitable consequence of (1) the incremental fashion in which innovation proceeds in certain industries and (2) the patent system, which awards improvement patents to inventions that may be nonobvious to a person skilled in the relevant art but nonetheless cannot be practiced without infringing the earlier patent.[162] The presence of bottlenecks in industries with cumulative innovation thus necessitates licensing between the initial and follow-on innovator.

Licensing is needed for both broad and narrow initial patents. Broad patents, in claiming an expansive scope of subject matter, constitute the traditional bottleneck covering the field and precluding subsequent breakthroughs in the absence of licensing. The lack of follow-on innovation in this context would have devastating consequences not only in obstructing the path of innovation, but also in discouraging future inventors, who would be less likely to innovate because they could not exploit the subsequent generation of invention.[163]

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161 *See id.* at 883.

162 *See* 35 U.S.C. § 103 ("A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."). Merges and Nelson describe the situation of blocking patents as one patentee having a broad, "dominant" patent on an invention and another having a narrower, "subservient" patent on an improved feature of the invention. Merges & Nelson, *supra* note 153, at 860-61. Neither of the patentees can practice their invention since, absent a license, the holder of the dominant patent cannot practice the improved feature claimed in the narrower patent, and the holder of the subservient patent cannot practice the invention. *Id.*; *see also* Gilbert Goller, *Competing, Complementary and Blocking Patents: Their Role in Determining Antitrust Violations in the Areas of Cross-Licensing, Patent Pooling and Package Licensing*, 50 J. PAT. OFF. SOC'Y 723, 723 (1968) ("A patent is 'blocked' if its production would infringe the broad claims of an unexpired prior basic patent.").

Licensing also may be needed where the initial generation of innovation is characterized by narrow patents. In these cases, the follow-on innovator might be reluctant to enter a field in which, because the initial patent does not cover a significant area, it often will compete with the earlier product. Here also, any lack of follow-on innovation would tend to discourage the initial innovator.[164] Finally, licensing can prevent the often-inefficient inventing around of the patented product, since a licensee gets the benefit of the labor that the patentee has undertaken and does not need to spend resources devising an alternative to the already-discovered protected product.[165]

The need for licensing, however, sometimes outpaces its use. As Mark Lemley has detailed, there are an array of reasons why efficient licensing might not occur: (1) the "significant" transaction costs of intellectual property licenses (which include difficult valuation, uncertain patent scope, the difficulty of measuring and monitoring contractual performance,[166] an ongoing relationship between the parties, and complex assignments of partial legal rights); (2) uncertainty, primarily (once again) over the difficulty of valuation[167] and scope of the patent[168];

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163 *See* Suzanne Scotchmer, *Competition Policy and Innovation: The Context of Cumulative Innovation, testimony presented at* U.S. Department of Justice & Federal Trade Commission Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy [hereinafter Hearings on Competition and IP Law] (Feb. 26, 2002); *see also* Merges & Nelson, *supra* note 153, at 908 (blockages resulted in broad patents on components in cumulative industries, particularly when a multicomponent system was involved).

164 *Id.*

165 *See* Scotchmer, *Cumulative Innovation*, *supra* note 153, at 15.

166 Deepak Somaya & David J. Teece, *Combining Multi-invention Products: Organizational Choices, Patents, and Public Policy* 22 (Dec. 4, 2000) (on file with author).

167 *See* Robert P. Merges, *Of Property Rules, Coase, and Intellectual Property*, 94 COLUM. L. REV. 2655, 2657-59 (1994).

168 The scope of the patent is unclear because of "drafting ambiguities, . . . the Doctrine of Equivalents, and . . . uncertainty about the validity of the patent." Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 1056 n.305 (1997).

(3) externalities; (4) strategic behavior; and (5) noneconomic (perhaps irrational) incentives.[169] These costs are particularly severe given the immense uncertainty about the path of new technologies, such as radio, plastics, computers, and VCRs.[170]

Several historical examples have demonstrated the "bargaining breakdown"[171] that has occurred when different generations of inventors are not able to enter into licenses. The development of radio was stalled by a stalemate lasting ten years between the Marconi Wireless Telegraph Co. (the owner of an oscillating radio tube in the form of a diode patent) and Lee DeForest (who owned an improved design in the form of a triode patent).[172] The formation of RCA years later resolved the impasse and revealed the inefficiency of the stalemate, as its sales growth rose from $1.5 million in 1921 to almost $600 million in 1929.[173] Similarly, the grant of Thomas Edison's patent encompassing the use of a carbon filament as the source of light slowed the pace of improvements in the industry as Edison's company failed to improve the patent or to license it.[174] Finally, the Wright brothers' patent on an expansive airplane stabilization and steering system limited the pace of aircraft development in the United States, which was relieved

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169 *Id*. at 1053-61. Other transaction costs include technological interconnectedness, the transfer of tacit know-how, the strategic isolation of rents, and diffuse entitlement problems. *See* Somaya & Teece, *supra* note 166, at 13-17.

170 *See* Robert Merges, *Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents*, 62 TENN. L. REV. 75, 86 (1994).

171 *Id*. at 84.

172 *Id*. at 84-85.

173 LEONARD S. REICH, THE MAKING OF AMERICAN INDUSTRIAL RESEARCH: SCIENCE AND BUSINESS AT GE AND BELL, 1876-1926, at 297 n.21 (1985).

174 *See* A. Bright, The Electric-Lamp Industry: Technological Change and Economic Development from 1800 to 1947, at 91-93 (1949); Merges & Nelson, *supra* note 153, at 885-87.

only during World War I when the Secretary of the Navy insisted on automatic cross-licensing.[175] Analogous concerns have been raised about licensing in the biotechnology industry.

b) Biotechnology anticommons

The recent proliferation of upstream patents on biomedical research has threatened innovation in the field. Heller and Eisenberg have written about an "anticommons," in which "multiple owners each have a right to exclude others from a scarce resource and no one has an effective privilege of use."[176] Resulting from the privatization of biomedical discoveries in the past two decades, this anticommons has required downstream developers to gain "access to multiple patented inputs to create a single useful product,"[177] thus creating obstacles to research and development.[178]

The biomedical anticommons arises in two ways, according to Heller and Eisenberg. First is through the creation of too many concurrent fragments of intellectual property rights, as occurs when gene fragments are patented before the corresponding gene, protein, biological function, or potential commercial product is identified.[179] Second, reach-through license agreements ("RTLAs") on patented research tools give rights in subsequent downstream

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175 *See* Merges & Nelson, *supra* note 153, at 890-91.

176 Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698 (1998).

177 *Id.* at 699.

178 *Id.* Research tools include "cell lines, monoclonal antibodies, reagents, animal models, growth factors, combinatorial chemistry libraries, drugs and drug targets, clones and cloning tools (such as PCR [polymerase chain reaction]), methods, laboratory equipment and machines, databases and computer software." Report of the National Institutes of Health (NIH) Working Group on Research Tools, Presented to the Advisory Committee of the Director, June 4, 1998, *available at* http://www.nih.gov/news/researchtools/#exec, *last visited* July 12, 2002.

179 Heller & Eisenberg, *supra* note 176, at 699. This problem could be ameliorated by the PTO's Utility Guidelines, issued in 2000, which promise to reduce the patenting of gene fragments by providing a more rigorous

discoveries to the owner of patented inventions utilized in upstream research.[180] The anticommons is created "as upstream owners stack overlapping and inconsistent claims on potential downstream products."[181]

Compounding these difficulties, according to the scholars, participants cannot negotiate around these obstacles because of the presence in the industry of heterogeneous rights holders, cognitive biases among researchers, and transaction costs. First, the field is composed of a diverse array of participants, including universities, government agencies, and biotechnology and pharmaceutical companies.[182] Even if heterogeneity has been somewhat reduced by recent integration among the participants[183] and greater certainty in the law,[184] it still exceeds that in other industries, which typically lack the combination of public and private actors and of upstream and downstream innovation.[185] Second, consistent with the prevailing research atmosphere, owners of upstream biomedical research patents tend to overvalue their discoveries and disparage claims of their opponents.[186] Third, significant transaction costs arise from the

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threshold of utility that requires a "specific" and "substantial" utility before a patent is issued. Utility Examination Guidelines, 66 Fed. Reg. 1092, 1098 (Jan. 5, 2001).

180 Heller & Eisenberg, *supra* note 176, at 699. RTLAs take the form of royalties on sales resulting from the use of the research tool, a license on future discoveries, or an option to acquire such a license. *Id.*

181 *Id.*

182 *Id*. at 700-01.

183 *See* Rai, *supra* note 114, at 847.

184 *See* Lawrence M. Sung & Don J. Pelto, *Greater Predictability May Result in Patent Pools: As the Federal Circuit Refines Scope of Biotech Claims, Use of Collective Rights Becomes Likely*, NAT'L L.J. (June 22, 1998), at C2.

