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Antitrust For Innovation: A Progress Report

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ANTITRUST FOR INNOVATION: A PROGRESS REPORT

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ABSTRACT. Economists have long understood that innovation has a far more significant impact on economic welfare than the deadweight loss from prices that exceed levels in competitive markets or from other static inefficiencies.[1] Antitrust law is concerned with promoting welfare by protecting competition. Therefore, to the extent that antitrust law is focused on economic welfare, it needs to be shaped at least in part in light of the best understanding of how competition affects innovation. For this purpose, innovation means a new or improved product or process that differs significantly from previous products or processes and that is put into active use by the innovator or others.[2]

Partially as a consequence of developments in highly dynamic and research-intensive sectors of the economy, the connection between antitrust law and innovation is of increasing importance to competition policy makers and scholars. The authors of this paper have written about that connection.[3] The purpose of this paper is to describe the evolution of that connection and to provide a preliminary assessment of the extent to which antitrust enforcement reflects the best current understanding of how competition affects innovation.[4]

In part I, we review the understanding of lawmakers and judges about the relationship between competition and innovation in the first decades after the enactment of the Sherman Act in 1890. In part II, we summarize what economics teaches about that relationship. In parts III and IV, we review the more recent treatment of innovation by antitrust enforcement agencies and the courts under the Sherman Act and the Clayton Act. We add some thoughts regarding analytical approaches for conduct or mergers that affect innovation in Part V and conclude in Part VI.

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[1] See, e.g., Robert M. Solow, Technical Change and the Aggregate Production Function, 39 REV. ECON. & STAT. 312 (1957); Robert J. Gordon, Perspectives on the Rise and Fall of American Growth, 106 AM. ECON. REV.: PAPERS & PROCEEDINGS 72 (2016); Oliver E. Williamson, Economies as an Antitrust Defense: The Welfare Tradeoffs, 58 AM. ECON. REV. 18 (1968); and F.M. Scherer, Antitrust, Efficiency, and Progress, 62 N.Y.U. L. REV. 998, 1002 (1987).

[2] See, e.g., OECD, OSLO MANUAL, THE MEASURMENT OF SCIENTIFIC, TECHNOLOGICAL, AND INNOVATIVE ACTIVITIES at 20, 44 (4th Ed., 2018).

[3] See, e.g., Richard J. Gilbert & A. Douglas Melamed, Innovation Under Section 2 of the Sherman Act, 84 ANTITRUST L. J. 1 (2021); Richard J. Gilbert, INNOVATION MATTERS: COMPETITION POLICY FOR THE HIGH-TECHNOLOGY ECONOMY (MIT Press 2020).

[4] Our focus is on US antitrust enforcement. For a review of antitrust enforcement for innovation by European Union courts, see Thibault Schrepel, A Systematic Content Analysis of Innovation in European Competition Law, Amsterdam Law & Technology Institute, Working Paper 2-2023 (April 11, 2023).

I. THE FIRST SEVERAL DECADES

Innovation is no stranger to antitrust law. In the Congressional debate that preceded the Sherman Act of 1890, innovation in transportation, and its resulting implications for commerce among states, was cited as a justification for federal antitrust legislation.[5] Representative George Fithian of Illinois said more broadly during the debate that "[trusts] are destructive to commerce by interfering with competition. Skill is created and is stimulated by competition."[6] He quoted a contemporary writer on political economy:[7]

> Wherever monopoly is dominant, the incentive for improvement and skill is deadened. It is only when competitors contend with each other for the favor of the consumer that they are stimulated to attract that customer by presenting him with wares both skillfully and cheaply made.

The unqualified proposition that monopoly suppresses the incentive for improvement and skill is in tension with the Constitution, which authorizes Congress to provide patents and copyrights "for limited times" in order "to promote the progress of science and useful arts."[8] As explained by Thomas Jefferson in 1813, the "embarrassment of an exclusive patent" was justified because these "monopolies of invention" benefit society.[9]

There is little in the record of antitrust enforcement during most of the twentieth century that takes account of any connection between market structure and innovation. There is, for example, no mention in the Supreme Court opinion of harm to innovation in petroleum refining from the conduct that led to the 1911 dissolution of the Standard Oil Trust, nor was there discussion in the opinion of the impact of the dissolution on innovation. Somewhat to the contrary, the Court suggested that Standard Oil's size promoted rather than suppressed the growth of the petroleum industry:[10]

> The Sherman Act does not compel private traders, however organized, to compete with each other. The character of the oil business was and is such that a great corporation was and is an economic necessity for carrying on that industry. The growth and success of the Standard Oil Company was the result of individual enterprise and the natural laws of

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[5] Testimony of Senator James Kimbrough Jones of Arkansas in favor of S. 3445, 20 Cong. Rec. 1457-1458 (February 4, 1889).

[6] 21 Cong. Rec. 4102 (May 1, 1890).

[7] The quote omitted attribution. It is from John Milton Bonham, RAILWAY SECRECY AND TRUSTS, 1890, New York: G.P. Putnam's Sons, at 18.

[8] Article 1, Section 8 of the U.S. Constitution. This is not to imply that there is a conflict between antitrust enforcement and patent protection. "[T]he aims and objectives of patent and antitrust laws may seem, at first glance, wholly at odds. However, the two bodies of law are actually complementary, as both are aimed at encouraging innovation, industry and competition." Atari Games Corp. v. Nintendo of Am., Inc. 897 F.2d 1572, 1575 (1990).

[9] Letter from Thomas Jefferson to Isaac McPherson (Aug. 13, 1813), in 13 THE WRITINGS OF THOMAS JEFFERSON 326, 334-35 (Andrew A. Lipscomb ed., 1903).

[10] Standard Oil Co. v. United States, 221 U.S. 1 *; 31 S. Ct. 502 ** (1911).

> trade. It was not the result of unlawful means, but of skill, unremitting toil, denials and hardships, and is an instance of where the continuous use for forty years of skill, labor and capital reached a great success.

Subsequent antitrust opinions that established key precedents for the treatment of monopoly under the Sherman Act focused on the identification of monopoly rather than its consequences for innovation. There were exceptions. Judge Learned Hand famously suggested in *United States v. Aluminum Co. of America*, that monopoly might reduce incentives for innovation:[11]

> Many people believe that possession of unchallenged economic power deadens initiative, discourages thrift and depresses energy; that immunity from competition is a narcotic, and rivalry is a stimulant, to industrial progress; that the spur of constant stress is necessary to counteract an inevitable disposition to let well enough alone.

Judge Hand made that observation to explain why the antitrust laws are concerned with monopoly, not to invite an inquiry into whether the monopoly has had or might have any such deleterious effect in the case at hand. To the contrary, Judge Hand rejected Alcoa's defense that it had not earned excessive profits or abused its power, reasoning that "[Congress] did not condone 'good trusts' and condemn 'bad' ones; it forbad all."[12]

In *United States v. Grinnell Corp*., the Supreme Court described unlawful monopolization under Section 2 of the Sherman Act as having two elements: "(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."[13] In this formulation, a firm does not violate the antitrust law by obtaining a monopoly as a result of innovative activity. The Court did not consider whether the possession of monopoly might promote or deter innovation.

II. THE TEACHINGS OF ECONOMICS

In the early twentieth century many economists endorsed the importance of firm scale for efficiency and technological progress. Their views were influenced by the emergence of industrial titans such as General Electric, Westinghouse, Du Pont, Alcoa, and AT&T, bolstered by their corporate research laboratories. In his treatise *The Control of Trusts* co-authored with his son in 1914, John Bates Clark, one of the pioneers of neoclassical economics, attributed economic progress since the late ninetieth century to improvement in productive methods and "production on a vast scale, carrying with it a corresponding increase of efficiency."[14] In a 1912

[11] 148 F.2d 416, 427 (1945).
[12] Id.
[13] 384 U.S. 563, 571 (1966).
[14] John Bates Clark & John Maurice Clark, The Control of Trusts (1914) at 9.

article published in the *Journal of Political Economy*, Jeremiah Jenks, a co-founder with John Bates Clark of the American Economic Association, expressed his concern that the breakup of the Standard Oil and American Tobacco trusts ordered by the Supreme Court "failed to take sufficiently into account the economic benefits that come from the saving of industrial energy and the promotion of industrial efficiency by industrial combination."[15]

Notwithstanding their recognition of the efficiency benefits of scale, most early twentieth century economists objected to the accumulation and exercise of monopoly power. In 1935 Sir John Hicks famously wrote that "The best of all monopoly profits is a quiet life."[16] The idea was that a monopolist is not pressured to engage in onerous innovative activities. John Bates Clark, his son John Maurice Clark, and Jeremiah Jenks were active supporters of legislation that led in 1914 to the Clayton Act and the Federal Trade Commission Act.[17]

A. *The Foundational Teachings*

By the time the Court decided *Grinnell*, there was support in the economics literature for the proposition that monopoly is a deterrent for innovation. In 1962, Kenneth Arrow wrote "Economic Welfare and the Allocation of Resources for Invention", which demonstrated conditions under which monopoly profit has a negative effect on innovation incentives through what has become known as the "replacement effect."[18] Assuming that innovation is protected from imitation, all else equal, a monopolist has a diminished incentive to innovate compared to a firm in a competitive industry if innovation would cannibalize its existing profits. There are two reasons for this. First, diversion of sales from existing products to a new product will be more costly if the existing products are sold at monopoly prices and earn monopoly margins. Second, diversion of sales from existing products will have a larger impact on a firm that accounts for most or all of the sales of those products than on a firm that accounts for only a small portion of those sales.

Arrow's theory is both elegant and simple. And it is consistent with numerous examples of failures of dominant firms to be leaders in new technologies that would replace their dominance, although sometimes for reasons that have more to do with misplaced priorities or organizational rigidities than concerns with lost profits.[19] Of course, dominant firms are not always

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[15] Jeremiah W. Jenks, Economic Aspect of the Recent Decisions of the United States Supreme Court on Trusts, 20 J. Pol. Economy 346, 357 (1912).
[16] J.R. Hicks, Annual Survey of Economic Theory: The Theory of Monopoly, 3 Econometrica 1, 8 (1935).
[17] See Luca Fiorito, When Economics Faces the Economy: John Bates Clark and the 1914 Antitrust Legislation, 25 REV. POL. ECON. 139 (2013).
[18] Kenneth Arrow, Economic Welfare and the Allocation of Resources for Invention, in The Rate and Direction of Inventive Activity: Economic and Social Factors, National Bureau of Economic Research, Princeton University, 609-626 (1962).
[19] See, e.g., Clayton M. Christensen, THE INNOVATOR'S DILEMMA: WHEN NEW TECHNOLOGIES

technological laggards. They have capabilities that often are not shared by new competitors, and under some conditions they have incentives to invest aggressively to preserve their market dominance.[20]

Arrow received the Nobel Prize in 1972 for his pioneering contributions to general economic equilibrium theory and welfare theory.[21] Although the Nobel committee did not mention his paper on innovation incentives in describing his award, Arrow did note it in his Nobel biography,[22] and it has had an enduring impact on economic research. In the past 12 months "Economic Welfare and the Allocation of Resources for Invention" was his second-most downloaded paper and had more abstract views than any of his multitude of other papers.[23]

Thanks to Arrow, post-*Grinnell* there was a clear understanding of how monopoly power might suppress innovation. Yet popular sentiment was, if anything, the opposite. The contrary popular sentiment reflects two strands of economic thought. The first is the long history of support for the patent system's award of limited exclusivity for successful innovation. In some circumstances, the exclusive rights to an invention provided by a patent can enable the patent holder to exercise monopoly power; and support for the patent system is often associated with an implied positive connection between innovation and the reward of monopoly power.

