MERGERS AND INNOVATION

Michael L. Katz
Howard A. Shelanski*

I. INTRODUCTION

Policy makers and economists strongly agree that innovation is a critical component of a sustained, healthy economy. It is no accident that policy makers' concern with fostering innovation grew over the course of the 1980s and 1990s, a period during which those industrial sectors typically defined as "high technology"—such as aerospace, telecommunications, biotechnology, software, and computers—increased their combined share of manufacturing output by more than 50 percent.[1]

At the same time that innovation has become a central focus of economic policy, merger enforcement has been the most active area of U.S. antitrust policy. From 1996–2005 the Antitrust Division of the U.S. Department of Justice (DOJ) initiated an average of 210 merger investigations each year, which is more than all of the Division's other civil and criminal investigations combined.[2] Merger investigations constitute a

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* Michael L. Katz is Professor of Economics and Sarin Chair in Strategy and Leadership, University of California, Berkeley, and formerly Deputy Assistant Attorney General, Antitrust Division, U.S. Department of Justice (2001–2002), and Chief Economist, Federal Communications Commission (1994–1995). Howard A. Shelanski is Professor of Law, University of California, Berkeley, and formerly Chief Economist, Federal Communications Commission (1999–2000), and Senior Economist, President's Council of Economic Advisers (1998–1999).

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[1] U.S. Council of Economic Advisors, Economic Report of the President 171 (1999).

[2] The DOJ conducted an average of 120 other investigations per year. U.S. Dep't of Justice, Antitrust Division, Workload Statistics FY 1996–2005 (2006), *available at* http://www.usdoj.gov/atr/public/workstats.htm. Nonmerger antitrust actions include criminal prosecutions of price-fixing cartels, as well as civil actions against individual companies found to have engaged in anticompetitive practices (e.g., the *Microsoft* case).

similarly important part of the Federal Trade Commission's "Maintaining Competition Mission."[3]

The fact that much of the merger activity in recent years has occurred in the industries attracting attention because of their innovation-based growth highlights the question of how well traditional merger enforcement accounts for technological change. Merger policy faces a perplexing problem in industries marked by ongoing technological innovation: a problem related, in part, to the uncertain fit between the market conditions that produce innovation and the market conditions to which antitrust policy generally aspires, and, in part, to uncertainty about how innovation might affect market structure and performance. Antitrust law, in general, is concerned with the structure of markets and the behavior of firms within those markets. Merger enforcement, in particular, is concerned with preserving meaningful competition and protecting consumer welfare when business enterprises attempt to combine. At the heart of merger policy is antitrust law's presumption that greater competition in the form of reduced product-market concentration brings improved market performance and increased consumer benefits in the form of lower prices, higher quality, and higher output. Although this presumption is reasonably well-accepted for consumer welfare effects due to changes in short-term price and output levels, it is much less accepted for consumer welfare effects due to changes in innovation, the flow of new products, and other longer-term benefits. In some instances, innovation may be greater when concentration is greater. Hence, merger policy's problem: if antitrust enforcement is to promote and not disrupt the benefits of innovation, and if antitrust is properly to account for innovation's effects on market performance over time, to what extent should it adhere to its conventional presumptions regarding concentration in markets characterized by technological change?

To the extent there are significant instances in which greater concentration is conducive to innovation, innovative industries pose another central problem for antitrust enforcement because there can be tradeoffs between static and dynamic objectives. Consumers benefit from competition because, when producers face rivalry, they seek to attract customers through lower prices and higher quality. Consumers also benefit from technological innovation because, when firms invest in research and development (R&D), they can create valuable new products and reduce the costs of producing existing products. Product-market competition

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[3] *See* FEDERAL TRADE COMM'N, FISCAL YEAR 2002 CONGRESSIONAL BUDGET JUSTIFICATION 46–60 (2001), *available at* http://www.ftc.gov/os/2001/04/2002budgetjustification.pdf.

and innovation are both, therefore, natural objectives of public policies designed to further consumer welfare. But policies designed to pursue one of these objectives cannot always be implemented without costs for the other. The patent system, for example, sometimes confers temporary monopolies on inventors to encourage technological progress and sacrifices competition for the sake of innovation. Antitrust law, in contrast, generally works against monopoly by restricting anticompetitive conduct and preventing consolidations that lead to accumulations of market power that undermine price or output competition.

In the light of the potential tension between competition and innovation, and in the light of the uncertainty that innovation creates for predictions about competitive effects of mergers and future conditions in relevant markets, a growing body of commentary has questioned the relationship of antitrust law to innovation. More specifically, that commentary has criticized enforcement policy toward mergers and acquisitions for attempting to preserve short-run price competition even when doing so has adverse effects on technological progress and even where innovation is likely to ameliorate a merger's short-run harms to competition.[4]

Antitrust authorities have themselves shared the critics' recognition of innovation as an important driver of national economic welfare. Enforcement officials have identified investment in research and the diffusion of new technology as being among the most important dimensions of market performance. One former head of the DOJ's Antitrust Division observed that "the more important that innovation becomes to society, the more important it is to preserve economic incentives to innovate."[5] Another senior antitrust official stated that "as important as price competition is to us, a second major and possibly even greater concern is maintaining competition for innovation."[6] These two statements illustrate the recognition that innovation has important consequences for merger policy. But within them also lurks an important question: Does "maintaining competition for innovation" in fact "preserve economic incentives to innovate"? In other words, does the

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[4] *See infra* text accompanying note 8.

[5] Joel I. Klein, Assistant Attorney General, Antitrust Division of the U.S. Dept. of Justice, Statement Before the Antitrust, Business Rights and Competition Subcommittee, Committee on the Judiciary, U.S. Senate 6 (Mar. 22, 2000), *available at* http://www.usdoj.gov/atr/public/testimony/4381.pdf.

[6] Robert Kramer, Chief, Litigation II Section, Antitrust Division, U.S. Department of Justice, Antitrust Considerations in International Defense Mergers, Address Before the American Institute of Aeronautics and Astronautics (May 4, 1999), *available at* http://www.usdoj.gov/atr/public/speeches/2649.pdf.

static efficiency presumption that more competition (as measured by the degree of concentration) is generally better carry over to dynamic efficiency considerations?[7] Thus, although antitrust policy has increasingly focused on innovation, what exactly this new focus means or how it translates into enforcement can be difficult to ascertain.

Given criticism of conventional enforcement and recognition of the importance of innovation, two fundamental questions have arisen about the appropriate response of merger policy. Should merger enforcement take innovation considerations into account? And, if so, how? There is little consensus among scholars, policy makers, or practitioners about the answers to these questions or about the appropriate degree of governmental intervention in markets with significant actual or potential innovation.

Concern for the potential adverse effects of mergers on R&D has motivated some scholars and policy makers to argue that merger enforcement must be active in markets characterized by high levels of actual or potential innovation. They assert that the existing framework for merger analysis can be applied to dynamic markets or, alternatively, that incorporating innovation into merger review can be accomplished by modifying the standard approach to merger analysis. One such proposed modification is to define "innovation markets"—markets that encompass the actual and potential competitors in the research and development for a future product—and to apply merger law to those markets in much the same way that merger law is conventionally applied to markets for beer, bicycles, computer chips, or any tangible good or service.

An opposing set of observers argues that, as a practical matter, "innovation markets" are so difficult to define that they cannot be the basis for rational enforcement decisions. More fundamentally, some of these opposing observers also argue that innovation provides a rationale for a more permissive merger policy. One argument advanced in support of this line of reasoning appeals to what is known as "Schumpeterian competition," in which temporary monopolists successively displace one another through innovation.[8] Under Schumpeterian competition, there

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[7] Of course, even static efficiency may be higher with less competition if there are economies of scale and "competition" is equated with the number of suppliers.

[8] Schumpeterian competition is named after Joseph Schumpeter, who asserted that innovation-based rivalry is a central feature of the modern economy. JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM AND DEMOCRACY chs. 7–8 (Harper & Row 1942) (1927). For a discussion of antitrust policy toward single-firm conduct in markets characterized by Schumpeterian competition, see David S. Evans & Richard Schmalensee, *Some Economic Aspects of Antitrust Analysis in Dynamically Competitive Industries*, *in* 2 INNOVATION POLICY AND THE ECONOMY (Adam B. Jaffe, Joshua Lerner & Scott Stern eds., 2002).

may be little head-to-head price competition between the product market's leading supplier and its rivals at any given time, but there is ongoing innovation competition from firms seeking to take over the leading supplier's role: rival innovation that challenges the current product-market leader itself either to invest in R&D to stay ahead of its competitors or to lose its market position. Proponents of permissive merger policy contend that mergers in such markets can do only limited harm because of the constant competitive threat from new technologies, and that market consolidation may in fact help to speed innovation by bringing complementary assets together. They argue that, in innovation-based industries, merger enforcement promises little benefit but risks the unintended effect of slowing innovation by blocking mergers that would bring together complementary assets in a way that would foster innovation.

Even those who favor the use of innovation markets by merger authorities divide over whether, once such markets are defined, the anti-concentration presumptions of merger law should apply to them or should instead be withdrawn in favor of a neutral, fact-intensive inquiry into whether the merger will hinder innovation. Those who reject the innovation market idea divide over whether merger enforcement should continue along conventional lines or, in keeping with the "Schumpeterian" idea, systematically retreat in the face of uncertainty over the effects of merger enforcement on technological innovation.

These debates have yielded substantial sentiment in favor of retreat from applying conventional enforcement guidelines and presumptions where innovation is at stake.[9] They have produced less, but not insignificant, support for incorporating innovation into the conventional framework through the analysis of innovation markets, and some, but even less, argument in favor of maintaining merger enforcement's narrow focus on short-run price competition or at least applying the same competitive presumptions to innovation that apply to static price and output measures.

In this article, we offer our own answers to the questions of whether and how merger enforcement should take innovation into account. Our answer to the question of whether merger policy should take innovation into account is "yes." Our answer to the question of how it should do so is to propose several changes to the presumptions and analytical framework of the current merger enforcement process. We argue that merger enforcement should neither systematically retreat from markets characterized by significant innovation nor assume that innovation

[9] *See generally* Ronald W. Davis, *Innovation Markets and Merger Enforcement: Current Practice in Perspective,* 71 ANTITRUST L.J. 677, 695–703 (2003).

competition can be appropriately treated in a manner wholly parallel to price competition. We propose several specific ways to strengthen merger review to incorporate a better understanding of the relationships between competition and innovation. In brief, we recommend that merger review proceed on a more fact-intensive, case-by-case basis where innovation is at stake, with a presumption that a merger's effects on innovation are neutral except in the case of merger to monopoly, where there would be a rebuttable presumption of harm. In addition to developing the expertise for such case-specific analysis of innovation, we also recommend that antitrust authorities reduce reliance on defining bright-line (but often illusory) market boundaries and focus more on direct evidence of likely effects on price competition and innovation. We similarly propose a more sophisticated treatment in merger review of uncertainty over future events by making use of established tools of decision theory. These tools will be particularly important in cases involving complex predictions about the future path and effect of technological innovation.

We begin in Part II with a discussion of the conventional approach to merger review. We then develop the ways that innovation challenges the conventional approach and examine the potential responses of merger policy to those challenges.

II. CONVENTIONAL MERGER REVIEW

As groundwork for understanding the implications of innovation for the application of merger policy, we first present a brief survey of the current U.S. merger-review process.[10] The vast majority of mergers challenged by the U.S. antitrust agencies—the DOJ and the FTC—are reviewed under Section 7 of the Clayton Act. The Act makes it illegal for one company to acquire some or all of the stock or assets of another firm where the effects "may be substantially to lessen competition, or to tend to create a monopoly."[11] The statute reflects the fundamental premise of merger policy, and of antitrust policy in general, that increased competition results in improved economic performance.[12] Specifically,

[10] Although our focus is on the United States, it is worth observing that the European Commission and many other competition policy agencies in other regions and nations have modeled their merger-review processes in whole or in part on the U.S. approach.

[11] 15 U.S.C. § 18. Mergers can also be challenged under § 1 of the Sherman Act, 15 U.S.C. § 1, which bars "[e]very contract, combination in the form of trust or otherwise, or conspiracy in restraint of trade or commerce among the several States, or with foreign nations." In addition, private challenges can be made against mergers (although they face antitrust-injury and standing hurdles), which may be motivated by very different considerations than governmental challenges. Our focus here is on public policy.

[12] *See, e.g.,* U.S. Dep't of Justice, Antitrust Enforcement and the Consumer §§ 1, 2, & 4 (2001), *available at* http://www.usdoj.gov/atr/public/div_stats/9142.pdf; U.S. Dep't of

antitrust policy is grounded on the belief that competitive markets generally do the best job of producing and delivering at the lowest feasible prices the goods and services consumers want, and the statutes are typically interpreted as imposing a consumer-welfare standard.

Economists generally favor some notion of economy-wide efficiency over a consumer-welfare standard.[13] Although some antitrust commentators write as if the pursuit of overall economic efficiency and the maximization of consumer welfare are identical objectives, they are not.[14] The critical difference is that economy-wide efficiency involves accounting for the effects of actions on the welfare of both producers and consumers, while a consumer-welfare standard considers only the latter.[15]

Under the consumer-welfare standard, agencies challenge mergers they think are likely to increase the ability of the merged parties to control prices and output of given goods and services. The courts use a largely standardized process to evaluate mergers when the agencies bring such legal challenges.[16] In brief, merger analysis forms a prediction of a proposed transaction's effects on consumer welfare by examining present characteristics of the parties to the transaction and the market setting in which those parties operate.[17]

The federal antitrust agencies have issued Horizontal Merger Guidelines that purport to provide a blueprint for how the agencies will conduct

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Justice & Federal Trade Comm'n, Antitrust Guidelines for Collaborations Among Competitors 1, 4, & 6 (2000), *available at* http://www.ftc.gov/os/2000/04/ftcdojguidelines.pdf.

[13] This is a matter of judgment, rather than economic theory. Moreover, the theoretical and empirical tools of economics are extremely valuable in assessing mergers under a consumer-welfare standard.

There can also be an important distinction between the overall objective of merger policy and the nature of decision rules used by an agency, which is only one part of a larger system with multiple decision makers, including the merging parties, rival suppliers, and the courts. For a discussion of this distinction and some of its implications, see Joseph Farrell & Michael L. Katz, *The Economics of Welfare Standards in Antitrust,* 2 COMPETITION POL'Y INT'L 3 (2006), and references therein.

[14] *See, e.g.,* Damien J. Neven & Lars-Hendrik Röller, *Institution Design: The Allocation of Jurisdiction in International Antitrust,* 44 EUR. ECON. REV. 845 (2000).

[15] It should be observed, however, that application of the consumer surplus standard in antitrust policy is tempered by the fact that consumer harm is of concern to antitrust policy only if it arises from harm to competition. Thus, it is not illegal for a monopolist to charge "high" prices if that monopoly has been legitimately obtained. And antitrust policy does not seek drive prices below their competitive level even if doing so might increase consumer surplus (at least in the short run). For further discussion, see Farrell & Katz, *supra* note 13.

[16] *See, e.g.,* Jonathan B. Baker, *Responding to Developments in Economics and the Courts: Entry in the Merger Guidelines,* 71 ANTITRUST L.J. 189, 201–02 (2003); *see generally* David Scheffman, Malcolm Coate & Louis Silvia, *Twenty Years of Merger Guidelines Enforcement at the FTC: An Economic Perspective,* 71 ANTITRUST L.J. 277 (2003).

[17] *See, e.g.,* FTC v. Univ. Health, Inc., 938 F.2d 1206, 1211 n.12 (11th Cir. 1991); FTC v. PPG Indus., Inc., 798 F.2d 1500, 1503 (D.C. Cir. 1986); FTC v. Staples, Inc., 970 F. Supp. 1066, 1081–82 (D.D.C. 1997).

their analysis of a merger.[18] These guidelines provide a specific market-definition methodology, as well as benchmarks for the assessment of concentration. The Merger Guidelines do not have the force of law and, indeed, the Merger Guidelines explicitly (and accurately) state that the agencies may pursue different lines of argument in litigation.[19] Nonetheless, the broad contours of the Merger Guidelines process have been widely adopted by the agencies and the courts. That process can be summarized as consisting of four main steps.