185 *See* Heller & Eisenberg, *supra* note 176, at 700 (noting contrast between private firm, which "is more likely to use intellectual property to maintain a lucrative product monopoly" and politically accountable government agency like NIH that "may further its public health mission by using its intellectual property rights to ensure widespread availability of new therapeutic products at reasonable prices"); *id*. at 700-01 (noting reluctance to sue public sector investigators and higher tolerance of academic laboratories and biotechnology firms to patent infringement, thus lessening the likelihood of cross-licensing).

involvement of public institutions, the difficulty of valuation, and the need for licensing at an early stage, when the outcome of the project is uncertain.[187]

Empirical evidence supports both the likelihood and a diminished apprehension of such an anticommons. A study conducted in 1997 and 1998 by the National Institutes of Health ("NIH") Working Group on Research Tools concluded that "[m]any scientists and institutions involved in biomedical research are frustrated by growing difficulties and delays in negotiating the terms of access to research tools."[188] Scientists wait months or years to carry out experiments "while their institutions attempt to renegotiate the terms of 'Material Transfer Agreements' ("MTAs"), database access agreements, and patent license agreements."[189] Anecdotal evidence supports the thesis: the chief scientific officer at Bristol-Myers Squibb, for example, recently indicated that his company was not able to work on more than fifty proteins that could potentially be involved in cancer "because the patent holders either would not allow it or were demanding unreasonable royalties,"[190] and another pharmaceutical executive complained

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186 "Overcommitment by individuals to particular research approaches ensures that no hypothesis is dismissed too quickly, and skepticism toward rivals' claims ensures that they are not too readily accepted." *Id.* at 701. *See also* NIH Report, *supra* note 178 ("Unrealistic valuations, inspired by occasional cases of institutions earning extraordinary financial returns, often present an obstacle to prompt dissemination of research tools. . . . Those who develop new tools tend to overvalue them, without taking into account all the other tools necessary to study a particular biological problem. Moreover, the relative value of research tools is often difficult to predict and even more difficult to agree upon.").

187 *See* Heller & Eisenberg, *supra* note 176, at 700. For a similar recitation of the difficulties of licensing in the field, see Eisenberg, *supra* note 114, at 231-48; Arti Kaur Rai, *Regulating the Scientific Research: Intellectual Property Rights and the Norms of Science* 94 NW. U. L. REV. 125-29 (1999); Arti K. Rai & Rebecca S. Eisenberg, *The Public and the Private in Biopharmaceutical Research* 157, 160, *at* http://www.law.duke.edu/pd/papers/raieisen.pdf, *last visited* July 13, 2002 ("Exchanges of DNA sequences, laboratory animals, reagents, and data that were once subject to a normative expectation of free access are today subject to license agreements, material transfer agreements and database access agreements that need to be reviewed and renegotiated before research may proceed, imposing high transaction costs long before the research has yielded a likely revenue stream that would justify these costs.").

188 NIH Report, *supra* note 178.

189 Eisenberg, *supra* note 114, at 225.

190 Andrew Pollack, *Bristol-Myers and Athersys Make Deal on Gene Patents*, N.Y. TIMES, Jan. 8, 2001, at C2.

that his company "ha[s] frustration internally because we can't do what we consider basic research with a cloned gene . . . at the end of the day, you are cut off from tools, from making a breakthrough discovery."[191]

On the other hand, a recent study prepared for the National Academy of Sciences concluded that the worst aspects of an anticommons have not come to pass because the participants have created "working solutions" allowing their research to proceed.[192] Such solutions include the invocation of an informal "research exemption" allowing infringement of the patents (which the patentee might elect not to challenge because of the cost of infringement litigation); applying the knowledge of the research tool patents outside the United States; and creating public databases, making genomic information widely available.[193]

Depending on the empirical evidence considered, upstream biomedical research presents the case of either an actual or potential bottleneck. At worst, the dangers envisioned by Heller and Eisenberg threaten to completely block the path of innovation in the field of biopharmaceuticals. At best, such an anticommons has been alleviated through the participants' collaboration, with such activities being crucial in preventing the otherwise-imminent bottleneck. The next Section will delineate the contexts in which bottlenecks are likely to arise.

c) Bottlenecks and their evasion

Bottlenecks in cumulative industries naturally arise in one of two settings. The first, similar to that in biomedical research, involves the interrelationship between upstream research

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191 John P. Walsh, Ashish Arora, & Wesley M. Cohen, *The Patenting of Research Tools and Biomedical Innovation, prepared for* THE SCIENCE, TECHNOLOGY AND ECON. POLICY BOARD OF THE NAT'L ACADEMY OF SCIENCES 9 (forthcoming 2002). [Awaiting permission for cites to this source.]

192 Walsh, Arora, & Cohen, *supra* note 191.

and downstream development. Where commercial development grows out of upstream research, at least a potential bottleneck is present. For the development cannot take place absent access to the research upon which it is based.[194] There is some evidence that actual bottlenecks, in the form of significant delays and holdups, have occurred in the biotechnology industry.[195] The second setting involves cumulative incremental innovation based on an initial broad patent.[196] Here, follow-on innovation cannot take place without infringing the patent, which covers the field.[197] The Marconi, Edison, and Wright Brothers patents provide examples of stalemates, unexploited opportunities, and stifled innovation between pioneers and improvers.

Intergenerational bottlenecks threaten grave potential danger. By definition, innovation in cumulative industries proceeds across generations. Where the initial patentholder refuses to allow successors to utilize the patented product, and where this patent is broad or lies upstream, the path of innovation threatens to come to a halt. With innovation the key determinant to economic growth, and with several industries of crucial significance (including automobiles, biotechnology, semiconductors, and computers) based on cumulative (and broad and/or upstream) innovation, bottlenecks present a severe threat to the economy.

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193 *Id.* at 15-17.

194 There is always at least the theoretical alternative of following alternative research paths. But the more important and pioneering the upstream research tool is, the less promising will be the alternative paths.

195 *See supra* notes 188-91 and accompanying text.

196 The reference to "initial" products distinguishes the initial from the follow-on innovation in the context of the relationship between the two products. The initial product, of course, typically appears in the middle of a long line of incremental improvements and is not actually the pioneer innovation in the field.

"Broad" patents are patents that claim an expansive subject matter and upon which the next generation of innovation must rely. In other words, they are patents that would be infringed if the follow-on innovation were not licensed. The scope of the patent thus informs the likelihood of infringement and, in turn, the need for collaborative activity.

197 Narrow patented products, in contrast, may not block the field since subsequent innovators could create the next generation of product without infringing the patent. *See supra* notes 164-65 and accompanying text.

Therefore, activity undertaken by patentees and others to resolve intergenerational bottlenecks should be recognized as being reasonably necessary to promote the path of innovation. Such recognition is even more crucial given the hurdles to licensing and other collaborative activities.[198] Licensing, patent pools, joint ventures, and mergers between upstream and downstream patentees, or between earlier and later generations of inventors, offer the potential to circumvent (and, in some case, have avoided) industry bottlenecks.[199]

Activity resolving the intergenerational bottleneck can take several forms. Typical is a license, an agreement between two entities that remain separate but by which the patentee permits another to use or sell the patented technology or product. Licensing between participants in upstream research and downstream development, or between earlier and later generations of broad patented products, should be encouraged. Where an intergenerational bottleneck is present, and the license promises to resolve the impasse, the activity should be found to be reasonably necessary to attain innovation.[200]

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198 *See supra* notes 166-75 and accompanying text.

199 *See infra* Subsection III.E.2.b.

In certain settings, collaboration between potential competitors could reduce the diversity of paths to innovation and lead to fewer patent races. *See* Richard J. Gilbert & Steven C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 63 Antitrust L.J. 569, 591 (1995). But where the initial patent in an industry marked by cumulative innovation is broad or lies upstream from commercial development, there are no other realistic non-invent-around paths to innovation: either (1) the cost and inefficiency of inventing around the patent are prohibitive or (2) there are no alternate paths to innovation. The likely and devastating danger in such settings is that no follow-on innovation *at all* will occur in the absence of licensing or other collaborative activity.

200 *Cf.* Scotchmer, *Standing on the Shoulders of Giants*, *supra* note 153, at 34 (contending that collusion through licensing "allows the first innovator to profit from the externality conferred on later innovators" when incentives to innovate are implicated); Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When Is It the Best Incentive System?*, UC Berkeley Working Paper No. E01-303, at 16 (noting that benefits of broad patents such as "preventing duplication of R&D costs, facilitating the development of second-generation products, and protecting early innovators" disappear if licensing fails); David J. Teece, *Intellectual Property, Valuation, and Licensing*, *testimony presented at* Hearings on Competition and IP Law (Feb. 26, 2002) (licensing is essential when innovation is "systemic," composed of numerous separately patentable elements).

Other, more permanent activity such as joint ventures or mergers also could resolve bottlenecks by allowing access to essential patents. For example, a small biotechnology company that has the patent on a therapeutic target could merge with another small biotechnology company that has a patent on an assay that can be used to measure certain (e.g., in vivo) activities. Such a merger would be reasonably necessary for innovation since it would otherwise be impossible for either of the companies to create the drug. On the other hand, if one company has the target patent and one assay, and the second company has another assay that can be used at moderately lower cost, their merger might save resources but would not be necessary for (and could inhibit) innovation.[201]

Courts and agencies still should consider the dangers with which antitrust has traditionally been concerned, such as heightened market power, as explained in the next Part. But the challenged conduct and the location in the path of innovation will determine the question of whether the activity is reasonably necessary to resolve bottleneck-plagued cumulative innovation.

2. Intragenerational bottlenecks

Bottlenecks also can occur within one product generation. Where one product is composed of multiple patented inputs, the holder of any of the patents can hold the development of the product hostage to infringement lawsuits and injunctions. This problem has been referred to as a "patent thicket."

