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Resolving the Patent-Antitrust Paradox Through Tripartite Innovation

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Resolving the Patent-Antitrust Paradox Through Tripartite Innovation

*Michael A. Carrier**

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The issues presented by the intersection of the patent system and the antitrust laws have never been as pressing as they are today. 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; refuse to license their patented products in various industries; 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 these patent-based 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 product,

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, 816-40 (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 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. For further discussion of the differences between the two approaches, see *infra* note 265.

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 on the text and legislative history of the relevant statutes, 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 satisfy (and that fail to satisfy) the test. Part IV concludes by applying the reasonable necessity concept to the antitrust analyses of monopolization, agreements, 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

2. See Sherman Antitrust Act, 15 U.S.C. §§ 1-7 (2000) (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 (2000)) (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.

(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

The very exclusion that forms the foundation of the patent system nevertheless 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

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 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., *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).

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

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 & ROSS, *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).

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 restrictions¹² on licensees. Most of these 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 take advantage of all the potential uses for 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

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 U.S. DEP’T OF JUSTICE & FED. TRADE COMM’N, *ANTITRUST GUIDELINES FOR THE LICENSING OF INTELLECTUAL PROPERTY* § 5.6 (Apr. 9, 1995) [hereinafter GUIDELINES].

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., *Gen. Talking Pictures Corp. v. W. Elec. Co.*, 304 U.S. 175, 179-82 (1938).

13. See GUIDELINES, *supra* note 10, § 5.5; *infra* Part III.E.2.b.

14. The systems also differ in (1) their divergent focal points (as intellectual property has emphasized quality and investment while antitrust has looked 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) (on file with author) (emphases omitted).

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

- 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 that 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

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.

16. *In re Indep. Serv. Orgs. Antitrust Litig. v. Xerox Corp.* (“Xerox”), 203 F.3d 1322, 1327-28 (Fed. Cir. 2000); see also *Townshend v. Rockwell Int’l Corp.*, No. C99-0400, 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 state an antitrust violation.”).

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 Pat. 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 Elec. 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 the 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 Servs., Inc. v. Eastman Kodak Co.* (“Kodak II”), 125 F.3d 1195, 1219 (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, Acting Assistant Attorney General, Dep’t of Justice Antitrust Division, to Gerrard R. Beeney, Sullivan & Cromwell, (Dec. 16, 1998) (Sony DVD pool), available at <http://www.usdoj.gov/atr/public/busreview/2121.htm>; Letter from Joel I. Klein to Gerrard R. Beeney (June 26, 1997) (MPEG-2 pool), available at <http://www.usdoj.gov/atr-public/busreview/1170.htm>; *In re Summit Technology, Inc.*, FTC Dkt. No. 9286 (eye surgery laser pool), available at <http://www.ftc.gov/os/1998/9803/summit.cmp.htm>.

- 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 and
- 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, through a 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 measures on both sides. I have elsewhere proposed innovation as this common denominator.²³ This Article provides an abridged version of the argument.

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

21. *C.R. Bard, Inc. v. M3 Sys., 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 Corp.*, 253 F.3d 34, 63 (D.C. Cir. 2001) (dismissing as "frivolous" Microsoft's copyright argument and stating that "[i]ntellectual property rights do not confer a privilege to violate the antitrust laws") (quoting *In re Indep. Serv. Orgs. Antitrust Litig.*, 203 F.3d 1322, 1325 (Fed. Cir. 2000)).

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

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 only 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

A. Patent Laws

Ever since the Framers of the Constitution authorized Congress to "promote the Progress of Science and 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

24. Thomas M. Jorde & David J. Teece, *Innovation, Cooperation, and Antitrust*, in ANTITRUST, INNOVATION, AND COMPETITIVENESS 47, 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.

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, 809-10 (1988), this distinction is not significant for our purposes because inventors typically will consider innovation to be the closely related (and desired) successor to invention. See, e.g., RICHARD R. NELSON & SIDNEY G. WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE 263 (1982) (finding that firms consider both business and technical risks in pursuing research and development).

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 1793³⁵ offered defenses against claims of patent infringement in circumstances in which the patentee did not contribute to innovation—i.e., situations in which 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, utility, nonobviousness, and enablement 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

30. Patent Act of 1790 § 1, ch. 7, 1 Stat. 109 (1790).

31. § 1.

32. § 1.

33. § 1.

34. § 2.

35. Patent Act of 1793, ch. 11, 1 Stat. 318 (1793).

36. *Id.*

37. See 35 U.S.C. § 102 (2000).

38. See *id.* § 101 (“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 § 103(a).

40. See § 112:

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.

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

B. Antitrust Laws

In contrast to the patent laws, there is no universally accepted goal animating the antitrust laws. Because the traditional tools of statutory interpretation—the text and legislative history of the Sherman Act—offer little guidance on the issue, this section relies upon tools of greater import in antitrust analysis: judicial opinions and economic efficiencies.

1. Statutes/Legislative History

The text of the Sherman Act fails to provide guidance on the role of innovation—or 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 to lessen competition, or tend to create a monopoly.”⁴⁵

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 n.201.

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. La. Power & Light Co.*, 435 U.S. 389, 398 (1978); *Atlantic Cleaners & Dyers, Inc. v. United States*, 286 U.S. 427, 434 (1932).

43. 15 U.S.C. § 1 (2000). 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. § 2. 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.

45. § 18. Section 7 provides:

The vague language of the statutes does not shed light on the objectives 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 concerning which the legislative history of the Sherman Act is 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

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," § 14, and section 5 of the Federal Trade Commission Act, which protects against "[u]nfair methods of competition." § 45. This Article will not focus as directly on these provisions, as they do not play as significant a role in the patent-antitrust intersection.

46. See Robert H. Bork, *The Role of Courts in Applying Economics*, 54 ANTITRUST L.J. 21, 24 (1985):

In looking to the legislative history, one discerns repeated concern for the welfare of consumers and also for the welfare of small business 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, 315 (1962); see also Derek C. 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 Bok, *supra*, 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").

48. See *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. [.]

the text and legislative history, together with Congress's delegation to the courts⁴⁹ of the authority to develop antitrust jurisprudence and the courts' full-fledged utilization of that delegation, requires analysis of the case law 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 reasoning⁵³) have varied, the goal of maximizing economic efficiency⁵⁴ has been nearly

see also id. at 2456 (statement of Sen. Sherman) (stating that 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 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. [.]

Nat'l 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."); 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.* at 913.

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. Phila. 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, Inc. v. FTC*, 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 social wealth." Joseph F. Brodley, *The Economic Goals of Antitrust: Efficiency, Consumer Welfare, and Technological Progress*, 62 N.Y.U. L. REV. 1020, 1025 (1987).

unanimously accepted 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 therefore have analyzed the effect of challenged practices on price or output in the relevant markets. But at times, courts also have analyzed innovative efficiencies.⁵⁶ In *United States v. United Shoe Machinery Corp.*, for example, the court explained that the antitrust laws permit “the process of invention and innovation . . . [as conduct] which a competitive society must foster.”⁵⁷ Courts have upheld under section 2 monopolists’ alterations of products that affect complementary products,⁵⁸ introductions of new products that have the effect of injuring competitors,⁵⁹ and failures to “predisclose” their products to competitors.⁶⁰ Even the district court in the *Microsoft* case declared a section 2 violation on the grounds that Microsoft’s acts “trammelled the competitive process through which the computer

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); *Bus. 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, 344 (D. Mass. 1953), *aff’d per curiam*, 347 U.S. 521 (1954).

58. *See, e.g.*, *Berkey Photo, Inc. v. Eastman Kodak Co.*, 603 F.2d 263, 286 (2d Cir. 1979) (noting that “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, Inc. v. M3 Sys., Inc.*, 157 F.3d 1340, 1370 (Fed. Cir. 1998) (“the jury verdict of monopoly power must be sustained although the power held . . . in this market is based on the patent right”).

59. *See, e.g.*, *Cal. Computer Prods. v. IBM Corp.*, 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).

60. *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.

software industry generally stimulates innovation and conduces to the optimum benefit of consumers.”⁶¹ Finally, innovation efficiencies and “innovation markets” have played a role in merger analysis.⁶²

In determining the relative significance of various types of efficiencies, the findings of economists obviously are essential. The consensus among economists since Schumpeter⁶³ is that the gains achieved from innovative efficiencies dwarf those derived from maximizing allocative efficiency and that innovation is the most important factor in the growth of the economy.⁶⁴ Economic studies

61. *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) (finding that “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”) (finding that 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 (concluding that Microsoft restricted innovation by making it more difficult for developers to write cross-platform Java applications).