(1) *Market Definition and Market Share Determination*. Antitrust policy is premised on a general presumption that an increase in concentration will harm consumer welfare. In order to determine the effects of a merger on market concentration, it is necessary to define one or more relevant markets.[20] Defining market boundaries with respect to their product and geographic scopes is, thus, a first step under the Merger Guidelines and is also typically an early issue in any merger litigation.[21] Indeed, given the weight that the courts attach to market concentration measures and the extent to which these measures depend on how market boundaries are drawn, it is often said that the outcome of merger litigation turns almost entirely on whether the market is defined narrowly or broadly and, thus, on whether the merging parties are viewed as having few or many competitors.[22]

An increase in concentration in the relevant product and geographic markets is taken as a proxy for a decrease in competition that—if large enough—will lead to a significant increase in the prices faced by consumers.[23] Merger analysis today begins with a set of presumptions established

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[18] U.S. Dep't of Justice & Federal Trade Comm'n, Horizontal Merger Guidelines (1992, revised 1997), *available at* http://www.ftc.gov/bc/docs/horizmer.htm [hereinafter Merger Guidelines].

[19] *Id.* § 0.1.

[20] Brown Shoe Co. v. United States, 370 U.S. 294, 324 (1962).

[21] *See, e.g.,* Merger Guidelines, *supra* note 18, § 1; Toys "R" Us v. FTC, 221 F.3d 928, 937 (7th Cir. 2000).

[22] *See, e.g.,* Richard G. Parker, Senior Deputy Director, Bureau of Competition, FTC, Trends in Merger Enforcement and Litigation, Prepared Remarks Before the Annual Briefing for Corporate Counsel (Sept. 16, 1998), *available at* http://www.ftc.gov/speeches/other/parker.htm.

[23] For the most part, economic theory and antitrust policy have long favored more competitors over fewer for the purpose of lowering prices, expanding output, and making consumers better off. There are, however, limited exceptions to this view. For example, certain industries in which per-unit cost declines as output increases to the point that it is most efficient to have just one firm producing all output in a given market have come to be known as natural monopolies. Historically, telecommunications networks were a leading example, and public policy actually served to limit entry. That view has since changed. For instance, the Telecommunications Act of 1996, 47 U.S.C. § 151 et seq., seeks to promote competitive entry.

in the Merger Guidelines. The Merger Guidelines adopt the Herfindahl-Hirshman Index (HHI), which is calculated by taking the individual market share of each firm in the market, squaring it, and then adding all the squared figures together to get a single index number. This "sum of the squares of the market shares" figure communicates two important things that a single firm's market share or a four-firm concentration ratio (a measure used in the past) does not: a picture of concentration for the entire relevant market, and a measure of the distribution of market shares across all firms in the market. The HHI is higher where market share is unevenly distributed across firms than if it is evenly distributed, thus capturing the idea that a market with five evenly-sized firms may be more vigorously competitive than a market with one very big firm and four smaller ones.

Depending on the level of the HHI, the antitrust agencies adopt different presumptions about the impact of the proposed merger. Under the Merger Guidelines, if the post-merger HHI would be below 1000, the agencies consider the market to be unconcentrated and generally view the merger as unlikely to have adverse effects on competition. If the post-merger HHI is between 1000 and 1800, the agencies label the market moderately concentrated and become concerned only if the merger would raise the HHI more than 100 points within that range. Post-merger HHIs above 1800 are the most likely to trigger an enforcement action under the Guidelines. Such markets are deemed highly concentrated, and mergers that have the effect of raising the HHI more than 50 points in the range above 1800 raise concerns, while those proposed transactions that would raise the HHI more than 100 points are presumed to be anticompetitive.

In actual practice, the U.S. antitrust agencies tend to challenge mergers only at concentration levels much higher than 1800. One recent study found that few mergers have been challenged with an HHI below 2000 and that, between 1999 and 2003, the median post-merger HHI for a challenged transaction was 4500, with a median change in HHI of about 1200.[24] One reason for the discrepancy between the Merger Guidelines' levels and actual enforcement is due to the fact that the HHI calculation supplies only a presumption of harm—a presumption that must be followed by assessment of market factors other than concentration that determine a merger's competitive effects.

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[24] John Kwoka, Professor, Northeastern University, Some Thoughts on Concentration, Market Shares, and Merger Enforcement Policy 8, Presentation at the FTC/DOJ Workshop on Merger Enforcement (Feb. 17, 2004), *available at* http://www. ftc.gov/bc/merger enforce/presentations/040217kwoka.pdf.

(2) *Competitive Effects Analysis.* The typical next step in the antitrust analysis of a proposed merger is to go beyond presumptions to predict the transaction's effects on competition. This more intensive analysis of competitive effects generally focuses on two kinds of impacts a merger might have: "unilateral" effects and "coordinated" effects. The Merger Guidelines define unilateral effects as those that result "because merging firms may find it profitable to alter their behavior unilaterally following the acquisition by elevating price and suppressing output."[25] The ability a merger creates for the combined firm profitably to raise prices or reduce output without the necessity of cooperation from rival suppliers gives rise to unilateral effects. Coordinated effects, in contrast, are "comprised of [sic] actions by a group of firms that are profitable for each of them only as a result of the accommodating reactions of the others."[26]

Although the distinction between unilateral and coordinated effects is widely made, it is valuable to recognize that this distinction is not as sharp as often supposed. For example, it blurs when one considers "conscious parallelism" or tacit collusion, which as an economic matter looks like coordinated behavior but in which each firm acts unilaterally and in its own economic interests. Another possible way to think about the respective unilateral-effects and coordinated-effects inquiries is to say that the first asks whether the post-merger entity will have gained power profitably to set price and output regardless of what its rivals would do in response (within the bounds of supplier rationality), and the second asks whether a merger will increase the risk that firms in the market will act in concert to harm competition.

(3) *Efficiencies Analysis.* If the analysis of market shares and other market characteristics demonstrates that a proposed merger will not give rise to a significant competitive problem, one can conclude that the merger will not harm competition and consumers. But if a significant competitive problem is predicted by the preceding stages of analysis, then one must conduct another stage of review to predict correctly whether a proposed merger will, on balance, benefit or harm consumers. Simply put, a merger that is expected to give the merging parties the ability to raise prices profitably might nonetheless lead to lower prices or at least to greater social welfare if the merger gives rise to sufficient cost savings of the right sort. These cost savings are referred to as *efficiencies.*[27]

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[25] Merger Guidelines, *supra* note 18, § 2.2. A recent example of a unilateral effects case is *United States v. Oracle Corp.,* 2004 U.S. Dist. LEXIS 18063 (N.D. Cal. Sept. 9, 2004).

[26] Merger Guidelines, *supra* note 18, § 2.1. A recent example of a coordinated effects case is *FTC v. Arch Coal, Inc.,* 2004 U.S. Dist. LEXIS 15996 (D.D.C. Aug. 16, 2004).

[27] *See infra* Part VII.

We observe in passing that the agencies give the majority of mergers the benefit of the doubt when it comes to efficiencies. That is, the agencies tend not to challenge mergers unless they predict anticompetitive effects above some threshold level. This approach can be rationalized by the implicit assumption that any merger tends to generate some efficiencies, perhaps by combining complementary assets, by rationalizing operations, or by allowing the market for corporate control to discipline poor managers.[28] But we also observe that, in cases where agencies predict a merger will give rise to significant adverse competitive effects, the courts rarely, if ever, allow the merger on the grounds of offsetting efficiencies. Efficiencies, thus, become a factor mostly when a merger might cause modest competitive harm and where the case is close.

(4) *Remedy Design*. Several public policy responses are available if analysis indicates that the effect of a merger in its proposed form may be substantially to lessen competition or to tend to create a monopoly. One, of course, is simply to block the transaction. Often, however, less drastic steps are available that can allow a modified version of the transaction to take place. These steps include the divestiture of assets where competitive overlaps are particularly significant, the mandatory licensing of intellectual property to other firms to allow them to compete more effectively with the merging parties, and limitations on the merged firm's conduct (e.g., a requirement to offer the same prices to all customers to prevent the merged firm from targeting customers whose only practical options were the two merging suppliers). In theory, such remedies allow the realization of efficiencies while averting the harms that might otherwise arise from the loss of competition—either static price competition or dynamic innovation competition—between the two merging suppliers.

As this brief description illustrates, the conventional approach to merger review is "static" in nature. By "static" we mean it takes a short-term perspective focused on products and markets as they exist at the time of (or within a limited time frame after) a proposed merger and predicts the likely, short-run impact on prices and outputs of those goods as the level of competition changes with the merger. Dynamic considerations, such as R&D, although not altogether absent, play relatively little role.[29] This lack of a dynamic approach may cause merger

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[28] This assumption has been called a "standard deduction" for merger efficiencies. *See* Michael Salinger, Director, FTC Bureau of Economics, Presentation to ABA Section of Antitrust Law Economics Committee Brown Bag: Four Questions About Horizontal Merger Enforcement 3 (Sept. 14, 2005), *available at* http://www.ftc.gov/speeches/salinger.htm.

[29] Some early nonmerger cases noted innovation considerations. United States v. Aluminum Co. of Am., 148 F.2d 416, 427 (2d Cir. 1945) (recognizing the effects of market power on innovation, although innovation concerns did not play a significant role in the

review to miss forms of competition that are not reflected in the structure of current product markets and to miss effects on consumers other than those reflected in short-run price and output levels.

III. HOW INNOVATION COMPLICATES MERGER ENFORCEMENT

The conventional paradigm and the issues for merger review change substantially in two broad ways when technological innovation is taken into account. The first way is that innovation can dramatically affect the relationship between the premerger marketplace and what is likely to happen if the proposed merger is consummated. That is, technological change can fundamentally alter the nature of the appropriate analysis even if one focuses on traditional, product-market performance measures, such as static pricing efficiency. For example, market shares are often used as an indicator of market power. But, in theory at least, significant innovation may lead to the rapid displacement of a supplier that, by traditional measures, such as current market share, appears to be dominant. We will refer to this effect of innovation on merger analysis as the "innovation impact" effect.

The second way in which innovation can fundamentally affect merger policy is that innovation can itself be an important dimension of market performance that is potentially affected by a merger. That is, through its effects on innovation, a merger can generate considerable efficiency and consumer-welfare effects even apart from any direct effects on short-run product-market competition. Merging parties frequently assert that their transaction will allow them to engage in greater innovation, while antitrust enforcers may object to a transaction on the grounds that it will lead to a loss of competition that would otherwise spur innovation. To assess fully the impact of a merger on market performance, merger authorities and courts must examine how a proposed transaction changes market participants' incentives and abilities to undertake investments in innovation. We will refer to this effect of innovation on merger policy as the "innovation incentives" effect.

To examine the innovation incentives effect, one asks how the change in market structure and competition brought about by a merger will likely affect consumer welfare through effects on the pace or nature of innovation that might reduce costs or bring new products to market. To

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decision). Innovation played a more central role in *United States v. Automobile Manufacturers Association*, 307 F. Supp. 617, 618 (C.D. Cal. 1969) (finding that the leading American automobile manufacturers had engaged in a conspiracy "to eliminate competition in the research, development, manufacture and installation of motor vehicle air pollution control equipment . . ." in violation of § 1 of the Sherman Act), *aff'd in part and appeal dismissed in part*, 397 U.S. 248 (1970).

examine the innovation impact effect, the situation is reversed. This effect refers not to how market structure will affect innovation but to how innovation will affect the evolution of market structure and competition and to what competitive inferences static measures of market structure reasonably support.

The two ways that innovation may factor into merger analysis have important policy implications. To the extent that innovation is itself a significant objective, antitrust agencies need to understand the relationship between market structure and innovation in a given case with sufficient depth to distinguish legitimate from merely opportunistic claims that the merger will benefit, or at least not harm, innovation incentives. Similarly, the fact that innovation may affect the post-merger marketplace in ways that are hard to predict challenges merger authorities to distinguish mere claims by the merging parties that they face potential, innovation-based competition from situations in which such potential entry really exists.

Finally, the importance of innovation incentives raises the question of whether the enforcement guidelines and precedent aimed at promoting conventional competitive goals of low prices and high output are consistent with promoting the goal of efficient innovation.[30] To the extent that tension exists between innovation and the static economic goals of merger policy, merger enforcement must develop a framework for deciding how to make trade-offs between those objectives.

In the following sections we identify particular challenges—either entirely new issues or especially strong instances of issues that arise more broadly—created by the presence of significant innovation. We address both the innovation impact effect and the innovation incentives effect. Before we discuss how innovation relates to each step of conventional merger analysis, however, we examine a critical, underlying question: Does antitrust law's basic premise that consumer welfare increases with competition apply when innovation, rather than short-run price level, is the important measure of market performance?

IV. THE CONCENTRATION-COMPETITION-WELFARE PRESUMPTION

As summarized above, in conventional merger review, agencies and courts presume that higher concentration leads to less competition and that less competition leads to lower levels of consumer welfare and

[30] Of course, from a long-run perspective, promoting innovation and promoting low, quality-adjusted prices are largely the same objective. The distinction we draw in the text can be viewed as one between static pricing efficiency and dynamic pricing efficiency.

efficiency—a chain of reasoning sometimes referred to as the "concentration-competition-welfare presumption."[31] Absent a presumption that changes in concentration lead to changes in consumer welfare, the traditional rationale for market definition and approaches that depend on it weakens. As we will now discuss, there are difficult issues concerning such a presumption in the context of technological innovation.

A. The Effects of Innovation on the Traditional Concentration-Competition-Welfare Presumption

Although subject to some well-placed criticism, the concentration-competition-welfare presumption is on fairly sound footing for traditional, static price and output concerns when one is talking about contemporaneous concentration, competition, and welfare.[32] However, the linkage between *current* concentration and *future* price and output competition and resulting welfare may be weak in some circumstances, notably when there is significant, ongoing innovation. This is so because innovation may be unrelated to the concentration of current sales and may make future market structures hard to predict. In other words, in markets in which innovation is significant, the traditional concentration-competition relationship is on a weaker or more nuanced empirical and theoretical footing than otherwise.

Indeed, innovation raises the fundamental question of whether current product-market shares are meaningful predictors of future competitive conditions in a dynamic industry and, thus, whether they are relevant to the prediction of the price and output effects of a merger. If a market is in constant turmoil because of dramatic innovation, the argument goes, what does one learn from current product sales? If the merged firms would have a dominant market share immediately post-merger, another firm in the market could produce the next great new advance

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[31] *See supra* note 23 and accompanying text.

[32] Many (but not all) formal economic models of static competition in markets with only a few suppliers indicate that equilibrium output falls and equilibrium prices rise as the number of firms declines. Empirically, substantial evidence supports the theoretical correlation of prices and market concentration. *See, e.g.,* Richard Schmalensee, *Inter-Industry Studies of Structure and Performance, in* 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 987–88 (Richard Schmalensee & Robert D. Willig eds., 1989).

Although the presumption that increased competition leads to increased consumer welfare or greater efficiency is on generally firm footing, there is also need for caution. Even in static settings, for instance, perfect competition does not attain the first best in the presence of externalities, and distortions due to concentration may in some cases offset those due to externalities.

and leave the merged entity behind.[33] Even in the conventional static setting, a strong consensus exists among economists that rival suppliers' capacity to enter and expand in a market must be considered in addition to current market share data. The Merger Guidelines accordingly recognize that, in changing markets, current market share may be an inaccurate measure of a firm's forward-looking competitive significance.[34] In sum, a firm's monopoly today may say little about the firm's prospects one, two, or five years from now, and the greater the level and rate of innovation in an industry, the less reliable a predictor of future events market share becomes.

Innovation also raises issues with respect to the assessment of potential competition. In assessing concentration, the conventional focus is on actual rather than potential competitors, the latter of which are included in the market only when certain conditions of imminence and probability are met.[35] But when innovation is important, identifying potential innovation and product-market competitors may be particularly critical to understanding competition and the welfare effects of transactions. Identifying potential competitors can be difficult in the best of situations, and competitive potentiality in the innovation context often hinges on the possession of certain skills and information assets that can be particularly hard to identify and measure. In the other direction, however, the existence of ongoing innovation efforts can render claims of potential product-market competition more readily verifiable because a firm that has made substantial investments in R&D aimed at a specific product is more likely to enter the market for that product than is a firm that has the relevant technological capabilities but has invested nothing.