There is no doubt that patents provide incentives for innovation in many circumstances, although the magnitude is questionable relative to other factors that enable firms to reap the fruits of their inventions in some industries.[24] But the idea that the reward of ex post monopoly through the patent system or otherwise can be an incentive for innovation says very little about the impact of ex ante monopoly on innovation. Moreover, depending on the scope and duration of patent rights, those rights can inhibit discoveries that build on existing innovations. And in some circumstances, the ex post obstacles to innovation created by the patent system can reduce innovation more than the ex ante incentive created by the patent reward increases innovation.[25] These tradeoffs between ex ante incentives and ex post inhibitions are central to determining the optimal design of intellectual property protections, which we do not address here.

CAUSE GREAT FIRMS TO FAIL (1997); Rebecca M. Henderson & Kim B. Clark, Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms, 35 ADMIN. SCI. Q. 9 (1990).

[20] Richard J. Gilbert & David M.G. Newbery, Preemptive Patenting and the Persistence of Monopoly, 72 AM. ECON. REV. 514 (1982).

[21] Kenneth J. Arrow Facts, The Nobel Prize, https://www.nobelprize.org/prizes/economic-sciences/1972/arrow/facts/, accessed June 20, 2023.

[22] Id. In this respect, Arrow shares the experience of Albert Einstein, whose Nobel Prize did not recognize his theory of relativity, which is arguably the most enduring contribution of his genius.

[23] Access Statistics for Kenneth J. Arrow, available at https://logec.repec.org/RAS/par7.htm, accessed January 9, 2024.

[24] See. e.g., Wesley M. Cohen & Richard C. Levin, Empirical Studies of Innovation and Market Structure, HANDBOOK OF INDUSTRIAL ORGANIZATION, Vol. II (R. Schmalensee and R.D. Willig eds.) (explaining that patents are not the most effective means to appropriate the value of intellectual property in many industries)

[25] See Suzanne Scotchmer, INNOVATION AND INCENTIVES (MIT Press 2006).

The second main strand had its origins in the views expressed by early twentieth century economists such as the Clarks and Jenks described above and later expanded by Joseph Schumpeter in his influential book, *Capitalism, Socialism and Democracy*, published in 1942, and complemented by the rise of large industrial R&D laboratories. Schumpeter was a critic of then-prevailing economic doctrine that extolled the benefits of perfect and atomistic competition. He wrote extensively about dynamic competition and particularly the process of creative destruction "that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one."[26]

Schumpeter is sometimes associated with the view that monopoly promotes innovation. It is correct that Schumpeter expressed some tolerance for restrictive practices to protect investments and lauded monopoly for its ability to attract intellectual and financial capital:[27]

> [T]here are superior methods available to the monopolist which either are not available at all to a crowd of competitors or are not available to them so readily: for there are advantages which, though not strictly unattainable on the competitive level of enterprise, are as a matter of fact secured only on the monopoly level, for instance, because monopolization may increase the sphere of influence of the better, and decrease the sphere of influence of the inferior, brains, or because the monopoly enjoys a disproportionately higher financial standing.

However, for the most part his arguments focused on the benefits of scale, rather than monopoly power itself. He wrote that "What we have got to accept is that [the large-scale establishment or unit of control] has come to be the most powerful engine of that progress …"[28] and added that:[29]

> There cannot be any reasonable doubt that under the conditions of our epoch such superiority [in output and productivity] is as a matter of fact the outstanding feature of the typical large-scale unit of control, though mere size is neither necessary nor sufficient for it. These units not only arise in the process of creative destruction and function in a way entirely different from the static schema, but in many cases of decisive importance they provide the necessary form for the achievement. They largely create what they exploit. Hence the usual conclusion about their influence on long-run output would be invalid even if they were genuine monopolies in the technical sense of the term.

Schumpeter believed that monopoly, when it existed, was typically a transient outcome of the process of creative destruction. Some of his writings suggested that monopoly might free a firm from short-run competitive pressures that inhibit long-run planning and, presumably, innovation:

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[26] Joseph A. Schumpeter, CAPITALISM, SOCIALISM & DEMOCRACY, Routledge (2003) (originally published in 1942) at 83 (footnote omitted).
[27] Id. at 100-101.
[28] Id. at 106.
[29] Id. at 101.

"The main value to a concern of a single seller position that is secured by patent or monopolistic strategy does not consist so much in the opportunity to behave temporarily according to the monopolist schema, as in the protection it affords against temporary disorganization of the market and the space it secures for long-range planning."[30] But his views about scale and monopoly power evolved over time, and his other writings were quite different. In *The Theory of Economic Development*, published in 1912, Schumpeter insisted that innovations typically originated in new, characteristically small, firms,[31] a perspective that is consistent with more recent evidence that small firms are often sources of major innovations in the modern economy.[32]

Although Schumpeter wrote broadly about the benefits for innovation of scale and the shortcomings of the classical model of perfect competition, his views regarding antitrust enforcement were more nuanced and conditional. He was opposed to what he called "*indiscriminate* trust busting" but supported antitrust enforcement that was attuned to "the particular circumstances of each individual case."[33]

B. *Current Economic Learning*

In recent decades, the core concern of antitrust law has been anticompetitive conduct that creates market power and, in that way, injures competition. Market power is defined as the ability profitably to charge prices above competitive prices or to take other actions, like reducing output or product quality, to the detriment of trading partners. It follows from this definition of market power that higher quality-adjusted prices or reduced output can generally be presumed when market power is increased. The relationship between market power and innovation is more complex.[34]

1. *General Principles*

The relationship between market power and innovation depends on both the *ability* and the *incentive* of the firm that gained market power to innovate. To understand the relationship, it is useful to think of two basic situations.

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[30] Id. at 102-103.
[31] Joseph A. Schumpeter, THE THEORY OF ECONOMIC DEVELOPMENT, Harvard Economics Studies (1934) (originally published in 1912). See also F.M. Scherer, Schumpeter and Plausible Capitalism, 28 J. Reprints ANTITRUST L. & ECON. 759, 762 (1998).
[32] See, e.g., Ufuk Akcigit & William R. Kerr, Growth through Heterogenous Innovations, 126 J. POL. ECON. 1374 (2018). (the relative rate of major inventions is higher in small firms)
[33] Joseph A. Schumpeter, Science and Ideology, 39 AMER. ECON. REV. 346, 357-358 (1949) (emphasis in the original).
[34] The authors have written in some detail about that relationship in an earlier paper. See Gilbert & Melamed, note 3 *supra*. The discussion here is a brief summary.

In the first situation, the antitrust defendant both engages in R&D that might be exploited in the relevant product market and produces and sells products in that market. Assume, for example, that the defendant is the only firm well situated with the assets needed for R&D that might be commercialized in the relevant product market.[35] Those assets include, among other things, specialized equipment, patents and other intellectual property, and trained personnel. If the conduct at issue in the antitrust case gives the defendant market power in the relevant product market, it is likely to reduce future innovation that would compete with the defendant's existing product. The increased market power in the product market would increase the amount of current revenues that would be jeopardized by innovation and would thus reduce the value of the innovation to the defendant. That is of course Arrow's replacement effect.[36] Because the defendant is the only firm with assets needed for innovation for the relevant product market, the likelihood of innovation for that market would be reduced.

Similarly, if the defendant already had a significant presence in the relevant product market and engaged in conduct that gave it a monopoly over assets needed for R&D that might be commercialized in that market, the conduct would also be likely to reduce innovation that would jeopardize the defendant's existing profits. In that event, the defendant would have an incentive to reduce market-wide innovation because of its large present stake in the product market, and the conduct would give it control over needed R&D assets and thus the ability to restrict innovation. Conduct that gives rise to control of R&D assets that is short of monopoly can have a similar effect if it is sufficient to restrict market-wide innovation.

If, however, there are multiple firms capable of R&D that might be commercialized in the relevant product market and multiple firms capable of exploiting the fruits of that R&D, the defendant's increased market power in the product market might not lead to reduced innovation. In that event, the defendant would face a continuing threat of possible innovation by rivals and would thus have an incentive to innovate.[37]

In the second situation, the defendant does not produce and sell products that are at risk from innovation. In that situation, conduct that gives the defendant a monopoly over assets needed for R&D in some space is likely to reduce future innovation in that space because it will reduce the competitive pressures on the defendant to innovate. That is especially likely to be the case if the defendant earns revenues by licensing fruits of its R&D to firms producing and selling products

[35] As explained below, we would in that situation say that the defendant has monopoly power in the relevant R&D market.

[36] The replacement effect supports a weaker presumption of decreased innovation from conduct that creates or maintains monopoly power in the product market, even if the defendant does not have a monopoly over relevant R&D assets.

[37] Steve Jobs reportedly said, "If you don't cannibalize yourself, someone else will." Walter Isaacson, STEVE JOBS: THE EXCLUSIVE BIOGRAPHY 408 (2011) (quoting Steve Jobs).

that an innovation would replace. In that event, the replacement effect would reduce licensees' willingness to pay for the innovation and indirectly reduce the defendant's incentive to innovate.

To the extent that scale, rather than market power, promotes innovation, exclusionary practices that limit opportunities for rivals to achieve scale or otherwise benefit from their innovations can have a particularly deleterious effect on innovation. Of course, there are tradeoffs. Exclusionary practices both enable incumbents to capture more value from innovation and limit the opportunities available for new competition. Michael Whinston and Ilya Segal analyze these tradeoffs in an elegant theoretical model.[38] Their model suggests that the negative effect of exclusionary practices on innovation incentives for new competitors typically outweighs the positive effect for incumbents.

2. *Ways in Which Mergers Can Harm Innovation*

Concerns about effects on innovation can arise with respect to any merger in which the surviving company has market power in the R&D market and is likely because of the merger to abandon one of the merging parties' R&D programs in order to protect the revenues or R&D program of the other merging party. Eliminating one would-be innovator would reduce the number of innovation rivals. That might itself lower the probability that someone will succeed or at least prolong the period until someone succeeds, especially if the eliminated innovator is one of a very few likely innovators in the relevant space[39] or is differentiated from other potential innovators in important respects.[40] Eliminating a would-be innovator might also reduce the competitive incentive of other firms to innovate.

A horizontal merger also might suppress innovation incentives and thus lead to reduced investment in or redirection of R&D programs even if it does not result in the elimination of those programs. First, post-merger each division of the merged company has a lower incentive to innovate because successful innovation by one division reduces the expected value of R&D for the other division. Second, conditional on no innovation by a rival, the merger lowers each

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[38] Ilya Segal & Michael D. Whinston, Antitrust in Innovative Industries, 97 AMER. ECON. REV. 1703 (2007).

[39] If there are many potential innovators, each might have little incentive to invest heavily in innovation because of a concern that it is unlikely to be the first to be successful in the innovation race. In that event, a reduction in the number of innovators could increase the incentive of the remaining firms to invest in innovation and, under some circumstances, the likelihood of successful innovation. See, e.g., Morton I. Kamien & Nancy L. Schwartz, On the Degree of Rivalry for Maximum Innovative Activity, 90 Q. J. ECON 245 (1976) and Richard J. Gilbert, Competition, Mergers, and R&D Diversity, 54 REV. INDUS. ORG. 465 (2019).