62. *See, e.g.*, *Fed. Trade Comm’n. v. H.J. Heinz Co. & Milnot Holding Corp.*, 246 F.3d 708, 722-24 (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); *United States v. Gen. Motors Corp.*, Civ. No. 93-530 (D. Del. filed Nov. 16, 1993) (challenging merger between division of General Motors and ZF Friedrichshafen, manufacturers of automatic transmissions for buses, trucks, and other commercial and military vehicles on the grounds that it would reduce competition in a global innovation market involving the design, development, and production of medium and heavy automatic transmissions); Robert P. Taylor & Matthew E. Carswell, *Research into Developing a New Idea: Innovation Markets*, in *INTELLECTUAL PROPERTY ANTITRUST 1996*, at 51, 56-59 (P.L.I. Patents, Copyrights, Trademarks, & Literary Prop. Course, Handbook Series No. 449, 1996) (citing eight complaints brought by FTC alleging harm to competition in innovation markets). “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*, *supra* note 10, § 3.2.3; *see infra* notes 288-90 and accompanying text.

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

64. *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.”); Frank H. Easterbrook, *Ignorance and Antitrust*, in *ANTITRUST, INNOVATION, AND COMPETITIVENESS*, *supra* note 24, at 119, 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.”); Brodley, *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.”); F. M. Scherer, *Antitrust, Efficiency, and*

have revealed that at least fifty percent of the increase in U.S. output from the late 1920s to the late 1960s was due solely to technological and scientific progress⁶⁵ and that declines in innovation contributed to a reduction in the growth of business-sector productivity by roughly sixty-five percent from the period from 1947 to 1973 to the period from 1973 to 1987.⁶⁶ In contrast, the loss from monopolistic pricing is substantially less than one percent of the gross national product.⁶⁷

Buttressing these conclusions, innovation is more important than ever in today's high-tech economy. The currency of today's economy 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."⁶⁸ And the tools that courts have 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

Progress, 62 N.Y.U. L. REV. 998, 1018 (1987) (stating that productive efficiency is "much more important quantitatively" than allocative efficiency and that [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) (noting that "in the long run, technological progress "contributes far more to consumer welfare than does the elimination of allocative inefficiencies caused by non-competitive pricing") (citation omitted).

65. 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*, 61 ANTITRUST L.J. 579 (1992), at <http://www.ftc.gov/opp/global/jorde2.htm> (last visited Jan. 15, 2002). If anything, the percentage of economic growth resulting from innovation has increased in the past generation.

66. 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 & ROSS, *supra* note 6, at 614.

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

68. David J. Teece & Mary Coleman, *The Meaning of Monopoly: Antitrust Analysis in High-Technology Industries*, 1998 ANTITRUST BULL. 801, 804; see also David S. Evans, *Antitrust and the New Economy*, SF63 ALI-ABA 41, 52 (2000) (noting that 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) (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).

additional unit is insignificant.⁶⁹ 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.⁷⁰

In short, any attempt to unearth the goals of antitrust will not find guidance in the text and legislative history of the Sherman Act, which are indeterminate on the issue.⁷¹ Nonetheless, the legislative history reveals that Congress intended the courts to play the primary role in developing antitrust jurisprudence, and for at least the past generation, courts have emphasized economic efficiencies to the exclusion of noneconomic objectives. Because innovation contributes more to economic growth than any other type of efficiency, positing that it is the most important goal of the antitrust laws is well supported.⁷²

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

69. See Evans, *supra* note 68, 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, *supra* note 68, at 118.

70. See Evans, *supra* note 68, 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.").

71. 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.

72. Although innovation should be the primary objective of the antitrust laws, it is not the *only* goal, and so the approach developed in the Article considers other outputs, such as price.

73. As a preliminary matter, the challenged activity must actually be based on a valid patent to receive deference. Such activity would not encompass patents obtained by fraud or the filing of sham litigation. See *Walker Process Equip., Inc. v. Food Mach. & Chem. Corp.*, 382 U.S. 172, 177 (1965); *Handgards, Inc. v. Ethicon, Inc.*, 601 F.2d 986, 999 (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 conceivably take place through horizontal market division agreements among competitors, output or price restraints implemented through patent pools, vertical price restrictions imposed at the behest of powerful dealers, or collusive standard-setting organizations. 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.

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 generally⁷⁴ has only an anticompetitive effect), all antitrust proceedings involve 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, in which the right to exclude allows patentees to raise price and reduce output 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

It is not to be applied where it appears that the anticompetitive effects of the arrangement outweigh the procompetitive effects.

74. "Tying" offenses, although 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 Enters., Inc. v. U.S. Steel Corp.*, 394 U.S. 495, 498-99 (1969).

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 that take the form of "an agreement between horizontal competitors to minimize generic competition and to allocate the entire United States market for [the pharmaceutical] to [the branded drug manufacturer] during the life of the [a]greement." *In re Cardizem CD Antitrust Litig.*, 105 F. Supp. 2d 682, 699 (E.D. Mich. 2000); see also *In re Terazosin Hydrochloride Antitrust Litig.*, 164 F. Supp. 2d 1340, 1348-49 (S.D. Fla. 2000) (finding that generic drug manufacturers "forsook 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. June 16, 1994); *Gemini Concerts, Inc. v. Triple-A Baseball Club Assocs.*, 664 F. Supp. 24,

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 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

27 (D. Me. 1987); *Net Realty Holding Trust v. Franconia Props, 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. Wash. Post Co.*, 438 F. Supp. 470, 475 (D.D.C. 1977).

80. See, e.g., *Broad Music, Inc. v. Columbia Broad. Sys. ("BMI")*, 441 U.S. 1, 21-23 (1979); *Nat'l 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); *Nat'l 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).

82. See, e.g., *Northeastern Educ. Television v. Educ. Television Ass'n*, 758 F. Supp. 1568, 1578 (N.D. Ohio 1990) (increasing diversity of output); *Grappone, Inc. v. Subaru of New Eng., Inc.*, 858 F.2d 792, 799 (1st Cir. 1988) (preventing parts shortages); *Net Realty Holding Trust v. Franconia Props., Inc.*, No. 82-0318-A, 1983 WL 1786, at *8 (E.D. Va. Jan. 20, 1983) (promoting comparison shopping); *Jetro Cash & Carry Enters., Inc. v. Food Distrib. Ctr.*, 569 F. Supp. 1404, 1416 (E.D. Pa. 1983) (same); *Gunter Harz Sports, Inc. v. U.S. Tennis Ass'n*, 511 F. Supp. 1103, 1117 (D. Neb. 1981) (preserving integrity of game).

83. GUIDELINES, *supra* note 10, § 2.3.

84. *Id.* § 5.5.

85. See *infra* notes 114-20 and accompanying text.

circumventing patent bottlenecks. The clearing of patent roadblocks in these situations allows innovation to proceed.

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 system 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 that ties the challenged activity 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 primarily contributing 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. A patentee could also utilize territorial divisions that restrict where unpatented goods can be produced⁸⁷ or enter into settlement agreements that only have the effect of restricting competition.⁸⁸ The range of potential activities that nominally are based on a patent but that do not promote innovation recommends the demonstration of a link between the activity and innovation for the defendant to claim the innovation-based justification.⁸⁹

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 129 and accompanying text.

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.

This link must have teeth. "Plausible" justifications for which a post hoc rationale could be unearthed 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 and the range of possible activities related to the patent system would lead to immunity for an overwhelming array of activity.⁹¹

On the other hand, the nexus cannot be impossible to prove, as a matter of theory or of 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 delineated 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 [defendant's restraint] exists that would provide the same benefits as the . . . restraint."⁹² Stated in this manner, who could oppose such a test?

But for two primary reasons, courts cannot practically apply the test.⁹³ First, courts' focus turns naturally to whether less restrictive alternatives exist, rather than to 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.⁹⁴ The latter inquiry,

Of course, certain activity is expressly authorized by the patent laws. See, e.g., 35 U.S.C. § 261 (2000) (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 competition "cannot be whether any plausible efficiency justification can be conceived; for if that were the test, defendants almost never would lose").

91. The link thus requires more searching scrutiny than the "plausible" claim that the integration of two products is advantageous. See, e.g., *United States v. Microsoft Corp.*, 147 F.3d 935, 950 (D.C. Cir. 1998) (applying a tying analysis).

92. *Sullivan v. NFL*, 34 F.3d 1091, 1103 (1st Cir. 1994); see also, e.g., *L.A. Mem'l Coliseum Comm'n v. NFL*, 726 F.2d 1381 (9th Cir. 1984).

93. 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.

94. See *infra* note 95 and accompanying text.

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 when 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: 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 by a nonexclusive license, or that a substitute patent could have been excluded from 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 improvements.⁹⁵ 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 of the activity (or lack thereof) 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.”⁹⁶ 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

95. See statement of Mark A. Lemley, Roundtable Discussion at the Federal Trade Commission, Hearings on Competition and IP Law and Policy in the Knowledge-Based Economy, 34-43 (Feb. 25, 2002), available at <http://www.ftc.gov/opp/intellect/020225transc.pdf>.

96. MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY, at <http://www.m-w.com> (last visited Feb. 26, 2003).

duty of care in negligence actions,⁹⁷ to determine whether there has been a seizure under the Fourth Amendment,⁹⁸ and to ascertain whether a work has value for purposes of obscenity law,⁹⁹ among many other instances.¹⁰⁰ In antitrust law, courts have successfully applied the standard of whether the defendant's activity is reasonably necessary to achieve a procompetitive objective.¹⁰¹

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.

97. See, e.g., *Nelson v. Freeland*, 507 S.E.2d 882, 883 (N.C. 1998) (using the reasonable person standard to define the duty of care in a negligence action).

98. 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”).

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

100. See, e.g., *Faragher v. City of Boca Raton*, 524 U.S. 775, 787 (1998) (“[T]o 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.”); *Harlow v. Fitzgerald*, 457 U.S. 800, 818 (1982) (“[G]overnment 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.”); 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”).

101. See, e.g., *SCFC ILC, Inc. v. Visa USA, Inc.*, 36 F.3d 958, 970 (10th Cir. 1994) (finding restraints to be reasonably necessary where they created product that would not otherwise have been available); *Broad. Music, Inc. v. Moor-Law, Inc.*, 527 F. Supp. 758, 769 (D. Del. 1981) (same); *Newberry v. Wash. Post Co.*, 438 F. Supp. 470, 475 (D.D.C. 1977) (finding that test was met where restraint increased market penetration and improved service to customers); see also *Gunter Harz Sports, Inc. v. United States Tennis Ass’n*, 511 F. Supp. 1103, 1121 (D. Neb. 1981) (finding test to be satisfied where agreement furthered professional or amateur athletic endeavors); *Justice v. NCAA*, 577 F. Supp. 356, 381 (D. Ariz. 1983) (same).

B. Tripartite Innovation

Innovation occurs over 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 back to the first patent granted—for Samuel Hopkins' discovery of a method for making potash from wood soap.¹⁰² 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 on the path of innovation, it must be encouraged. Antitrust condemnation of such activity would threaten innovation and could discourage patentees from entering into arrangements that would facilitate 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.¹⁰³ Accordingly, activities that do just 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, the patent-related purpose of which 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,

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

103. 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 SUBCOMM. ON PATENTS, TRADEMARKS AND COPYRIGHTS OF THE SENATE COMM. ON THE JUDICIARY, 85TH CONG., *AN ECONOMIC REVIEW OF THE PATENT SYSTEM* 9-10 (Comm. Print 1958) (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."); JOHN JEWKES ET AL., *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 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.

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 the 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 innovation timeline frequently will result in the test of reasonable necessity being satisfied for only one stage.

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.¹⁰⁴ One straightforward example of activity that is reasonably necessary for this stage occurs when 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.¹⁰⁵ In the biotechnology industry, for example, many mergers combine small firms that otherwise would not be able to create particular products.¹⁰⁶

104. When this Article refers to the creation of a "product," the reader should consider not just downstream commercialized products but also upstream research tools or even processes.

105. See Robert P. Merges, *Antitrust Review of Patent Acquisitions: Property Rights, Firm Boundaries, and Organization*, in GALLINI & TREBILCOCK, *supra* note 4, at 111, 124 (noting the significant role played by intellectual property in joint ventures, "especially those with an R&D component").

106. 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.

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,”¹⁰⁷ and, as a consequence, the participants in the field “have turned to all manner of joint ventures, research partnerships, strategic alliances, minority equity investments, and licensing arrangements to speed the process of drug development and to compensate for their lack of internal capabilities.”¹⁰⁸ Significantly reducing the time to market is particularly critical in the pharmaceutical context, where new drugs “sometimes assume life-and-death importance.”¹⁰⁹

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.¹¹⁰ So moderate synergies and

107. *Id.* at 252.

108. *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, combinatorial 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*, 46 J. INDUS. ECON. 125, 126 (1998) (noting that 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.”).

109. 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), at <http://www.ftc.gov/speeches/anthony/stip000601.htm>.

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 114-19 and accompanying text. Collaborations that would bring products to market significantly faster should be found to be reasonably necessary for innovation.

110. 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

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 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.¹¹¹

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 vary 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 innovation¹¹²), and agricultural products, the search for the next breakthrough can be prohibitive.¹¹³

Biopharmaceutical companies¹¹⁴ often spend hundreds of millions of dollars and take ten to fifteen years to bring new drugs to market.¹¹⁵ These companies must pass through multiple stages of

global antitrust analysis and, in particular, more weight in the calculus than adverse effects on price or output.

111. See *infra* notes 130-37 and accompanying text.

112. See *infra* Part III.E.1.b.

113. See SCHERER & ROSS, *supra* note 6, at 627; W. KIP VISCUSI ET AL., *ECONOMICS OF REGULATION AND ANTITRUST* 831 (2d ed. 1995); Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 1987 BROOKINGS PAPERS ON ECON. ACTIVITY 793, 809; FED. TRADE COMM'N, *ANTICIPATING THE 21ST CENTURY: COMPETITION POLICY IN THE NEW HIGH-TECH, GLOBAL MARKETPLACE* [hereinafter *FTC REPORT*], ch. 8 ("Intellectual Property and Antitrust Policy for New Technologies") at 6.

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

115. See TUFTS CTR. FOR THE STUDY OF DRUG DEV., *OUTLOOK 2002*, at 3, 4 (stating that the cost of developing new drugs and bringing them to market averages \$802 million and takes ten to fifteen years), at <http://csdd.tufts.edu/InfoServices/OutlookPDFs/Outlook2002.pdf> (2002); PHARM. RESEARCH & MFRS. OF AM. (PHARMA), *PHARMACEUTICAL INDUSTRY PROFILE 2001*, ch. 9 (2002) ("On average, it takes 14.2 years and costs \$500 million to develop a new medicine."), available at <http://www.phrma.org/publications/publications/profile01/chapter9.phtml>; 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 (finding that it costs \$175 to \$300 million to develop a new biotechnology medicine and \$300 to \$500 million to develop a new pharmaceutical drug).

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 part—estimated by one CEO of a bioinformatics company to be one percent—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. 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.

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.¹¹⁶ Only one out of every four thousand discovered compounds tested in industry laboratories passes through each of the stages and reaches the marketplace.¹¹⁷ Moreover, biopharmaceutical products “arise out of living systems, and are typically intended to interact with other human or non-human living systems,”¹¹⁸ with the result that the functionality of biotechnology products “is always unforeseeable, and always involves a high degree of uncertainty and risk.”¹¹⁹ 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.¹²⁰

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”¹²¹ patent—are usually simple ideas easily

116. Rai, *supra* note 115, 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 19 (IPC Working Paper No. 98-006 WP, 1998) (on file with author); SCHERER & ROSS, *supra* note 6, at 626-27; 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) (noting that after completion of the three testing stages, an 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, the FDA gives its decision).

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

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

119. *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.

120. 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. Again, this uncertainty applies to the chemical compounds in the pharmaceutical area. See TAYLOR & SILBERSTON, *supra* note 24, at 252; *supra* notes 114-19 and accompanying text.

121. 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).

conceived.¹²² 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.¹²³ In these industries, in which firms do not consider patents to be effective appropriability mechanisms,¹²⁴ there is a reduced likelihood of firms needing to enter 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 of collaborations¹²⁵ with fluid arrangements among participants and competitors on one project becoming partners on another.¹²⁶ The result is an innovating field, with “external alliances accelerat[ing] the pace of drug discovery far

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

123. See WESLEY M. COHEN ET AL., PROTECTING THEIR INTELLECTUAL ASSETS: APPROPRIABILITY CONDITIONS AND WHY U.S. MANUFACTURING FIRMS PATENT (OR NOT) tbl.1 (Nat'l Bureau of Econ. Research, Working Paper No. 7552, 2000); Richard C. Levin, *The Semiconductor Industry, in GOVERNMENT AND TECHNOLOGICAL PROGRESS: A CROSS-INDUSTRY ANALYSIS* (1982); ALMARIN PHILLIPS, TECHNOLOGY AND MARKET STRUCTURE: A STUDY OF THE AIRCRAFT INDUSTRY (1971); J. R. TILTON, INTERNATIONAL DIFFUSION OF TECHNOLOGY: THE CASE OF SEMICONDUCTORS (1971).

124. See, e.g., COHEN ET AL., *supra* note 123, at 10 (noting that managers consider secrecy and lead time to be two most effective appropriability mechanisms); Merges & Nelson, *supra* note 120, at 217 (“[I]n 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”); Levin et al., *supra* note 113, at 796 (presenting a survey demonstrating 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); F. M. Scherer, *First-Mover Advantages from Pioneering New Markets: Comment*, 9 REV. INDUS. ORG. 173, 175 (1994) (noting that in most corporations’ R&D decisions, patents played “a minor role” and that “the necessity of maintaining competitive leadership” and “profits resulting from customer belief in the company’s technological leadership” were more critical).

125. See *supra* notes 107-09 and accompanying text. See also Rai, *supra* note 115 (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. Sch. & NBER, Working Paper, 1998) (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).