The above discussion shows that it is imperative that merger enforcement agencies look beyond current market share data in markets characterized by innovation. There is also a deeper question; one that lies at the heart of the "Schumpeterian" critique discussed above: is the concentration-competition-welfare presumption valid when one is talking about innovation? It is to that question we now turn.

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[33] The flip side is that a merger may have substantial effects on competition even if the post-merger product-market share is permissible within the enforcement guidelines. If the merger brings together two imminent technologies that otherwise would have competed, then consumers lose out on rivalry that otherwise would have come to exist absent the merger. *See infra* Part IV.B.2.

[34] Merger Guidelines, *supra* note 18, § 1.521. The extent to which the agencies are willing to adopt forward-looking views of competition is the subject of some debate.

[35] *Id.* § 3.

B. The Concentration-Competition-Welfare Presumption for Innovation

Is concentration a reliable basis for predicting the strength of innovation competition? Even if the market in which innovation takes place can be well-defined, the question arises of how changes in market structure will affect the performance of that market. The use of market-share data to predict a merger's likely effects on innovation raises several fundamental issues. A first is how to measure concentration. Should one consider concentration of product sales or concentration of R&D capabilities? Firms conduct R&D with an eye toward the future. Thus, one can raise serious doubts about the value of current product-market sales as indices of the state of innovation-based competition.[36] Concentration of R&D capabilities may, thus, provide a better measure. A second issue is how to treat potential competition. The threat of entry or potential competition may be a stronger spur to innovation efforts than to lowering current prices and increasing current output.[37] Indeed, even R&D programs that never succeed in developing new products or processes may nonetheless benefit consumers by stimulating potential rivals to innovate. These considerations are important, and we will return to them in later sections.

A deeper issue is that, even if appropriate market share measures are found and the transaction truly would increase market concentration in a sustained way, the increased concentration may affect innovation incentives differently from how it affects static economic variables like short-run price and output. The idea that concentration will not harm, and in fact may help, innovation is central to the Schumpeterians' claims that merger enforcement should tread cautiously in the name of innova-

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[36] *See, e.g.,* Morton I. Kamien & Nancy Schwartz, *Timing of Innovations Under Rivalry*, 40 Econometrica 43, 50–51 (1972) ("[C]oncentration reflects the current sellers of a product and may be quite unrelated to the extent of actual and potential rivalry in innovating new products."); *see also* Evans & Schmalensee, *supra* note 8, at 16–18; Raymond Hartman, David J. Teece, William Mitchell & Thomas Jorde, *Assessing Market Power in Regimes of Rapid Technological Change*, 2 Indus. & Corp. Change 317, 322–23 (1993). However, current concentration can be related to innovation in some circumstances. In the case of process innovations that are used solely by the innovators in their own production, for example, firms with higher market shares have greater innovation incentives.

[37] Under the theory of limit pricing, incumbent firms set low prices today to deter future entry. In many circumstances, however, the threat entry will have little effect on pre-entry prices, and potential competition plays a relatively small role in price setting. This relationship holds when: (a) pre-entry prices do not signal otherwise unknown information about incumbents to potential entrants, and (b) incumbent suppliers can rapidly change their prices in response to entry if and when it occurs. (For additional discussion of limit pricing, *see infra* Part VI.A.) In contrast, shifting R&D programs may be a slow process that takes time to bear fruit. Hence, incumbents may increase their R&D investments in anticipation of entry.

tion. The discussion that follows examines the relevant economic evidence and its implications.

1. *The Concentration-R&D Relationship*

A central tenet of merger policy is that markets characterized by atomistic competition generally promote consumer welfare better than do concentrated markets. The presumption that increased benefits come from an increased number of competitors is weaker, however, when the policy goal is not just lowering prices toward more efficient levels for a given set of goods produced using a fixed set of technologies, but also promoting efficient innovative activity by firms over time. Economic theory has long raised questions about the degree to which increased product-market competition or an increase in the number of firms undertaking R&D leads to an increase in overall R&D investment.[38] Both the theoretical and empirical bases for predicting that an increase in concentration will lead to less innovation are mixed.

The idea that the economic conditions that maximize innovation over time may not be the same conditions that allocate resources efficiently in the short run was suggested over 50 years ago by Joseph Schumpeter, who wrote that, for purposes of promoting economic welfare, "perfect competition is not only impossible but inferior, and has no title to being set up as the model of ideal efficiency."[39] Schumpeter's argument that most technological innovation would come from large corporations with market power and organized R&D operations implied that the ideal of competition under antitrust law could have substantial social costs over time.[40]

Although Schumpeter wrote mostly about large firms, their associated economies of scale for R&D, and their ability to attract capital and talented scientists, his critique of perfect competition and discussion of

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[38] For example, in their 1975 survey of work on innovation and market structure, Kamien and Schwartz stated that "[f]ew, if any, economists maintain that perfect competition efficiently allocates resources for technical advance." Morton I. Kamien & Nancy L. Schwartz, *Market Structure and Innovation: A Survey,* 13 J. ECON. LIT. 1, 2 (1975). Today, economists have a deeper appreciation for licensing and other forms of innovation diffusion, so there might be less agreement with such a sweeping statement because multiple interpretations of what is meant by perfect competition are possible in this context.

[39] SCHUMPETER, *supra* note 8, at 106.

[40] Of course, the competitive ideal of antitrust policy has evolved over time. When Schumpeter was writing, the ideal was rivalry among small, atomized economic actors. Any cooperation or concentration deviating from that standard was inherently suspect. The Chicago School revolution did much to improve understanding of why different market structures might have different effects in different contexts and thereby reduced rigid adherence to the perfectly competitive model. Because of its benefits for allocative efficiency, competition nonetheless remains the touchstone of antitrust policy.

the benefits of market power suggest that his ideal innovators not only were large but had market power as well. Early theoretical explorations of Schumpeter's claim found that, when the polar cases of monopoly and perfect competition were compared, the latter provided stronger incentives for cost-reducing innovations.[41] Subsequent theoretical research has shown that, depending on various conditions, either monopoly power or competition may lead to greater total innovation.[42] Other research suggests that oligopoly—competition among a few firms—is the market structure most conducive to development of new products and processes.[43]

There is an extensive academic literature modeling market structure and innovation, but much of the research on market structure and innovation has a straightforward intuition behind it.[44] There are two opposing sets of forces shaping the relationship between market structure and innovation. On one hand, a firm facing strong product-market rivalry has an incentive to develop new products and processes that will help it improve or defend its market position. Similarly, a firm engaged in a race with several others to develop a new patentable technology will be under pressure to act quickly to win the race. Absent rivalry, a firm will not face such pressure. As Sir John Hicks famously remarked, "[the] best of all monopoly profits is a quiet life."[45] Considerable anecdotal evidence suggests that competition drives organizations to be more innovative than does a protected monopoly position. Further, a monopolist may bring product innovations to market more slowly than would a competitor because the monopolist is concerned about cannibalizing its existing business.[46] Therefore, a monopolist might be an inferior innovator from the perspective of consumers.[47]

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[41] William Fellner, *The Influence of Market Structure on Technological Progress*, 65 Q.J. ECON. 556 (1951); Kenneth Arrow, *Economic Welfare and the Allocation of Resources for Invention, in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY (R.R. Nelson ed., 1962).

[42] F.M. Scherer, *Schumpeter and Plausible Capitalism*, 30 J. ECON. LIT. 1416 (1992).

[43] F.M. Scherer, *Market Structure and the Employment of Scientists and Engineers*, 57 AM. ECON. REV. 524 (1967); F.M. Scherer, *Research and Development Resource Allocation Under Rivalry*, 81 Q.J. ECON. 359 (1967); Kamien & Schwartz, *supra* note 38, at 18; Morton I. Kamien & Nancy Schwartz, *On the Degree of Rivalry for Maximum Innovative Activity*, 90 Q.J. ECON. 245 (1976).

[44] In addition to the articles cited *supra* note 43, *see* Jennifer F. Reinganum, *The Timing of Innovation: Research, Development, and Diffusion, in* HANDBOOK OF INDUSTRIAL ORGANIZATION (Richard Schmalensee & Robert D. Willig eds., 1989).

[45] John R. Hicks, *Annual Survey of Economic Theory: The Theory of Monopoly*, 3 ECONOMETRICA 1, 8 (1935).

[46] Arrow, *supra* note 41.

[47] It should be observed that, in terms of efficiency, the social value of innovation is the *incremental* improvement that it represents over the existing technology. Hence, the fact that a monopolist is concerned with cannibalization is not entirely indicative of an efficiency problem.

On the other hand, there are also forces affecting the relationship between market structure and innovation that favor market power over competition. The possibility of sudden and sweeping entry, combined with large up-front investment demands, can necessitate high initial returns to allow costs to be recouped before the next innovator supplants the incumbent investor. A firm with a large market share and significant market power may better amortize the fixed costs of R&D and reap a high percentage of the benefits of R&D. Large, established firms might be particularly adept at marshaling resources for incremental innovation or for helping to bring a small firm's invention to market. Suppliers with many product-market rivals may have less ability to appropriate the returns from innovation that make the investment in innovation worthwhile, either because their innovations are readily copied or invented around by rivals, or because atomistic competitors lack the other assets needed to exploit their innovations fully (e.g., a firm with a small share of the product market may not amortize its cost-reducing innovation over many units of output). Similarly, if many firms are racing to obtain a patent, each firm may conclude that its chances of winning the race are sufficiently small that it is not profitable to invest as much in R&D as it would without so many competitors.

Strong intellectual property rights can reduce some of the risks from innovation in competitive markets, specifically those associated with rapid imitation. Licensing also may make it possible and profitable for an innovator to benefit from the use of its intellectual property throughout an industry with many firms. However, even in the presence of strong intellectual property rights, other firms may develop similar or better advances and may circumvent an innovator's initial patent. These risks exist for competitive firms and product-market monopolists alike. But the risk that another firm will respond to an innovation with an innovation of its own may grow with the number of firms competing in the relevant product market, at least initially.

The theoretical discussion above shows that, although economic intuition suggests an overarching presumption that innovation will be greatest for firms facing competitive pressures *and* the prospects of supracompetitive returns to innovation, it is also clear that, depending on assumptions, the theoretical balance could swing toward either a greater number of competitors or toward monopoly in a given case.

Empirical data do not resolve the ambiguous theoretical relationship between competition and innovation. There are several strands of the empirical literature that shed light on these issues, even though they are not all directly related to concentration. These various strands examine the effects on R&D inputs and/or outputs of: (a) firm characteristics,

specifically size and liquidity; (b) market characteristics, primarily industry concentration; and (c) changes in industry structure, including entry and mergers and acquisitions. Strands (a) and (b) are relevant because mergers give rise to larger and possibly less-liquid firms and to more concentrated industries. The entry component of strand (c) is relevant to the extent that de novo entry is a substitute for entry through acquisition, or to the extent the reduction in concentration due to entry is the opposite of an increase in concentration due to merger. As discussed below, the two processes of merger and entry are not entirely mirror images of one another. Nevertheless, the study of entry is informative about the effects of changes in concentration, including how rival firms respond to a change in industry structure.

One might expect the studies of the effects of mergers on innovation to be of the most direct relevance. We observe, however, that these studies reflect the joint outcome of competitive effects and efficiencies. Hence, these studies may shed limited light on the validity of a concentration-innovation presumption, which concerns solely competitive effects. Instead, studies in this strand of the literature could be useful for determining whether to have a different sort of presumption: namely, how to allocate the burden with respect to establishing competitive effects or efficiency benefits from a merger. Specifically, one might take this research—which typically finds limited innovation benefits from merger—as indicating that the initial burden should fall on the merging parties to establish that there are likely to be merger efficiencies. Then, if they do, it would fall to the plaintiffs to show that adverse competitive effects would outweigh the established efficiencies.[48] Although this is an intriguing suggestion for burden shifting, our focus here is on whether empirical research supports the view that the traditional presumption concerning concentration and competitive effects applies to innovation.

Consider first firm characteristics. One possibly relevant firm characteristic is size. As we discuss below in Part VII.A, however, the link between firm size and innovation is hard to generalize, and the empirical findings vary depending on the measure of innovation one uses and on a variety of industry-specific variables. Another potentially important firm characteristic is financial health, notably liquidity. Philippe Aghion et al. develop a theoretical model in which the threat of bankruptcy can create pres-

[48] In this regard, it should also be noted that studies finding a lack of efficiency benefits from mergers generally suggest that the benefits of mergers in promoting process innovations may be limited, which again might inform presumptions and the assignment of burdens. For a survey, see Lars-Hendrick Röller, Johan Stennek & Frank Verboven, *Efficiency Gains from Mergers* (WZB Social Science Research Center Berlin, Discussion Paper FS IV 00-09, Aug. 2000).

sures to innovate.[49] They define financial pressure as debt payments divided by the sum of operating profits and depreciation, and find empirical support for their prediction that financial pressure motivates innovation. The result raises a question of potential endogeneity, however, to the extent the firms that have high ratios of debt to returns are firms that are at an early stage of major R&D investments. Perhaps more important, the findings of Aghion et al. appear to be in tension with Bronwyn Hall's finding that large increases in debt reduce R&D investments.[50]

Next, consider the effects of market characteristics, especially market concentration, on innovation. Many analyses supported the Schumpeterian view by finding a positive correlation between market concentration and R&D investment.[51] Other analyses, however, found data to show concentration to have a negative effect on innovation.[52] An early and influential study by F.M. Scherer indicated that both could be correct over a sufficiently large range of market structures because the relationship between innovation and concentration is nonlinear. His study, which corroborated the theoretical intuition discussed above, found the relationship between market structure and innovation to follow an inverted-U pattern: innovation is observed to be low at high levels of competition, reach its peak at intermediate levels of oligopoly (where the four leading firms control roughly half the market), and then to fall off as market structure approaches monopoly.[53] Other studies replicated and confirmed Scherer's results.[54]

Later work, however, raised serious doubts about these findings and identified several reasons why one should be cautious when interpreting the empirical literature. First, questions surround the statistical significance of the parameter estimates leading to a U-shaped relationship and

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[49] Philippe Aghion et al., *Competition and Innovation: An Inverted U Relationship*, 120 Q.J. ECON. 701, 713 (2005).

[50] Bronwyn Hall, *The Impact of Corporate Restructuring on Industrial Research and Development*, 1990 BROOKINGS PAPERS ON ECONOMIC ACTIVITY, MICROECONOMICS 85 (1990).

[51] *See, e.g.,* EDWIN MANSFIELD, INDUSTRIAL RESEARCH AND TECHNOLOGICAL INNOVATION (1968).

[52] Oliver E. Williamson, *Innovation and Market Structure*, 73 J. POL. ECON. 67 (1965); BARRY BOZEMAN & ALBERT N. LINK, INVESTMENTS IN TECHNOLOGY: CORPORATE STRATEGY AND PUBLIC POLICY ALTERNATIVES (1983); Arun K. Mukhopadhyay, *Technological Progress and Change in Market Concentration in the U.S., 1963–1977*, 52 S. ECON. J. 41 (1985).

[53] Scherer, *Market Structure and the Employment of Scientists and Engineers*, *supra* note 43.

[54] Richard C. Levin, Wesley Cohen & David Mowery, *R&D Appropriability, Opportunity, and Market Structure: New Evidence on Some Schumpeterian Hypotheses*, 75 AM. ECON. REV. PAPERS & PROC. V (1985); John T. Scott, *Firm Versus Industry Variability in R&D Intensity, in* R&D, PATENTS AND PRODUCTIVITY (Zvi Griliches ed., 1984).

whether they are, in fact, picking up the effects of omitted variables, such as technological opportunity (i.e., the degree to which there is low-hanging fruit for R&D).[55] Second, care must be taken in interpreting cross-sectional studies because the causality between market structure and innovation rates can run in both directions.[56] One detailed analysis of British data found that the higher profit expectations in concentrated markets increased innovative activity but that, over time, innovation reduced concentration levels in the sample industries.[57] Many empirical studies fail to account for the fact that market structure itself might be affected by the perceived possibilities for innovation and that market structure might therefore be a result, rather than a cause, of innovation incentives. The literature addressing how market structure affects innovation (and vice versa) in the end reveals an ambiguous relationship in which factors unrelated to competition play an important role.[58]

One can imagine variables other than market structure on which to base presumptions about the relationship between competition and innovation and, hence, about the innovation effects of mergers. For example, Aghion et al. (2005) find an inverted-U relationship between product-market competition and innovation, where they measure the former by a calculation of the percentage markup of price over average cost in an industry.[59] Their theory says that firms in highly competitive markets with lower returns will innovate in order to "escape" the dissipation of profits that arises when roughly equal firms engage in intense product-market competition. At the other end of the spectrum, the

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[55] *See* Kamien & Schwartz, *supra* note 38, at 20–22. Kamien and Schwartz summarized their survey of the empirical literature as follows: "In reviewing the diverse findings on research efforts and concentration, we find little consensus," *id.* at 22, and "[o]ur review of the impact of market structure on innovation has netted little more than reaffirmation of the early observation that both competitive pressures and market opportunity seem important," *id.* at 24. Somewhat surprisingly, they then concluded their survey by saying, "A new empirically inspired hypothesis has emerged to the effect that a market structure intermediate between monopoly and perfect competition would promote the highest rate of innovative activity." *Id.* at 32.