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[201] The hypothetical bears some resemblance to the acquisition by Vertex Pharmaceuticals of Aurora Biosciences, as Vertex's drug discovery expertise combined with Aurora's assay development and screening capabilities. *See Climate Right for Accelerated Mergers & Acquisitions in the Biotechnology Industry*, CHEMICAL MKT. REPORTER, Jan. 14, 2002, at 2; *Other News To Note*, BIOWORLD TODAY, July 20, 2001. Another analogous example involves Millenium, which bought four companies in four years in order "to master each step of the drug-discovery process." *Biotech Grows Up*, TIME, Dec. 24, 2001.

a) Patent thickets

Carl Shapiro has defined a patent thicket as "an overlapping set of patent rights requiring that those seeking to commercialize new technology obtain licenses from multiple patentees."[202] The patent thicket has most frequently been associated with the semiconductor industry, but it also has been observed in the biotechnology, computer software, and Internet industries.[203]

The existence of a patent thicket increases the power of each patentholder with a patented part in the product, who can block the use of the product by all others. The power is magnified by the patent system, with its use of injunctions and costly and lengthy infringement litigation.[204] The dangers of the patent thicket are exacerbated when patents are issued for products that already are on the market.[205] In these cases, the owner of the newly-issued patent holds a commanding position over the manufacturer already in large-scale production, who cannot easily redesign its product.[206]

A prominent example of a patent thicket is the semiconductor industry, where hundreds, if not thousands, of patents can read onto a single product.[207] The patents typically cover "aspects of the circuitry design, materials used to achieve a certain outcome, and the broad array

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202 Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, *in* INNOVATION POLICY AND THE ECONOMY 119, 119 (Adam B. Jaffe et al. eds., 2001).

203 *Id*. at 144.

204 *See* 35 U.S.C. § 283. Moreover, unlike a positive right to use property, the negative right to exclude does not give the patentee the ability to practice its invention, but rather only allows exclusion, which leads to "bargaining with one's 'neighbors' . . . [who] are most likely to be one's chief competitors . . . in technology space." Putnam, *supra* note 14, at 10.

205 Shapiro, *supra* note 202, at 119, 121.

206 *Id*. at 125.

of methods used to manufacture the device."[208] Consequently, companies such as IBM, Intel, and Motorola "find it all too easy to unintentionally infringe on a patent in designing a microprocessor, potentially exposing themselves to billions of dollars of liability and/or an injunction forcing them to cease production of key products."[209] This concern is especially relevant for firms that have made "costly and rapidly-depreciating investments in wafer fabrication facilities, which inherently utilize a 'thicket' of innovations developed by many parties."[210] As a result, in markets for the design and manufacture of microprocessors, "broad cross licenses are the norm,"[211] with many of the companies licensing most of their patent portfolio to others.[212]

Where patent thickets and blocking patents predominate, activity such as cross-licensing[213] and patent pools[214] that promise to resolve the bottleneck should be rewarded. Not

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[207] *Id*. at 125-26. Products in the computer software and hardware industries also could potentially infringe hundreds of patents. *See* Statement of Dr. David C. Mowery, *roundtable discussion, at* Hearings on Competition and IP Law (Feb. 27, 2002).

[208] Hall & Ziedonis, *supra* note 157, at 110.

[209] Shapiro, *supra* note 202, at 121.

[210] Hall & Ziedonis, *supra* note 157, at 121.

[211] Shapiro, *supra* note 202, at 129. Cross licenses also permit "the more efficient use of engineers . . ., better products, and faster product design cycles." *Id*. at 130.

[212] *Id*. at 130. For more detail on the role of licensing in the semiconductor industry, see Hall & Ziedonis, *supra* note 157.

A focus on intragenerational bottlenecks like that presented in this Section might have altered the proceedings in the Federal Trade Commission's case against Intel. The FTC challenged Intel's denial of technical information about its microprocessors to customers who had sued Intel for patent infringement, allegedly "as a means of coercing those customers into licensing their innovations to Intel." Intel Corp. Complaint ¶ 11 (FTC Dkt. No. 9288, filed June 8, 1998). But the FTC neglected to consider the patent thicket that makes up the semiconductor industry, where cross-licensing is crucial and where Intel's ability to withdraw access to its intellectual property would tend to make it less susceptible to holdup by other patentholders. *See* Randal C. Picker, *Regulating Network Industries: A Look at Intel*, 23 HARV. J.L. PUB. & POL'Y 159, 181, 192 (1999).

[213] To be clear, a cross-license is an agreement by which two firms license to each other the right to practice the other's patents. *See* Shapiro, *supra* note 202, at 127.

only is such activity crucial to the continuous path of innovation, but it also recognizes the role of bargaining that is built into the patent system. The rule of blocking patents, for example, encourages negotiation between the original inventor and the improver by giving to each "a much larger stake in the success of the licensing negotiation" and by "increas[ing] the costs of failing to come to an agreement."[215] Patent pools present an instance of cross-licensing that allows bargaining among repeat players and that reduces transaction costs. Antitrust, then, should be very cautious before punishing licensing between firms with blocking patents.

The government agencies have appropriately recognized that patent pools and cross-licensing agreements often are procompetitive in "integrating complementary technologies, reducing transaction costs, clearing blocking positions, and avoiding costly infringement litigation."[216] The arrangements "promot[e] the dissemination of technology"[217] and allow the participants to share R&D risks. They are especially crucial when they clear blocking positions in patent thickets, as they promise to resolve a bottleneck that otherwise could prevent the other patentees from manufacturing the product.[218]

b) Patent pools

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214 A patent pool involves a single entity – either a new entity or one of the original patentholders – that licenses the patents of two or more companies to third parties as a package. *See* Shapiro, *supra* note 202, at 32; *see also* HOVENKAMP ET AL., *supra* note 73, ¶ 34.2b, at 34-4 & n.9 (describing a patent pool as a "mutual exchange of patent rights" sweeping more broadly than a cross-license, and which "encompasses many different patent exchange arrangements").

215 Lemley, supra note 168, at 1062.

216 *Guidelines* ¶ 5.5.

217 *Id.*

218 Shapiro, *supra* note 202, at 123.

In part because of concern about antitrust liability, patent pools have been used only sporadically throughout the past century.[219] But when they have been utilized, they frequently have resolved potential bottlenecks. Some pools, such as the pool in the sewing machine industry in the 1850s and the aircraft industry in the early twentieth century, solved the problem of different firms owning patents on "the basic building blocks of the industry's products."[220] The aircraft pool was "lauded far and wide as a success,"[221] and led to the major patentholders lowering their royalty rates after the formation of the pool.[222] Smaller pools developed in industries such as movie projectors, hydraulic pumps, swimming pool cleaners, and synthetic polypropylene fiber production.[223]

In the past decade, the use of patent pools has increased. The government agencies recently have examined pools relating to (1) MPEG-2, a video compression technology underlying the transmission, storage, and display of digitized moving images and sound tracks[224]; (2) DVD-ROM and DVD-Video formats describing "the physical and technical parameters for DVDs for read-only-memory and video applications"[225]; and (3) lasers used in

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219 Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations*, 84 CALIF. L. REV. 1293, 1355 (1996). For a discussion of the history and antitrust treatment of patent pools, see Richard J. Gilbert, *Patent Pools: 100 Years of Law and Economic Solitude* 3-27 (May 5, 2002) (on file with author).

220 Merges, *supra* note 219, at 1341. The automobile pool around the turn of the twentieth century was another significant industry-wide pool. *See id.* at 1342.

221 *Id.* at 1346.

222 *Id.* at 1345.

223 Robert P. Merges, *Institutions for Intellectual Property Transactions: The Case of Patent Pools*, *in* EXPANDING BOUNDARIES, *supra* note 3, at 142-43.

224 This technology has been applied to high definition television (HDTV), Digital Video Broadcasting (DVB), direct broadcast by satellite (DBS), digital cable television systems, multichannel-multipoint distribution services (MMDS), personal computer video, digital versatile discs (DVD), and interactive media. *See Statement of Baryn S. Futa*, Hearings on Competition and IP Law 2 (Apr. 17, 2002).

photorefractive keratectomy ("PRK"), a form of eye surgery used to correct vision disorders.[226] The Department of Justice sanctioned the first two pools, but the Federal Trade Commission filed a complaint against the third.[227]

Critical to the agencies' analysis of the pools was the distinction between essential and substitute patents.[228] Patents are essential if the product or standard at issue in the pool cannot be produced without infringing the patent. Essential patents "by definition have no substitutes"[229] and typically are complementary to each other, possessing a greater value if the licensee can use other essential patents.[230] Substitute patents, in contrast, are not necessary for the use of a technology in the pool, but rather present alternate ways of creating certain products that otherwise would be used in competition with each other.[231] An example of a substitute patent

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225 Letter from Joel I. Klein to Gerrard R. Beeney (Dec. 16, 1998), *available at* http://www.usdoj.gov/atr/public/busreview/2121.htm, at 1. This pool, between Philips, Sony, and Pioneer, will be discussed in the remainder of the section. Another pool relating to DVD technology sanctioned by the DOJ involved Toshiba and Time Warner and covered products manufactured in compliance with the DVD-ROM and DVD-Video formats. *See* Letter from Joel I. Klein to Carey R. Ramos (June 10, 1999), *available at* http://www.usdoj.gov/atr/public/busreview/2485.htm. This pool was similar to the Sony DVD pool but relied on a more independent patent expert, obligated members to offer patents independently of the pool, and defined essentiality to include patents "for which there is no realistic alternative." *Id.*

226 *In re Summit Technology, Inc. and VISX, Inc.*, FTC Dkt. No. 9286, *available at* http://www.ftc.gov/os/1998/9803/summit.cmp.htm ("Summit Complaint") ¶ 4.