[40] Daniel L. Rubinfeld and John Hoven state that concerns about a reduction in the diversity of innovation was a reason why the Department of Justice blocked Lockheed Martin's proposed acquisition of Northrop Grumman. Daniel L. Rubinfeld & John Hoven, Innovation and Antitrust Enforcement, in DYNAMIC COMPETITION AND PUBLIC POLICY: TECHNOLOGY, INNOVATION, AND ANTITRUST ISSUES 65, 86 (Jerry Ellig ed., 2001). Rubinfeld was chief economist for the Antitrust Division at the time of the Lockheed challenge, and Hoven was an economist with the Division. United States v. Lockheed Martin & Northrop Grumman, Complaint (March 23, 1998).

division's incentive to innovate because doing so would take sales from the other division. Third, a merger would lower each division's incentive to innovate as a consequence of the Arrow replacement effect if the merger increases the merged firms' market power in the product market and thus their profits from existing products that are at risk from innovation.

A vertical merger can raise innovation concerns by foreclosing access to or raising the cost of important products or services. The products or services that are foreclosed or whose cost are increased might be inputs to the activity of R&D, products or services that result from the R&D, or services such as distribution networks that facilitate access to downstream markets. A vertical merger also can reduce the ability of competitors of the merged firm to innovate if it restricts the competitors' access to or increases the costs of needed R&D assets. A merger that limits the market available to potential innovators of complements for the foreclosed products or services can reduce rivals' incentives to innovate because scale is an important determinant of the value of an innovation.

A vertical merger also could suppress innovation if it combines a firm that has a monopoly in the relevant R&D market with a firm that has a substantial position in the relevant downstream product market. In that event, the merger would reduce the incentive of the owner of the R&D assets to innovate if the innovation would displace revenues from the merged firm's existing products.

3. *How a Merger or Non-merger Conduct Can Promote Innovation*

A merger or non-merger conduct might, in some circumstances, have other effects that would tend to promote innovation. For example, if intellectual property protection, first mover advantages, and the like are insufficient to ensure that an innovator will be sufficiently rewarded for its innovation, a merger or conduct that enables the defendant to protect a larger share of market-wide revenues from successful R&D might increase the defendant's incentive to innovate.[41] In addition, a merger might increase the incentive to innovate if it enables the merged firm to benefit from technological spillovers otherwise not available to it. Technological spillovers allow a division of a merged firm to profit by exploiting an innovation by a different division, thereby increasing the payoff from the innovation. The effects of such spillovers are a mirror image of the effects of diversion, for which innovation by one division takes profits from

[41] A merger also might increase the profit from innovation, and thus the incentive to innovate, by reducing post-innovation competition; and increased market power can in some circumstances increase the incentive to innovate if a firm can by innovation defeat the threat of rivalry and maintain its market power. Richard Gilbert & David Newbery, Preemptive Patenting and the Persistence of Monopoly, 72 AMER. ECON. REV. 514 (1982); but see Jennifer Reinganum, Uncertain Innovation and the Persistence of Monopoly: Comment, 73 AMER. ECON. REV. 741 (1983), for analysis of the effects of uncertainty on incentives for preemptive patenting. Enforcement agencies, however, are unlikely to credit these effects as cognizable merger benefits.

another division. Technological spillovers also can allow each division of the merged firm to benefit from knowledge acquired by the other division.[42]

A vertical merger also has potential benefits for innovation. A merger might increase the incentive and ability of the combined firms to innovate by combining complementary R&D assets or other factors of production that cannot otherwise be combined as effectively.[43] This is similar to the output-expanding effect when a merger of complements eliminates double-marginalization in price-setting. Moreover, a vertical merger might increase the merged firm's ability to innovate by, for example, facilitating the merged firm's detailed knowledge about the product market. Furthermore, as with horizontal mergers, a vertical merger can internalize technological spillovers and might increase the ability of the merged firm to appropriate the fruits of its innovation and thus its incentive to innovate.

III. THE TREATMENT OF INNOVATION IN SHERMAN ACT ENFORCEMENT

Innovation issues have rarely been central in cases involving enforcement of the Sherman Act. While antitrust complaints often allege that defendant's conduct has harmed or threatens to harm innovation and some courts have asserted that competition promotes innovation, the cases have focused on whether the conduct at issue was anticompetitive and whether it increased or maintained the defendants' market power. A finding of anticompetitive conduct that increases market power is sufficient to establish an antitrust violation in most cases, and neither the parties nor the courts have found it necessary to investigate specifically the effects of the conduct on innovation. While there are circumstances in which proof of harm to innovation might be necessary to establish an antitrust violation or to inform an optimal antitrust remedy, and otherwise unlawful conduct might promote innovation is some circumstances, these circumstances have generally not been explored in detail in the decided cases.[44]

Antitrust authorities have, however, long known that antitrust enforcement could be improved by considering possible anticompetitive reductions in innovation competition.[45] In 1985 William Baxter wrote, regarding joint ventures, that[46]

> Competition is as important in R&D as it is in any other commercial endeavor. The patent system - this country's main institutional stimulus for invention and innovation

[42] For a comprehensive discussion of possible merger benefits for innovation, see Pierre Régibeau & Katharine E. Rockett, Mergers and Innovation, 64 ANTITRUST BULLETIN 31 (2019).
[43] The phrase "cannot otherwise be combined" suggests an inquiry into whether the defendant could have achieved similar ends by means less likely to reduce competition.
[44] These circumstances are discussed in Gilbert and Melamed, note 3 *supra* at 13-18.
[45] See, e.g., Federal Trade Commission, Anticipating the 21st Century: Competition Policy in the New High-Tech, Global Marketplace (1996), Ch 7 at 1.
[46] William F. Baxter, Antitrust Law and Technological Innovation, 1 ISSUES IN SCIENCE AND TECHNOLOGY 80, 85-86 (1985).

> – is premised on the prospect of rivalry in innovation. A number of competitors, motivated by the promise of a limited grant of exclusive rights and by the threat of being excluded if someone else develops and patents the invention first, race to develop new products and processes. Condoning overinclusive joint ventures - that is, joint ventures that control a very large fraction of all potential R&D efforts in a field of investigation - would constitute a de facto repeal of the patent system. Rather than many entities competing to be the sole owner of the fruits of research, the participants of an all-inclusive joint venture are guaranteed access to whatever is developed. The benefits of being a winner and the costs of being a loser - that is, failing to develop new technology - are reduced.

Although Baxter's statement is focused on joint ventures and in part on the patent system, the logic of his analysis is equally applicable to any circumstances in which potential innovators can reasonably expect sufficient commercial rewards for their innovation. Those circumstances could include mergers or other conduct and could include other forms of intellectual property that would prevent copying by rivals such as copyright and trade secrets and first mover or other commercial advantages unrelated to intellectual property laws.

But policy makers have also long understood that the relationship between innovation and competition is more complex than, for example, the relationship between output and competition. This complexity is reflected in the treatment of innovation issues in different antitrust enforcement contexts.

A. *R&D Joint Ventures*

In 1969, the Department of Justice filed a complaint which alleged that General Motors, Ford, Chrysler, American Motors, and their trade association conspired with others to eliminate competition in the development and installation of motor vehicle emission control devices in violation of Section 1 of the Sherman Act. The complaint alleged that the defendants agreed to delay installation of existing emission control devices and to forestall the development of improvements to such devices. It also charged that the defendants conspired to misrepresent the industry's technological progress in order to delay the imposition of more stringent motor vehicle emission control standards.[47]

The case settled with a consent decree that enjoined the defendants from conspiring with others to prevent or delay development or installation of emission control devices. The decree also required the defendants to terminate a network of cross-licensing and patent pooling restraints, grant royalty-free licenses under the patent rights and refrain from cross-licensing future patent

[47] United States v. Motor Vehicle Mfrs. Ass'n, 1982 U.S. Dist. LEXIS 17850; 1982-83 Trade Cas. (CCH) P65,175.

rights or conditioning the acquisition of patent rights upon the availability of such rights to other patents on a most-favored-purchaser basis.[48]

In deciding whether to accept the proposed consent decree, the district court acknowledged that "the Government's case is based on a novel and unadjudicated theory." The court did not, however, address the harm to innovation from the alleged conspiracy. Instead, the court addressed whether the consent decree was enforceable and whether the relief which the decree provides is consistent with the prayer of the complaint. The court responded in the affirmative to both questions.[49]

Several years later the parties revisited the terms of the 1969 consent decree. The court granted the parties' request to modify the consent decree in 1982. Among other terms, the modification abandoned the original decree's prohibitions on patent cross-licensing and acquisition agreements and explicitly allowed defendants to pursue otherwise lawful joint research and development projects. As justification for the modified decree, the court noted that much of the conduct prohibited by the original decree is not unlawful in isolation and that "today it is apparent that the problems of air pollution and the efficient use of fuels is beyond the ability of any single manufacturer, technologically or financially. Solutions to these problems more probably lie in a combination of efforts far beyond that which a single manufacturer can supply." The court also opined that recent increases in competition from foreign automobile manufacturers made it unlikely that the defendants would benefit from the kind of anticompetitive conduct that had been alleged in the complaint.[50]

In 1984, Congress seemed to share the view that many important technical challenges require coordination among multiple entitles and passed the National Cooperative Research Act (NCRA), which codified the notion that agreements involving R&D cooperation should have some protection from antitrust liability. The Act provided that antitrust liability for registered R&D joint ventures should be judged under the rule of reason "taking into account all relevant factors affecting competition, including, but not limited to, effects on competition in properly defined, relevant research and development markets." The Act also limited recovery for damages and attorneys' fees.[51]

In his 1985 article, Baxter outlined the steps that an antitrust authority might employ in a rule of reason analysis of the competitive effects of a R&D joint venture. His analysis included an approach to market definition that anticipated the concept of an "innovation market" introduced

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[48] Id.
[49] United States v. Automobile Mfrs. Ass'n, 307 F. Supp. 617 (C.D. Cal. 1969).
[50] United States v. Motor Vehicle Mfrs. Ass'n, 1982 U.S. Dist. LEXIS 17850; 1982-83 Trade Cas. (CCH) P65,175.
[51] Pub. L. No. 98-462, 15 U.S.C. §§ 4301-4306. (The statute was amended in 1993 to become the National Cooperative Research and Production Act.)

ten years later in the agencies' *Antitrust Guidelines for the Licensing of Intellectual Property*.[52] Baxter noted the potential for efficiency benefits from R&D joint ventures, but he also recognized that "there is an increase in the danger that the joint venture will result in the restriction of output both at the R&D level and at the production and marketing level where the participants compete."[53]

The NCRA coincided with a more permissive attitude toward cooperative arrangements in the face of foreign competition. In 1984, the FTC approved a production joint venture between General Motors and Toyota notwithstanding that the joint venture was not limited to the production of a new product. The Commission approved the venture because, among other things, it was expected to have a positive impact on the diffusion of new manufacturing techniques from Toyota to U.S. auto production. Specifically, the Commission concluded that the venture would enable U.S. firms to learn about "more efficient Japanese manufacturing and management techniques" and should thus "lead to the development of a more efficient and competitive U.S. industry."[54]

Economists generally supported the flexible antitrust approach toward cooperative R&D arrangements adopted in the NCRA. Carl Shapiro and Robert Willig wrote that "Joint R&D activities are natural candidates for preferred antitrust treatment, since joint research is especially likely to generate efficiencies."[55] Efficiencies include the reduction in free-riding that suppresses R&D incentives for discoveries that have ineffective intellectual property protection, economies of scale in R&D, and possible synergies from R&D cooperation. However, the authors also noted that "even joint ventures whose activities are confined to research and development may have anticompetitive effects" by reducing R&D rivalry.[56]

B. Patent Licensing and Patent Pools

Courts decided a number of cases involving conduct by patent holders and participants in standard-setting organizations that had implications for innovation incentives, although their decisions did not address innovation directly.