[56] In terms of theory, a recent demonstration of this possibility is provided in a paper by Jan Boone, which finds that an increase in the intensity of competition can drive a leading firm to increase its innovation by relatively more than its rivals and, thus, increase future concentration. Jan Boone, *Intensity of Competition and the Incentive to Innovate,* 19 INT'L J. INDUS. ORG. 705 (2001).

[57] Paul A. Geroski, *Innovation, Technological Opportunity, and Market Structure*, 42 OXFORD ECON. PAPERS 586 (1990).

[58] Wesley M. Cohen & Richard C. Levin, *Empirical Studies of Innovation and Market Structure, in* 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 1074–79 (Richard Schmalensee & Robert D. Willig eds., 1989); *see also* Wesley M. Cohen, Richard C. Levin & David Mowery, *Firm Size and R&D Intensity: A Re-Examination,* 35 J. INDUS. ECON. 543 (1987).

[59] Philippe Aghion et al., *supra* note 49.

prospect of large quasi-rents will engender Schumpeterian competition in industries with low levels of product-market competition.

Aghion et al.'s analysis is sophisticated and thought-provoking. However, its implications for merger policy are far from clear. Because changes in average returns need not correspond to changes in market structure, Aghion et al.'s findings do not immediately match up with the existing, market structure-oriented framework for drawing presumptions about merger effects. Moreover, there is no evidence that the two-digit SIC codes the study uses to group firms into industries correspond to meaningful antitrust markets. More fundamentally, the robustness of the results is open to question because the patent-based measure of innovation does not account for cross-industry differences in the importance and role of patenting (as opposed to innovation generally). Although the study makes valuable progress in understanding the relationship between competition and innovation, it does not provide (or purport to provide) a basis for drawing systematic presumptions about the effects of mergers on technological progress.

An alternative way to draw presumptions about the effects of mergers on innovation is to look directly at evidence of the impact that entry or merger has on innovation, regardless of what the underlying market structure is. In other words, if there is evidence that entry is good for innovation, then one might presume that, because de novo entry and merger have opposite effects on concentration, mergers will be harmful to innovation. Some caution is warranted in making such an inference because entry and merger are not exact mirror images. Entry typically brings new intellectual property and/or other assets into the market. Mergers, meanwhile, do not typically destroy such assets so much as bring them under unified control. Hence, evidence showing de novo entry to be good (or bad) for innovation would not necessarily imply that a merger of firms in the relevant market would have the opposite effect.

More importantly for current purposes, the evidence about the relationship between new entry and innovation is too ambiguous to support a presumption of harm from merger even if entry and merger were mirror images. Aghion et al. (2006) empirically examine how incumbents react to entry and find that firms already operating near the technological frontier increase their R&D efforts in response to entry, while firms whose technology lags behind the frontier reduce their efforts.[60] Bertrand

[60] Philippe Aghion et al., *The Effects of Entry on Incumbent Innovation and Productivity* (NBER Working Paper No. 12027, Jan. 2006).

et al. examine different modes of direct investment into new markets.[61] They find that acquired subsidiaries do more R&D and have higher R&D intensities than do subsidiaries created de novo to enter a given market. At first glance, this finding might suggest that increased competition is harmful to innovation. However, the authors find that de novo entry and entry through acquisition are not perfect substitutes as means of entry into new markets. Hence, there are endogeneity issues that need to be addressed further before one can reach definitive conclusions about the effects of entry on innovation. In summary, the analysis of the effects of entry on innovation is complex and, we think, still inconclusive.

Lastly, as noted above, there is an empirical literature that examines the effects of industry concentration on innovation by looking directly at the effects of mergers on R&D. Bertrand and Zuniga compare the effects of domestic versus cross-border mergers on R&D investment by the merging parties.[62] They find the evidence highly ambiguous, with merger and acquisition activity having little significant impact on R&D overall, and with the impact varying across industries. They also find that in some cases (e.g., in "medium-technology intensive" industries), cross-border mergers had a positive impact on R&D compared to domestic transactions, while in other industries ("low-technology intensive" ones) the effect was reversed. The results suggest that few presumptions can be drawn even if transactions are broken down by industry and by their domestic versus cross-border nature.

Carmine Ornaghi examines mergers among large firms in the pharmaceutical industry.[63] One of the issues that studies of mergers and innovation must confront is whether there are underlying factors that drive both the decision to merge and the firms' innovation levels. Ornaghi corrects for these effects by constructing merger propensity scores. He examines the effects on R&D inputs and innovation outputs over a three-year window following a merger. He finds that mergers do not lead to significant increases in R&D expenditures, innovation, or the efficiency of R&D. Interestingly, he does find that mergers appear to improve the innovation performance of nonmerging rivals. He also finds that the results appear to vary with the degree of technological and product relatedness.

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[61] Olivier Bertrand, Katariina Hakkala & Pehr-Joahn Nobäck, Does the Entry Mode of FDI Matter for Affiliate R&D? (2006) (unpublished manuscript, on file with authors).

[62] Olivier Bertrand & Pluvia Zuniga, *R&D and M&A: Are Cross-Border M&A Different? An Investigation of OECD Countries*, 24 INT'L J. INDUS. ORG. 410 (2005).

[63] Carmine Ornaghi, Mergers and Innovation: The Case of the Pharmaceutical Industry (Oct. 2006) (unpublished manuscript, on file with authors).

Through case studies, Bruno Cassiman et al. examine the effects of 31 mergers and acquisitions on both R&D inputs and outputs.[64] They analyze these effects conditional on how the respective parties' technologies and product-market outputs relate to each other. They find that R&D rises when the merging firms have complementary technologies but falls when they have substitute technologies. Of course, in theory, improvements in efficiency of R&D could outweigh this reduction in the level of R&D. Cassiman et al. find that R&D efficiency increases more when the parties' technologies are complements rather than substitutes. Lastly, they find that the R&D reduction is particularly large, and the efficiency gain particularly small, when the merging parties are product-market rivals with substitute technologies. Cassiman et al. conclude that their analysis "suggests that rival firms reap little technology gains from mergers."[65]

In addition to the competitive and efficiency effects discussed above, the management literature has emphasized that the merger process itself may disrupt the conduct of R&D, at least in the short run. Michael Hitt et al. review the literature and identify several mechanisms through which such adverse effects may arise in theory.[66] Hitt et al. find empirical indications that measures of both innovation input and output fall after a significant restructuring period. In addition to a general, adverse effect of acquisitions on innovation, their empirical work identifies a specific negative impact through the imposition of financial performance measures. In an earlier paper, Hitt et al. found that both innovation input and output are harmed when a transaction increases the degree of diversification.[67] An interesting implication of this finding—if it is found to be a robust and economically significant result—is that the merger of two firms operating in unrelated product markets may raise the

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[64] Bruno Cassiman et al., *The Impact of M&A on the R&D Process: An Empirical Analysis of the Role of Technological and Market Relatedness*, 34 RES. POL'Y 195 (2005).

[65] *Id.* at 195.

[66] These mechanisms include: (a) the process of identifying partners and negotiating mergers and acquisitions may divert significant managerial effort away from innovation; (b) while their firm is in the process of being acquired, managers may be reluctant to make long-term investments, such as those in innovation; (c) post-acquisition problems in integrating different corporate cultures, systems, and processes may disrupt R&D efforts; (d) acquisitions that lead to greater diversification may increase the complexity and difficulty (because of unfamiliarity with the more diverse lines of business) of the tasks faced by a firm's top managers, leading them to adopt short-term, financial performance measures rather than long-term, "strategic measures"; and (e) acquiring firms may take on high levels of debt that discourage long-term investments, including R&D. Michael A. Hitt et al., *The Market for Corporate Control and Firm Innovation*, 39 ACAD. MGMT. J. 1084 (1996).

[67] Michael A. Hitt et al., *The Effect of Acquisitions on R&D Inputs and Outputs*, 34 ACAD. MGMT. J. 693, 699 (1991).

possibility of adverse welfare effects that the merger of two rivals would not. Pending confirmation by other studies, we believe this finding is an intriguing one, but should not serve as the basis of enforcement policy.

Although merger proponents emphasize that mergers combine financial resources to allow increased R&D efforts, critics of mergers argue that highly leveraged acquisitions can lead to cash-flow squeezes that drive down R&D investments. Observe that this theory posits not that concentration matters, but rather that the actual merger process, specifically the use of debt to finance acquisitions, drives the harmful effect on innovation. Bronwyn Hall examines the effects of debt financing on innovation for a sample of 340 acquisitions.[68] She finds the evidence "mixed" as to whether acquisitions had large negative effects on R&D investment over her sample period (1977–1987), but to the extent that there were such effects they appeared to be driven by changes in debt levels rather than the acquisitions themselves.[69] It should be observed that Hall's data do not allow her to test whether the merged firms became more efficient innovators and, thus, whether the reductions in R&D expenditures translate into less innovation.[70]

Even when one looks beyond market structure as the basis for drawing presumptions, therefore, the theory and data that support the systematic presumption in favor of increased competition for purposes of static pricing and output efficiency, thus, have no equivalent when it comes to understanding the optimal conditions for innovation. By the same token, it should be observed that Schumpeterian claims that merger policy should favor increased concentration as a means of promoting innovation equally lack firm empirical grounding. Meaningful general presumptions have not been identified: innovation is affected by a variety of market factors other than concentration. Although more rivals rather than fewer will often remain the correct decision in a particular case, enforcement authorities cannot confidently presume as a matter of eco-

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[68] *See* Hall, *supra* note 50.

[69] *Id.* at 110–11, 122. Recall that this finding regarding the effects of debt runs counter to that of Aghion et al., *supra* note 59. In an earlier study, Hall examined approximately 300 acquisitions in the manufacturing sector and did not find significant reductions in R&D spending over relatively short timeframes. Bronwyn Hall, *The Effect of Takeover Activity on Corporate Research and Development*, *in* CORPORATE TAKEOVERS: CAUSES AND CONSEQUENCES (Alan Auerbach ed., 1988).

[70] Hall was also unable to correct for the endogeneity of acquisition decisions. In a later Working Paper, she did so by creating merger propensity scores and roughly found that mergers by firms with low propensities to merge lowered R&D while mergers by firms with high propensities to merge had the opposite effect. Bronwyn Hall, Mergers and R&D Revisited 16 (unpublished draft, Univ. of Cal., Berkeley), *available at* http://elsa.berkeley.edu/~bhhall/bhpapers.html.

nomic theory or experience that more competitors are beneficial or that market power is detrimental for R&D, except in the limited case of merger to monopoly where the evidence supports a moderate presumption of harm. Importantly, however, nor can merger authorities presume with any confidence that increased concentration, firm size, or market power will be beneficial for R&D.

Bronwyn Hall speaks for several authors when she writes that "the overwhelming characteristic of a sample of firms is the variability of their experiences and the number of factors actually involved in predicting outcomes."[71] Similarly, Gautam Ahuja and Riita Katila emphasize that the effects of a merger on innovation may depend on a variety of characteristics of the merger.[72] They find differential impacts of mergers on innovation depending on the degree to which the acquisition of technology is one of the drivers of the transaction and on the characteristics of any such technology, such as its relatedness across firms.[73] Work in this vein, including the papers of Bertrand and Zuniga, Cassiman et al., Hall (1999), and Ornaghi summarized above, suggests that it will very likely be difficult to derive empirical generalizations that are not conditional on a number of characteristics of the parties and/or the markets in which they operate. The research surveyed is extremely valuable, however. For as the set of such conditioning features becomes more extensive and better understood, application of such regularities to the litigation process will provide the basis of a structured, but highly nuanced analytical process rather than burden shifting based on simple presumptions.

Where do the above results leave merger authorities? Although the available data and theory show it is impossible to make definitive general statements about the linkage between market structure and innovation, they do not foreclose reasonable predictions about the effects of specific transactions within a particular industry based on a fact-intensive investigation into the incentives and capabilities of actual and potential innovators. We think such fact-intensive, case-by-case inquiries are the better course than the systematic retreat from enforcement in dynamic settings for which the "Schumpeterian" school argues.

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[71] *See* Hall, *supra* note 50, at 122.

[72] Gautam Ahuja & Riita Katila, *Technological Acquisitions and the Innovation Performance of Acquiring Firms: A Longitudinal Study*, 22 STRAT. MGMT. J. 197 (2001).

[73] We observe in passing that the application to merger enforcement of Ahuja and Katila's specific findings is limited by their focus on changes in the innovation output of the acquiring firm rather than the changes in the innovation outputs of both parties to the transaction. The latter is typically of greater relevance to assessing the social welfare impacts of a transaction's innovation effects.

2. *The R&D-Consumer Welfare Relationship*

Once an agency makes a prediction about a merger's likely effect on innovation, an issue arises that does not come up in the analysis of conventional, static concerns. Although many may find it counterintuitive, a large body of economics literature has established theoretical reasons why profit-maximizing firms may invest more in R&D than is socially efficient.[74] An important implication is that the social welfare effects of an innovation-reducing merger may be positive. Patent races are one situation in which firms may invest excessive resources in R&D in order to innovate quickly. In a race to obtain a pharmaceutical patent, for example, preempting rivals by a day may allow a pharmaceutical firm to obtain intellectual property rights whose value far exceeds the social benefits of having the patented drug available one day sooner.[75] Society would have done better if the duplicative R&D resources were invested elsewhere and the innovation obtained a day later. In other situations, an innovation may allow a supplier to increase its share of the economic pie without increasing the total pie (e.g., a product or database innovation may facilitate price discrimination having these effects). Such an innovation might have private value for the innovator but no overall social value.[76]

The theoretical possibility of excessive private incentives notwithstanding, as an empirical matter private incentives to invest in R&D typically are too low.[77] This underinvestment arises because private firms are generally unable to appropriate fully the benefits that their R&D generates for the economy. [78] Of course, "typically" is not synonymous with

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[74] For a survey, see Reinganum, *supra* note 44.

[75] Similar effects may arise when being first to market creates a durable advantage in terms of favorable consumer perceptions.

[76] A firm might also engage in predatory innovation (*see, e.g.,* Janusz A. Ordover, Alan O. Sykes & Robert D. Willig, *Nonprice Anticompetitive Behavior by Dominant Firms Toward the Producers of Complementary Products, in* ANTITRUST AND REGULATION: ESSAYS IN MEMORY OF JOHN J. MCGOWAN (Franklin M. Fisher ed., 1985)), although this is likely to be more of an issue of monopolization or attempted monopolization rather than merger. Business-stealing effects (where one supplier gains sales at another's expense) might be a more important source of distortion than in the case of price competition because the real resource costs of innovation imply that, in contrast to the effects of price reductions, the rivals' losses do not translate dollar for dollar into another economic agent's gain. Lastly, in markets with network effects, excessive innovation competition to attract new consumers may have the effect of stranding the installed base of customers with an old, incompatible technology.

[77] *See, e.g.,* Zvi Griliches, *The Search for R&D Spillovers*, SCANDINAVIAN J. ECON. 94 (Supp.) 29 (1992); Charles I. Jones & John C. Williams, *Measuring the Social Return to R&D*, 113 Q.J. ECON. 1119 (1998).

[78] Dennis Carlton and Robert Gertner point out that empirical studies generally compare *average* private and social returns, while the privately and socially optimal R&D levels

"always." Under specific conditions, firms can have socially excessive innovation incentives, but one can examine any particular market to determine if those conditions are present.