227 The VISX complaint was ultimately settled, with the parties agreeing to dissolve the pool and to make pricing and licensing decisions independently. *See* http://www.ftc.gov/os/1998/9808/d09286suagr.htm.

228 For a discussion of caveats to be applied to the distinction, see *infra* note 242.

229 Dec. 16, 1998 Letter from Klein to Beeney, *supra* note 225, at 6.

230 *Id.* Complementary patents "combine to produce or form a single product." Goller, *supra* note 162, at 725.

231 Dec. 16, 1998 Letter from Klein to Beeney, *supra* note 225, at 5 ("If the Licensors owned patent rights that could be licensed and used in competition with each other, they might have an economic incentive to utilize a patent pool to eliminate competition among them [and] . . . could serve as a price-fixing mechanism, ultimately raising the price of products and services that utilize the pooled patents."); *see also* Goller, *supra* note 162, at 725-26 (defining "competing patents" as "those patent processes or apparatus which produce by different methods the same or similar products or those products which can be substituted for one another and thus compete for a particular market").

Moreover, the pooling of substitute patents could reduce future innovation where the members of the pool are required to share their successful R&D and "each of the members can free ride on the accomplishments of other

involves the inclusion in a pool for DVD standards of one of several alternative patented methods for placing DVD-ROMs into packaging.[232]

The MPEG-2 and DVD patent pools sanctioned by the agencies were composed solely of essential patents. Essentiality took different forms, with the patents limited to those technically essential in the MPEG pool[233] and those necessary "as a practical matter" for compliance with the DVD Standard specifications in the DVD pool.[234] Strengthening these conclusions was the determination by an independent expert that the technology was essential, not only at the time of the formation of the pool but also thereafter.[235] And the finding of essentiality was critical for the agencies: the limitation of the MPEG-2 pool to essential patents, for example, signified that "there is no technological alternative to any of them and that the [package] license will not require licensees to accept or use any patent that is merely one way of implementing the MPEG-2 standard, to the detriment of competition."[236] Other characteristics of the pools sanctioned by the agencies that were beneficial for innovation included the ability of participants to license the technology outside the pool in a nondiscriminatory manner, the restriction of grantback clauses

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pool members" without offering the benefits of clearing blocking positions that would otherwise obstruct future innovation. *Guidelines* ¶ 5.5.

232 Dec. 16, 1998 Letter from Klein to Beeney, *supra* note 225, at 6.

233 Letter from Joel I. Klein to Gerrard R. Beeney (June 26, 1997), *available at* http://www.usdoj.gov/atr/public/busreview/1170.htm, at 6, 9. Essential patents were defined as "any Patent claiming an apparatus and/or a method necessary for compliance with the MPEG-2 Standard." MPEG-2 Patent Portfolio License § 1.18 (*cited in id.* at 10 n.4).

234 Dec. 16, 1998 Letter from Klein to Beeney, *supra* note 225, at 2. The Department of Justice understood the definition to encompass "patents which are technically essential – i.e., inevitably infringed by compliance with the specifications – and those for which existing alternatives are economically unfeasible." *Id.* at 11 n.8.

235 June 26, 1997 Letter from Klein to Beeney, *supra* note 233, at 3, 6 (regarding the MPEG-2 pool: "The continuing role of an independent expert to assess essentiality is an especially effective guarantor that the Portfolio patents are complements, not substitutes."); Dec. 16, 1998 Letter from Klein to Beeney, *supra* note 225, at 2.

236 June 26, 1997 Letter from Klein to Beeney, *supra* note 233, at 6; *see also id.* ("The limitation of the Portfolio to technically essential patents, as opposed to merely advantageous ones, helps ensure that the Portfolio

to essential patents and to licensing on a nonexclusive basis with fair and reasonable terms, and the imposition of reasonable royalty rates.[237]

The Summit-VISX pool, on the other hand, was composed not of essential patents, but of competing patents, according to the FTC. As the Complaint alleged: "in the absence of the [pool agreement], VISX and Summit could have and would have competed with one another in the sale or lease of PRK equipment by using their respective patents, licensing them, or both."[238] The arrangement also required the participants to pay a $250 fee to the partnership each time a PRK procedure was performed. Summit and VISX each charged their respective sublicensees a $250-per-procedure fee, and because the firms were required to pay this amount to the pool, neither party had an incentive to reduce the fee.[239] Unlike the MPEG pool, for which the individual members could make the patents available outside the pool, both VISX and Summit gave up "the right to unilaterally license"[240] any patent contributed to the pool. Further, each

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patents are not competitive with each other and that the Portfolio license does not, by bundling in non-essential patents, foreclose the competitive implementation options that the MPEG-2 standard has expressly left open.").

[237] Dec. 16, 1998 Letter from Klein to Beeney, *supra* note 225, at 3, 4, 6, 8-9; June 26, 1997 Letter from Klein to Beeney, *supra* note 233, at 4, 6, 7, 9. The restriction of grantback clauses to essential patents renders it "unlikely that there is any significant innovation left to be done that the grantback could discourage." June 26, 1997 Letter from Klein to Beeney, *supra* note 225, at 8.

A patent pool that has similar rules on essential patents (a patent is essential if one or more of its claims is infringed by compliance or implementation of the standard) and that uses independent patent experts is the IEEE 1394 Standard, an external bus standard supporting data transfer rates of up to 400 Mbps (400 million bits per second). *See* Jeanne Clark et al., *Patent Pools: A Solution to the Problem of Access in Biotechnology Patents?* 15-16 (Dec. 5, 2000).

[238] Summit Complaint ¶ 8. The Complaint also claims that "VISX and Summit would have engaged in competition with each other in connection with the licensing of technology related to PRK." *Id.*

[239] *Id.* ¶ 12; *see* Sheila F. Anthony, *Antitrust and Intellectual Property Law: From Adversaries to Partners*, 28 AIPLA QUARTERLY J. 1, 17 (2000).

[240] Summit Complaint ¶ 9.

party could prevent the pool from licensing any of the patents to others that manufactured PRK equipment.[241]

The agencies' distinction between essential and substitute patents closely tracks the bottleneck issue discussed throughout this Article. A patent that is essential to the technology is a blocking patent, one that cannot be avoided in the patent thicket. In contrast, competing patents are not necessary for the use of the technology, and so do not create intragenerational bottlenecks. Arrangements between competitors relating to such patents thus threaten competitive harm without offering the justification of resolving bottlenecks.[242]

Antitrust should recognize (as it recently has) the benefits of cross-licensing and patent pools that resolve bottlenecks.[243] The prevalence of such arrangements, in the context of

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[241] *See id.* ¶ 10. The FTC also challenged VISX's withholding from the PTO of "articles, patents, and patent applications that [it] knew were material prior art." *Id.* ¶ 16. As the agencies had earlier indicated, a licensing scheme "premised on invalid or expired intellectual property rights will not withstand antitrust scrutiny," as restrictions on licensors or licensees unaccompanied by legitimate intellectual property rights "are highly likely to be anticompetitive." June 26, 1997 Letter from Klein to Beeney, *supra* note 233, at 5; Dec. 16, 1998 Letter from Klein to Beeney, *supra* note 225, at 5.

[242] It is not the case that *every* patent in the pool needs to be essential for the pool to promote innovation. "Manufacturing steps, calculations, or processes that must be accomplished in order to produce the defined product, but which may be accomplished in more than one way" present a class of substitute patents that could clear antitrust review. *See* Gerrard R. Beeney, *Pro-Competitive Aspects of Intellectual Property Pools: A Proposal for Safe Harbor Provisions*, *testimony presented at* Hearings on Competition and IP Law, *supra* note 163, at 6. In other words, to produce the downstream product defined by the license field of use, one of the substitutes must be infringed. *Id.* at 7. Moreover, the test distinguishing between essential and substitute patents can be applied by courts and the agencies. *See* Merges, *supra* note 223, at 158 (noting that the pools considered by courts "seem to fall fairly readily" into "pools which reduce the volume of licensing and lead to greater technological integration" and "pools that do not add to interfirm technology adoption").

Even if patent claims do not always neatly fall into the categories of blocking and substitute claims, *see* HOVENKAMP ET AL., *supra* note 73, § 34.2, at 34-8 to 34-10, the concept is valuable to focus the analysis on the relationship among the patents. And even if the full effect of a blocking patent is felt after the infringement lawsuit is filed or the injunction is issued, pre-litigation activity will be affected since potential infringers typically do not know when their infringement will be litigated and would tend to avoid activity that would lead to debilitating lawsuits. Consequently, they will refrain from infringing activity, with the result that the blocking patents thwart innovation.