126. Powell, *supra* note 107, at 259 (observing that “the playing field resembles less a horse race and more a rugby match, in which the players frequently change their uniforms”).

more rapidly than a company establishing research capabilities solely in-house."¹²⁷ At a minimum, it would be much more difficult to create products in the biopharmaceutical industry absent collaboration.¹²⁸

That is not to say that *every* collaboration in these industries would satisfy the test. For example, settlements between manufacturers of brand-name pharmaceuticals and makers of generics by which the former pay the latter to delay entering the market would not be reasonably necessary for innovation.¹²⁹ Moreover, courts should skeptically view combinations (especially 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

127. *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 (PLI Patents, Copyrights, Trademarks & Literary Prop. Course, Handbook Series No. 514, 1998); see *supra* notes 107-09 and accompanying text.

128. 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.*

129. 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 thirty-month stay of 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, Schering-Plough, Upsher-Smith, and American Home Products for similar types of agreements. Compl., *In re Schering-Plough Corp.*, No. C-9297, Mar. 30, 2001 FTC LEXIS 39 (2001) (No. C-9297); Compl., *In re Hoechst Marion Roussel, Inc.*, No. C-9293, Mar. 16, 2000 FTC LEXIS 16 (2000).

in imposing conditions on merging parties¹³⁰ 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,¹³¹ Upjohn and Pharmacia,¹³² Baxter and Immuno,¹³³ American Home Products and Cyanamid,¹³⁴ Ciba-Geigy and Sandoz,¹³⁵ and Pfizer and Warner-Lambert.¹³⁶ The proposed

130. Reasonable necessity is determined with respect to a particular challenged (patented) 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* Part IV.C.

131. *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 at 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>.

132. *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).

133. *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, at *1 (Dec. 19, 1996) (imposing a condition on the 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 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”).

134. *In re* Am. Home Prods. Corp., 119 F.T.C. 217, 219-20 (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).

135. *In re* Ciba-Geigy Ltd., No. 961-0055, 1996 F.T.C. LEXIS 701 (Dec. 15, 1996) (imposing a condition on the merger between Ciba-Geigy and Sandoz requiring licensing of a 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 &*

merger between Pfizer and Pharmacia, which would make the largest pharmaceutical company in the world (Pfizer) even larger, also warrants scrutiny.¹³⁷

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 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 only of the initial creation of the product, and if 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

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.”).

136. See Compl., Pfizer, Inc. & Warner-Lambert Co., No. C-3957, June 17, 2000 (noting that the 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.

137. 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., Bill Brubaker, *Pfizer Buys Rival Pharmacia for \$60 Billion; Top Drugmaker Does Not Expect Antitrust Problems*, WASH. POST, July 16, 2002, at E01; Nicholas Kulish, *Pharmaceuticals Firms’ Pact Raises Few Antitrust Concerns*, ASIAN WALL ST. J., July 17, 2002, at A4.

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.¹³⁸

Moreover, it is usually more efficient for the patentee to enter into licensing agreements with parties that own complementary assets or capabilities.¹³⁹ 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 property."¹⁴⁰ To realize the commercial value of the patent, the patentee must collaborate with others.¹⁴¹ 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."¹⁴² These arrangements also "increas[e] the expected returns from intellectual property," thus "promot[ing] greater investment in research and development."¹⁴³

A patentee can utilize a broad range of licenses, which may include customer, territorial, and field-of-use restrictions and various types of royalties.¹⁴⁴ 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."¹⁴⁵ 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

138. 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.").

139. See, e.g., Patrick Rey & Ralph A. Winter, *Exclusivity Restrictions and Intellectual Property*, in COMPETITION POLICY AND INTELLECTUAL PROPERTY RIGHTS IN THE KNOWLEDGE-BASED ECONOMY, *supra* note 4, at 168.

140. GUIDELINES, *supra* note 10, § 2.3.

141. *Id.*

142. *Id.*

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

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

145. CARL SHAPIRO, COMPETITION POLICY AND INNOVATION (STI Working Paper 19, 2002) (on file with author).

licensor's own technology in a market niche that it prefers to keep to itself."¹⁴⁶

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;¹⁴⁷ where exclusive licenses with suppliers allow firms to increase price by extraordinary (e.g., 3200%) amounts;¹⁴⁸ and where brand-name pharmaceutical 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 thirty-month stay on FDA approval of the generic drug,¹⁴⁹ the license will not be reasonably necessary for innovation.

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 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

146. GUIDELINES, *supra* note 10, § 2.3.

147. 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.

148. See Fed. Trade Comm'n v. Mylan Lab., Inc., No. 1:98CV03114 (TFH) ¶ 29 (D.D.C. Feb. 8, 1999) (amended complaint filed under seal) (alleging that a five-hundred-count bottle of 7.5 mg clorazepate tablets increased in price more than 3200%, from approximately \$11.36 to \$377.00), available at <http://www.ftc.gov/os/1999/9902/mylanamencmp.htm> [hereinafter Mylan Complaint]; Mylan, *Nation's Second Largest Generic Drug Maker, Charged with Restraint of Trade, Conspiracy & Monopolization*, FED. TRADE COMM'N, (Dec. 21, 1998) (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"), available at <http://www.ftc.gov/opa/1998/9812/mylanpv.htm>.

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

patentee can recover its investment.¹⁵⁰ In industries such as chemical structures, fabricated metals, food processing, and simple machinery, where innovations are easy to imitate,¹⁵¹ 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,¹⁵² 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 cost. But there is an independent role for the second stage, in particular in allowing the patentee to recover its modest investment in industries in which 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 where access to earlier

150. Cf. Samuelson & Scotchmer, *supra* note 139, at 1587:

[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.

151. See, e.g., SCHERER & ROSS, *supra* note 6, at 626; TAYLOR & SILBERSTON, *supra* note 24, at 251; VISCUSI ET AL., *supra* note 117, at 851; 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 113, at 851; Burk & Lemley, *supra* note 118, 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).

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

generations of products is required for innovation, the presence of potential obstacles increases significantly. This Article refers to such holdups or obstacles as “bottlenecks.”¹⁵³

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 when 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 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.”¹⁵⁴ Industries marked by this type of innovation require nuanced analysis: the optimal breadth of patents is unclear, since stronger patent protection

153. The term “bottleneck” has been used in connection with the “essential facility” doctrine, by which a monopolist must share with competitors facilities that are deemed essential to compete in the market. See, e.g., *Otter Tail Power Co. v. United States*, 410 U.S. 366 (1973); *United States v. Terminal R.R. Ass’n*, 224 U.S. 383 (1912); *MCI Communications Corp. v. AT&T*, 708 F.2d 1081, 1132 (7th Cir. 1982). The Article selects this phrase—as opposed to, for example, “essential facility,” which the elasticity of language and judicial interpretation have expanded beyond true essentiality—to emphasize the actual impasse that can result from blocking patents.

154. See SUZANNE SCOTCHMER, CUMULATIVE INNOVATION IN THEORY AND PRACTICE (GSPP Working Paper, 1999) (on file with author). See generally Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 J. ECON. PERSP. 29 (1991).

Some industries will not encounter the problem of cumulative innovation and therefore 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.

helps the initial innovator but hurts subsequent (or “follow-on”) innovators, and licensing is critical to keep the path of innovation flowing.¹⁵⁵

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 or research tools—to products.¹⁵⁶ The second context involves lengthy sequences of products, each of which improves upon its predecessor, which are known as “quality ladders.”¹⁵⁷

Cumulative innovation occurs in industries as diverse as automobiles, aircraft, biotechnology, semiconductors, computer hardware, and computer software.¹⁵⁸ Computer software, for example, can be viewed as “a series of inventions piled on top of each other.”¹⁵⁹ Incremental improvement in computer programs offers several advantages: enhancing interoperability, rendering programs more stable, and responding to hardware-based architectural constraints in the industry.¹⁶⁰ 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.¹⁶¹ And science-

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

156. SCOTCHMER, CUMULATIVE INNOVATION, *supra* note 154, 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.*

157. *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.

158. Jorde & Teece, *supra* note 24, at 48; 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); Levin et al., *supra* note 113, at 788; SCOTCHMER, CUMULATIVE INNOVATION, *supra* note 154, 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, *Standing on the Shoulders of Giants*, *supra* note 154, at 29.

159. FTC REPORT, *supra* note 113, ch. 8, at 18; Scotchmer, *Standing on the Shoulders of Giants*, *supra* note 154, 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), available at <http://www.researchoninnovation.org/patent.pdf>.

160. Burk & Lemley, *supra* note 118, at 52.

161. See Merges & Nelson, *supra* note 154, at 882-83.

based technologies (such as biotechnology, lasers, and superconductors) also emphasize cumulative development, with R&D efforts seeking to exploit recent scientific advances.¹⁶²

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.¹⁶³ The presence of bottlenecks in industries with cumulative innovation thus necessitates licensing between the initial and follow-on innovator.