Early patent cases were broadly supportive of patent rights. In *National Harrow*, for example, the Supreme Court said that "the general rule is absolute freedom in the use or sale of rights under the patent laws of the United States. The very object of these laws is monopoly, and the

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[52] William F. Baxter, Antitrust Law and Technological Innovation, 1 ISSUES IN SCIENCE AND TECHNOLOGY 80, 84-86 (1985), note 46 *supra*. See also William F. Baxter, Antitrust Law and the Stimulation of Technological Invention and Innovation, Discussion Paper for The Preparatory Conference on Government Organization & Operation & The Role of Government in the Economy, University of San Diego, July 19-21, 1983. (Baxter (1983)

[53] Baxter (1983) at 10.

[54] General Motors Corp., 103 F.T.C. 374, 387-88 (1984).

[55] Carl Shapiro & Robert D. Willig, On the Antitrust Treatment of Production Joint Ventures, 4 J. ECON. PERSP. 113, 120 (1990).

[56] Id.

rule is, with few exceptions, that any conditions which are not in their very nature illegal with regard to this kind of property, imposed by the patentee and agreed to by the licensee for the right to manufacture or use or sell the article, will be upheld by the courts."[57] The license agreements that the Court upheld in that case, among other things, specified the prices at which the licensee could sell products manufactured under the National Harrow license and required that the licensee make or sell only the licensed products. The U.S. government encouraged the creation of the Manufacturers Aircraft Association in 1917 to facilitate licensing of patents related to aircraft technology.[58]

In later cases, courts were less deferential to patent holders and held that collaborations to increase prices violated the antitrust laws. Examples include the Supreme Court's condemnation of the Hartford-Empire patent pool, which combined patented technologies related to the manufacture of glassware,[59] and efforts by Singer and European companies to cross-license and jointly defend patents related to sewing machines capable of performing various functional and ornamental stitch patterns.[60] In the latter case, the Court articulated a principle that has continued to inform the law regarding the application of the antitrust laws to patent matters: "the possession of a valid patent or patents does not give the patentee any exemption from the provisions of the Sherman Act *beyond the limits of the patent*."[61] While courts have been less than clear about what they understand this to mean, they have employed the concept to limit conduct by an individual patent holder that would insulate its patent from potential competition.[62]

Most challenges to patent pooling arrangements were premised on the concern that the arrangements raised entry barriers and thus tended to exclude competitors more than the patents themselves authorized. While courts rarely expressed in antitrust cases a concern about innovation explicitly, a few challenges did focus on the impact of pooling arrangements on innovation. In 1975, the government abandoned its earlier advocacy for the creation of the Manufacturers Aircraft Association patent pool and sought to break up the pool in part because of concerns that the requirement in the pool that innovators share royalties with their competitors lessened industry incentives to innovate.[63]

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[57] E. Bement & Sons v. National Harrow Co., 186 U.S. 70, 91 (1902).
[58] See George Bittlingmayer, Property Rights, Progress, and the Aircraft Patent Agreement, 31 J. L. & ECON. 227, 232 (1988).
[59] Hartford-Empire Co. v. United States, 46 F. Supp. 541 (N.D. Ohio 1942), modified by 323 U.S. 386 (1945).
[60] United States v. Singer Manufacturing, 374 U.S. 174 (1963).
[61] Id. at 196-97 (emphasis added). See, e.g., Richard J. Gilbert, Antitrust for Patent Pools: A Century of Policy Evolution, 2004 STAN. TECH. L. REV. 3.
[62] For example, in 2013 the Supreme Court ruled that large payments by branded drug-makers to potential generic entrants to settle patent disputes could be unlawful. FTC v. Actavis, Inc., 133 S. Ct. 2223, 570 U.S. 756 (2013).
[63] See, Bittlingmayer, note 58 *supra*. More recently, academic studies by Ryan Lampe and Petra Moser have found that patent pooling arrangements can discourage innovation if they require pool members to share royalties from new discoveries with other members of the pool. See, e.g., Patent Pools, Competition, and Innovation—Evidence from 20 US Industries under the New Deal, 31 J. Law Econ. & Org. 1 (2016); Patent Pools and Innovation in Substitute Technologies – Evidence from the 19th Century Sewing Machine Industry, 44 RAND J. ECON. 757 (2013);

The Department of Justice refined its analysis of innovation concerns in patent pooling arrangements in its 1997 Business Review Letter for the MPEG-2 patent licensing pool.[64] In that letter and thereafter, antitrust authorities recognized that patent pools have pro-competitive benefits if they are limited to patents that are essential to make or sell products that employ the patents and if they do not prevent members of the pool from licensing their patents independently.[65]

C. Standard Setting and Related Matters

Standardization decisions impact innovation because they often define the contours of the roadmap for the evolution of new technologies. However, most early antitrust cases that alleged abuse of the standard-setting process did not address innovation, but instead focused on procedural irregularities that excluded rivals for reasons other than the intended objective of the standard setting organization to promulgate and enforce standards that promoted quality or safety.[66]

D. *Innovation under Section 2*

In principle, Section 2 can be used to prohibit anticompetitive conduct that is likely to reduce innovation. As explained above, the likelihood of innovation can be reduced by conduct that creates or maintains market power in a product market by a firm that has monopoly power in a related R&D market or that creates or maintains monopoly power in an R&D market.[67] Such conduct can violate Section 2 unless it provides a countervailing benefit to trading partners, such as aiding innovation by enabling the defendant to better appropriate the fruits of innovation or increasing its ability to innovate.[68]

Do Patent Pools Encourage Innovation? Evidence from the 19th-Century Sewing Machine Industry, 70 J. ECON. HISTORY 898 (2010).

[64] Business Review Letter from Joel I. Klein, Ass't Att'y Gen., U.S. Dep't of Justice, to Garrard R. Beeney, Esq., Sullivan & Cromwell LLP (June 26, 1997) (MPEG-2 Business Review Letter). For a discussion of antitrust policies for patent pooling arrangements, see, e.g., Richard J. Gilbert, Ties That Bind: Policies to Promote (Good) Patent Pools, 77 ANTITRUST L. J. 1 (2010).

[65] See, e.g., Richard J. Gilbert, Collective Rights Organizations: A Guide to Benefits, Costs and Antitrust Safeguards, in Jorge L. Contreras, ed., THE CAMBRIDGE HANDBOOK OF TECHNICAL STANDARDIZATION LAW, COMPETITION, ANTITRUST, AND PATENTS 125 (2017).

[66] Prominent examples include American Soc'y of Mechanical Eng'rs v. Hydrolevel Corp., 456 U.S. 556 (1982) (antitrust liability for manipulating standards to make a competitive product non-compliant); Allied Tube & Conduit Corp. v. Indian Head, Inc., 486 U.S. 492 (1988) (rejected antitrust immunity for conduct that excluded a competing product from the standard); Consolidated Metal Prods. v. American Petroleum Inst., 846 F.2d 284 (5th Cir. 1988) (rejected allegation that defendant's certification delay was a ploy to exclude competing products); ECOS Elecs. Corp. v. Underwriters Labs., Inc., 743 F.2d 498 (7th Cir. 1984) (rejected allegation that development of a standard approving inferior and less expensive products violated the Sherman Act).

[67] See Part II.B, *supra*.

[68] These points are discussed in more detail in Gilbert and Melamed, note 3 *supra*.

While courts have found conduct that enables firms to gain or maintain monopoly power to violate Section 2, they have not yet done so explicitly because of its impact on innovation. The Court of Appeals decision in *U.S. v. Microsoft*[69]– perhaps the most important Section 2 decision since *Grinnell* – is illustrative. The court found to be unlawful a pattern of exclusionary conduct that included agreements with internet access providers, internet content providers, and independent software vendors that conditioned the provision of valuable services on agreements to exclude Netscape's Navigator browser or design their products to be more compatible with Microsoft's Internet Explorer browser rather than Netscape's browser. Microsoft's technological bundling of Windows and Internet Explorer was also found to have had the effect of limiting the available market for rival browsers.

The court found Microsoft's conduct to be illegal because it raised barriers to entry by unknown potential entrants into the operating system market, in which Microsoft had long had monopoly power. Those potential entrants would have had to innovate to at least some extent in order to enter the market, in part because intellectual property laws would have prevented entrants from copying Microsoft's operating system. The case thus seems clearly, albeit implicitly, to have found to be unlawful conduct that reduced the likelihood of innovation by rivals.

The court could have explained that Microsoft's efforts to limit the scale available for rival innovations reduced the likelihood of innovation by such rivals, and it could have explained the disincentive to innovation by Microsoft itself because of the Arrow replacement effect and how easier entry by new rivals might have ameliorated that effect by providing a competitive stimulus to innovation by Microsoft. But the court did not explicitly discuss the impact of Microsoft's conduct, or of competition, on innovation. The court had no obligation to do so because, following *Grinnell*, it was sufficient for a finding of antitrust liability to conclude that Microsoft's exclusionary conduct had the effect of maintaining its operating system monopoly.

The court was, however, keenly aware of the technological context in which the case arose. It introduced its opinion with the comment that: "As an initial matter, we note that there is no consensus among commentators on the question of whether, and to what extent, current monopolization doctrine should be amended to account for competition in technologically dynamic markets characterized by network effects."[70] The court echoed Schumpeter in noting that "[r]apid technological change leads to markets in which firms compete through innovation for temporary market dominance, from which they may be displaced by the next wave of product advancements," and the court cited Schumpeter for the proposition that "entrenchment [by a monopolist] may be temporary because innovation may alter the field altogether."[71] But the

[69] 253 F.3d 34 (D.C. Cir. 2001) (en banc).
[70] Id. at 50.
[71] Id. at 49 (citing Joseph A. Schumpeter, CAPITALISM, SOCIALISM AND DEMOCRACY 81-90 (1942).

court's discussion of technologically dynamic markets seemed more focused on the factual context that might need to be taken into account to evaluate the effects of the conduct at issue on the defendant's market power than on possible consequences of antitrust intervention or the lack thereof for innovation.[72]

E. "Predatory" Innovation

Antitrust enforcement typically focuses on conduct, including mergers, that might suppress output or innovation. Yet there is a strand of antitrust cases that deals with the potential threat to competition from successful innovation. *Berkey Photo v. Eastman Kodak* involved, among other issues, the introduction of Kodak's Pocket Instamatic camera and a new color print film, Kodacolor II. The plaintiff, Berkey, competed with Kodak in supplying photofinishing services and cameras. Berkey alleged that Kodak violated the antitrust laws by failing to release advance information about the new film and camera format and by restricting Kodacolor II to the Instamatic format for a period of time, thereby preventing Berkey from providing photofinishing services or competing to sell cameras in the new format. The court of appeals reversed a jury verdict in favor of Berkey on these issues. The court ruled:[73]

> If a monopolist's products gain acceptance in the market, … it is of no importance that a judge or jury may later regard them as inferior, *so long as that success was not based on any form of coercion*.

Several other cases have been similarly deferential to product innovation. They include design changes by International Business Machines that allegedly foreclosed manufacturers of peripherals that interacted with IBM's mainframes;[74] and Apple's updates to its FairPlay encryption protocol, which made its iPod media player and songs downloaded from its iTunes music store incompatible with other media players and streaming services.[75] Courts have been cautious but less deferential in a number of pharmaceutical "product hopping" cases which

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[72] In a later section of the opinion, the court held that the limited per se rule applicable to tying arrangements under Section 1 of the Sherman Act should not be applied to tying of software used as a platform for third-party applications and complementary software functionality, in part because of the "pervasively innovative character of platform software markets." Id. at 93. Here, too, the court was focused on market attributes that affected the court's ability to assess the implications of the conduct at issue for competition, not on the impact of that conduct or competition on future innovation.

[73] Berkey Photo v. Eastman Kodak Co., US Court of Appeals for the 2nd Circuit, 603 F.2d 263, 286 (June 25, 1979) (emphasis added).