[243] *Cf.* Merges, *supra* note 219, at 1391 (recommending that antitrust enforcement actions against patent pools "consider the enormous transaction cost savings they engender").

potentially treacherous roadblocks, and in industries that are innovating, recommends deference to the activity.[244]

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[244] As the MPEG-2 and DVD pools reveal, the issue of standard-setting often arises in patent pools. A standard is "any set of technical specifications which either does, or is intended to, provide a common design for a product or process." HOVENKAMP ET AL., *supra* note 73, § 35.1a, at 35-3. There are two types of standards: (1) quality and safety standards (which "define the design or performance characteristics that products must have either to be sold in the market (e.g., automobile emissions standards) or to obtain 'approval,' 'certification,' or 'listing' by a standard-setting body (e.g., the Underwriters Laboratories' seal)) and (2) interoperability or interface standards (which "specify whether and how one type of product will be able to fit or communicate with other products (e.g., gauge of railroad tracks, color TV transmission standards, or computer operating system interfaces with applications programs)"). James J. Anton & Dennis A. Yao, *Standard-Setting Consortia, Antitrust, and High-Technology Industries*, 64 ANTITRUST L.J. 247, 247 (1995). Although standards may not automatically fit into the patent-based tripartite innovation construct introduced in this Article, they often will implicate similar concerns, particularly in resolving bottlenecks.

At their most beneficial, interoperability standards serve functions analogous to patent pools consisting of essential patents. Even if competing standards are not formally as dangerous as blocking patents, the infringement of which threatens costly litigation, the adoption of standards promises benefits similar to the cross-licensing of blocking patents in paving the way for subsequent innovation. And it is promising that most standard-setting activities have taken place in industries that have experienced substantial patent bottlenecks and in which interoperability is particularly crucial: the software, Internet, telecommunications, and semiconductor industries. *See* Mark A. Lemley, *Intellectual Property Rights and Standard Setting Organizations*, __ CAL. L. REV. __ (forthcoming 2003, at 107 of draft on file with author).

Standards are critical, for example, where a product category "would fail to take off in the absence of standardization." Carl Shapiro, *Setting Compatibility Standards: Cooperation or Collusion?*, *in* EXPANDING BOUNDARIES, *supra* note 3, at 89. This could occur where consumers delay making purchases so that they will not be locked into a technology that eventually loses the standards war. *Id.* In these settings, where interoperability is practically essential to the operation of a market, the situation approximates that of circumventing patent bottlenecks, and so activity promoting the selection of a standard would be reasonably necessary to attain innovation. Such activity includes measures ensuring that members of the standard setting organization do not hoard intellectual property that ultimately is incorporated into the standard: requiring the disclosure of intellectual property, and royalty-free or reasonable and nondiscriminatory licensing. These requirements "expand[] competition by insuring that all members of the organization are free to build products incorporating that standard." Lemley, *supra*, at 95.

Other types of activity involving standards, however, are less analogous to circumventing patent bottlenecks. Analysis of quality and safety standards often requires consideration of both the benefits and costs of the activity. *See* David A. Balto, *Standard Setting in a Network Economy*, *available at* http://www.ftc.gov/speeches/other/standardsetting.htm, at 2 (standard setting "can thwart innovation or entrench an older standard when a newer, better, or more widely accepted technology is available" or, if overinclusive, can lead to "reduced differentiation, dampened incentives to innovate, and potential entrenchment of an inferior standard"). These standards cannot summarily be determined to be reasonably necessary for innovation.

Finally, certain activity related to standard setting will present easy cases, as it will not only not be necessary for innovation, but also will lack any procompetitive justification, often constituting an antitrust (or other type of) violation. Activity falling into this sphere includes (1) misleading a standard-setting organization regarding the scope of a firm's intellectual property, *see Dell Computer Co.*, C-3658 (May 20, 1996) (consent order) (for standard designed for Video Electronics Standards Association ("VESA") for local bus to transfer instructions between computer's CPU and peripherals, Dell, after having twice certified that it did not have intellectual property rights that would conflict with the standard, asserted that the standard selected infringed its patent); (2) packing a

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Because of the more dangerous position of patents in intergenerational or intragenerational bottlenecks, activity that promises to circumvent the bottlenecks is reasonably necessary for innovation. Any concerns that antitrust has with the price or output effects of licensing agreements must be considered in the context of innovation in the industry, which might not continue – or, at a minimum, would be significantly and expensively delayed – absent agreements clearing the underbrush of patent landmines on the path of innovation.

The first two stages of innovation are just as crucial. The patented products that eventually form bottlenecks might never come into existence absent incentives to create the product and the ability to recover the investment incurred in developing the product. Antitrust thus must recognize activity that is reasonably necessary for these stages of innovation. The next Part incorporates the finding on reasonable necessity into the overall antitrust analysis.

## IV. Incorporation of Tripartite-Innovation Finding into Antitrust Analysis

Once the court determines whether the activity is reasonably necessary for tripartite innovation, it can conduct the overall analysis. If the activity is *not* reasonably necessary, then the defendant's justifications based on the patent system will not apply. Other justifications – say, preventing free-riding or enhancing quality – may apply, and, in any event, the activity will not constitute an antitrust violation unless there are substantial anticompetitive effects.[245] But the court need not embrace the rationale for deferring to the patent system.

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meeting to block an amendment that would have benefited a competitor, *see Allied Tube & Conduit Corp. v. Indian Head, Inc.*, 486 U.S. 492 (1988); and (3) declining to certify a product solely because it was patented, *see American Society of Sanitary Engineering*, 106 F.T.C. 324 (1985) (standard setting organization refused to approve new toilet tank fill valve that could lower manufacturing costs, was safer, was more durable, and would better conserve water in order to protect existing manufacturers).

If the activity *is* reasonably necessary, then the defendant will have a powerful defense. The role of the justification based on reasonable necessity for tripartite innovation will be more significant than is the role for the defendant's justifications under current analysis. Antitrust courts today focus primarily on allocative efficiency, with the result that price and output are the key ingredients in the analysis. The defendant's justifications might explain the reason for the anticompetitive effects, but they generally will not push in the opposite direction (i.e., of lower price and higher output). Positing innovation as the centerpiece of the analysis will lead to a stronger role for the defendant's justification centered on innovation. Although the anticompetitive inquiry still will consider the effects on price and output, innovation will be analyzed both for its anticompetitive (e.g., reduced innovation) and procompetitive (e.g., innovation-based justifications) effects. The greater role for the new justification will be detailed in this Part, which sets forth the proposed antitrust framework for the three main offenses of monopolization, agreements, and mergers.

### A. Monopolization

Section 2 of the Sherman Act requires an antitrust plaintiff to show "(1) the possession of monopoly power in the relevant market and (2) the willful acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident."[246] Although the first prong has confused courts in the past (that have considered a patent to confer monopoly power),[247] it is the second prong that currently presents the greatest difficulties.

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[245] To the extent that the defendant justified its activity based on its patents, and that activity is found to not be reasonably necessary for innovation, the reliance on patents more likely will be a cover for anticompetitive activity.

[246] United States v. Grinnell Corp., 384 U.S. 563, 570-71 (1966).

The lack of clear direction from the text of the statute[248] and the legislative history[249] has led courts to pursue an array of conflicting and confusing tests for monopolization, based on the intent of the defendant,[250] a change in the market,[251] the presence of an "essential facility,"[252] practical immunity from the antitrust laws,[253] and a failure to defer to the intellectual property system.[254] This confusion becomes particularly dangerous when applied to patent-based activity. The exclusion that is the foundation of the patent system often appears suspicious when viewed through monopolization-tinted glasses.

Particularly where the challenged activity is based on a patent, a focus on the defendant's legitimate business justifications is required. This Article proffers a new justification to a Section 2 claim that applies if the activity is reasonably necessary to attain tripartite innovation. Activity that is reasonably necessary for any of three crucial stages of innovation has a

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247 A patent gives its owner the right to exclude others from technological substitutes for the invention, while the antitrust market encompasses products that consumers treat as economic substitutes. The two frequently will not overlap. *See* Dam, *supra* note 5, at 250 ("[L]eading companies may obtain 1,000 or more patents in a single year, and yet many such firms are unlikely ever to obtain even a single monopoly in any market."); Gallini & Trebilcock, *supra* note 4, at 22 (in a survey of patent licensors, there were no close substitutes for the patented product in only 27 percent of the cases; there were more than ten competitors in more than 29 percent of cases).

Courts also would benefit from applying Section 2 to true monopolists, rather than parties who unsurprisingly have significant power in "markets" defined by their own products. *See* Carrier, *supra* note 1, at 779 (criticizing ruling in *Eastman Kodak Co. v. Image Technical Servs.*, 504 U.S. 451 (1992), that "made every manufacturer of a durable product requiring servicing or parts a potential monopolist").

248 15 U.S.C. § 2 (prohibiting parties from "monopoliz[ing], [] attempt[ing] to monopolize, or combin[ing] or conspir[ing] . . . to monopolize").

249 *See* Carrier, *supra* note 1, at 808 (in adopting Sherman Act, members of Senate Judiciary Committee indicated that the term "monopoly" was not intended to apply to someone "who merely by superior skill and intelligence" amassed a significant share of the market, but rather was meant to encompass "the sole engrossing to a man's self by means which prevent other men from engaging in fair competition with him") (citations omitted).