Licensing is especially needed for broad patents, which claim an expansive scope of subject matter. Such patents constitute the traditional bottleneck covering the field and precluding subsequent breakthroughs in the absence of licensing.¹⁶⁴ 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.¹⁶⁵ Moreover, licensing can prevent often inefficient inventing around of the patented product, since a licensee gets the benefit of the labor that the

162. See *id.* at 883.

163. 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 154, 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.”).

164. For a discussion of broad patents, see *infra* note 197.

165. See Suzanne Scotchmer, *Competition Policy and Innovation: The Context of Cumulative Innovation*, Testimony at the U.S. Department of Justice & Federal Trade Commission Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy, Feb. 26, 2002 [hereinafter Hearings on Competition and IP Law]; see also Merges & Nelson, *supra* note 154, at 908 (blockages resulted in broad patents on components in cumulative industries, particularly when a multicomponent system was involved).

patentee has undertaken and does not need to spend resources devising an alternative to the already discovered protected product.¹⁶⁶

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,¹⁶⁷ an ongoing relationship between the parties, and complex assignments of partial legal rights); (2) uncertainty, primarily (once again) over the difficulty of valuation¹⁶⁸ and scope of the patent;¹⁶⁹ (3) externalities; (4) strategic behavior; and (5) noneconomic (perhaps irrational) incentives.¹⁷⁰ These costs are particularly severe given the immense uncertainty about the path of new technologies, as revealed by the development of radio, plastics, computers, and VCRs.¹⁷¹

Several historical examples have demonstrated the "bargaining breakdown"¹⁷² 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. (which owned 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).¹⁷³ 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 1929.¹⁷⁴ 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

166. See SCOTCHMER, *CUMULATIVE INNOVATION*, *supra* note 154, at 15.

167. Deepak Somaya & David J. Teece, *Combining Inventions in Multi-invention Products: Organizational Choices, Patents, and Public Policy* 22 (2000) (unpublished manuscript on file with author).

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

169. 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).

170. *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 167, at 13-17.

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

172. *Id.* at 84.

173. *Id.* at 84-85.

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

company failed to improve the patent or to license it.¹⁷⁵ 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 only during World War I when the Secretary of the Navy insisted on automatic cross-licensing.¹⁷⁶ 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."¹⁷⁷ 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,"¹⁷⁸ thus creating obstacles to research and development.¹⁷⁹

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.¹⁸⁰ Second, reach-through license agreements ("RTLAs") on patented research tools give rights in subsequent downstream discoveries to the

175. See ARTHUR A. BRIGHT, *THE ELECTRIC-LAMP INDUSTRY: TECHNOLOGICAL CHANGE AND ECONOMIC DEVELOPMENT FROM 1800 TO 1947*, at 91-93 (1949); Merges & Nelson, *supra* note 154, at 885-87.

176. See Merges & Nelson, *supra* note 154, at 890-91.

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

178. *Id.* at 699.

179. *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 (Nat'l Inst. of Health, Bethesda Md., June 4, 1998), at <http://www.nih.gov/news/researchtools/#exec> (last visited July 12, 2002).

180. Heller & Eisenberg, *supra* note 177, at 699. This problem has shown signs of being ameliorated by the PTO's Utility Guidelines, issued in 2000, which provide a more rigorous threshold of utility that requires a "specific" and "substantial" utility before a patent is issued. Utility Examination Guidelines, 66 Fed. Reg. 1092, 1098 (Dep't of Commerce Jan. 5, 2001).

owner of patented inventions utilized in upstream research.¹⁸¹ The anticommons is created “as upstream owners stack overlapping and inconsistent claims on potential downstream products.”¹⁸²

Compounding these difficulties, according to Heller and Eisenberg, 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.¹⁸³ Even if heterogeneity has been somewhat reduced by recent integration among the participants¹⁸⁴ and greater certainty in the law,¹⁸⁵ it still exceeds that in other industries, which typically lack the combination of public and private actors and of upstream and downstream innovation.¹⁸⁶ Second, consistent with the prevailing research atmosphere, owners of upstream biomedical research patents tend to overvalue their discoveries and disparage claims of their opponents.¹⁸⁷ Third, significant transaction costs arise from the 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.¹⁸⁸

181. Heller & Eisenberg, *supra* note 177, 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.*

182. *Id.*

183. *Id.* at 700-01.

184. See Rai, *supra* note 115.

185. 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.

186. See Heller & Eisenberg, *supra* note 177, at 700 (noting the contrast between a private firm, which “is more likely to use intellectual property to maintain a lucrative product monopoly,” and a 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 of patent infringement, thus lessening the likelihood of cross-licensing).

187. “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. The NIH reports that:

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.

REPORT OF THE NIH WORKING GROUP ON RESEARCH TOOLS, *supra* note 179.

188. See Heller & Eisenberg, *supra* note 177, at 700. For a similar recitation of the difficulties of licensing in the field, see Eisenberg, *supra* note 115, at 231-48; Arti Kaur Rai,

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.”¹⁸⁹ 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.”¹⁹⁰ 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,”¹⁹¹ and another pharmaceutical executive complained 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.”¹⁹²

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.¹⁹³ 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

Regulating the Scientific Research: Intellectual Property Rights and the Norms of Science 94 NW. U. L. REV. 125-29 (1999). Rai and Eisenberg also note that

[e]xchanges 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.

Arti K. Rai & Rebecca S. Eisenberg, *The Public and the Private in Biopharmaceutical Research* 157, 160 (Nov. 2001) (unpublished manuscript), available at <http://www.law.duke.edu/p/papers/raiseisen.pdf> (last visited Mar. 10, 2003).

189. REPORT OF THE NIH WORKING GROUP ON RESEARCH TOOLS, *supra* note 179.

190. Eisenberg, *supra* note 115, at 225.

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

192. John P. Walsb et al., *The Patenting of Research Tools and Biomedical Innovation*, in 9 THE SCIENCE, TECHNOLOGY AND ECON. POLICY BOARD OF THE NAT’L ACADEMY OF SCIENCES (forthcoming 2002).

193. Walsh et al., *supra* note 192.

United States; and creating public databases, making genomic information widely available.¹⁹⁴

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 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 to preventing the otherwise imminent bottleneck. In either case, antitrust law must take such bottlenecks into account when analyzing licensing in the industry. 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 and downstream development. A potential bottleneck is present when commercial development grows out of upstream research, for the development cannot take place absent access to the research upon which it is based.¹⁹⁵ As just discussed, some evidence exists that actual bottlenecks, in the form of significant delays and holdups, have occurred in the biotechnology industry.¹⁹⁶ The second setting involves cumulative incremental innovation based on an initial broad patent.¹⁹⁷ Here, follow-on innovation cannot take place without infringing the patent, which covers the field.¹⁹⁸ The Marconi, Edison, and Wright Brothers patents provide examples in this context of stalemates,

194. *Id.* at 15-17.

195. There is always at least the theoretical alternative of following alternate research paths. But as the upstream research tool becomes more important and pioneering, the alternate paths will be less promising (and the courts will grant the patent a broader scope).

196. *See supra* notes 189-92 and accompanying text.

197. 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 first innovation in the field.

"Broad" cumulative patents are patents that claim an expansive subject matter 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.

198. 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 165-66 and accompanying text.

unexploited opportunities, and stifled innovation between pioneers and improvers.

Intergenerational bottlenecks in either of these two settings threaten grave danger. By definition, innovation in cumulative industries proceeds across generations. When the initial patentholder refuses to allow successors to utilize the patented product, and when 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.

Therefore, activity undertaken by patentees and others to resolve intergenerational bottlenecks should be recognized as reasonably necessary to promote the path of innovation. Such recognition is even more crucial given the hurdles to licensing and other collaborative activities.¹⁹⁹ 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 cases, have avoided) industry bottlenecks.²⁰⁰

Activity resolving the intergenerational bottleneck can take several forms. Typical is a license, an agreement between two entities that remain separate, 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.²⁰¹

199. See *supra* notes 167-76 and accompanying text.

200. See *infra* Part 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.

201. Cf. Scotchmer, *Standing on the Shoulders of Giants*, *supra* note 154, 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? 16 (UC Berkeley, Working Paper No. E01-303, 2002) (noting that the benefits of broad patents such

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.²⁰² 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 even inhibit) innovation.

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 hostage the development of the product through infringement lawsuits and injunctions. This problem has been referred to as a “patent thicket.”

a. Patent Thickets

Carl Shapiro has defined a patent thicket as “an overlapping set of patent rights requiring that those seeking to commercialize new

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 at the Hearings on Competition and IP Law*, supra note 165 (noting that licensing is essential when innovation is “systemic,” composed of numerous separately patentable elements).