That enforcement authorities might want to act when such conditions for overinvestment in innovation exist, however, raises a possible tension between consumer welfare and social welfare when merger policy focuses on innovation rather than static competition. This is so because consumers almost always benefit from increased R&D. Even in patent race models, it is possible that consumers would be better off if firms invested still more and, thus, brought the fruits of innovation to the market even faster.[79] We discuss the possible trade-off from allowing mergers that reduce inefficient innovation in the efficiencies section below.

In the end, we conclude from the economic evidence that the concentration-competition-welfare presumption is—at present—weak for the innovation effects of mergers. One exception is merger to monopoly, which can leave a firm facing little pressure to race to innovate and diminished incentives to engage in follow-on innovations that could cannibalize revenues from the firm's existing products. Moreover, in the face of potential entry, such a firm is more likely to attain intellectual property rights solely to block potential rivals from attaining them, rather than to bring improved products to market. In contrast, with two or more incumbents, there is a free-rider problem with respect to entry deterrence, and, thus, entry deterrence of this sort is less likely. Further—and moving beyond a traditional competitive analysis—a firm that lacks rivals against which to benchmark itself may be a less efficient innovator. For these reasons, we believe that economic analysis supports a presumption of harm to innovation in the case of merger to monopoly.[80]

It is important to recognize that a general lack of a presumption in one direction does not imply a presumption in the opposite direction. Our analysis, therefore, suggests that the claim for systematic laissez-

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depend on *marginal* returns. In settings where R&D investment is driven by preemption incentives, the private marginal returns may deviate from the private average returns by more than the marginal social returns deviate from the average social returns, suggesting that perhaps excessive private incentives would be a problem. It is far from evident, however, that patent preemption incentives are of empirical significance in many industries. Dennis W. Carlton & Robert H. Gertner, *Intellectual Property, Antitrust and Strategic Behavior, in* 3 INNOVATION POLICY AND THE ECONOMY (Adam B. Jaffe, Joshua Lerner & Scott Stern eds., 2003).

[79] The source of the socially excessive R&D is the fact that the innovating firm's rivals may see their profits fall as a result of the innovation, and the innovator does not count this reduction in total surplus as a cost.

[80] In terms of welfare effects, our earlier caveats regarding cannibalization and business-stealing effects stand. *See supra* notes 46 and 47 and accompanying text.

faire in technologically dynamic markets is not soundly grounded in economics. It will not always, or even often, be true that unchecked consolidation will produce the conditions fostering the intense investment in new technology that leads to sequential competition "for the market," as the Schumpeterians sometimes argue. Although the current product-market shares of most firms might well be largely irrelevant to merger enforcement in such cases, it would be a mistake to think the irrelevance of current market shares inexorably leads to permissive merger policy. Indeed, a merger policy designed to foster and protect dynamic competition might appear fairly restrictive when viewed through the lens of conventional merger analysis. For instance, the Schumpeterian approach might instead imply that the currently dominant firm should be blocked from merging with essentially any other firm because that firm might otherwise be the next successful rival. Similarly, it might be socially optimal to block a merger between two firms that currently had no product-market sales because each was involved in R&D that might make it the next market winner. The key point is that, to understand a proposed merger's potential effects on Schumpeterian competition, one would need to ask which firms have the potential to engage in innovation that could challenge the position of the dominant firm and then have a framework for understanding how the merger would affect the incentives and abilities of those firms to engage in development and deployment of new technology.

In summary, consolidation can cause harm depending on the particular facts of the case, and we think those facts should, therefore, become central to the merger analysis. When the government can marshal evidence of harm to innovation, we think the better policy is to give the government the opportunity to present that evidence in an enforcement case, not to free merging parties at the outset from having to rebut the evidence. We conclude that in mergers short of monopoly the government should have no presumption of harm to innovation and should bear the initial burden of proving harm that the defendant would then have to rebut. In mergers to monopoly, we think that there should be a presumption of harm and that defendants should carry the initial burden of rebutting that presumption with evidence that there would be no reduction in innovation from the merger or that any reduction would bring with it compensating efficiencies.

Although, for all but mergers to monopoly, we recommend a neutral presumption regarding the innovation effects of mergers, we are not saying that consolidation from four firms to three, or from three firms to two, presents no cause for concern. And we are not saying that such mergers should receive a free pass. Rather, we believe that the specific

facts of such transactions should be closely scrutinized for evidence of the mergers' likely innovation effects. Neutrality of presumption does not imply neutrality regarding the desirability of rigorous merger review.

We turn next to how specific steps in the current enforcement framework affect, and may be affected by, technological change. We begin with market definition, the exercise that lies at the heart of the traditional merger review process.

V. MARKET DEFINITION

Even in the absence of innovation, there are two broad concerns about the importance that is attached to market definition in merger review. First, there is a question of whether market definition is, in fact, necessary to a sound analysis of the consumer-welfare and efficiency effects of a merger. Second, there are concerns that the mechanics of formal market definition may actually be an obstacle to good analysis in some instances. Innovation heightens these two concerns both with respect to static analyses of price and output effects and also to dynamic analyses of investment and innovation.

In order to understand the concerns about merger policy's emphasis on defining markets, it is useful to describe in more detail the mechanics of market definition. There is a longstanding principle by which economists define the product scope of a market: two goods or services are in the same relevant market if, and only if, consumers view them as sufficiently close substitutes.[81] A similar logic is used for geographic scope. To give some precision to the concept of sufficiently close substitutes, economists undertaking market delineation exercises often conduct the so-called hypothetical monopolist test. This test asks whether a hypothetical, profit-maximizing monopolist over a group of products in a given area could profitably raise prices above a specified level by a small but significant amount for a sustained period of time.[82] The group of products considered in the test comprises a candidate relevant market. The actual relevant market is the smallest set of products the monopolist would need to control in order to raise prices profitably.[83]

A price increase will raise a hypothetical monopolist's profits unless unit sales volume falls sufficiently to offset the higher price received for

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[81] *See, e.g.,* George W. Stocking & Willard F. Mueller, *The* Cellophane *Case and the New Competition*, 45 AM. ECON. REV. 29, 44–48 (1955).

[82] Merger Guidelines, *supra* note 18, § 1.0; FTC v. Swedish Match N. Am., Inc., 131 F. Supp. 2d 151, 160 (D.D.C. 2000); California v. Sutter Health Sys., 130 F. Supp. 2d 1109, 1120 (N.D. Cal. 2001); *see also* Michael L. Katz & Carl Shapiro, *Critical Loss: Let's Tell the Whole Story*, ANTITRUST, Spring 2003, at 49–56.

[83] Merger Guidelines, *supra* note 18, §§ 1.0 & 1.11.

the units sold.[84] Thus, the hypothetical monopolist test indicates that a set of products or a geographic area constitutes a relevant market if the hypothetical monopolist could make a small but significant and non-transitory increase in price without inducing so many consumers to switch to substitute goods that the price increase becomes unprofitable. The hypothetical monopolist test is used both by enforcement agencies and by the courts that review agency actions.[85]

It is important to observe that it is the plaintiff's burden to establish the boundaries of relevant markets, and this burden is often interpreted as an obligation to establish "the" bright-line boundary. Hence, some courts might dismiss or discount the plaintiff's case for being unable to establish a clear market boundary. Indeed, the DOJ lost its bid to block the merger between Oracle and PeopleSoft in large part because the trial court found that the Department failed to prove the product and geographic markets it had alleged in its complaint.[86]

A. Implications of Innovation for the Use of Market Definition to Predict the Static Price Effects of a Merger

Drawing and defending specific bright-line market boundaries can be very difficult even in the absence of innovation. Interestingly, the trial judge who ruled that the government failed to meet its burden in *Oracle* was well aware that it could be "difficult to identify 'clear breaks in the chain of substitutes' sufficient to justify bright-line market boundaries," especially in markets with similar but differentiated products.[87] But the court's recognition of the difficulty of defining sharp market boundaries did not lead it to lessen the government's burden of proving a market definition that would support its unilateral effects theory of harm in the case. Here, we note an unfortunate irony. Market share analysis is central to the traditional legal analysis of unilateral effects in differentiated products markets. But this is precisely where the definition of the relevant market is most difficult and—because products are differentiated and competition is localized—analysis of a supplier's share of sales within a broader market is the least likely to be informative.

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[84] We are assuming that the baseline price is greater than or equal to incremental cost.

[85] The U.S. Court of Appeals for the Eighth Circuit, for example, reversed the FTC's injunction of a merger between two hospitals in a single town on the grounds that the FTC had failed to show that its narrow definition of the relevant market could satisfy the hypothetical monopolist test. FTC. v. Tenet Healthcare Corp., 186 F.3d 1045, 1053 n.11 (8th Cir. 1999).

[86] United States v. Oracle Corp., 2004 U.S. Dist. LEXIS 18063 (N.D. Cal. Sept. 9, 2004).

[87] *Id.* at 41.

The presence of significant innovation can make the definition of market boundaries even more difficult because the characteristics of various suppliers' differentiated products may constantly shift in significant ways, making it especially hard to draw bright-line market boundaries with certainty. Thus, a requirement that the plaintiff establish bright-line boundaries could make it extremely difficult for the plaintiff to prevail in a case concerning a merger in an industry with significant innovation even if the welfare concerns focus on static price and output effects.

Our analysis leads us to conclude that courts are imposing a counterproductive burden on plaintiffs with respect to market definition. Clearly, one cannot predict the competitive effects of a merger without developing some sense of the competitors and the constraints that they apply to the merging parties' behavior. It is important to know whether—prior to the merger—rivalry between the merging parties was critical in driving them to serve consumer interests. Consequently, the need for market definition, broadly conceived, is not in doubt. What is in doubt is the need to define bright-line boundaries through application of a formal algorithm that is applied separately from the analysis of competitive effects.[88]

Economists—including former chief economists for both principal U.S. antitrust agencies—have long noted that formal market delineation may not be necessary to a sound competitive-effects analysis.[89] Doubts about the necessity or value of a market-definition algorithm are particularly strong in markets with strong innovation. As discussed in Part IV.A above, innovation raises the fundamental question of whether current product-market shares are meaningful predictors of future competitive conditions in a dynamic industry and, thus, are relevant to the prediction of the price and output effects of a merger. To the extent that current shares have little probative value, it makes little sense to impose a heavy burden on either party to establish specific market boundaries with a high degree[90] of certainty.

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[88] It is important to distinguish between different uses of bright lines in antitrust enforcement. We are not objecting to the use of bright lines to simplify evidentiary burdens or to establish safe harbors. Rather, we are objecting to a process under which enforcement policy requires one of the litigants to draw a bright line and then defend that bright line as "the" appropriate boundary.

[89] Jonathan B. Baker, *Contemporary Empirical Merger Analysis*, 5 GEO. MASON L. REV. 347, 351 (2003); Janusz A. Ordover & Daniel M. Wall, *Understanding Econometric Methods of Market Definition*, ANTITRUST, Summer 1989, at 20.

[90] Indeed, the very question asked by the hypothetical monopolist test raises issues about this separation of formal market definition and competitive-effects analysis. Under the Merger Guidelines' approach, the answer to the following question provides the basis of

In nonmerger cases, courts have agreed that market definition is an indirect method of establishing whether a supplier possesses significant market power and that such a method should not stand in the way of considering direct evidence of competitive harm. For example, the United States Court of Appeals for the Second Circuit stated that "[i]f a plaintiff can show that a defendant's conduct exerted an actual adverse effect on competition . . . this arguably is more direct evidence of market power than calculations of elusive market share figures."[91] The Supreme Court held in *FTC v. Indiana Federation of Dentists:*

> Since the purpose of the inquiries into market definition and market power is to determine whether an arrangement has the potential for genuine adverse effects on competition, "proof of actual detrimental effects, such as a reduction of output" can obviate the need for an inquiry into market power, which is "but a surrogate for detrimental effects."[92]

If the formalities of market definition can be skipped in favor of direct analysis of harm in monopolization and collusion cases, there is no reason the same should not hold true for merger analysis where the issue—likely competitive harm—is similar. To be sure, merger analysis is often more prospective and predictive than other kinds of antitrust cases where the conduct at issue frequently has been ongoing for some time. But that simply means direct effects may be easier to show in nonmerger cases and not that direct evidence of market power should not have the same priority in merger cases where such evidence is available.

The current process could be significantly improved even if courts continue to require the delineation of market boundaries. Specifically, a more rational approach would recognize the inherent uncertainty and take it into account.[93] One way to do so would be to ask where the dividing line matters for the analysis of competitive effects and allow the

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market definition: Would a hypothetical monopolist with control and ownership of a particular set of products be able to raise price profitably in a significant way, holding the prices of other products constant? But why not make predictions about what *actual* suppliers would do rather than focus on a hypothetical monopolist? Specifically, why not ask directly whether the merging parties would find it profitable to raise price by a significant amount post-merger? (One answer is that the second question does not entail holding other prices fixed. But in unilateral effects cases, an assumption along somewhat similar lines is made.) That is the question whose answer matters for consumer welfare. If one possesses the answer to that question, then the answer to the hypothetical monopolist question is completely superfluous.

[91] Todd v. Exxon Corp., 275 F.3d 191, 206 (2d Cir. 2001).

[92] FTC v. Indiana Fed'n of Dentists, 476 U.S. 447, 460 (1986) (citing 7 PHILLIP E. AREEDA, ANTITRUST LAW ¶ 1511 at 429 (1986)).

[93] As we discuss in Part VII.D below, there is a general failure of merger enforcement to address uncertainty in a rational manner.

plaintiffs and defendants to make their arguments about on which side of the critical line the "actual" market boundary lies without a requirement of certainty. Under this approach, plaintiffs would not be held to a standard of establishing a unique, bright-line boundary with a high degree of certainty.[94] But plaintiffs would be held to a standard of establishing that significant competitive effects were likely.[95]

The problem of bright-line market boundaries aside, significant innovation raises additional issues for an analysis of static pricing effects. First, some commentators have objected to the nature of the price changes used in conducting the hypothetical monopolist test when there is significant ongoing technological progress. Under American and EU competition policy, a small but significant price increase in the context of the hypothetical monopolist test is often taken to mean a price change in the range of 5–10 percent.[96] Several different criticisms have been made regarding application of this approach to markets with rapid technological progress, where quality-adjusted prices might fall by 20 percent or more annually.[97]

One critique is that a 5- or 10-percent price increase may be an inappropriate test because it may either understate or overstate the merged firm's market power when costs and quality-adjusted prices are

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[94] They would, however, have to establish a likelihood of significant harm to competition.

[95] In a separate article we explain in detail how moving away from requiring certain and definitive market boundaries can improve market definition. Michael L. Katz & Howard A. Shelanski, *Merger Analysis and the Treatment of Uncertainty: Should We Expect Better?* (UC Berkeley Public Law Research Paper No. 821234, 2006), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=821234, 74 ANTITRUST L.J. (forthcoming).

[96] Merger Guidelines, *supra* note 18, § 1.11 ("In attempting to determine objectively the effect of a 'small but significant and nontransitory' increase in price, the Agency, in most contexts, will use a price increase of five percent lasting for the foreseeable future."). European Commission, Commission Notice of the Definition of the Relevant Market for the Purposes of Community Competition Law, 1997 O.J. (C 372), *available at* http://europa.eu.int/comm/competition/antitrust/relevma_en.html ("The question to be answered is whether the parties' customers would switch to readily available substitutes or to suppliers located elsewhere in response to an hypothetical small (in the range 5%–10%), permanent relative price increase in the products and areas being considered.").

For most mergers, premerger prices are taken as the benchmark. In cases where premerger prices reflect coordinated behavior, some measure of a competitive price is used instead. Merger Guidelines, *supra* note 18, § 1.11.