250 Image Technical Services, Inc. v. Eastman Kodak Co. ("Kodak II"), 125 F.3d 1195 (9th Cir. 1997).

251 Aspen Skiing Co. v. Aspen Highlands Skiing Corp., 472 U.S. 585 (1985).

252 Intergraph Corp. v. Intel Corp., 3 F. Supp. 2d 1255 (N.D. Ala. 1998), *vacated*, 195 F.3d 1346, 1357-58 (Fed. Cir. 1999).

253 In re Independent Service Organizations Antitrust Litig. ("Xerox"), 203 F.3d 1322 (Fed. Cir. 2000).

substantial justification, one that is essential to the operation of the patent system and, indirectly, to the growth of the economy. Activity that is reasonably necessary to achieve innovation should be rewarded or, at a minimum, should not be punished, least of all with the heavy stick of the monopolization offense.

The presence of reasonable necessity to achieve tripartite innovation should be sufficient to absolve a defendant from liability under Section 2 of the Sherman Act.[255] The finding of reasonable necessity demonstrates that the defendant has proffered a sufficient explanation for its action, which is linked to the attainment of innovation. Even if the activity increases price or reduces output, the importance of the activity in achieving innovation predominates and should preclude a finding of "willful acquisition or maintenance"[256] of monopoly power. Such an approach is supported in several respects.

First, it emphasizes the critical factor of whether the monopolist's conduct has an efficiency justification.[257] The operative test applied by courts asks whether the conduct constitutes "willful acquisition or maintenance" of monopoly power, on the one hand, or "growth or development as a consequence of a superior product, business acumen, or historic accident," on the other.[258] Although the challenged activity will not always fall clearly on one side of the line, patent-based activity that is reasonably necessary for innovation is far closer to an

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254 United States v. Microsoft, 253 F.3d 34 (D.C. Cir. 2001).

255 As a reminder, activity that is not based on a valid patent will not receive the benefit of the test based on reasonable necessity. *See supra* note 73 and accompanying text.

256 *Grinnell*, 384 U.S. 563.

257 *See, e.g.*, Aspen Skiing Co. v. Aspen Highlands Skiing Corp., 472 U.S. 585, 605 (1985) ("If a firm has been attempting to exclude rivals on some basis other than efficiency, it is fair to characterize its behavior as predatory."); Lorain Journal Co. v. United States, 342 U.S. 143, 155 (1951).

258 *Grinnell*, 384 U.S. at 570-71.

efficiency justification, a "superior product," and "business acumen" than to the "willful acquisition or maintenance" of monopoly power. The test also is consistent with courts' rulings that have upheld monopolists' alterations of products that affect complementary products,[259] introductions of new products that have the effect of injuring competitors,[260] and failures to "predisclose" their products to competitors.[261]

Second, the activity challenged under Section 2 often will directly implicate exclusion, the foundation of the patent system. Competitors denied use of a patented product often will claim monopolization, and the courts cannot be left to apply a test that would require them to balance the concrete effects on such competitors against a more ethereal look to the purposes of the patent system. Immunity for reasonably necessary activity ensures that courts will consider patentees' recovery of their investment, the purposes of the patent system, and the promotion of innovation.

Third, the test is consistent with the relative error costs of applying antitrust analysis by reducing the likelihood of false convictions.[262] This is particularly beneficial since (1)

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[259] *See, e.g.*, Berkey Photo, Inc. v. Eastman Kodak Co., 603 F.2d 263, 286 (2d Cir. 1979) ("it would be difficult to fault Kodak for attempting to design a [new] film that could provide better results" than the old film).

[260] *See, e.g.*, California Computer Prods. v. IBM, 613 F.2d 727, 744 (9th Cir. 1979) (IBM could "redesign its products to make them more attractive to buyers . . . [It] need not have . . . constricted its product development so as to facilitate sales of rival products."); ILC Peripherals Leasing Corp. v. IBM, 458 F. Supp. 423, 440-41 (N.D. Cal. 1978) (upholding modification by IBM of a plug device as a justifiable innovation even though it prevented the operation of interfaces with competitors' peripheral devices), *aff'd sub nom.*, Memorex Corp. v. IBM, 636 F.2d 1188 (9th Cir. 1980).

[261] *See, e.g.*, *Berkey Photo*, 603 F.2d at 281 ("If a firm that has engaged in the risks and expenses of research and development were required in all circumstances to share with its rivals the benefits of those endeavors, this incentive [to innovate] would very likely be vitiated. Withholding from others advance knowledge of one's new products, therefore, ordinarily constitutes valid competitive conduct.").

[262] The "error costs" approach draws on the often-voiced contention that false convictions (in which a defendant is wrongfully found guilty of, say, monopolization) are more harmful than false acquittals (in which the defendant is wrongfully exonerated). Several arguments support such a contention.

agreements with competitors are not implicated in unilateral conduct, (2) it often is difficult to distinguish predatory behavior from business success, and (3) courts have not had much success in analyzing activity based on exclusion.[263] Moreover, the test promises greater certainty and predictability in an unclear area of the law.[264]

To consider an example, several courts have considered the situation where an owner of a machine with a patented part refuses to license that part to competitors.[265] The product typically is a diagnostic part that an organization providing service or parts for the patentee's product would find helpful.[266] Where such an owner licenses the part itself, it will usually satisfy the second stage of reasonable necessity, as the activity will help it recover the expenditures it

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First, false convictions may increase litigation and encourage plaintiffs to redress their grievances in court. This is particularly true where the act challenged is based on a patent's right to exclude, which plaintiffs may always view as a justified trigger for a lawsuit. Second, and relatedly, such errors may encourage monopolists to compete less vigorously and to enter into agreements with their competitors. Third, false convictions cannot be remedied by the marketplace – once the defendant is found guilty, it may be forced to leave the market or, at a minimum, will likely be much weaker than it had been (and should have been). Nor can the deterrent effect of such convictions on innovation easily be corrected. False acquittals, on the other hand, often (though not always) can be remedied through the marketplace, as exonerated monopolists are still subject to the demands of the market, particularly in high-technology markets, where the tide of competition continually threatens to erode monopoly. *See generally* Ronald A. Cass & Keith N. Hylton, *Preserving Competition: Economic Analysis, Legal Standards and Microsoft*, 8 GEO. MASON L. REV. 1, 30-33 (1999). The costs of false convictions are even greater where they affect not only the competition process but also the incentives underlying the patent system.

263 *See supra* notes 248-54 and accompanying text. *Cf.* Teece & Coleman, *supra* note 69, at 812 (expressing doubt that antitrust can grapple with increasing returns and can imp rove network effects markets, and stating that "the traditional hallmarks of monopoly (reduction in output or increases in price) are rarely seen" in high-technology industries).

264 *See supra* notes 248-54 and accompanying text.

Such a standard can be applied by courts, who either can dismiss a case upon a finding of reasonable necessity or, for cases in which the defendant cannot show reasonable necessity, can consider other nonpatent-based justifications along with the anticompetitive effects of the activity.

The test also is less structured than that presented in Carrier, *supra* note 1. In the earlier work, the relevant industry had a more dispositive effect. While the test proposed in this Article shifts the central focus from the industry to the activity, it similarly adopts a high threshold that would find Section 2 violations only where the challenged activity is in fact not necessary for innovation.

265 *E.g.*, *Xerox*, 203 F.3d 1322; *Kodak II*, 125 F.3d 1195; Data General v. Grumman, 36 F.3d 1147 (1st Cir. 1994).

266 *See id.*

incurred in developing the product. Even if competitors are disadvantaged by not obtaining access to the product, the monopolist's exploiting of the patent is necessary to the process of innovation.[267] Reasonable necessity thus would replace courts' current analyses, which provide practical immunity for patentholders[268] or offer presumptions that can be rebutted based on the defendant's subjective intent[269] or other unspecified grounds.[270]

### B. Agreements

Section 1 of the Sherman Act targets agreements among competitors and prohibits "unreasonable" restraints of trade.[271] Other than a small class of agreements that are deemed per se unlawful because they lack any competitive justification,[272] most agreements (in particular, patent-based activity) are considered under the Rule of Reason.[273] Courts applying the Rule of Reason consider both the anticompetitive and procompetitive effects of the arrangements. Although courts have traditionally claimed to balance the two effects, the reality is more of a burden-shifting approach, with the court first examining whether the plaintiff has demonstrated a

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[267] To the extent these cases also involved the tying of diagnostic parts to service, the finding on reasonable necessity would not necessarily dispose of the analysis. The tying of an unpatented to a patented product is often not reasonably necessary for innovation. Thus, the validity of any tying provision would be determined in relation to the law on tying, which focuses on the existence of two products, coercion, market power in the tying product market, and an effect on commerce in the tied product market. *See supra* note 74.

[268] *Xerox*, 203 F.3d 1322.

[269] *Kodak II*, 125 F.3d 1195.

[270] *Grumman*, 36 F.3d 1147.

[271] Standard Oil Co. v. United States, 221 U.S. 1, 58 (1911).

[272] United States v. Socony-Vacuum Oil Co., 310 U.S. 150, 218, 224 n.59 (1940). *See supra* note 76 and accompanying text for a discussion of per se treatment applied to agreements between manufacturers of branded pharmaceuticals and makers of generic drugs.