[74] See, e.g., Cal. Computer Prods. v. IBM Corp., 613 F.2d 727 (1979) and Memorex Corp. v. IBM Corp., 636 F.2d 1188 (1980) (design changes lowered costs and increased performance). In Transamerica Computer Co. v. IBM Corp., 698 F.2d 1377 (9th Cir. 1983), a district court held that a design change was anticompetitive but the plaintiff did not suffer antitrust injury.

[75] In re Apple iPod iTunes Antitrust Litigation, US District Court for the Northern District of California (May 19, 2011).

allege exclusion of generic drug competition resulting from changes to the composition or packaging of the reference drug.[76]

For the most part, these cases have been resolved by following the guidance in *Berkey Photo* and its focus on the presence or absence of coercion. Courts have generally concluded that innovation does not incur antitrust liability if the innovator does not coerce its adoption, for example by making it difficult for consumers or intermediaries to purchase a product that the innovation replaces. Whether this rule of thumb might be too broad a safe harbor for some types of innovations, such as changes to communication protocols that have no efficiency justification or minor improvements to a drug that exclude generic competitors, is an open question.

The courts' reluctance to second-guess innovation decisions has been driven at least in part by a concern that courts are not well-suited to evaluate decisions about technology and product design. But that reluctance is not unlimited. In the *Microsoft* case, for example, the court found to be unlawful certain product design decisions that tended to exclude rivals and were not shown to further any legitimate purpose.[77]

Innovation might have a more central role in cases recently pursued by the Department of Justice against Alphabet, the parent of Google, and by the Federal Trade Commission against Meta, the parent of Facebook. The DOJ alleged that Google's payments for default status on devices that access the internet and its agreements that require Android mobile phone licensees to install Google search and other Google services deny rivals scale to compete effectively and thus thwart potential innovation.[78] The FTC alleged that Facebook engaged in conduct that "deprives personal social networking users in the United States of the benefits of competition, including increased choice, quality, and innovation."[79] Innovation effects might be central to the outcomes of these cases because they involve dynamic industries that offer services, such as internet search and social networking, without monetary compensation but in exchange for the collection of users' personal information that enhances the value of advertising.[80]

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[76] The courts rejected antitrust challenges to product hopping in Walgreen Co. v. AstraZeneca Pharms., 534 F. Supp. 2d 146 (D.D.C. 2008) (decision to market and promote a drug with no generic competition was not exclusionary conduct), and Mylan Pharm., Inc. v. Warner Chilcott Public Ltd. Co., WL 1736957 (E.D. Pa. 2015) (rejecting a claim of anticompetitive product switching upon finding, among other things, that the alleged product switch did not amount to exclusionary conduct); but they ruled for plaintiffs in New York v. Actavis PLC, 787 F.3d 638 (2nd Cir. 2015) (holding that the trial court did not abuse its discretion by issuing a preliminary injunction that barred a brand company from withdrawing its branded drug from the market), and In re Namenda Direct Purchaser Antitrust Litig., 331 F. Supp. 3d 152 (2018) (defendants not entitled to summary judgment upholding its attempted hard switch to a slightly different new product).

[77] Microsoft, 253 F.3d at 65-68.

[78] Complaint ¶ 167, United States v. Google LLC, Case 1:20-cv-03010 (D.D.C. Oct. 20, 2020).

[79] First Amended Complaint ¶ 9, FTC v. Facebook, Inc., Case 1:20-cv-03590 (D.D.C. Aug. 19, 2021).

[80] See, e.g., Richard J. Gilbert & A. Douglas Melamed, note 3 *supra*.

IV. INNOVATION AND MERGER POLICY

In 1914, when Congress debated the legislation leading to the Clayton Act, the prevailing economic thought reflected in the writings of Jenks and the Clarks distinguished between the benefits of scale for economic efficiency and the ills of monopoly power achieved through merger. These authors acknowledged that monopoly could be a natural and inevitable result of industrial efficiency[81] but said little about monopoly power's effects on innovation. While most early economists viewed monopoly as having negative effects on innovation, some, like Schumpeter, were more sympathetic to monopoly.

Legislators that participated in the Clayton Act debate showed little interest in the connection between monopoly and innovation. There were exceptions. Representative Guy Helvering of Kansas, speaking in favor of the proposed legislation, presciently said "Monopoly is fatal to invention and ever stifles initiative. … The man with a monopoly does not need to encourage efficiency and improvement, for his profits are assured, even if he never makes progress."[82] But it was a long time before this concern was reflected in enforcement or judicial decisions.

A. *Merger Guidelines*

For decades merger policy evolved with barely a mention of possible effects of mergers on innovation incentives.[83] The Department of Justice issued its first general statement of merger enforcement policy in 1968, which it called "Merger Guidelines." In that statement, the Department noted that innovation might change the relevant market for a transaction, but the Guidelines made no mention of the possible harm or benefit from a merger for innovation.[84] In effect, innovation was seen as an input into antitrust analysis, but not an output.

The DOJ revised its merger guidelines in 1982. That revision noted that "[s]ellers with market power also may eliminate rivalry on variables other than price," but it did not mention innovation specifically other than to comment that rapid technological change may complicate the use of a single price to analyze markets and effects on competition.[85] Again, the guidelines seemed mostly to treat innovation as an input, but not an output.

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[81] For example, Jeremiah Jenks wrote that "Under a system of free competition industrial efficiency tends toward monopoly. The business genius whose industrial efficiency is greatest tends to overcome his rivals, and to take over a continually increasing proportion of the business, until he becomes a monopolist." Jeremiah W. Jenks, Economic Aspect of the Recent Decisions of the United States Supreme Court on Trusts, 20 J. POL. ECON. 346, 349 (1912).
[82] 51 Cong. Rec. 9184 (May 23, 1914).
[83] See, generally, Richard J. Gilbert & Hillary Greene, Merging Innovation into Antitrust Agency Enforcement of the Clayton Act, 83 GEORGE WASHINGTON L. R. 1919 (2015).
[84] U.S. DEP'T OF JUSTICE, MERGER GUIDELINES), 4 Trade Reg. Rep. (CCH) ¶ 13,101 (1968).
[85] U.S. DEP'T OF JUSTICE, MERGER GUIDELINES, 4 Trade Reg. Rep. (CCH) ¶ 13,102 (1982).

The DOJ provided additional clarification of its approach to merger analysis in a 1984 revision of its guidelines. The 1984 revision explained how the Department might consider efficiencies as a merger defense. Although this general concession provided an opening to consider innovation benefits from mergers, the guidelines did not mention innovation specifically other than to repeat the caution that technological change could complicate the analysis of a merger's effects on competition.[86]

In short, to the extent agency merger guidance in or before the 1984 guidelines gave any consideration to innovation, it did so with a nod to the Schumpeterian view of creative destruction that could disrupt the boundaries of market definition, a consequence that might affect the relative size and importance of individual firms.

It was not until the 1992 revision, nearly eighty years after the Clayton Act was enacted, that the guidelines first mentioned harm to innovation as a potential consequence of a merger, and even then innovation was mentioned only in a footnote. The footnote stated: "Sellers with market power also may lessen competition on dimensions other than price, such as product quality, service, or innovation."[87]

In 1993 the Department challenged a proposed merger based in part on a theory of harm to innovation. ZF Friedrichshafen, AG proposed to acquire the Allison Transmission Division of General Motors Corp. The companies were the two most important rivals in design, development, and production of automatic transmissions for medium and heavy trucks, buses, and other commercial and military vehicles. The complaint alleged that the merger would eliminate competition and raise prices in the US for some types of transmissions. It went further and alleged that the merger would harm innovation for automatic transmissions used in many commercial and military vehicles because ZF and Allison were global competitors for these transmissions and their rivalry incentivized innovations that benefited US customers. The complaint defined a highly concentrated "innovation market" in which Allison and ZF were the most significant competitors.[88] The parties abandoned the transaction after the complaint was filed, so the innovation issues were not litigated.

The Department of Justice and Federal Trade Commission described the concept of an innovation market in their joint 1995 *Antitrust Guidelines for the Licensing of Intellectual Property* (IP Guidelines):[89]

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[86] U.S. DEP'T OF JUSTICE, MERGER GUIDELINES, 4 Trade Reg. Rep. (CCH) ¶ 13,103 (1984).
[87] U.S. DEP'T OF JUSTICE MERGER GUIDELINES, (1992).4 Trade Reg. Rep. (CCH) ¶ 13,104 (1992).
[88] United States v. General Motors Corp., ZF Friedrichshafen, AG et al., U.S. District Court, District of Delaware, Civil Action 93-530, Complaint, November 16, 1993.
[89] U.S. Dep't of Justice & Federal Trade Comm'n, Antitrust Guidelines for the Licensing of Intellectual Property (1995) at §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, for example by limiting the ability and incentive of a hypothetical monopolist to retard the pace of research and development. The Agencies will delineate an innovation market only when the capabilities to engage in the relevant research and development can be associated with specialized assets or characteristics of specific firms.

The merger guidelines were revised jointly by the DOJ and the FTC in 1997.[90] The new guidelines included an expanded discussion of efficiencies and, for the first time, explicitly acknowledged that a merger could benefit consumers by enhancing the merged firm's incentive to develop new or improved products. However, the Guidelines added the qualifications that "certain types of efficiencies are more likely to be cognizable and substantial than others" and that efficiencies related to R&D "are potentially substantial but are generally less susceptible to verification and may be the result of anticompetitive output reductions."

The 1997 guidelines made no mention of innovation markets and did not expand on the footnote in the 1992 Guidelines regarding the possible lessening of innovation competition from a merger. By contrast, the *Antitrust Guidelines for Cooperation Among Competitors,* published jointly by the DOJ and the FTC in 2000, refer repeatedly to innovation and state that, "if a competitor collaboration may have competitive effects on innovation that cannot be adequately addressed through the analysis of goods or technology markets, the Agencies may define and analyze an innovation market as described in Section 3.2.3 of the [1995] *Intellectual Property Guidelines*."[91]

The virtual silence in merger guidance regarding innovation effects is difficult to reconcile with the somewhat greater attention paid to innovation effects in Sherman Act matters and, as discussed below, in several merger challenges that have not been litigated. The legislative history of the NCRA expressly recognized that competition can be a key stimulant of innovation.[92] As noted above, the DOJ challenged a research joint venture in *United States v. Automobile Manufacturers Association* in 1969. And, as to mergers, Judge Robert Bork acknowledged concern about the loss of innovation competition in a merger case brought by the FTC in 1986.[93]

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[90] U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, HORIZONTAL MERGER GUIDELINES, 4 Trade Reg. Rep. (CCH) ¶ 13,104 (1997).
[91] Department of Justice and Federal Trade Commission, ANTITRUST GUIDELINES FOR COLLABORATIONS AMONG COMPETITORS, Section 3.32 (c) (2000).
[92] National Cooperative Research Act of 1984, JOINT EXPLANATORY STATEMENT OF THE COMM. OF CONF., 98th Cong., 2d Sess. 9 (1984), reprinted in 1984 U.S.C.C.A.N. 3131, 3133-34.
[93] Federal Trade Commission v. PPG Industries, Inc., 798 F.2d 1500, 1504 (D.C. Cir. 1986).