[97] In addition to the issues in the text, Raymond Hartman et al. offer another criticism of the standard hypothetical monopolist approach to market definition. Their criticism, however, appears to be based on a misunderstanding of the Merger Guidelines. Hartman et al. wrote that "[d]uring [the 1970s] a variety of [minicomputer] systems competed on price and performance while exhibiting price differences of several hundred percent. Strict interpretation of the Merger Guidelines suggests that such price differences imply that the products are in different markets." Hartman et al., *supra* note 36, at 317–50, 323. The hypothetical monopolist test, however, is based on the effects of price *changes,* not existing price differentials.

routinely changing by much greater amounts.[98] For instance, if innovation were driving costs down significantly, then merely holding prices constant at the premerger baseline could be indicative of the exercise of substantially increased market power because profit margins would have increased significantly. Conversely, in a market where prices were rising on a nominal basis but costs were rising faster because innovation was leading to higher quality, but more-expensive-to-produce goods, a 10 percent price increase over the premerger baseline might reflect competitive pricing and indicate no market power at all. What is needed is a careful analysis of what constitutes a real price increase in the face of cost and product changes. Stated another way, what is needed is a comparison of alternative price *paths,* recognizing that prices might well have changed over time even in the absence of the merger under examination. Without such a comparison, the hypothetical monopolist test can be applied in ways that generate misleading conclusions.

A related criticism is that the hypothetical monopolist approach to defining market boundaries conducts a test based on the assumption that *other* suppliers hold their prices constant when such prices may in fact be falling. This criticism is somewhat misplaced; under the hypothetical monopolist test, the prices of potential substitute products are assumed not to change in response to a change in the monopolist's price, but this assumption does not preclude the possibility of technological progress as a driver of price changes over time. This criticism and the one preceding it do, however, raise an important question: What baseline prices for the hypothetical monopolist and other suppliers should be used in defining the product scope of a market with rapid technological progress? Specifically, should one use current or future prices?

Because the concern of merger analysis is with post-merger market performance, we believe that it is more appropriate to use projections of future prices. Of course, forming reliable projections can sometimes be difficult, and this difficulty can be compounded by the fact that innovation can itself be affected by the merger. Moreover, when technological progress is ongoing, the scope of the product market may continue to change, so that multiple projections are necessary. However, relying on current prices can lead to market definitions that are either

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[98] *See, e.g.,* Christopher Pleatsikas & David J. Teece, *The Analysis of Market Definition and Market Power in the Context of Rapid Innovation,* 19 INT'L J. INDUS ORG. 665, 671 (2001) (arguing that markets will be too narrowly defined).

too narrow (when technological progress in substitute products is rapid) or too broad (when the hypothetical monopolist's product is subject to greater technological progress than are substitute products).[99]

Put differently, the issue comes back to the question of market boundaries because the agencies and the courts may not know which products will be viable substitutes in the near future. Under the traditional approach to market definition, the central aim, whether one uses the hypothetical monopolist test or some other algorithm, is to identify existing products that are at present meaningful substitutes for one another from a consumer's perspective. When innovation is significant, the analysis may need to be much more forward-looking. Innovation may result in the creation of new products that compete in the relevant market or innovation may lower the costs of producing existing products that are, at present, too expensive to be considered viable substitutes for the products of the merging parties.

The summary nature of our discussion to this point should not be taken as a sign that the difficulties of forming reliable projections are minor or readily dealt with. Conceptually, the issues are straightforward and are compatible with the Merger Guidelines' market definition framework, as long as that framework is applied on a forward-looking basis. But, in practice, there are two problems. First, actually projecting future substitution possibilities in a fast-changing and highly uncertain environment is often difficult. Second, the agencies generally limit the extent to which they take a forward-looking view.[100] Their short-range perspective is, in part, a reaction to practical difficulties but, as we discuss below in Part VII.D, the agencies generally have not made use of well-established tools of decision theory that could provide a more coherent approach for decision making under uncertainty and do a better job of taking possible, future events into account. Although adopting these tools would benefit merger review in every case, it is particularly important given the effect innovation can have on products and production processes.

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[99] For the latter reason, Pleatsikas and Teece are incorrect when they assert that "defining markets from a static perspective when innovation is rapid will inevitably lead to identification of markets that are too narrow." *Id.* at 687. *See also* David J. Teece & Mary Coleman, *The Meaning of Monopoly: Antitrust Analysis in High Technology Industries*, 43 ANTITRUST BULL. 801, 826–28 (1998).

[100] For example, the Merger Guidelines, *supra* note 18, § 3, indicate that the agencies generally will look only two years forward in considering entry, although the Merger Guidelines provide no rationale for this cutoff.

B. The Role of Market Definition in Predicting the Innovation Effects of a Merger

The discussion above addresses how innovation can complicate market definition for purposes of gauging a merger's effects on price and output in a relevant product market. What about the use of market definition to assess a merger's effects on innovation itself? The purpose of defining relevant markets is to identify the boundaries of competition in order to make predictions about post-merger price and output levels. When the question instead involves post-merger innovation levels, a fundamental issue is whether a focus on product markets is appropriate to the analysis. An argument in favor of taking a product-market focus is that the ultimate aim of innovation—and the way in which it affects consumers—is the creation of products and processes that allow an innovator (or its licensees) to compete successfully in one or more product markets. An argument against this approach is the claim that the notion of a well-defined product market is too limiting because the products of the future cannot be predicted with any degree of certainty and, more fundamentally, that a sustained stream of innovations, rather than any particular product, is in the long run most important for consumer welfare. A potential response is to consider markets defined in terms of innovation capabilities rather than specific products. But even here one must ultimately tie the analysis to some notion of (potential) competition among products to know which innovation capabilities are relevant.

Consider two firms wishing to merge that have strong R&D capabilities in similar areas but are not at present significant product-market competitors with one another. From the standpoint of static price competition, presumptively no public policy rationale exists for blocking the merger. But if the firms are the only two, or are among the few, firms that have the capability to undertake particular innovation efforts, then the antitrust agencies might nonetheless be concerned with the consumer-welfare effects of the proposed merger.

Antitrust enforcers might be concerned either that: (a) the two firms would have otherwise engaged in competing R&D efforts that would have led to their becoming direct, product-market competitors, or (b) the merged firm will reduce its R&D and lower the probability that even one supplier brings out improved products or processes. The first concern is ultimately about potential competition in the particular product market(s) at issue in the merger. The second concern, however, arises even when—in the nonmerger counterfactual—the innovation under consideration might not lead to product-market competition

between the merging firms. The same two concerns arise when the merging parties compete in what today are unconcentrated markets but where the firms are the only two, or are among the few, firms that have the capability to undertake substantial innovation efforts necessary to develop future products in this area.

These two concerns raise legal and economic issues for market definition and the subsequent competitive-effects analysis. A first issue arises from the fact that potential competition cases are difficult to bring successfully in the United States. Courts tend to be skeptical of claims that a merger will harm consumers by reducing future competition between two merging firms that are not at present competing with one another.[101] A second issue is that it may be extremely difficult to define a product market if one does not yet know what the product will be. A third issue is that changes in upstream innovation can have effects on multiple downstream product markets. A fourth consideration is that, as discussed above, the relationship between competition and innovation is much less understood than that between competition and short-run price or output levels.

In response to these difficulties and the absence of any express provisions in the Merger Guidelines for dealing with innovation, enforcement officials and policy makers have proposed various ways to make market definition more dynamic and sensitive to innovation considerations. One approach focuses neither on final product markets nor on innovation itself, but on "technology markets." Technology is a product that can result from innovation. In some cases, technology is fully embodied in some other product that is sold in the marketplace (e.g., when innovation produces technology that improves the performance of a home-electronics component or of some machine tool). In other cases the technology itself is sold in the marketplace and used as an input not by the innovating firm that produced the technology but by its customers who, in turn, incorporate the component into the product they sell to consumers (e.g., a biotechnology patent that the inventor licenses to a pharmaceutical company that incorporates the invention in a drug sold to consumers).

Even though technology markets are—in the end—just product markets, examining them as a separate category may have the virtue of

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[101] General principles of antitrust law require "clear proof" or at least a "reasonable probability" that entry into the new market would in fact have occurred in the near future and disallow speculation about "ephemeral possibilities." *See* United States v. Marine Bancorp, 418 U.S. 602, 617–23 (1974); Tenneco, Inc. v. FTC, 689 F.2d 346, 352 (2d Cir. 1982); B.A.T. Indus., 104 F.T.C. 852, 919–28 (1984).

highlighting the importance of innovation by focusing enforcement attention on a set of products that results from the process of R&D rather than from manufacturing or the direct provision of services. Moreover, technology markets have some notable features that are relevant to market definition and that may distinguish them from more conventional goods and services markets. For example: (a) production is often highly uncertain; (b) they are intermediate goods markets and can have strong vertical issues; and (c) the output is information, for which the marginal costs are very low relative to average costs (or first-copy costs) and for which there can be well-known difficulties in selling, such as those related to protection against expropriation.[102]

Technology markets may also have quite different geographic features than do traditional product markets. We note at the outset that geographic market definition is a poorly understood subject even in the absence of innovation, with much confusion about whether a geographic market refers to suppliers, customers, or both. The presence of innovation—specifically, an important role for intellectual property sold in technology markets—can compound the problems. The reason is that intellectual property can typically be shipped anywhere in the world at an extremely low cost.[103] Given the low costs of transporting information, the location at which technology is developed has no effect on the cost of providing the subsequent intellectual property for use anywhere in the world. But does this mean the geographic scope of technology markets is global?

One approach to defining the geographic scope of relevant markets is explicitly to define both the buyers and sellers of concern in a particular investigation. For jurisdictional reasons, the federal agencies and the courts focus on effects on consumers located in the United States. The remaining issue is where the parties who can compete to serve American consumers are located. We would expect that suppliers located anywhere in the world could compete to supply pure intellectual property, but there are limitations that should be taken into account. For instance, location may affect the innovation process (e.g., proximity to specific scientists or information about consumer wants), and intellectual property may be useful only in certain locations because of the need for complementary products or due to differences in legal regimes.[104] In

[102] For a seminal analysis, see Arrow, *supra* note 41.

[103] The cost of shipping intellectual property is not always small. For example, the intellectual property may consist of tacit knowledge of collections of employees.

[104] Our presumption about the global nature of pure technology markets is in accord with the presumption found elsewhere that innovation markets would have global geographic scope. *See* Richard J. Gilbert & Steven C. Sunshine, *Incorporating Dynamic Efficiency*

cases where the technology is not sold separately but is embodied in other products, foreign suppliers often will not have the complementary assets to serve American consumers. So the answer may be very different when a pure technology market is at issue from when the results of innovation are fully embodied in another product.

R&D is the process of innovation, and technology is a product that can result from that innovation. To focus on technology markets is, therefore, to focus on an intermediate product market closely tied to innovation, not on the process of innovation itself. The shortcoming of using "technology markets" to address innovation is that defining such markets at best allows one to measure R&D activity through its generation of concrete, marketable results, which can be an imperfect proxy for a process that may yield incremental improvements that are not in themselves marketable or innovations that take some time to be recognized or reduced to practice. A further limitation of the technology-markets approach on its own terms is that it does not address the enormous amount of technology that firms produce for internal rather than market consumption, innovation which is of no less interest than innovation aimed at creating technology for license.[105]

To shift the focus of merger review further from product markets and more directly to investment in R&D, Richard Gilbert and Steven Sunshine, both at the time working at the DOJ, developed the concept of "innovation markets."[106] The import of their contribution is to shift attention away from potential product competition and toward actual innovation competition. In Gilbert and Sunshine's words, "The innovation markets framework provides a methodology for identifying mergers that are likely to affect competition in output markets through a lessening of innovation."[107] Their proposed framework consists of five principal steps: (1) identify overlapping R&D activities of the merging firms; (2) identify alternative sources of R&D; (3) evaluate actual and potential downstream competitors to the merging parties; (4) assess how the increased concentration in R&D would affect investment in R&D; and (5) evaluate how the merger would affect the efficiency of R&D.

Concerns in Merger Analysis: The Use of Innovation Markets, 63 ANTITRUST L.J. 569, 594–95 (1995).

[105] One might simply include such in-house technology in the relevant market, but there can be severe practical difficulties obtaining output measures for this technology, as well as conceptual issues concerning the extent to which such technology provides meaningful competition to third-party innovators.

[106] *See* Gilbert & Sunshine, *supra* note 104.

[107] *Id.* at 597–98.

Although each of those steps is in the abstract a tall order, Gilbert and Sunshine proposed limiting their approach to cases in which specific R&D activities could be identified that could have a potentially significant impact on specific downstream product markets. They further recommended that their approach be applied only "to markets in which R&D directed toward particular new products or processes requires specific assets that are possessed by identified firms."[108] Taken together, these qualifications limit the use of innovation markets to cases in which innovation is at a sufficiently advanced stage that its effects on downstream markets can reasonably be predicted and in which the pool of relevant innovators can be determined with a high degree of certainty.[109]

Despite the cautious way Gilbert and Sunshine recommended using innovation markets, the idea has met with substantial skepticism and criticism.[110] One commentator argued that the innovation market idea is in most cases "superfluous" and amounts to little more than analysis of potential competition in product markets, while in the remaining cases it is a dangerous foray into unknown economic relationships that promises to do at least as much harm as good.[111] Dennis Carlton testified before the FTC that it would be too difficult in practice for antitrust agencies successfully to identify mergers that should be blocked on innovation grounds, and he opined that "a movement toward relying on the concept of innovation markets could easily lead to a vast decline in the predictability of enforcement policy and in the reliability of enforcement in improving welfare."[112] Yet others have questioned the legal basis on which enforcement agencies and courts could base decisions on nonprice effects like innovation.[113]

In the light of such criticism, it is perhaps not surprising that the innovation markets concept has not to date significantly affected the

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[108] *Id.* at 596.

[109] Similarly, former FTC Chairman Timothy Muris has warned against using the innovation market concept unless it is obvious who the potential innovators are. Timothy Muris, Chairman, FTC, Public Statement in the Matter of Genzyme Corporation/Novazyme Pharmaceuticals, Inc. 3 (Jan. 13, 2004), *available at* http://www.ftc.gov/os/2004/01/murisgenzymestmt.pdf.

[110] For a useful survey of arguments for and against the use of innovation markets, see Davis, *supra* note 9.

[111] Richard T. Rapp, *The Misapplication of the Innovation Market Approach to Merger Analysis*, 64 ANTITRUST L.J. 19, 19–20 (1995).

[112] Dennis W. Carlton, Testimony Before the Federal Trade Commission Hearings on Global and Innovation-based Competition: Antitrust Policy Toward Mergers When Firms Innovate: Should Antitrust Recognize the Doctrine of Innovation Markets (Oct. 25, 1995), *available at* http://www.ftc.gov/opp/global/carlton.htm. Dennis Carlton is currently the DOJ's Deputy Assistant Attorney General for Economic Analysis.

[113] *See* Davis, *supra* note 9.

outcomes of merger cases, although it has affected the agencies' analysis and discussion in a growing number of investigations.[114] If nothing else, innovation has become a focal point that has aided in understanding the potential product-market effects of mergers in dynamic markets. The innovation markets approach has also helped the agencies look more deeply into the future impacts of transactions that would pose little concern viewed through a static framework geared solely to price and output effects in current product markets.

We think the underlying idea of the innovation markets approach—that the set of competitors is sometimes best identified by examining which firms have the skills and assets needed to innovate effectively—is a sound one. Now that innovation has become part of the picture in merger review, however, there are important questions about how to approach market definition in cases that do not fit the strict parameters that Gilbert and Sunshine established for their innovation market framework.[115]

Both the technology markets and innovation markets approaches leave open important questions and have limited application for a number of issues that mergers raise for technological progress. First, the restrictions to innovation tied to actual or imminent product markets in the respective approaches do not provide guidance as to whether and how merger authorities should account for innovation that is not connected to any specific current or future product. Second, both approaches incorporate the traditional emphasis on market definition but do not address the limitations of market definition or how its application might need to be modified to address innovation. Gilbert and Sunshine recognize the difficulty of defining innovation markets and, therefore, limit their proposal to situations in which agencies can identify with reasonable certainty the pool of potential innovators. But neither the technology-markets nor the innovation markets framework provides guidance on what, if anything, a finding of increased concentration means for innovation or on what welfare presumptions enforcement officials should apply once they have defined markets for innovation or technology. As we discussed above in Part IV, findings of increased concentration at best support only very weak presumptions about effects on innovation. The most important aspects of determining innovation-related welfare effects

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[114] *See id.* at n.94; *see also* 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).

[115] As a pragmatic matter, it may also be less necessary now for purposes of policy acceptance to fit innovation so closely to the methodology established by the Merger Guidelines than it was when the innovation markets concept was first introduced.

of a merger are, therefore, not likely to center on market definition but on more direct, factual evidence of alternative sources of innovation and of the economic incentives of the potential merger partners.