[273] Broadcast Music, Inc. v. Columbia Broadcasting System, 441 U.S. 1 (1979); Continental T.V., Inc. v. G.T.E. Sylvania, Inc., 433 U.S. 36 (1977).

substantial anticompetitive effect, the defendant showing a procompetitive justification, and then – only in the handful of cases that survive these stages – balancing the two.[274]

If the plaintiff demonstrates a significant anticompetitive effect, the court then considers procompetitive justifications, such as limiting free-riding, enhancing quality, encouraging dealer investment, or allowing a new product to be developed.[275] This Article adds to the mix a new justification, which applies if the activity is reasonably necessary for tripartite innovation. It also shifts the balance in the direction of favoring such a justification.

The balancing of anticompetitive effects and the new justification is not to be an unpredictable, even-handed tallying where increased price and reduced output are weighed on a level scale against reasonable-necessity-for-tripartite-innovation. Rather, the reasonable necessity side of the scale will be weighted more heavily, with a higher burden on the plaintiff, who would need to show that the anticompetitive effects *significantly* outweigh reasonable necessity for tripartite innovation.[276] Although only extreme increases in price or reductions in output would outweigh the defendant's innovation-based justifications, supported allegations of reduced innovation[277] would (because of the importance of innovation for the inquiry) be

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274 *See* Carrier, *supra* note 92 (finding that courts disposed of 84 percent of Rule of Reason cases in the modern era at the first stage on the grounds that the plaintiff could not demonstrate an anticompetitive effect).

275 *See supra* notes 77-82 and accompanying text.

276 Significant outweighing denotes exceeding by a measurable amount, perhaps (quantifying the unquantifiable) a 70/30 ratio.

277 In contrast to increased price and reduced output, allegations of harm to innovation frequently will be less concrete, taking the form of arguments that, absent the defendant's activity, others would have developed even better products. *See* John E. Lopatka & William H. Page, *Monopolization, Innovation, and Consumer Welfare*, 69 GEO. WASH. L. REV. 367, 371 (2001). The difficulty of proving this counterfactual makes support for the allegation crucial.

The case that the Department of Justice brought against Visa and MasterCard provides an example of what thwarted innovation might look like. The DOJ alleged that the entities' dual governance structure, by which banks have "formal decision-making authority in one system while issuing a significant percentage of its credit and charge

considered as seriously as the reasonable necessity justification. On the other side, a less robust finding of reasonable necessity – such as a less cogent recovery of investment in an industry in which it is difficult to invent around the product, or a less-than-critical need for collaboration in creating the product – could be outweighed by significant anticompetitive effects.

Such a formula would clarify that innovation should take priority over allocative efficiency. Activity that is reasonably necessary for innovation is to be encouraged, even at the expense of modest increases in price or reductions in output. Such an innovation-weighted balance would best promote the purposes of the patent and antitrust systems and the growth of the economy. Imposing an asymmetric balance would force courts to recognize the importance of innovation and to apply heightened deference to innovation-promoting activity. Weighting the balance also would give courts a default position, removing from the calculus cases in which the two effects are in equipoise.[278]

To pick an example, cross-licenses and patent pools are reasonably necessary to circumvent bottlenecks in the semiconductor and biotechnology industries. As long as the arrangements actually target the thicket of blocking patents, they will satisfy the test of reasonable necessity. If, on the other hand, competitors combine substitute patents or make half-

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cards on a rival system," prevented the two companies from "mov[ing] forward in the 1980's with plans to convert credit cards from the prevailing magnetic stripe technology to 'smart' cards with embedded computer chips." United States v. Visa U.S.A. Inc., 163 F. Supp. 2d 322, 328, 347 (S.D.N.Y. 2001). The failure to embrace a new and superior technology could, in fact, demonstrate anticompetitive effects on innovation. But the evidence in the case did not appear to support the allegation that the arrangement blocked innovation and prevented a better technology from being used. *See id*. at 350 (finding that "neither Visa nor MasterCard has been able to demonstrate a viable business case for the wide-scale implementation of smart cards in the United States"); *id*. at 348 ("Merchants . . . did not believe that the extra effort and costs of processing chip cards would be justified by any real benefit over the recently installed magnetic stripe terminals."); *id*. at 364 (finding that the companies did innovate, moving from "inefficient, labor-intensive, paper-based systems to sophisticated electronic systems," upgrading their systems, and providing fraud and loss controls).

[278] Under the proposed test, the difficult cases would shift to the setting where reasonable necessity outweighs anticompetitive effects. Even so, at least those cases will occur where the anticompetitive effects are on par with the innovation-based justifications (from a total welfare standpoint) rather than where they are less important. Of

hearted (i.e., not through independent patent experts) attempts to demonstrate the presence of blocking patents, reasonable necessity will not be met.[279]

Once reasonable necessity is shown, the activity most likely will not constitute an antitrust violation. The intensity of the reasonable necessity finding is strong, as the arrangement resolves a particularly dangerous bottleneck that would otherwise block the path of innovation. The anticompetitive effects, on the other hand, of, perhaps, the exclusion of a competitor or an increase in price,[280] are not on the same level, let alone significantly higher than the benefits. Anticompetitive effects would predominate only where, for example, (1) there is an adverse effect on innovation (as in, for example, the failure to embrace available, superior technology[281] or the use of exclusive grantback provisions that expansively cover not just essential but also competing patents), (2) the participants exclude from the arrangement small competitors whose participation would be essential in resolving bottlenecks, or (3) a patentee or licensee increases

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course, even an asymmetric balance requires courts to compare price with innovation. But so would any test that would incorporate the effects of the activity on the two different outputs of price and innovation.

[279] It bears mention that patent pools in fact have enhanced innovation. For example, the pool containing MPEG-2 video compression technology, with approximately 100 patent families owned by 21 licensors, has "assisted hundreds, if not thousands, of enterprises to enter the various markets for products which employ MPEG-2 technology." Beeney, *supra* note 242, at 4. Without the pool, each of the companies "would be faced with negotiating multiple licenses, paying multiple royalties, and only guessing at the amount of their ultimate royalty obligation." *Id*. Similarly, small and new manufacturers can enter the DVD player market by licensing the technology from the patent pools at a reasonable rate, with DVD players sold to consumers today for less than $100. James J. Kulbaski, *Comments on Patent Pools and Standards for Federal Trade Commission Hearings Regarding Competition and Intellectual Property*, *testimony presented at* Hearings on Competition and IP Law, *supra* note 163, at 7-8. Moreover, innovation has continued after the implementation of the pools. *See id*. at 7 (stating that firms continue to develop new digital video standards like MPEG-4 and MPEG-7 that offer advantages over MPEG-2 and that "new and better DVD standards have been and continue to be developed such as standards defining recordable DVD, and high-definition DVD").

[280] Of course, increased price is the anticipated result of the patent system and of the ability to recover the investment from creating the product. Only severe increases in price – like Mylan's raising the price of its product 3200 percent – will lead to the predomination of anticompetitive effects. *See supra* note 147. The test carves out at least this space for pricing because such effects, even if less critical than innovation, should not be immune from scrutiny.

[281] *See supra* note 277.

the price of its product by a staggering amount.[282] But in most other cases, the reasonable necessity for tripartite innovation of cross-licensing and patent pools in the semiconductor and biotechnology industries will outweigh any anticompetitive effects.

Similarly, many other license agreements will not constitute antitrust violations since they will allow the patentee to recover its investment from creating the product. Patentees typically will not be so efficient in every aspect of development that they would not benefit from relying on licensees that are more experienced in certain fields of use or established in particular geographic areas. Licensing to recover investment in these situations would be reasonably necessary for innovation. For example, if an inventor of a new technology lacks the capability to bring a product embodying the technology to market, and thus grants a larger company an exclusive license to sell the product, the activity would be reasonably necessary for the creation (in particular, the commercialization) of the product, and would outweigh any far-from-apparent anticompetitive effects.[283]

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[282] *See* Mylan Complaint, *supra* note 147.

[283] A word on settlements between competitors is in order. Settlements often will take the form of conduct introduced elsewhere in this Article, including license agreements, patent pools, joint ventures, and mergers. These settlements will receive the treatment appropriate to that type of activity, as outlined in this Part.

The industry involved will often inform the determination of whether the settlement is reasonably necessary to attain innovation. For example, in the intragenerational bottleneck of semiconductors or the intergenerational bottleneck occurring between upstream and downstream innovation in biotechnology, the settlement often will be necessary for innovation. On the other hand, settlements between pharmaceutical patentholders and generic challengers involving a payment to the generic and an agreement to stay off the market for a period of time have appeared to constitute strategies for the patentee to extend the patent term, and would not be reasonably necessary for innovation. *See supra* note 128 and accompanying text. Settlement provisions that are more likely to be reasonably necessary allow competition to continue, license without restriction, involve payments from infringer to patentee (rather than from patentee to infringer), and include nonexclusive licenses and lump sum royalties. George S. Cary, *Antitrust Implications of Patent Settlements*, Hearings on Competition and IP Law (May 2, 2002).

### C. Mergers

Section 7 of the Clayton Act prohibits a merger or acquisition whose effect "may be substantially to lessen competition, or tend to create a monopoly."[284] The market shares of the merging parties are crucial to the courts' and agencies' determinations of whether to allow the merger to proceed. Other factors considered are the ease of entry in the industry and the level of concentration in the market. Efficiency justifications for the merger are considered, but they typically make the most significant difference in the cases in which the parties' market shares are not overwhelming.