The antitrust agencies finally gave prominent attention to innovation concerns in their 2010 revision of the *Horizontal Merger Guidelines*. Because the Guidelines offer the first comprehensive official statement of merger enforcement for innovation, we quote them extensively here. The 2010 Guidelines begin a section entitled "Innovation and Product Variety" with the statement that:[94]

> Competition often spurs firms to innovate. The Agencies may consider whether a merger is likely to diminish innovation competition by encouraging the merged firm to curtail its innovative efforts below the level that would prevail in the absence of the merger. That curtailment of innovation could take the form of reduced incentive to continue with an existing product-development effort or reduced incentive to initiate development of new products.
>
> The first of these effects is most likely to occur if at least one of the merging firms is engaging in efforts to introduce new products that would capture substantial revenues from the other merging firm. The second, longer-run effect is most likely to occur if at least one of the merging firms has capabilities that are likely to lead it to develop new products in the future that would capture substantial revenues from the other merging firm.

The 2010 Guidelines describe an analytical methodology to evaluate innovation incentives that parallels their analysis of unilateral price effects. Specifically, they note that "The Agencies evaluate the extent to which successful innovation by one merging firm is likely to take sales from the other"[95]; i.e., the diversion of sales between the merging parties from innovation. Diversion could occur because both merging firms are engaged in R&D, and innovation by one firm would reduce the value of R&D by the other firm, or because one firm has existing revenues that would be at risk of cannibalization as a consequence of innovation from the other firm. The latter is the Arrow replacement effect.

The 2010 Guidelines recognize the potential for efficiency benefits from combining R&D programs: "The Agencies also consider whether the merger is likely to enable innovation that would not otherwise take place, by bringing together complementary capabilities that cannot be otherwise combined or for some other merger-specific reason."[96] A separate section in the Guidelines dealing with efficiencies notes that:[97]

> When evaluating the effects of a merger on innovation, the Agencies consider the ability of the merged firm to conduct research or development more effectively. Such efficiencies may spur innovation but not affect short-term pricing. The Agencies also

[94] U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, HORIZONTAL MERGER GUIDELINES §6.4 (2010).
[95] Id.
[96] Id.
[97] Id., at §10.

> consider the ability of the merged firm to appropriate a greater fraction of the benefits resulting from its innovations. Licensing and intellectual property conditions may be important to this enquiry, as they affect the ability of a firm to appropriate the benefits of its innovation. Research and development cost savings may be substantial and yet not be cognizable efficiencies because they are difficult to verify or result from anticompetitive reductions in innovative activities.

The 2010 Horizontal Merger Guidelines do not specifically mention the concept of an innovation market, although they do state that "The Agencies … also consider whether a merger will diminish innovation competition by combining two of a very small number of firms with the strongest capabilities to successfully innovate in a specific direction.[98]

The agencies made minor revisions to the IP Guidelines in 2017. The revised guidelines replaced the term "innovation market" with the term "research and development market," but left the description of the market otherwise unchanged.[99]

The 2023 Merger Guidelines make frequent reference to innovation, and they include a separate section entitled "Considerations for Innovation and Product Variety Competition".[100] That section expands somewhat on the unilateral effects analysis of innovation in the 2010 Merger Guidelines:[101]

> When a firm introduces a new product or improves a product's features, some of the sales it gains may be at the expense of its rivals, including rivals that are competing to develop similar products and features. As a result, competition between firms may lead them to make greater efforts to offer a variety of products and features than would be the case if the firms were jointly owned, for example, if they merged. The merged firm may have a reduced incentive to continue or initiate development of new products that would have competed with the other merging party, but post-merger would "cannibalize" what would be its own sales. A service provider may have a reduced incentive to continue valuable upgrades offered by the acquired firm. The merged firm may have a reduced incentive to engage in disruptive innovation that would threaten the business of one of the merging firms. Or it may have the incentive to change its product mix, such as by ceasing to offer one of the merging firms' products, leaving worse off the customers who previously chose the product that was eliminated.

That section also notes that the incentives to innovate depend "on the capabilities of the firms" and that, where the merging firms are two of a small number of companies with R&D assets in a

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[98] Id., at §6.4.
[99] U.S. Dep't of Justice & Federal Trade Comm'n, ANTITRUST GUIDELINES FOR THE LICENSING OF INTELLECTUAL PROPERTY §3.2.3 (2017).
[100] U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, MERGER GUIDELINES, § 4.2.E (2023).
[101] Id. footnote omitted.

particular area, "competition between them will have a greater impact on their incentive to innovate."

Elsewhere, the Guidelines describe a possible product market focused on new products that might result from future innovation:[102]

> In the case where a merger may substantially lessen competition by decreasing incentives for innovation, the Agencies may define relevant antitrust markets around the products that would result from that innovation, even if they do not yet exist. In some cases, the Agencies may analyze different relevant markets when considering innovation than when considering other dimensions of competition.

The Guidelines do not, however, specifically describe an R&D or innovation market focused on innovation capabilities like that described in the 1995 IP Guidelines. Nor do they specifically describe as a potential harm from a merger obtaining a monopoly over R&D assets needed for a particular type of innovation. As explained in Part II.B., *supra*, gaining such a position over R&D assets could both increase the ability of the merging parties to restrict innovation and reduce their incentive to innovate.

The Guidelines include a short section on possible pro-competitive efficiencies from a merger. That section does not discuss the possibility that a merger might enable innovation that would not otherwise take place, for example by bringing together complementary capabilities that cannot be combined without a merger. To the contrary, the section on efficiencies begins by noting that the Supreme Court has held that "possible economies [from a merger] cannot be used as a defense to illegality"[103] and thereafter addresses only the narrower question whether "evidence of procompetitive efficiencies shows that no substantial lessening of competition is in fact threatened by the merger."[104] The Guidelines thus suggest that the agencies might consider innovation benefits as a possible defense only to the extent that they are offered to rebut allegations of innovation harm as a result of the merger and that the agencies might not consider innovation benefits as a possible defense to a merger that is thought to lessen competition in some other way.

Antitrust authorities routinely allege that mergers in high-technology markets would harm innovation by combining firms that are likely innovators.[105] However, relatively few cases have

[102] Id. at Appendix 4.3.D.7.
[103] Phila. Nat'l Bank, 374 U.S. 363, 371 (1963).
[104] U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, MERGER GUIDELINES, § 3.3.
[105] See Richard J. Gilbert & Hillary Greene, Merging Innovation into Antitrust Agency Enforcement of the Clayton Act, 83 GEORGE WASHINGTON L. R. 1919 (2015), note 83 *supra*. (antitrust authorities allege harm to innovation in over 90 percent of challenges to mergers in high-technology industries).

turned on innovation effects,[106] and as noted, antitrust authorities have been slow to describe innovation concerns in their merger guidelines.

B. *Innovation and R&D Market*s

Much ink has been spilt over whether the concept of an innovation or R&D market has a viable role in merger analysis. Twenty years ago, Ronald Davis wrote an excellent review of the treatment of innovation markets in the legal system.[107] No court has since ruled on the legal status of innovation or R&D markets for merger enforcement.

Critics argue – often vociferously – that research and development is rarely traded in a market (an exception being technologies licensed for use in an end product) and therefore an R&D market generally has no legitimate status in a proceeding under the Clayton Act.[108] That criticism misses the point. The relevant question is not whether there exists an R&D market in which competition can affect terms of trade or transactions involving R&D. Instead, the question is whether defining an R&D market can be a useful tool to help predict the effects of a merger on subsequent innovation. While the term "market" might in some semantic sense seem inappropriate in the absence of commercial transactions, the idea is to use the well-developed conceptual framework used in more ordinary markets to identify likely innovators and their shares in R&D investments or assets directed to one or more types of innovations.

To see this, it is useful to consider two types of horizontal mergers or acquisitions that can reduce innovation by the merging parties and have been the focus of enforcement in several cases. The first is a "**product-to-project**" transaction in which a firm with an existing product acquires or merges with a firm that has an R&D project in its pipeline which, if successful, would compete with the existing product. The antitrust theory is harm from the elimination of an actual potential competitor of the existing product.[109] Like all potential competition cases, challenges to product-to-project mergers depend in part on proof that the acquired R&D project is one of a very few, or one of a very few significant, potential competitors of the merging product. Assessment of the significance of the acquired project requires, in effect, analysis of the relevant R&D market.

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[106] See, e.g., 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 (2001).
[107] Ronald W. Davis, Innovation Markets and Merger Enforcement: Current Practice in Perspective, 71 ANTITRUST L. J. 677 (2003).
[108] See, e.g., Robert J. Hoerner, Innovation Markets: New Wine in Old Bottles?, 64 ANTITRUST L. J. 49, 53 (1995).
[109] Depending on the circumstances, a product-to-project merger might also harm competition by reducing the incentive created by the separately owned project for the firm with the existing product to innovate to improve its product in anticipation of possible innovation by a rival. This is sometimes referred to as elimination of the benefits of perceived potential competition.

Courts have not been kind to the potential competition doctrine, finding fault in litigated cases with plaintiffs' claims about the likelihood of entry and its competitive effects if entry should occur.[110] Nonetheless, antitrust authorities have challenged numerous mergers and acquisitions on the ground that they would eliminate a potential competitor.[111] They have blocked mergers that threatened potential competition or settled disputes with consent decrees requiring divestiture of potentially overlapping assets. The agencies began to prosecute these cases at least as early as 1995. In that year the FTC filed three separate complaints alleging that a merger would eliminate a potential competitor.[112]

The number of product-to-project transactions that have been challenged by the antitrust authorities with implications for innovation is too large to allow a comprehensive listing in this article.[113] An example of a challenge to a transaction that would eliminate a potential competitor occurred in the market for left ventricular assist devices (LVADs), a type of surgically implanted mechanical blood pump. The Thoratec Corporation was a leader in this technology at the beginning of the millennium. Thoratec sold the HeartMate XVE and a second-generation product, the HeartMate II. In 2009, Thoratec proposed to purchase HeartWare. At the time, Thoratec's products were the only LVADs approved by the US Food and Drug Administration (FDA) for destination therapy, rather than as a temporary bridge to a transplant. HeartWare was a potential new entrant into the line of LVADs with a device that it called the HeartWare HVAD. HeartWare's HVAD was in clinical trials at the time of the proposed acquisition, and initial results were promising. Doctors praised the HVAD's innovative design and small size, which simplified surgical implantation. The FTC challenged the transaction, alleging, among other effects, that it would eliminate innovation competition and maintain Thoratec's existing monopoly position.[114] The parties ultimately abandoned the transaction.

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[110] See, e.g., Joseph F. Brodley, Potential Competition under the Merger Guidelines, 71 CALIF. L. REV. 376 (1983).

[111] See See, e.g., Federal Trade Commission, Anticipating the 21st Century: Competition Policy in the New High-Tech, Global Marketplace (1996), Ch 7 at 7.

[112] Hoechst AG, C-3629, 5 Trade Reg. Rep. (CCH) ¶ 23,895 (FTC Dec. 5, 1995) (allegation that merger would eliminate potential competition in three categories of drugs); Boston Scientific Corp., C-3573, 5 Trade Reg. Rep. (CCH) ¶ 23,774 (FTC Apr. 28, 1995) (allegation that acquisition would eliminate the only potential competitor); Wright Medical Technology, Inc., C-3564, 5 Trade Reg. Rep. (CCH) ¶ 23,726 (FTC Mar. 23, 1995) (allegation that merger would eliminate potential competition in the market for the sale of orthopedic implants used in human hands).

[113] For more examples of U.S. enforcement of product-to-project mergers, see, e.g., Federal Trade Commission, Anticipating the 21st Century: Competition Policy in the New High-Tech, Global Marketplace (1996), Ch 7; 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 (2001), note 106 *supra*; Ronald W. Davis, Innovation Markets and Merger Enforcement: Current Practice in Perspective, 71 ANTITRUST L. J. 677 (2003); Giulio Federico, Fiona Scott Morton & Carl Shapiro, Antitrust and Innovation: Welcoming and Protecting Disruption, in 20 INNOVATION POLICY AND THE ECONOMY 125 (2020); Richard J. Gilbert, INNOVATION MATTERS: COMPETITION POLICY FOR THE HIGH-TECHNOLOGY ECONOMY, Ch. 7 (MIT Press 2020), note 3 s*upra*.