VI. FURTHER ANALYSIS OF COMPETITIVE EFFECTS

As a legal matter, if the plaintiffs establish that a merger will lead to high levels of concentration, then it falls to the defendants to rebut the presumption of a competitive problem by pointing to other factors, such as the possibility of entry by new competitors or certain market characteristics that can make it difficult to raise prices (e.g., the presence of large, sophisticated buyers who can exert bargaining pressure). As the Merger Guidelines recognize, "market share and concentration data provide only the starting point for analyzing the competitive impact of a merger."[116] A complete analysis considers both the abilities and incentives of competitors to expand their output levels and/or change the attributes of their products in response to price changes by the merging parties that would harm consumers.

A. Implications of Innovation for Further Analysis of Static Competition

We begin our discussion of further competitive analysis by briefly considering the implications of innovation for static pricing effects. Specifically, we examine the implications of innovation for entry by new suppliers and product repositioning by existing suppliers. There are two situations to consider with respect to entry. In one, the likelihood of entry is independent of whether or not the merging parties would otherwise raise their pre-entry prices. In the other, the likelihood of entry depends on pre-entry prices and, thus, the threat of entry can discipline post-merger price increases. The entrants who stayed out under competitive, premerger prices might come in if the merged entity tries to exercise market power and raise prices.

Consider first the implications of innovation for the analysis of entry that will likely occur regardless of the pre-entry prices. Merging parties often claim that entry will reduce future concentration and allay competitive concerns associated with their merger. At the same time, the agencies often are skeptical of such claims and seek tangible evidence of the likelihood of entry. The fact that one or more firms have engaged in substantial R&D efforts relevant to the product market at issue may constitute such evidence. Investments in R&D, as well as in specialized

[116] Merger Guidelines, *supra* note 18, § 2.0.

plant and equipment, may strongly indicate that the firms will shortly be entering the product market and, hence, that a merger analysis based on current market shares would overstate likely future concentration. By the same token, it should also be noted that the lack of ongoing R&D by one or more incumbents may be an indicator that those suppliers are going to be of less competitive significance in the future and, thus, a merger analysis based on current market shares would understate likely future concentration.

Now, consider situations in which entry is contingent on premerger prices. These situations raise subtle issues even in the absence of innovation. When entry is contingent on the premerger behavior of the merging suppliers, the threat of entry—as opposed to actual entry—can induce incumbents to keep their prices at premerger levels, or at least to moderate the increases. Difficult issues arise for antitrust enforcers, in part, because it can be harder to assess threats of potential entry than to measure progress toward actual entry.

Economic analysis identifies two classes of situations in which pre-entry prices can be influenced by the threat of entry. One is where the entrant takes pre-entry prices as a signal regarding private information that incumbents have about their costs or some other factor that affects their profit-maximizing prices.[117] For instance, an entrant might take pre-entry prices as signals of the incumbents' marginal costs, which are relevant to predicting how vigorously these incumbents would compete if faced with a new, competitive entrant. In such situations, incumbents may set low pre-entry prices to convince potential entrants that the incumbents have low costs ("limit pricing"). If there is rapid technological innovation, however, current prices may be a very poor signal of future costs and, thus, may have relatively little effect on a potential entrant's prediction of the likely post-entry equilibrium. Hence, the presence of rapid innovation tends to reduce the feasibility of limit pricing and the disciplining role of the threat of entry (as opposed to actual entry).

A second circumstance in which the threat of entry may affect current prices is one in which incumbents make investments before new entrants have come into the market, such as building large-capacity plants or setting low "penetration prices" to build up large installed bases of customers, that have the effect of both making the incumbents "tougher"

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[117] For a fully worked out theoretical analysis, see Paul Milgrom & John Roberts, *Limit Pricing and Entry Under Incomplete Information: An Equilibrium Analysis*, 50 ECONOMETRICA 443 (1982).

post-entry rivals and of driving down pre-entry prices.[118] In some cases, these effects will make it profitable for merging parties to forgo large price increases, even if doing so would be profitable in the short run. Such pre-entry investments may include R&D expenditures. In other words, the threat of entry may drive incumbents to innovate as a means of making entry less attractive and, once the innovations are realized, some of the benefits will typically accrue to consumers in the form of lower quality-adjusted prices.

Now consider product repositioning by incumbent suppliers. Under a unilateral effects theory of competitive harm in a differentiated market, the concern is that the products of the two merging parties are each other's close competitors and the merger will eliminate localized competition that would otherwise drive prices to efficient levels.[119] A central issue in the analysis under this theory is, therefore, whether existing competitors would reposition their products to compete more closely with those of the merging parties. For example, if two leading manufacturers of pick-up trucks merged, would other vehicle manufacturers expand their lines of pick-up trucks to compete more directly with the merged firms' line? When there is already significant ongoing or potential innovation directed at a product, some of that innovation can be used to speed repositioning. Of course, suppliers' innovation capabilities may not always support repositioning, but as a general matter it seems logical that repositioning will be easier when the product is already on the proverbial drawing board for other purposes.

In addition to considering traditional entry and product repositioning issues, the further analysis of competitive effects may also be the stage in a trial in which Schumpeterian arguments can be addressed with the least disruption to the overall process typically followed by the courts.[120]

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[118] *See, e.g.,* Avinash K. Dixit, *A Model of Duopoly Suggesting a Theory of Entry Barriers*, 10 BELL J. ECON. 20 (1979); A. Michael Spence, *Entry, Capacity, Investment and Oligopolistic Pricing*, 8 BELL J. ECON. 534 (1977).

[119] It is important to recognize that unilateral effects also arise in undifferentiated product markets in which competition is not localized.

[120] One might argue that Schumpeterian arguments should be addressed before or simultaneously with market definition because the utility of defining relevant product markets strongly depends on whether competition is Schumpeterian. To oversimplify somewhat, if Schumpeterian competition is the appropriate model of industry behavior, then why define a relevant product market and calculate conventional market shares? In the long term, it may be sensible to amend the legal process so that early in litigation the parties address the issue of whether Schumpeterian competition is the appropriate framework. In the interim, we recommend addressing these issues after the concentration-competition-welfare presumption because we believe courts will be more comfortable with adopting the reform in this incremental fashion.

However, the Schumpeterian dynamic does more than extend the analysis of price effects beyond presumptions based on market concentration; it shifts the fundamental focus of the analysis away from pricing altogether. The principal competitive effects of a merger under Schumpeterian competition would be the effects that it has on the pace and direction of innovation. Hence, that is where the analysis of competitive effects would focus, beginning with the weak presumptions regarding the relationship between innovation competition and concentration, and then moving to a further analysis of the competitive effects on innovation.

B. Further Analysis of Competitive Effects Regarding Innovation

Even more so than with price competition, it is necessary to look beyond market share data to understand innovation competition. As discussed above in Part IV.B, the theory and data that support the systematic presumption in favor of increased competition for purposes of static pricing and output efficiency have no analog when it comes to understanding the optimal conditions for innovation. However, despite the impossibility of making definitive general statements about the linkage between market structure and innovation, one can often make reasonable predictions about the effects of specific transactions within a particular industry based on a fact-intensive investigation. Here, we make two brief points.

First, for reasons discussed above, it is important to understand the distribution of R&D assets among various actual and potential rivals. Only then can the case-specific effects of a transaction on R&D even begin to be explored.

Second, there are reasons to expect that a merger is less likely to have adverse coordinated effects on innovation than on price. In markets with only a few competitors (oligopolies), enforcement officials may worry that firms will tacitly collude on price.[121] As the Merger Guidelines note, such collusion on price becomes progressively harder as products and firms in a market become more heterogeneous and as information the firms have about each other becomes less complete.[122] Although the underlying economic principles for understanding coordinated effects are the same for pricing and innovation, R&D activities have certain characteristics that give rise to differences in practice. For example, R&D efforts may be more complex and multi-dimensional, which makes it

[121] Merger Guidelines, *supra* note 18, § 2.1.

[122] *Id.* § 2.11.

difficult for firms tacitly to coordinate innovation strategies.[123] Similarly, the uncertain, stochastic nature of R&D output can greatly increase the difficulty of reaching and monitoring agreements to restrict R&D efforts. Another factor is the length of detection and response lags. With process innovation it may be possible to keep both R&D programs and their results secret. Thus, each supplier may fear that its rivals are secretly cheating on any tacit or explicit agreement to suppress innovation. Even with product innovation, where the results often will become visible, this may happen only with long lags after the initial efforts, which leaves a supplier that abides by an agreement to suppress its innovation efforts vulnerable to rivals that do not.

Unilateral effects on innovation, in turn, could in principle be quite strong in some circumstances. The typical question in unilateral effects analysis in a differentiated product market is whether the merged firms could act without concern that there are firms whose products are sufficiently close substitutes that they provide competitive discipline to the merged entities. The primary new issue raised by innovation is that, to the extent the focus is on determining whether there is localized competition, it is necessary to determine whether the localization occurs at the innovation or product level. For example, in a race to obtain a patent, localization is defined in terms of the set of firms with the particular skills and assets necessary to undertake the relevant R&D. In other instances, a wide range of firms may be capable of engaging in innovation, but if the innovation has no market except as embodied in specific products, then the localization of competition of those products should be the central focus.

C. What if the Competitive Effects for Static Pricing and Innovation Run in Opposite Directions?

In theory, the competitive-effects analysis of a merger could indicate that the merger would harm price competition but stimulate innovation. This raises the issue of how enforcement agencies will determine the comparative value of those two benefits. Part of the Schumpeterian critique is premised on precisely this trade-off between the terms (prices and quantities) on which a good is sold and the nature (qualities and capabilities) of the good that is being sold. The Schumpeterian school reflexively resolves this tension in favor of stimulating improvements in the latter through innovation. But it cannot be the case that innovation will always be so likely or beneficial that it will outweigh harmful price

[123] *See* Kamien & Schwartz, *supra* note 38, at 15 (attributing this general idea to Galbraith).

effects. On the other hand, it cannot be true that the opposite bias that conventional merger enforcement has displayed in favor of price effects will always be correct either. A more careful analysis of the comparative benefits of price effects and innovation effects is needed. Although there are important differences, in many ways the issues raised by the price/innovation trade-off are similar to the issues that arise when weighing market power effects against cost-saving efficiencies in the conventional merger framework. For that reason, we will discuss both the price/innovation and market-power/efficiency trade-offs together in the next part.

VII. EFFICIENCIES AND WELFARE TRADE-OFFS

If the analysis of market shares and other market characteristics demonstrates that a proposed merger will not give rise to a significant competitive problem, one can conclude that the merger will not harm competition and consumers. But if a significant competitive problem is predicted by the preceding stages of analysis, then one must conduct another stage of review to predict correctly whether a proposed merger will benefit or harm consumers. This is so because a merger that is expected to give the merging parties the ability to raise prices profitably might nonetheless lead to greater social welfare and, eventually, to lower prices and/or better products over time if the merger gives rise to sufficient cost savings of the right sort.[124] These cost savings are referred to as "efficiencies."[125] Under the Merger Guidelines' approach, cost savings count as efficiencies if they are merger-specific (that is, cannot reasonably be achieved by means other than merger) and are passed on to consumers.[126]

As a general matter, it is very difficult to predict with any certainty the magnitude of cost savings likely to result from a proposed merger because doing so entails making predictions about the results of combining complex operations and corporate cultures. Indeed, we are unaware of any decision in which a court has found that a merger threatened to have major competitive harms but nonetheless allowed the merger on

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[124] For a seminal economic analysis of merger efficiencies, see Oliver E. Wiliamson, *Economies as an Antitrust Defense: The Welfare Trade-Offs*, 58 AM. ECON. REV. 18 (1968).

[125] The Merger Guidelines, *supra* note 18, § 4, describe the process as follows:

> The Agency will not challenge a merger if cognizable efficiencies are of a character and magnitude such that the merger is not likely to be anticompetitive in any relevant market. To make the requisite determination, the Agency considers whether cognizable efficiencies likely would be sufficient to reverse the merger's potential to harm consumers in the relevant market, e.g., by preventing price increases in that market. (internal footnote omitted).

[126] *See id.*

the grounds that it would generate offsetting efficiencies. Efficiencies can, however, be of greater significance at the stage of agency review and can tip a "close call" on whether the DOJ or FTC will challenge a merger in court in the merging parties' favor.

Merging parties sometimes identify increased innovation capabilities as a significant efficiency that will result from their transaction. Thus, it may be necessary to predict whether a merger will improve the combined firm's innovation capabilities in ways that will generate consumer benefits. This undertaking can be particularly difficult. Indeed, the agencies themselves have expressed skepticism about innovation-based claims for a merger's benefits and have asserted that "[o]ther efficiencies, such as those relating to research and development, are potentially substantial but are generally less susceptible to verification and may be the result of anticompetitive output reductions."[127] In other words, there is a danger that the "savings" in R&D expenditures merely represent a reduction in competitive activities aimed at innovation. Although the Schumpeterian school may too readily privilege innovation over price effects, the passage above suggests the Merger Guidelines may too readily discount innovation in favor of higher output, lower prices, and short-run efficiency.

A. Potential Sources of Efficiencies

A first step toward righting the balance between static and dynamic benefits in the welfare analysis of mergers is to see how a merger might lower the costs of R&D, or in other ways increase merging firms' abilities to innovate successfully. There are at least three types of effects that merging parties might assert would occur: (1) increased capabilities realized by combining complementary assets; (2) larger firm size, which somehow gives rise to a greater ability to absorb the risks of, or to fund, R&D; or (3) less competition and greater product-market profits, which can then fund R&D. We address these effects in order.

With respect to combining complementary assets, a fundamental issue is whether an alternative means (e.g., licensing of complementary intellectual property) can achieve the same efficiencies without removing a competitor. Mergers have specific institutional features that may give rise to certain advantages in facilitating the exchange of complementary assets. For example, Oliver Williamson argued that, under some conditions, merged ownership may reduce transaction costs of exchanging goods and services compared to less integrated forms of governance like

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[127] *Id.*

contracts or joint ventures.[128] Available research shows, however, that the issue needs careful attention on a case-by-case basis.[129]

Turning to the second type of effect, considerable debate surrounds the relevance of firm size for innovation.[130] Following Schumpeter, some observers have praised large enterprises for their superior ability to attract financial and human capital, bear the risk, and recoup the investment required for sustained R&D activities.[131] Other analysts tout small firms as being more creative than larger, more bureaucratic enterprises.[132] Many empirical studies have addressed the relationship between firm size and innovation. Most recent research yields a consensus that, in general, R&D rises only proportionally, and only up to a point, with firm size.[133] The strength of the causal relationship between firm size and R&D, however, remains somewhat questionable despite the observed correlations. Because many variables correlate with firm size, it is unclear in many studies whether firm size itself is a statistically significant factor in innovation. Although early studies did purport to find significance,[134] others have found that, when other firm and industry characteristics are factored in, firm size does not significantly affect R&D investment.[135] When the focus of analysis shifts from innovation inputs, such as R&D expenditures, to outputs, such as patents, large firms show no advantage over small ones.[136] Data matching R&D investment with patent output

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[128] OLIVER E. WILLIAMSON, MARKETS AND HIERARCHIES: ANALYSIS AND ANTITRUST IMPLICATIONS (1975).

[129] For a general comparison of alternative institutional arrangements, including merger, see Michael L. Katz, *Joint Ventures as a Means of Assembling Complementary Inputs*, 4 GROUP DECISION & NEGOTIATION 383 (1995). For a survey of empirical research testing transaction-cost hypotheses, see Howard A. Shelanski & Peter G. Klein, *Empirical Research in Transaction Cost Economics: A Review and Assessment*, 11 J.L. ECON. & ORG. 335 (1995).

[130] For an overview of the ambiguous relationship between firm size and innovation, see Wesley M. Cohen & Steven Klepper, *A Reprise of Firm Size and R&D*, 106 ECON. J. 925 (1996).

[131] JOHN KENNETH GALBRAITH, AMERICAN CAPITALISM: THE CONCEPT OF COUNTERVAILING POWER (1952); WILLIAM D. NORDHAUS, INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE (1969).