202. The hypothetical bears some resemblance to the acquisition by Vertex Pharmaceuticals of Aurora Biosciences, which combined Vertex’s drug discovery expertise with Aurora’s assay development and screening capabilities. See *Climate Right for Accelerated Mergers & Acquisitions in the Biotechnology Industry*, CHEMICAL MKT. REP., 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.

technology obtain licenses from multiple patentees.”²⁰³ Patent thickets have been associated most frequently with the semiconductor industry, but they also have been observed in the biotechnology, computer software, and Internet industries.²⁰⁴

The existence of a patent thicket increases the power of each patentholder with a patented part in the product, because each 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.²⁰⁵ The dangers of the patent thicket are exacerbated when patents are issued for products that already are on the market.²⁰⁶ 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 and thus is forced to comply with the patentee’s demands.²⁰⁷

A prominent example of a patent thicket is the semiconductor industry, in which hundreds, if not thousands, of patents can read onto a single product.²⁰⁸ The patents typically cover “aspects of the circuitry design, materials used to achieve a certain outcome, and the broad array of methods used to manufacture the device.”²⁰⁹ 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.”²¹⁰ 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.”²¹¹ As a result, in markets for the design and manufacture of microprocessors, “broad cross licenses are the

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

204. *Id.* at 144.

205. See 35 U.S.C. § 283 (2000). 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.

206. Shapiro, *supra* note 203, at 119, 121.

207. *Id.* at 125.

208. *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 the Hearings on Competition and IP Law, *supra* note 165.

209. Hall & Ziedonis, *supra* note 158, at 110.

210. Shapiro, *supra* note 203, at 121.

211. Hall & Ziedonis, *supra* note 158, at 121.

norm,"²¹² with many of the companies licensing most of their patent portfolio to others.²¹³

When patent thickets and blocking patents predominate, activities such as cross-licensing²¹⁴ and patent pools²¹⁵ that promise to resolve the bottleneck should be rewarded. Not 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."²¹⁶ Patent pools present an instance of cross-licensing that allows bargaining among repeat players and that reduces transaction costs. Antitrust, then, should be 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."²¹⁷ The arrangements "promot[e] the dissemination of technology"²¹⁸ and allow the participants to share R&D risks. They are especially crucial when they clear blocking positions in patent

212. Shapiro, *supra* note 203, at 129. Cross licenses also permit "the more efficient use of engineers, . . . better products, and faster product design cycles." *Id.* at 130.

213. *Id.* For more detail on the role of licensing in the semiconductor industry, see Hall & Ziedonis, *supra* note 158.

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." Compl. ¶ 11, Intel Corp. FTC Dkt. No. 9288 (June 8, 1998). But the FTC neglected to consider the patent thicket prevalent in the semiconductor industry, in which cross-licensing is crucial and in which Intel's ability to withdraw access to its intellectual property would tend to make it less susceptible to hold-up by other patentholders. See Randal C. Picker, *Regulating Network Industries: A Look at Intel*, 23 HARV. J. L. & PUB. POLY 159, 181, 192 (1999).

214. 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 203, at 127.

215. 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 203, at 132; 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").

216. Lemley, *supra* note 169, at 1062.

217. GUIDELINES, *supra* note 10, § 5.5.

218. *Id.*

thickets, as they promise to resolve a bottleneck that otherwise could prevent the other patentees from manufacturing the product.²¹⁹

b. Patent Pools

In part because of concern about antitrust liability, patent pools have been used only sporadically during the past century.²²⁰ But when they have been utilized, they often have resolved potential bottlenecks. Some pools, such as the pool in the sewing machine industry in the 1850s and the pool in 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.”²²¹ The aircraft pool was “lauded far and wide as a success”²²² and led to the major patentholders lowering their royalty rates after the formation of the pool.²²³ Smaller pools developed in industries such as movie projectors, hydraulic pumps, swimming pool cleaners, and synthetic polypropylene fiber production.²²⁴

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;²²⁵ (2) DVD-ROM and DVD-video formats describing “the physical and technical parameters for DVDs for read-only-memory and video applications”;²²⁶ and (3) lasers used in photorefractive keratotomy

219. Shapiro, *supra* note 203, at 123.

220. Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations*, 84 CAL. 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) (unpublished manuscript on file with author).

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

222. *Id.* at 1346.

223. *Id.* at 1345.

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

225. 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 Baryn S. Futa, Testimony at the Hearings on Competition and IP Law Before the U.S. Department of Justice Antitrust Division and the Federal Trade Commission (Apr. 17, 2002).

226. Letter from Joel I. Klein to Gerrard R. Beeney (Dec. 16, 1998), *supra* note 19. 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, Assistant Attorney Gen., to Carey R. Ramos, Paul, Weiss, Rifkind, Wharton and Garrison (June 10, 1999), available at

("PRK"), a form of eye surgery used to correct vision disorders.²²⁷ The Department of Justice sanctioned the first two pools, but the Federal Trade Commission filed a complaint against the third.²²⁸

Critical to the agencies' analysis of the pools was the distinction between essential and substitute patents.²²⁹ 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"²³⁰ and typically are complementary to each other, possessing a greater value if the licensee can use other essential patents.²³¹ Substitute patents, in contrast, are not necessary for the use of a technology in the pool, but present alternate ways of creating certain products that otherwise would be used in competition with each other.²³² An example of a substitute patent involves the inclusion in a pool for DVD standards of one of several alternative patented methods for placing DVD-ROMs into packaging.²³³

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 pool²³⁴ and those necessary "as a practical matter" for

<http://www.usdoj.gov/atr/public/busreview/2485.htm> (last visited Mar. 10, 2003). 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.*

227. Compl. ¶ 8, *In re Summit Tech., Inc.*, FTC Dkt. No. 9286, available at <http://www.ftc.gov/os/1998/9803/summit.cmp.htm> (last visited Mar. 10, 2003) (hereinafter "Summit Complaint").

228. The VISX complaint was ultimately settled, with the parties agreeing to dissolve the pool and to make pricing and licensing decisions independently. See *In re Summit Tech., Inc.*, FTC Dkt. No. 9286.

229. For a discussion of caveats to be applied to the distinction, see *infra* note 243.

230. Letter from Joel L. Klein to Gerrard R. Beeney (Dec. 16, 1998), *supra* note 19, at 6.

231. *Id.* Complementary patents "combine to produce or form a single product." Goller, *supra* note 163, at 725.

232. Letter from Joel L. Klein to Gerrard R. Beeney (Dec. 16, 1998), *supra* note 19, 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 163, 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 when 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 pool members" without offering the benefits of clearing blocking positions that otherwise would obstruct future innovation. GUIDELINES, *supra* note 10, § 5.5.

233. Letter from Joel L. Klein to Gerrard R. Beeney (Dec. 16, 1998), *supra* note 19, at 6.

234. Letter from Joel L. Klein to Gerrard R. Beeney (June 26, 1997), *supra* note 19, at 6, 9. Essential patents were defined as "any Patent claiming an apparatus and/or a method necessary

compliance with the DVD standard specifications in the DVD pool.²³⁵ 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.²³⁶ The finding of essentiality also 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.”²³⁷ 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 to essential patents and to licensing on a nonexclusive basis with fair and reasonable terms, and the imposition of reasonable royalty rates.²³⁸

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,

for compliance with the MPEG-2 Standard.” MPEG-2 Patent Portfolio License § 1.18 (cited in *id.* at 10 n.4).

235. Letter from Joel L. Klein to Gerrard R. Beeney (Dec. 16, 1998), *supra* note 19, 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.

236. Letter from Joel L. Klein to Gerrard R. Beeney (June 26, 1997), *supra* note 19, 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.”); Letter from Joel L. Klein to Gerrard R. Beeney (Dec. 16, 1998), *supra* note 19, at 2.

237. Letter from Joel L. Klein to Gerrard R. Beeney (June 26, 1997), *supra* note 19, at 6 (“The limitation of the Portfolio to technically essential patents, as opposed to merely advantageous ones, helps ensure that the Portfolio 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.”).

238. Letter from Joel L. Klein to Gerrard R. Beeney (Dec. 16, 1998), *supra* note 19, at 3, 4, 6, 8-9; Letter from Joel L. Klein to Gerrard R. Beeney (June 26, 1997), *supra* note 19, 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.” *Id.* 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 with 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) (unpublished manuscript), available at <http://www.uspto.gov/web/offices/pac/dapp/opla/patent-pool.pdf> (last visited Mar. 20, 2003).

licensing them, or both.”²³⁹ 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.²⁴⁰ 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”²⁴¹ any patent contributed to the pool. Further, each party could prevent the pool from licensing any of the patents to others that manufactured PRK equipment.²⁴²

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 akin to 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 therefore do not create intragenerational bottlenecks. Arrangements between competitors relating to such patents thus threaten competitive harm without resolving bottlenecks.²⁴³

239. Summit Compl., ¶ 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.*

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

241. Summit Compl. ¶ 9.

242. 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.” Letter from Joel L. Klein to Gerrard R. Beeney (June 26, 1997), *supra* note 19, at 5; see also Letter from Joel L. Klein to Gerrard R. Beeney (Dec. 16, 1998), *supra* note 19, at 5.