[114] In the matter of Thoratec Corporation, and HeartWare International, Docket No. 9339, Administrative Complaint (July 28, 2009).

The FTC also alleged harm to product-to-project competition from Bristol-Myers Squibb's proposed acquisition of Celgene. Celgene sold Otezla, the most significant oral product approved by the FDA to treat moderate-to-severe psoriasis in the United States, and BMS had an alternative treatment in development at the time of the proposed acquisition.[115] The FTC conditioned approval of the merger on the divestiture of Otezla to Amgen, Inc.[116]

The agencies have also challenged product-to-project mergers outside the pharmaceutical industry. The DOJ, for example, challenged General Electric's proposed acquisition of PSM Mfg., as part of a larger acquisition of assets of Alstom S.A., PSM's parent company.[117] The complaint alleged that GE and PSM were the two leading providers of aftermarket parts and service for the most common gas turbine model used for power generation in the United States and that, among other things, "the acquisition would eliminate PSM as a vigorous product innovator for the GE installed base and likely would reduce GE's incentive to innovate in response to PSM." The litigation was resolved by a consent decree pursuant to which the defendants agreed to divest PSM.[118]

Although courts have not yet fully embraced the concept of harm to actual potential competition as an antitrust problem, the theory is conceptually sound. The risks of harm are perhaps most readily understood in the pharmaceutical and medical device industries. Drugs and other therapies must transit a pipeline of clinical trials before they can be widely prescribed. As a result, it is not difficult to ascertain whether there is one or only a very few suppliers of specific types of therapies and devices that have completed advanced trials. New projects that are far along the pipeline have a predictable probability of success, and if the pending projects are successful, they can have significant competitive benefits. The incumbent firms thus have a substantial incentive to acquire firms with projects in the pipeline in order to protect their existing businesses. They might after acquisition terminate projects that threaten those businesses or redirect them to activities that have less consumer benefit. Either way, the acquisitions could significantly harm competition. The Arrow replacement effect implies that incentives for acquiring firms to invest in and promote acquired projects are suppressed if they own products with profits that would be at risk from sales by successful newly acquired projects.

An influential paper by Colleen Cunningham, Florian Ederer and Song Ma, aptly named "Killer Acquisitions," provides empirical support for the Arrow disincentive effect, finding that firms are less likely to commercialize acquired drugs if they would compete with the acquiring firms' drugs in the same concentrated therapeutic category.[119] Cunningham, et al., studied the

[115] In the matter of Bristol-Myers Squibb Company and Celgene Corporation, Docket No. C-4690, Complaint (November 15, 2019).
[116] See PRESS RELEASE: FTC Approves Modifications to Bristol Meyers Squibb Divestiture Agreement (November 12, 2021).
[117] United States v. General Electric Company, et al., Case 1:15-cv-01460-RMC (D.D.C., September 8, 2015).
[118] United States v General Electric Company, et al., CASE NO.: 1:15-cv-01460-ABJ (D.D.C., December 21, 2015).
[119] Colleen Cunningham, Florian Ederer & Song Ma, Killer Acquisitions, 129 J. POL. ECON. 649 (2021).

pharmaceutical industry, in which the acquired firm's project is often the only, or at least the most likely, threat to the acquiring firm's current business. While the theory of actual potential competition is applicable to all industries, the factual circumstances on which the theory depends might be different in other industries.

A product-to project merger might have offsetting effects that increase the likelihood of innovation. For example, acquisition by an established firm with effective marketing capabilities might increase the opportunity for innovators to profit from exploitation of their R&D. R&D incentives might also increase if patent and other protections are insufficient to ensure that the acquired firm will be able to appropriate value for its innovations as a standalone entity and acquisition by a firm with a large market share makes appropriation of value for the innovation more likely or more substantial. And in some circumstances, a merger might facilitate the employment of complementary assets that can enable improved or faster innovation and thus increase the ability of the merging firms to innovate. In all these examples, the importance of the offsetting benefits will depend in part on whether they could be realized by some means other than acquisition of the project by a firm with substantial revenues that are threatened by the project.

A second type of horizontal merger that is relevant for innovation is a "**project-to-project"** merger, in which two firms with potentially competing R&D projects merge. As discussed above, such a merger might suppress innovation by reducing the incentive of each merger partner to make investments that would take sales from its other partner, or it might promote innovation if there are merger-specific efficiencies. As with any horizontal merger, assessing the competitive effects of project-to-project mergers requires assessing the importance of the merging products to likely innovation in the relevant space, and that requires analyzing an R&D market.

The FTC had an opportunity to challenge a project-to-project merger that threatened innovation in 2001 when Genzyme proposed to acquire Novazyme. Genzyme and Novazyme were the only two companies with active research programs for Pompe disease, a rare genetic, and often fatal, muscular disorder. The FTC chose not to take any enforcement action. In a lengthy press release, Chairman Timothy Muris explained his view that there was no presumption that a merger, even a merger to monopoly, would harm innovation competition and described the exceptional factual circumstances of the case. John Crowley was chairman and a cofounder of Novazyme. Two of his children had been diagnosed with Pompe disease, and Crowley was determined to find a cure. Genzyme, however, terminated the Novazyme project not long after the acquisition.[120]

[120] See Richard J. Gilbert, INNOVATION MATTERS: COMPETITION POLICY FOR THE HIGH-TECHNOLOGY ECONOMY at 148-149 (MIT Press 2020), note 3 *supra*, for a discussion of factors that were relevant to this decision. One lesson from that case might be that predictions about future conduct are likely to be more reliable if they are based on the economic interests of the merging firms in light of objective economic factors, rather than subjective preferences of current management.

The agencies have challenged some project-to-project transactions in which concerns about harm to innovation competition were central to the enforcement decision. We mentioned above the DOJ's 1969 complaint in *U.S. v. Automobile Manufacturers Association* and its 1993 complaint in *U.S. v. General Motors Corp., ZF Friedrichshafen, AG et al*. The FTC had an active enforcement program for mergers that allegedly suppressed project-to-project innovation competition in the 1990s. Some examples include the following:

- Roche-Genentech (1990): The FTC alleged that the merger would combine two of a small number of companies engaged in R&D for CD4-based therapeutics (white blood cells that fight infection) for the treatment of AIDS/HIV.[121]
- American Home Products-American Cyanamid (1994): The FTC alleged that the merger would combine two of the three companies developing vaccines for rotavirus, which causes diarrhea, at or near the clinical trial stage.
- Glaxo/Burroughs-Wellcome (1995): The FTC alleged that the merger would combine the two companies furthest along in developing an oral treatment for migraine headaches.[122]
- Sensormatic-Knogo (1995): The FTC alleged that the merger would decrease competition in research and development for new systems to prevent retail shoplifting.[123]
- Upjohn-Pharmacia Aktiebolag (1996): The merging parties were two of only a very small number of companies in the advanced stages of developing a particular drug for colorectal cancer, and no competing product was currently on the market. Pharmacia's product was allegedly a few years behind Upjohn's in the FDA process. The FTC alleged that the merger would reduce incentives to develop and commercialize Pharmacia's product.[124]

In 2013, the FTC challenged the proposed acquisition of Arbitron by Nielsen Holdings. Both companies sold audience measurement services that provide metrics used by advertisers and networks in negotiations over purchases and sales of commercial airtime. The FTC alleged that both companies were well positioned to provide national syndicated cross-platform measurement services that measure audience participation across multiple media platforms, including online and mobile platforms in addition to television and radio. Although neither company offered such a comprehensive service at the time of the proposed acquisition, demand for such a service was increasing rapidly along with the profusion of various media platforms.

The FTC alleged that the acquisition would eliminate future competition and result in less innovation for national syndicated cross-platform audience measurement services. It conditioned approval of the acquisition on the divestiture of assets related to Arbitron's cross-platform

[121] Roche Holding Ltd., 113 F.T.C. 1086 (1990).
[122] Glaxo PLC, 119 F.T.C. 815 (1995).
[123] Sensormatic Elec. Corp., C-3572, 5 Trade Reg. Rep. (CCH) ¶ 23,742 (FTC Apr. 18, 1995).
[124] The Upjohn Co. and Pharmacia Aktiebolag, C-3638, 5 Trade Reg. Rep. (CCH) ¶ 23,914 (FTC Feb. 8, 1996).

audience measurement business, including data from its representative panel. The consent agreement also required Nielsen to provide the acquirer of these assets with a perpetual, royalty-free license to data, including individual-level demographic data, and technology related to Arbitron's cross-platform audience measurement business for a period of no less than eight years. In addition, the decree required Nielsen to make improvements and enhancements to the Arbitron panels at the request and expense of the acquirer in order to further its ability to offer a national syndicated cross-platform audience measurement service.[125]

The DOJ has also challenged project-to-project mergers based in part on concerns about harm to innovation. For example, in 2015 Applied Materials and Tokyo Electron abandoned a proposed merger after the DOJ concluded that there were no acceptable remedies for the merger's predicted harms to innovation and future price competition. Applied Materials and Tokyo Electron are two of very few firms with the capability to develop and manufacture leading-edge semiconductor tools for high-volume semiconductor manufacturing. The DOJ identified narrow overlaps in existing product markets and pipeline projects that raised concerns about product-to-project competition. It also emphasized broader project-to-project concerns related to the parties' differential capabilities to develop future high-value manufacturing tools for the semiconductor industry.[126]

Both product-to-project and project-to-project mergers can threaten innovation when they involve one or more of a small number of plausible innovators in an identifiable space. Determining whether the merged parties include one or two of those innovators requires identifying the most likely innovators; that requires determining which firms have the assets – including financial resources, human capital, and intellectual property – and incentive to innovate in that space. It requires, in other words, determining whether one or more of the merging parties has market power in what the *IP Guidelines* have called an innovation market or an R&D market.

Many project-to-project merger challenges have involved mergers in the heavily regulated pharmaceutical industry. In almost all of these transactions, the agencies identified the products or services whose innovation would likely be suppressed. An exception is the 1997 merger of Ciba-Geigy and Sandoz. The FTC alleged that the merger would have an adverse innovation effect by creating a dominant position in gene therapy, without identifying the therapies whose development would be slowed by the merger, and indeed no therapies were expected to reach the

[125] US Federal Trade Commission, In the Matter of Nielsen Holdings N.V. and Arbitron Inc., File No. 131 0058, Analysis of Agreement Containing Consent Order to Aid Public Comment, September 20, 2013.
[126] DOJ Press Release. Applied Materials Inc. and Tokyo Electron Ltd. Abandon Merger Plans After Justice Department Rejected Their Proposed Remedy (April 27, 2015). See also Nicolas Hill, Nancy L. Rose, & Tor Winston, Economics at the Antitrust Division 2014–2015: Comcast/Time Warner Cable and Applied Materials/Tokyo Electron. 47 REV. INDUS. ORG. 425 (2015). (The authors were economists at the Antitrust Division at the time of the merger.)

market for several years.[127] The FTC alleged that the merger would harm innovation because of the combination of the overlapping R&D capabilities of Ciba-Geigy and Sandoz and the merging parties' control of access to patents necessary to develop new gene therapies.