Because a merger involves a permanent combination of the market power of the merging entities, with the most lasting potential for anticompetitive effects[285] and extending over a range of products that may cover far more than the patent at issue, the market shares of the entities will still be important. And because critical stages of innovation precede the introduction of commercialized products, market power should be determined in reference to not only product markets, but also technology[286] and innovation markets[287] – in other words, markets for R&D upstream from the commercialized product.[288]

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284 15 U.S.C. § 18 (Supp. 1997). Section 7 provides:

> No person engaged in commerce or in any activity affecting commerce shall acquire, directly or indirectly, the whole or any part of the stock or other share capital and no person subject to the jurisdiction of the Federal Trade Commission shall acquire the whole or any part of the assets of another person engaged also in commerce or in any activity affecting commerce, where in any line of commerce or in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly.

285 Jorde & Teece, *Rule of Reason Analysis*, *supra* note 66, at 608-09 (proposing more lenient standard for collaborative activities "less integrative and less permanent (and thus less potentially anticompetitive)" than mergers); Thomas G. Krattenmaker & Steven C. Salop, *Anticompetitive Exclusion: Raising Rivals' Costs To Achieve Power over Price*, 96 YALE L.J. 209, 257-58 (1986) (explaining that mergers "are more permanent than commercial contracts, and any harm they cause is thus more lasting").

In most cases, the parties' market power will be decisive. For example, in extremely concentrated markets, or mergers consolidating the market from, say, three firms to two, or two firms to one, a very high burden should be placed on the parties to show potent countervailing efficiencies from the transaction.[289] On the other hand, where the firms have insignificant market shares, the merger can proceed. But for cases in the middle, the defendant's justifications will matter.

This Article proposes the presence of reasonable-necessity-for-innovation as a recognized efficiency and it modestly expands the cases in which it will be considered. The first and third stages of innovation will present the typical context in which the merger would be reasonably necessary for innovation. In certain industries or markets, the difficulty of creating the product or the small size of the participants renders combinations necessary to achieve a scale sufficient to create the product.[290] A merger also could resolve bottlenecks occurring, for example, upstream from the commercialized product.[291]

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286 "Technology markets consist of the intellectual property that is licensed . . . and its close substitutes – that is, the technologies or goods that are close enough substitutes significantly to constrain the exercise of market power with respect to the intellectual property that is licensed." *Guidelines* ¶ 3.2.2.

287 "An innovation market consists of the research and development directed to particular new or improved goods or processes, and the close substitutes for that research and development. The close substitutes are research and development efforts, technologies, and goods that significantly constrain the exercise of market power with respect to the relevant research and development." *Guidelines* ¶ 3.2.3.

288 Expansion of the scope of markets to encompass innovation markets has not materially altered the agencies' analysis to date. *See* Richard J. Gilbert & Willard K. Tom, *Is Innovation King at the Antitrust Agencies? The Intellectual Property Guidelines Five Years Later*, 69 ANTITRUST L.J. 43, 44 (2001) (concluding that "[m]ost of the merger cases that alleged effects on innovation likely would have been challenged [by the agencies] based on adverse impacts on competition in markets for existing goods and services").

289 *Cf.* Pitofsky, *supra* note 127, at 553 ("Mergers to monopoly or near-monopoly, especially when the product has already been developed and is near the marketing stage, threaten to cause short-term anticonsumer effects in intellectual property markets just as they would in markets generally."); *see supra* notes 129-36 and accompanying text (discussing mergers in highly concentrated markets in pharmaceutical industry).

290 *See supra* Section III.C.

291 *See supra* Subsection III.E.1.b.

Efficiencies that have been considered by courts include synergies, cost savings, the exploitation of complementary R&D assets and scale economies in R&D, and the elimination of redundant R&D programs.[292] Whether the merger is reasonably necessary for tripartite innovation is at least as important as these rationales. More likely, because of its direct role in increasing innovation, the new justification is even more important. Especially where the patent at issue encompasses a significant portion of the product lines of the firms, the justification is more potent, and the dangers of increased market power not related to the patented product are reduced. Consequently, marginally higher market shares can be tolerated and the zone of markets that, under the current Merger Guidelines, are not quite "highly concentrated" can moderately expand. The Article proposes raising the Herfindahl-Hirschman Index ("HHI") upper threshold of market concentration for unconcentrated markets from 1000 to 1800[293] and that for moderately concentrated markets from 1800 to, perhaps, 2200 or 2600 in cases where the reasonable necessity justification is demonstrated.[294]

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Again, the requirement of reasonable necessity has teeth, and will not allow any merger in a particular context. For example, a merger between a pharmaceutical patentholder and a generic challenger that settles a patent dispute between the two should be viewed skeptically. *See supra* note 128 and accompanying text. For another example of a merger where the parties' claims based on innovation appropriately were scrutinized, see David Balto, *The Efficiency Defense in Merger Review: Progress or Stagnation?*, 16 ANTITRUST 74, 77 (2001) (questioning Heinz's allegation that its proposed merger with Beech Nut was necessary to develop new products where it "was the largest baby food manufacturer in the world and had implemented many of the[] innovations elsewhere").

[292] *See* Gilbert & Sunshine, *supra* note 199, at 597. The Merger Guidelines note that efficiency claims "relating to research and development are potentially substantial." *Merger Guidelines* ¶ 4; *see also* FTC REPORT, *supra* note 112, at 32 ("[I]nnovation efficiencies may make a particularly powerful contribution to competitive dynamics, the national R&D effort, and consumer (and overall) welfare.").

[293] The HHI is calculated "by summing the squares of the individual market shares of all the participants" in the market. *Merger Guidelines* ¶ 1.5. This figure "gives proportionately greater weight to the market shares of the larger firms." *Id.* The Guidelines consider markets with a post-merger HHI below 1000 to be unconcentrated; an HHI between 1000 and 1800 to be moderately concentrated (with mergers increasing the HHI by more than 100 points raising significant competitive concerns); and an HHI above 1800 to be highly concentrated (with mergers increasing the HHI by more than 50 points raising significant competitive concerns). *Id.* ¶ 1.51. Other factors, such as ease of entry, can affect the analysis. *Id.* ¶¶ 3.0-3.4.

For example, imagine a market in the biopharmaceutical industry composed of firms with market shares of 30, 20, 20, 10, 7, 5, 5, and 3 percent. The HHI pre-merger is 1908.[295] The firms with 7 percent and 10 percent market shares merge to combine their research and commercialization capabilities in order to create a product that they otherwise could not create.[296] The new HHI of 2048 would be "highly concentrated" under the current Guidelines and the increase from the merger would be 140 (well above the threshold of 50 allowable in such markets). It thus is questionable whether the agencies would allow the merger to proceed.

The proposed approach would allow the merger. A market with an HHI of 2048 is not overly concentrated, and an increase from the merger of 140 is not critically significant. Most significant, the merger is reasonably necessary to create a product that otherwise would not be developed, as the cost of creating products in the biopharmaceutical industry is significant and as this merger, in particular, appears to be necessary for such innovation.[297]

## V. Conclusion

The divergent paths to increased welfare traversed by patent and antitrust create difficulties for courts across the entirety of business activity, from licenses to patent pools to joint ventures to mergers to refusals to license. This Article offers a paradigm that allows antitrust courts to consider patent-based activity in a simple, straightforward test.

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294 *See* Jorde & Teece, *supra* note 66. The test also anticipates raising the allowable increase in the HHI from the merger from 50 points in highly concentrated markets to 100 or 150, and from 100 points in moderately concentrated markets to 150 or 200.

295 (30*30) + (20*20) + (20*20) + (10*10) + (7*7) + (5*5) + (5*5) + (3*3) = 1908.

296 *See supra* notes 104-05 and accompanying text.

297 Another acceptable justification would involve the circumvention of an intergenerational bottleneck where an upstream biotechnology firm merges with a downstream pharmaceutical company. Such activity promises to address the anticommons in upstream biomedical research. If the merging parties had similar market shares of 7 and 10 percent, the merger would be allowed.

The first element of the paradigm involves the selection of innovation as a common denominator by which the patent and antitrust systems can be compared. Innovation is the recognized purpose of the patent system, and is a well-supported objective of the antitrust laws, playing the most significant role of the various efficiencies in the growth of the economy.

The second component is a new justification that applies if the defendant's patent-based activity is reasonably necessary for tripartite innovation. Such an inquiry ensures that courts will consider the link between the challenged conduct and each of three independent, critical stages of innovation.

Third, the Article adjusts standard antitrust analysis, proposing immunity from the monopolization offense, an asymmetric balance emphasizing innovation for agreements analyzed under the Rule of Reason, and a modestly more significant role for the justification in merger analysis. Such a construct promotes the purposes of the patent system and is especially useful where the patent-based activity is critical for innovation. At the same time, it retains a role for antitrust, which continues to consider anticompetitive effects, but which no longer will be blinded by overbroad defenses based on the patent system.

The most important factor in the growth of our economy is innovation: creating products, allowing patentees to recover their investment from developing products, and circumventing the bottlenecks that threaten to blockade the many tributaries and patented currents that make up the path of innovation. The approach offered by this Article increases the possibility of attaining such beneficial effects, as it prescribes a more prominent and lasting role in antitrust analysis for the patent system and for the multiple components of innovation.