243. It is not the case that every patent in the pool needs to be essential for the pool to promote innovation. “[M]anufacturing 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 at the Hearings on Competition and IP Law, *supra* note 165, 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 the courts and the agencies. See *Merges*, *supra* note 224, 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, prelitigation

Antitrust should recognize (as it recently has) the benefits of cross-licensing and patent pools that resolve bottlenecks.²⁴⁴ The prevalence of such arrangements, in the context of potentially treacherous roadblocks and in industries that are innovating, recommends deference to the activity.²⁴⁵

activity will be affected since potential infringers typically will not be certain when their infringement will be litigated and thus will tend to avoid activity that may lead to debilitating lawsuits. Consequently, they will refrain from infringing activity, with the result that the blocking patents thwart innovation.

244. *Cf. Merges, supra* note 224, at 1391 (recommending that antitrust enforcement actions against patent pools “consider the enormous transaction cost savings they engender”).

245. 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 fit automatically 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 interoperability standards (which increase competition within the standard) promises benefits similar to the cross-licensing of blocking patents in paving the way for subsequent innovation. It is also 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*, 90 CAL. L. REV. 1952 (2002).

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 failure could occur if 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 the intellectual property rules of standard-setting organizations, which typically require the disclosure of intellectual property that might be implicated by the standard and mandate royalty-free or reasonable and nondiscriminatory (“RAND”) licensing. These rules reduce the likelihood of a patentee holding up the standard *ex post*.

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, Speech at the Cutting Edge Antitrust Law Seminars International, Standard Setting in a Network Economy (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

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 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.²⁴⁶ But

incentives to innovate, and potential entrenchment of an inferior standard”), available at <http://www.ftc.gov/speeches/other/standardsetting.htm>, at 2 (last visited Mar. 8, 2003). 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) (noting that 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 meeting to block an amendment that would have benefited a competitor, see *Allied Tube & Conduit Corp. v. Indian Head, Inc.*, 486 U.S. 492, 496-97 (1988); and (3) declining to certify a product solely because it was patented, see *Am. Soc'y of Sanitary Eng'g*, 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 to protect existing manufacturers).

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

the court need not embrace the rationale for deferring to the patent system.

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 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 monopoly power and "the willful acquisition or maintenance of that power."²⁴⁷ Although the first prong confused courts throughout the twentieth century (which typically considered a patent to confer monopoly power),²⁴⁸ it is the second prong that currently presents the greatest difficulties.

247. *United States v. Grinnell Corp.*, 384 U.S. 563, 570-71 (1966) (offense requires "(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").

248. 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 Gallini & Trebilcock, *supra* note 4, at 22 (noting that in a survey of patent licensors, there were no close substitutes for the patented product in only twenty-seven percent of the cases; there were more than ten competitors in more than twenty-nine percent of cases); 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.").

Courts also would benefit from applying section 2 to true monopolists, rather than to parties who unsurprisingly have significant power in "markets" defined by their own products. See Carrier, *supra* note 1, at 779 (criticizing the 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").

The lack of clear direction from the text of the statute²⁴⁹ and the legislative history²⁵⁰ has led courts to employ an array of conflicting and confusing tests for monopolization. These tests have been focused on such considerations as the intent of the defendant,²⁵¹ a change in the market,²⁵² the presence of an “essential facility,”²⁵³ practical immunity from the antitrust laws,²⁵⁴ and a failure to defer to the intellectual property system.²⁵⁵ The resulting confusion becomes particularly dangerous when the tests are 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 when 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 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.²⁵⁶ The finding of reasonable necessity demonstrates that the defendant has proffered a sufficient explanation for its action, which is linked to innovation. Even if the activity increases price or reduces output, the importance of the

249. 15 U.S.C. § 2 (2000) (prohibiting parties from “monopoliz[ing], [] attempt[ing] to monopolize, or combin[ing] or conspir[ing] . . . to monopolize”).

250. See *Carrier*, *supra* note 1, at 808 (stating that in adopting the Sherman Act, members of the 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).

251. See *Image Technical Servs., Inc. v. Eastman Kodak Co.* (“Kodak II”), 125 F.3d 1195, 1202 (9th Cir. 1997).

252. See *Aspen Skiing Co. v. Aspen Highlands Skiing Corp.*, 472 U.S. 585, 604 (1985).

253. See *Intergraph Corp. v. Intel Corp.*, 3 F. Supp. 2d 1255, 1269 (N.D. Ala. 1998), *vacated* by 195 F.3d 1346, 1357-58 (Fed. Cir. 1999).

254. See *In re Indep. Serv. Orgs. Antitrust Litig.* (“Xerox”), 203 F.3d 1322, 1325 (Fed. Cir. 2000).

255. See *United States v. Microsoft Corp.*, 253 F.3d 34, 63 (D.C. Cir. 2001).

256. 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.

activity in achieving innovation predominates and should preclude a finding of “willful acquisition or maintenance”²⁵⁷ of monopoly power. Such an approach is supported in several respects.

First, the approach emphasizes the critical factor of whether the monopolist’s conduct has an efficiency justification.²⁵⁸ 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.²⁵⁹ 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 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,²⁶⁰ introductions of new products that have the effect of injuring competitors,²⁶¹ and failures to “predisclose” their products to competitors.²⁶²

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

257. *United States v. Grinnell Corp.*, 384 U.S. 563, 570-71 (1966).

258. *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).

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

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

261. *See, e.g., Cal. Computer Prods. v. IBM*, 613 F.2d 727, 744 (9th Cir. 1979) (IBM could “redesign its products to make them more attractive to buyers . . . [I]t 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).

262. *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.”).

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.²⁶³ This is particularly beneficial since (1) agreements with competitors are not implicated in unilateral conduct, (2) it is often difficult to distinguish predatory behavior from business success, and (3) courts have not had much success analyzing activity based on exclusion.²⁶⁴ Moreover, the test promises greater certainty and predictability in an unclear area of the law.²⁶⁵

263. 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.

First, false convictions may increase litigation and encourage plaintiffs to redress their grievances in court. This consequence 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, in which 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.

264. See *supra* notes 251-55 and accompanying text; cf. Teece & Coleman, *supra* note 68, at 812-14, 823 (expressing doubt that antitrust can grapple with increasing returns and can improve 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).

265. See *supra* notes 249-55 and accompanying text.

Such a standard can be applied by courts, which 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 non-patent-based justifications along with the anticompetitive effects of the activity.

The test builds upon the approach offered in *Carrier*, *supra* note 1. In the earlier work, the relevant industry had a more dispositive effect. There, the presumption that patent-based activity did not constitute monopolization could be rebutted (subject to the defendant's demonstration of innovation in the market) if the activity took place in an industry (e.g., Internet, computer software) in which competition, and not patents, was the catalyst for innovation.

The test proposed in this Article, appropriate for an approach applying to the entirety of antitrust law (which encompasses numerous types of potential activity), adopts as its central focus the activity at issue. The governing framework analyzes the relationship between the activity and the attainment of innovation. The industry involved will affect this determination (as in, for example, the issue of whether the activity is necessary to create the product), but will not have as dispositive an effect.

As an example, several courts have considered the situation in which an owner of a machine with a patented part refuses to license that part to competitors.²⁶⁶ The product typically is a diagnostic part that an organization providing service or parts for the patentee's product would find helpful.²⁶⁷ 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 incurred in developing the product.²⁶⁸ Even if competitors are disadvantaged by not obtaining access to the product, the monopolist's exploitation of the patent is necessary to the process of innovation.²⁶⁹ Reasonable necessity thus would replace courts' current analyses, which provide practical immunity for patentholders²⁷⁰ or offer presumptions that can be rebutted based on the defendant's subjective intent²⁷¹ or on other unspecified grounds.²⁷²

B. Agreements

Section 1 of the Sherman Act targets agreements among competitors and prohibits "unreasonable" restraints of trade.²⁷³ Other than a small class of agreements that are deemed per se unlawful because they lack any competitive justification,²⁷⁴ most agreements (in particular, those involving patents) are considered under the "Rule of

266. See, e.g., *In re Indep. Serv. Orgs. Antitrust Litig. ("Xerox")*, 203 F.3d 1322, 1324 (Fed. Cir. 2000); *Image Technical Servs. v. Eastman Kodak Co. ("Kodak II")*, 125 F.3d 1195, 1201 (9th Cir. 1997); *Data General Corp. v. Grumman Sys. Support Corp.*, 36 F.3d 1147, 1153 (1st Cir. 1994).

267. See *id.*

268. In contrast, where the development costs are minimal, the patentee suppresses the patent, or the patentee's exclusion lacks an efficiency justification (such as where a licensee could exploit markets unserved by the patentee), reasonable necessity might not be met, requiring courts to examine more thoroughly whether the activity constitutes monopolization.