C. Recent Enforcement Practice Regarding Horizontal Mergers

In recent years, both US antitrust agencies have regularly included allegations of harm to innovation in mergers in high-tech industries along with more traditional allegations of price effects[128], but innovation has rarely been central to outcomes or remedies in these cases.[129] By contrast, the European Commission has recently challenged transactions or pursued remedies based primarily on innovation concerns. The Commission alleged that the proposed merger of Dow and DuPont in 2017 would threaten innovation to develop new active ingredients for crop protection.[130] The parties divested the entirety of DuPont's global R&D organization as a condition to complete the merger. A year later, the Commission conditioned the merger of Bayer and Monsanto[131] on the divestment of Bayer's global R&D organization for seeds and traits, along with its project to develop a challenger product for Monsanto's glyphosate herbicide and corresponding herbicide-tolerant seeds.[132]

These European cases are notable examples of antitrust enforcement for innovation in two respects. First, with the exception of the glyphosate project, they did not identify specific R&D projects that would be eliminated or suppressed by the merger. In Dow/DuPont, the Commission defined "innovation spaces" for herbicides and insecticides that target similar crops and pests, but the Commission did not identify particular types of herbicides or insecticides whose development would be eliminated or slowed by the merger. In Bayer/Monsanto, the Commission defined innovation spaces for weed control for canola, cotton, soybean, and non-GM wheat; insect control for cotton; cross-crop weed control; and cross-crop insect control, but again did not specify the products that were likely to be adversely affected by the merger. Instead, these cases alleged harm to innovation stemming from the combination of overlapping R&D capabilities.

Second, in both cases the Commission relied on patent data to measure the extent of R&D overlaps for the merging parties. Previous cases that challenged head-to-head innovation competition measured R&D overlaps by the ownership of specialized assets such as necessary

[127] Ciba-Geigy, Ltd., 123 F.T.C. 842 (1997).
[128] See Gilbert & Greene, note 83 *supra*.
[129] See Gilbert & Tom, note 106 *supra*.
[130] European Commission, Dow/Dupont, Case M.7932 (2017).
[131] European Commission, Bayer/Monsanto, Case M.8084 (2018).
[132] See, e.g., Daniel Coublucq, David Kovo & Tommaso Valletti, Innovation Concerns in European Merger Control: Dow/DuPont and Bayer/Monsanto, in John E. Kwoka, Jr., Tommaso M. Valletti, & Lawrence J. White, eds., ANTITRUST ECONOMICS AT A TIME OF UPHEAVAL: RECENT COMPETITION POLICY CASES ON TWO CONTINENTS, Competition Policy International (2023).

production or R&D facilities that were unlikely to be duplicated by rivals in the near future. Access to such specialized resources is often essential for the development and improvement of relevant products, but patents are a more ambiguous measure of the capabilities of firms to innovate. There is evidence that patents are reasonable measures of the values of past innovations when weighted by citations to reflect their quality,[133] and ownership of broad and potentially blocking patents, or licenses to such patents, reduces the risk that future innovation by the firm will run afoul of patent rights held by others.[134] It is, however, unclear whether ownership of or licenses to use a large patent portfolio is a good predictor of likely future innovation. That depends on answers to many questions, including whether successful innovation in the past is a good predictor of likely future innovation, whether patents are good measures of past innovation, whether patents are important inputs into future innovation, and whether a large patent portfolio is an obstacle for future innovators. The answers to these questions are likely to be highly industry-specific.

The Commission's definition of an innovation space is similar to the definition of a research and development (R&D) market in the US IP Guidelines. Recall, however, that a research and development market consists of relevant assets directed to *particular new or improved goods or processes* and the close substitutes for that research and development. The European Commission described innovation spaces in its Dow/DuPont and Bayer/Monsanto decisions delineated by assets related to broadly defined categories of new products.

D. VERTICAL MERGERS

US antitrust enforcers have challenged several proposed vertical mergers based at least in part on concerns about adverse effects for innovation. For example, in 2016 Lam Research Corp. and KLA-Tencor Corp. abandoned their plans to merge after the Department of Justice informed the companies that it had serious concerns about the effect of the proposed transaction on innovation.[135] Lam Research is a leading provider of etch, deposition and clean tools and process technology used in the fabrication of semiconductors. KLA-Tencor is the leading provider of semiconductor fabrication metrology and inspection equipment. The merger would have been vertical: Lam Research's process tools and KLA-Tencor's metrology and inspection equipment are complementary inputs into semiconductor manufacturing. The DOJ alleged that the proposed merger "presented concerns about the ability of the merged firm to foreclose competitors' development of leading-edge fabrication tools and process technology on a timely basis."[136]

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[133] See, e.g., Bronwyn H. Hall, Adam Jaffe & Manuel Trajtenberg, Market value and patent citations, 36 RAND J. ECON. 16 (2005).
[134] The FTC challenged the merger of Ciba-Geigy and Sandoz in part because the combined company would control access to patents necessary to develop new gene therapies. Ciba-Geigy, Ltd., 123 F.T.C. 842 (1997).
[135] DOJ Press Release. Lam Research Corp. and KLA-Tencor Corp. Abandon Merger Plans (October 5, 2016).
[136] Id.

More recently, the FTC challenged the proposed merger of Illumina and Grail.[137] Illumina is the dominant manufacturer of advanced gene sequencing tools. Grail and others are developing tests that would use Illumina's gene sequencing tool to screen blood samples for early detection of multiple cancers. The FTC alleged that the merger would diminish innovation and potentially increase prices and reduce the choice and quality of multi-cancer early detection tests. After an administrative hearing, the Commission concluded that the merger was illegal. The merging parties appealed to U.S. Court of Appeals for the Fifth Circuit. The court upheld much of the FTC's decision, including its finding of a market for "the research, development, and commercialization" of the specified tests, but remanded the matter to the FTC for further proceedings.[138] The parties then abandoned the merger.

V. ENFORCEMENT GUIDELINES FOR MERGERS AND CONDUCT THAT AFFECT INNOVATION

Economic theory regarding the effects of market power on the ability and incentive to innovate has progressed significantly since the US antitrust laws were enacted more than one hundred years ago. The circumstances under which increases in market power might suppress innovation incentives are now well-understood.

Non-merger conduct can harm innovation by creating or maintaining a monopoly in R&D or, when a party has a monopoly in R&D, by creating or maintaining market power in a product market with revenues that are at risk from the R&D. The latter harm is a consequence of the replacement effect described by Kenneth Arrow. Conduct that gives rise to control of R&D assets that is short of monopoly can have similar effects if the control is sufficient to restrict market-wide innovation.

Mergers raise similar concerns. In addition, mergers can suppress innovation by eliminating a would-be innovator or by reducing the incentives of the merged firm to innovate if successful innovation by a division of one of the merging firms would reduce the expected value of R&D for, or takes sales from, one or more divisions of the other firm. Moreover, a merger would suppress the merged firms' incentive to innovate as a consequence of the Arrow replacement effect if the merger increases the profits from existing products that are at risk from innovation. And a vertical merger could suppress innovation if it enables foreclosure of rivals from assets needed for innovation or from downstream markets needed for monetization of the innovation or if it significantly raises rivals' costs to access these assets.

[137] U.S. Federal Trade Commission, In the Matter of Illumina, Inc. and Grail, Inc., Docket No. 9410, Complaint (March 30, 2021).
[138] Illumina v FTC, No. 23-60167 (5th Cir., December 15, 2023).

William Baxter's 1985 article suggested a useful roadmap for evaluating effects on innovation. While his focus was on the effects of a joint venture, the principles he elucidated are also applicable to horizontal mergers and single firm conduct and, with some modification, to vertical mergers and conduct that might foreclose rivals' access to inputs or downstream markets. Baxter noted that innovation concerns can arise in three arenas of rivalry: (i) today's market for existing products and services; (ii) tomorrow's markets for the new goods and services that will result from the successful R&D; and (iii) research and development to create tomorrow's new goods and services.[139]

Whether antitrust enforcement is aimed at mergers or non-merger conduct, the conventional focus on market power for existing products is also relevant to evaluate innovation effects because of its centrality to the Arrow replacement effect. All else equal, a merger or conduct that increases the replacement effect reduces innovation incentives by decreasing the incremental profit from innovation.

Antitrust enforcement also should consider how a merger or other conduct might affect market power for future products that might emerge from innovative activity. The conduct or merger is unlikely to harm consumers if markets for likely future products are not concentrated. Vertical mergers, and other conduct that forecloses access to required inputs or downstream markets or significantly raises rivals' costs to access these inputs or markets, can create market power in future markets that harms consumers and suppresses innovation incentives.

If conventional analysis of competition in existing markets is not sufficient address concerns about a merger or conduct, the analysis should proceed to the third step: evaluation of likely competition in R&D. The definition of an R&D market can facilitate that analysis by identifying the likely innovators and aiding in a determination of whether R&D activity is likely to be dominated by a few likely innovators. As we have noted, concentration in R&D along with conduct or a merger that increases the Arrow replacement effect is likely to suppress incentives for innovation.

Allegations of harm to innovation can be rebutted with evidence that a merger or conduct at issue will increase the defendant's incentive or ability to innovate. There is, however, no evidence that monopoly power generally accelerates the rate of innovation or that, in the limited circumstances in which it might, it does so in a way that benefits consumers.[140] Evidence that the conduct or a merger is likely to increase innovation might also be a defense to antitrust cases based on theories of harm unrelated to innovation. For example, proof that certain conduct is likely to reduce competition and thereby enable higher prices might be offset by proof that the same

[139] Baxter, Antitrust Law and Technological Innovation, note 46 at 86.
[140] Monopoly power might increase innovation by enabling the monopolist to charge higher prices, the prospect of which can increase the incentive to innovate.

conduct increases the likelihood of innovation that would result in reduced prices or improved product quality.

VI. CONCLUDING REMARKS

US antitrust authorities brought a flurry of innovation cases in the 1990s that were consistent with the current understanding of the circumstances under which market power might suppress innovation. Since then, the intensity of US innovation enforcement has subsided.

Antitrust agencies in the US and in other jurisdictions are likely to challenge a product-to-project acquisition when one party has a product in a highly concentrated market that is at risk from innovation by the other party, the other party is one of a very few innovators in the relevant space, and the acquisition is unlikely to have significant efficiencies. US enforcement of project-to-project mergers has diminished since the 1990s based on a count of enforcement actions. As explained in part IV.C., above, the European Commission has been more aggressive in challenging such mergers and has recently challenged mergers based on alleged harm to innovation from the merging of overlapping R&D capabilities.

An innovation theory of harm is not necessary in order to challenge dominant firm conduct or mergers that would otherwise violate the antitrust laws. However, in many situations, an innovation theory of harm could be an important complement to more traditional antitrust concerns. For one reason, consideration of how conduct at issue in an antitrust case might harm innovation, in addition to causing more traditional harms like increased price or reduced output, could be important in fashioning an optimal antitrust remedy.

In some cases, an innovation theory of harm might be the central determinant of antitrust liability. This is especially likely where more traditional theories of harm are problematic because, for example, products in the relevant market are sold for a zero monetary price and quality-adjusted price effects are difficult to show. Innovation theories of harm might also be necessary to challenge conduct or a merger that would give the merging parties a monopoly or near monopoly over relevant R&D capabilities.

The enforcement actions taken by the agencies in recent years reflect a sound understanding of the relationship between competition and innovation. But, while the agencies often pay lip service to that relationship, they attempt to prove innovation effects in their cases only infrequently. The infrequency of such cases probably reflects in part a belief that innovation effects are difficult to prove, always uncertain, and not necessary where more traditional theories will suffice to prove that the conduct at issue is unlawful. Increased focus on innovation theories of harm might nevertheless strengthen some cases and improve the remedies in some cases, and it might help to educate the courts about the complex relationship between competition and

innovation and might thus make courts receptive to such theories in cases that depend upon them.