269. 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 product to a patented one may not be reasonably necessary for innovation. Thus, any procompetitive justification for the arrangement would need to be considered in the context of the typical tying analysis, which examines 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.

270. *Xerox*, 203 F.3d at 1322.

271. *Kodak II*, 125 F.3d at 1195.

272. *Grumman*, 36 F.3d at 1147.

273. *Standard Oil Co. v. United States*, 221 U.S. 1, 58, 87 (1911).

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

Reason.”²⁷⁵ Courts applying the Rule of Reason consider both the anticompetitive and procompetitive effects of the arrangements. Although courts traditionally have claimed to balance the two effects, in reality they apply a burden-shifting approach, by first examining whether the plaintiff has demonstrated a substantial anticompetitive effect, then by the defendant next showing a procompetitive justification, and then—only in the handful of cases that survive these stages—by balancing the two.²⁷⁶

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.²⁷⁷ 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 by which 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 will need to show that the anticompetitive effects on price or output *significantly* outweigh reasonable necessity for tripartite innovation.²⁷⁸ Although only extreme increases in price or reductions in output would outweigh the defendant’s innovation-based justifications, supported allegations of reduced innovation²⁷⁹ would (because of the importance of innovation

275. See, e.g., *Broad. Music, Inc. v. Columbia Broad. Sys.*, 441 U.S. 1, 24-25 (1979); *Cont’l T.V., Inc. v. G.T.E. Sylvania, Inc.*, 433 U.S. 36, 59 (1977).

276. See Carrier, *supra* note 93, at 1268 (finding that courts disposed of eighty-four 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).

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

278. Significant outweighing denotes exceeding by a measurable amount, perhaps (quantifying the unquantifiable) a seventy-to-thirty ratio.

279. 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 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

for the inquiry) be 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 gives courts a default position, removing from the calculus cases in which the two effects are in equipoise.²⁸⁰

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-hearted (i.e., not through independent

embrace a new and superior technology could, in fact, demonstrate anticompetitive effects on innovation, effects that should be weighed as heavily as reasonable necessity for tripartite 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).

280. Under the proposed test, the difficult cases would shift to the setting in which anticompetitive price increases and output reductions outweigh the innovation benefits of the activity. (Again, anticompetitive effects on *innovation* will be weighed equally with procompetitive innovation benefits.) But at least these decisions—which are unavoidable in any analysis incorporating the effects of activity on different outputs such as price and innovation—will occur where their effect on societal welfare is roughly equal. In contrast, a test that considers equally the effects on price and innovation would underemphasize the significance of innovation and overemphasize that of price effects. The asymmetric balance thus reserves roles in the analysis for price and output, but requires a greater magnitude for such effects to outweigh the crucial benefits from innovation.

patent experts) attempts to demonstrate the presence of blocking patents, the test of reasonable necessity will not be met.²⁸¹

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 price²⁸² 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 the failure to embrace available, superior technology²⁸³ or the use of exclusive grantback provisions that expansively cover not only 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 the price of its product by a staggering amount.²⁸⁴ 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

281. It bears mention that patent pools in fact have enhanced innovation. For example, the pool containing MPEG-2 video compression technology, with approximately one hundred patent families owned by twenty-one licensors, has "assisted hundreds, if not thousands, of enterprises to enter the various markets for products which employ MPEG-2 technology." Beene, *supra* note 243, at 3-4. 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. See James J. Kulbaski, *Comments on Patent Pools and Standards for Federal Trade Commission Hearings Regarding Competition and Intellectual Property*, Testimony at the Hearings on Competition and IP Law, *supra* note 165, 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").

282. 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%—will lead to the predominance of anticompetitive effects. See *supra* note 148. 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.

283. See *supra* note 279.

284. See Mylan Complaint, *supra* note 148.

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 therefore 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.²⁸⁵

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.”²⁸⁶ The market shares of the merging parties are crucial to court and agency determinations of whether to allow the merger to proceed. Other factors considered include 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 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

285. 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 that involve a payment to the generic challenger and an agreement to stay off the market for a period of time have often appeared to constitute strategies for the patentee to extend the patent term and would not be reasonably necessary for innovation. *See supra* note 129 and accompanying text. Settlement provisions that are more likely to be reasonably necessary allow competition to continue, permit license without restriction, involve payments from infringer to patentee (rather than from patentee to infringer), and include nonexclusive licenses and lump sum royalties. *See George S. Cary, Antitrust Implications of Patent Settlements*, Testimony presented at the Hearings on Competition and IP Law, *supra* note 165, at 12-14.

286. 15 U.S.C. § 18 (2000). 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.

for anticompetitive effects,²⁸⁷ and extends over a range of products that may involve 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 not only to product markets, but also to technology²⁸⁸ and innovation markets²⁸⁹—in other words, markets for R&D upstream from the commercialized product.²⁹⁰

In most cases, the parties' market power will be decisive. For example, in extremely concentrated markets, or in 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 the potent countervailing efficiencies generated by the transaction.²⁹¹ 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

287. Jorde & Teece, *supra* note 65 (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").

288. "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, *supra* note 10, § 3.2.2.

289. *Id.* § 3.2.3:

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.

290. 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").

291. Cf. Pitofsky, *supra* note 128, 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 131-37 and accompanying text (discussing mergers in highly concentrated markets in the pharmaceutical industry).

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.²⁹² A merger also could resolve bottlenecks occurring, for example, upstream from the commercialized product.²⁹³

Efficiencies that courts have considered 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.²⁹⁴ 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 of even greater significance. Especially when the patent at issue encompasses a significant portion of the product lines of the firms, the justification is 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’s (“HHI”) upper threshold of market concentration for unconcentrated markets from 1000 to 1800²⁹⁵ and that for moderately concentrated markets from 1800 to,

292. See *supra* Part III.C.

293. See *supra* Part III.E.1.c. Again, the requirement of reasonable necessity has teeth and will not sanction every merger. For example, a merger between a pharmaceutical patentholder and a generic challenger that settles a patent dispute between the two should be viewed critically. See *supra* note 129 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 when it “was the largest baby food manufacturer in the world and had implemented many of the [] innovations elsewhere”).

294. See Gilbert & Sunshine, *supra* note 200, 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 113, at 32 (“[I]nnovation efficiencies may make a particularly powerful contribution to competitive dynamics, the national R&D effort, and consumer (and overall) welfare.”).

295. The HHI is calculated “by summing the squares of the individual market shares of all the participants” in the market. MERGER GUIDELINES, *supra* note 294, ¶ 1.5. This figure “gives proportionately greater weight to the market shares of the larger firms.” *Id.* The Guidelines consider markets with a postmerger 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.

perhaps, 2200 or 2600 in cases where the reasonable necessity justification is demonstrated.²⁹⁶

For example, imagine a market in the biopharmaceutical industry composed of firms with market shares of thirty, twenty, twenty, ten, seven, five, five, and three percent. The HHI premerger is 1908.²⁹⁷ The firms with seven percent and ten percent market shares merge to combine their research and commercialization capabilities in order to create a product that they otherwise could not create.²⁹⁸ 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.²⁹⁹

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.

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.

296. See generally Jorde & Teece, *supra* note 65. 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.

297. $(30*30) + (20*20) + (20*20) + (10*10) + (7*7) + (5*5) + (5*5) + (3*3) = 1908$.

298. See *supra* notes 105-06 and accompanying text.

299. 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 seven and ten percent, the merger would be allowed.

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 when 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 block 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.

Public Independent Fact-Finding: A Trust-Generating Institution for an Age of Corporate Illegitimacy and Public Mistrust

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Public distrust in the wake of corporate scandals caused corporate legitimacy crises for the companies involved and for the marketplace as a whole. The loss of trust has contributed to an environment in which traditional responses to allegations of wrongdoing and incompetence are less effective. Alternatively, organizations engage in "public independent fact-finding" ("PIFF") by hiring public figures with reputations for integrity to conduct internal investigations and to report their findings to the public. This Article describes the role played by trust, reputation, and social legitimacy in the health of organizations and examines corporate legitimacy crises and traditional responses. Identifying factors that undermine the effectiveness of apologia and other trust-generating institutions, it explores PIFF as an alternative process and considers the benefits and inherent problems of attempting to institutionalize the process better. Focusing on lawyers as fact finders and the American Arbitration Association's new Independent Fact-Finding Service, it analyzes the procedural and ethical issues associated with possible institutionalization models. The authors assert that procedures should ensure the integrity of the process. Ultimately, the public trust in individuals and entities and in the processes in which they engage is a precious commodity for institutions in crises. In turn, their reputations are a public good. Such fact finders are essentially "trustees" with corresponding fiduciary duties, and it is essential to conduct these processes to preserve the public's confidence. Although not a panacea, the PIFF concept may provide a quick, fair, and objective intervention to resolve controversy based on rumor and innuendo. In a global society in which public opinion changes rapidly, fact-finding fills a void in dispute-handling processes between the formal application of law and the informal shaping of public opinion.