[132] MORTON I. KAMIEN & NANCY L. SCHWARTZ, MARKET STRUCTURE AND INNOVATION (1982); Cohen & Levin, *supra* note 58, at 1067.

[133] F.M. Scherer, *Firm Size, Market Structure, Opportunity, and the Output of Patented Inventions*, 55 AM. ECON. REV. 1097 (1965).

[134] Cohen & Levin, *supra* note 58.

[135] Cohen, Levin & Mowery, *supra* note 54; Cohen & Levin, *supra* note 58.

[136] Franklin Fisher & Peter Temin, *Returns to Scale in Research and Development: What Does the Schumpeterian Hypotheses Imply?*, 81 J. POL. ECON. 56 (1973); Meir Kohn & John T. Scott, *Scale Economies in Research and Development: The Schumpeterian Hypothesis*, 30 J. INDUS. ECON. 239 (Mar. 1982), ZOLTAN J. ACS & DAVID B. AUDRETSCH, INNOVATION AND SMALL FIRMS (1990); Zoltan J. Acs & David B. Audretsch, *R&D, Firm Size, and Innovative Activity*, *in* INNOVATION AND TECHNOLOGICAL CHANGE: AN INTERNATIONAL COMPARISON (Zoltan J. Acs & David B. Audretsch eds., 1991).

have, in fact, shown that smaller firms produce more innovations per R&D dollar and per employee than do large firms.[137]

The evidence overall, thus, suggests that, to the extent firm size has an effect on innovation, its magnitude and direction depend on associated industry-level variables and are susceptible to few general presumptions. The results suggest that especially large firms have no special tendency—nor any predictable reluctance—to engage in innovation, and that small, fringe firms may play important roles over time in technologically advancing markets.[138]

Lastly, consider the argument that greater product-market profits make it possible for firms to conduct additional R&D. The profits-innovation linkage has two interpretations. One is that the potential for product-market profits generates innovation incentives. This interpretation concerns competitive effects and was addressed earlier in Part IV, in which we discussed the complex link between market structure and innovation. The other interpretation is that current profits can generate free cash-flow to finance R&D efforts. Because this interpretation is loosely a statement about the production of innovation, rather than incentives, we will treat it here as an efficiency-based claim. A first observation is that a remarkable and dangerous lack of a limiting principle exists in this argument. By this argument, for example, why not grant a firm a monopoly in a completely unrelated market to generate the cash flow needed to conduct R&D in the market of concern? Second, given the overall efficiency of U.S. capital markets, this argument is inherently suspect. It is not surprising that, in their review of the empirical literature some years ago, Kamien and Schwartz found that "[i]n sum, the empirical evidence that either liquidity or profitability are conducive to innovative effort or output appears slim."[139]

Thus, neither the evidence on firm size nor that on profitability supports any presumption that mergers will enhance R&D investment or make that investment more productive. Assessments of efficiency benefits for innovation will, therefore, likely turn on the analysis of whether the merger under consideration allows the combination of complementary assets that would not otherwise be combined through a means posing less of a threat to competition. We now return to this question in greater detail.

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[137] Acs & Audretsch (1991), *supra* note 136.

[138] *See, e.g.*, Jonathan B. Baker, *Fringe Firms and Incentives to Innovate*, 63 ANTITRUST L.J. 621 (1995).

[139] KAMIEN & SCHWARTZ, *supra* note 132, at 98. *See also* our discussion of the innovation effects of firm profitability and liquidity *supra* Part IV.B.1.

B. Merger Specificity

If a simple, arm's-length transaction would allow the parties to reap the cost savings in some way that would not raise competitive concerns, then those cost savings do not justify the merger. As should be readily apparent, it can often be extremely difficult to assess whether a practical alternative (e.g., a research joint venture under which competing suppliers jointly invest in innovation and share the results among themselves) exists for realizing the cost savings. Complex issues arise because, in theory, two firms might be able to separate cooperation regarding product-market activities from cooperation with respect to R&D activities. Thus, in some cases, an important element of merger analysis is to determine whether the parties need a merger rather than a research joint venture or some other form of research cooperation that creates innovation benefits without sacrificing product-market competition.

A first step of the analysis is, therefore, to ask whether the parties offer a credible argument that they need to cooperate to increase or improve R&D. As part of this analysis, enforcement authorities will want to ask *why* the parties need to cooperate—is it, for example, to gain the benefit of complementary assets, to reduce costly duplication, or to reduce the risk of failing to appropriate the benefits of R&D? Once the merging parties establish the basis for cooperative R&D, the next step is to examine whether the parties can get those asserted R&D benefits through an institution like a joint venture or licensing contract that would still preserve competition between the parties in the product market. If so, then society would then have the benefits of cooperation without the social costs of reduced product market competition and its associated inefficiencies.

The evidence shows that the second step above—finding less restrictive alternatives to full merger for cooperative innovation—sometimes will be feasible and sometimes not. On one hand, the value of R&D joint ventures is sufficiently great that Congress in 1984 passed the National Cooperative Research Act, amended in 1993 and re-titled the National Cooperative Research and Production Act (NCRPA), designed to encourage and protect such ventures by reducing their potential exposure to antitrust liability.[140] Although it is unclear how effective the NCRPA has been, the motivation behind the statute appears to have been sound. For example, a detailed study of semiconductor R&D found that firms in that industry achieve valuable innovation efficiencies through joint ventures that are comparable to the benefits that would be achieved

[140] 15 U.S.C. §§ 4301–4305.

though mergers but without the product-market inefficiencies mergers can create.[141] Encouraging joint ventures over alternative mechanisms for collaborative R&D would likely be beneficial in that particular industry.

On the other hand, there is evidence that joint ventures will not always suffice. Sometimes governance of the comparatively arm's-length transactions of a joint venture may be more costly than where a single owner can intervene to set the terms of collaboration.[142] In a different vein, firms may be hesitant to enter into joint ventures with firms they perceive to have a competitive edge in the use and production of the innovations the joint venture develops, thus making the firms unwilling to put their complementary assets into the mix without a more complete and permanent fusion of the enterprises. The upshot is that the evidence and studies on the value of joint ventures do not counsel blocking R&D-motivated mergers, but they do show that there will sometimes be a serious question about the merger specificity of innovation-based efficiencies.

C. Tensions Between Efficiency and Consumer Welfare

Consideration of efficiencies in merger review typically brings to the fore the difference between a consumer-welfare standard and an economic-efficiency, or total-surplus, standard. Under a pure consumer-welfare standard, cost savings are relevant only to the extent that they are passed on to consumers in the form of lower prices or better products. Thus, a consumer-welfare standard would not count as benefits any projected savings in corporate overhead that are predicted to have no effect on product prices. Nonetheless, such savings would represent real gains to the economy, and they would be counted as benefits under a total-surplus standard.

The analysis of efficiencies from a static pricing perspective often focuses solely on variable costs, on the grounds that changes in fixed costs will not affect the calculation of profit-maximizing prices. However, a change in the fixed costs of innovation may trigger a change in the resulting level of innovation (i.e., whether a project is undertaken or not), which then has consequences for consumer welfare. Consequently, it is important that fixed costs not be summarily excluded from the

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[141] Ralph Siebert & Klaus Peter Gugler, *Market Power Versus Efficiency Effects of Mergers and Research Joint Ventures: Evidence from the Semiconductor Industry* (Nat'l Bureau of Econ. Research, Working Paper No. 10323, 2004).

[142] Howard A. Shelanski, *Transaction-Level Determinants of Transfer-Pricing Policy: Evidence from the High-Technology Sector,* 13 INDUS. & CORP. CHANGE 953 (2004).

efficiencies analysis when innovation is at issue. Another way of describing this point is to state that it is important to remember that, over a long enough time horizon, everything is variable. This fact suggests that the tension between the consumer-surplus and total-surplus standards is somewhat attenuated when one takes a long-run view; consumers also have a strong long-run interest in firms' having incentives to invest in innovation, as well as production and distribution, in order to supply goods and services that consumers desire.

The tensions between the welfare concepts do not disappear completely, however.[143] For example, under an efficiency standard, one would take into account the fact that a merger might eliminate socially wasteful duplication of R&D, even if doing so did not speed up the date at which innovation occurred or reduce quality-adjusted product prices. Indeed, an economic-efficiency standard would in some circumstances count as a benefit the fact that a merger slowed the rate of innovation from a socially excessive level, although a consumer-surplus standard might find the merger harmful because new products reach customers later than they otherwise would. Under a consumer-welfare standard the cost savings from any reduction in innovation would count as benefits only if passed through to consumers as lower prices, similar to the criterion for weighing productive efficiencies in the conventional merger-review framework. But in the conventional, static-efficiencies situation, the consumer ideally gets the same product at a lower price post-merger (or at the same price, where the efficiencies offset adverse competitive effects). In contrast, when a merger reduces inefficient innovation, the consumer, at best, gets a different (less advanced) product at a lower post-merger price, and the price reduction may not compensate for the difference in product characteristics.

Indeed, there is a broader problem. As discussed next, there may not be a tight correspondence between the magnitude of the R&D investment and the magnitude of the resulting consumer-welfare benefit. If merger policy continues to increase its focus on innovation, it may therefore have to deal with welfare trade-offs that antitrust does not confront in conventional product-market competition cases. To do that it will need to adopt a more rigorous framework for judging a merger's predicted effects.

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[143] For a recent discussion of why the dynamic perspective does not fully reduce the tensions, see Steven C. Salop, Question: What Is the Real and Proper Antitrust Welfare Standard? Answer: The True Consumer Welfare Standard (Nov. 2005) (unpublished manuscript, on file with authors).

D. Assessing Consumer Welfare over Time and Under Uncertainty

Efficiencies are typically difficult to project with any confidence, even when innovation is not an issue. For several reasons, innovation makes the task even more difficult. First, there is a large element of uncertainty in innovation, and R&D projects often have long gestation periods. Second, as discussed above, economists, policy makers, and business decision makers only imperfectly understand the drivers of innovation. Third, where efficiency leads to greater product innovation and consumers have heterogeneous valuations of quality, projecting net consumer benefits can be complex. Finally, to the extent that innovation involves discrete projects and fixed-cost commitments, even a small change in fixed costs can lead to a large change in consumer welfare. This relationship holds when the cost change (or other merger efficiency) tips the balance in favor of a supplier's undertaking a discrete investment that generates a large amount of consumer surplus, such as the introduction of a new product. In principle, the consumer surplus generated by these new services made possible by an R&D investment can exceed the merger-specific reduction in the costs of conducting the R&D. Thus, the agencies have to be careful not to measure the efficiency benefits of R&D cost savings purely in terms of the cost savings themselves. Innovation can potentially multiply these benefits.

The extent of uncertainty makes the assessment of efficiencies difficult, and the general lack of sophistication in the treatment of uncertainty in litigation makes the problem worse. Uncertainty also arises from several other aspects of merger analysis, such as predicting competitor responses to the merger. In the innovation context, the treatment of uncertainty becomes even more critical because systematic presumptions about the effects of market concentration on innovation are particularly elusive. Both in conventional cases and in cases where innovation is an important consideration, merger review will have to do a good job of accounting for the effects of uncertain events to ensure its predictions and presumptions are welfare enhancing.

Unfortunately, current practice does not handle uncertainty well. Under current practice, for example, the agencies often take an approach of considering a two-year horizon in assessing the effects of entry, with little or no discounting within the horizon and complete discounting of anything beyond.[144] Similarly, efficiency benefits that are realized only

[144] Merger Guidelines, *supra* note 18, § 3.2. The agencies sometimes take a more sophisticated view, at least when deciding whether to file a case against a proposed merger, if not in court.

with a lag are "given less weight because they are less proximate and more difficult to predict."[145] The agencies and courts further appear to adopt arbitrary probability thresholds, whereby unlikely events are treated as impossible events. These approaches to uncertainty can lead to biased decision making. For instance, they tend to underestimate the effects of potentially revolutionary innovations that have some probability of having large effects over a period of several years.

To make the issue of probability thresholds more concrete, consider a merger that would likely increase market power by a modest amount but would, with less certainty, allow for substantial production efficiencies that make price decreases profitable for the merged entity. What weight do the less-than-likely efficiencies receive in the agency's overall assessment of the merger? Zero? Its magnitude discounted by its probability—i.e., its expected value? Something in between? The agencies and courts have not been clear or consistent in articulating how different potential effects factor into merger analysis, nor have they adopted a coherent method to account for uncertainty.

In its 1996 report, *Competition Policy in the New High-Tech, Global Marketplace*[146] (*1996 FTC Report*), the FTC came out squarely in favor of taking into account both the magnitudes and probabilities of potential, merger-related efficiencies. That position appears to be consistent with an approach that gives some weight to low-probability events and to be contrary to an approach that drops efficiencies from consideration based on a low probability alone. Yet the *1996 FTC Report* never expressly states how the agency should use the probabilities and magnitudes of efficiencies in analyzing a given merger. And the DOJ has continued to advocate a stringent standard of proof for efficiencies before the courts, suggesting that the agencies may still, at least implicitly, impose probability thresholds in their internal decision making.[147]

For their part, the federal courts have often relied on the Merger Guidelines to hold merging parties to a standard of "clear and convincing" proof that a merger would produce pro-consumer efficiencies.[148] Such a stringent evidentiary standard has the practical effect of imposing a probability threshold on efficiencies that has to be cleared before a

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[145] *Id.* § 4 n.37.

[146] 1 FEDERAL TRADE COMM'N, COMPETITION POLICY IN THE NEW HIGH-TECH, GLOBAL MARKETPLACE (1996), *available at* http://www.ftc.gov/opp/global/report/gc_v1.pdf.

[147] *See* David Balto, *The Efficiency Defense in Merger Review: Progress or Stagnation*, ANTITRUST, Fall 2001, at 74 n.39.

[148] *See, e.g.*, United States v. Country Lake Foods, 754 F. Supp. 669, 680 n.13 (D. Minn. 1990); United States v. Rockford Mem'l Corp., 717 F. Supp. 1251 (N.D. Ill. 1989).

court will take them into account: if proven to a "clear and convincing" likelihood, then the efficiencies get counted (although to what extent is not clear from the cases or agency practice), and if the evidence falls short of proving that level of likelihood, then the efficiencies are rejected and receive no weight at all.

In recent years, however, some courts have rejected the "clear and convincing" language. The D.C. District Court in *FTC v. Staples, Inc.* stated that such a standard would impose on defendants "the nearly impossible task of rebutting a possibility with a certainty."[149] The court's statement accords not only with common sense, but with decision theory as well. In contrast, the DOJ's position would require that efficiencies be proved to a very high level of probability before they could be balanced against anticompetitive merger effects, even if the anticompetitive effects had no greater a likelihood of occurring or had a smaller expected value. In place of the clear-and-convincing standard, the *Staples* court applied a "credible evidence" standard: "[D]efendants must simply rebut the presumption that the merger will substantially lessen competition by showing that the [FTC's] evidence gives an inaccurate prediction of the proposed acquisition's probable effect. Defendants, however, must do this with credible evidence."[150]

In a subsequent case, *FTC v. H.J. Heinz Co.*, the U.S. Court of Appeals for the D.C. Circuit characterized the necessary level of proof as that necessary "to ensure that those 'efficiencies' represent more than mere speculation and promises about post-merger behavior."[151] But even though the *Heinz* decision did not require that the efficiencies evidence be "clear and convincing," it did require that the efficiencies themselves be of "extraordinary" magnitude.[152] If proponents of a transaction could not prove the merger-specific efficiencies to be "substantial," the court ruled, then the efficiencies could not rebut the presumption of harm where the merger would result in a high level of concentration.[153] It is unclear from *Heinz* whether the court was saying that lower (i.e., below "extraordinary") levels of merger-specific efficiency gains could not as a matter of law be used to rebut an anticompetitive presumption or that lower levels of efficiency gains would not as a matter of fact offset the competitive harms from high concentration. Either interpretation is problematic for effective merger review. If modest efficiencies will be

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[149] 970 F. Supp. 1066, 1089 (D.D.C. 1997).

[150] *Id.*

[151] 246 F.3d 708, 721 (D.C. Cir. 2001).

[152] *Id.* at 720.

[153] *Id.*

achieved with a high probability, why should they be barred from consideration? In many cases, they may fail to offset the presumption of harm. But in cases where the probability of harm is moderate and the level of that harm low, even modest efficiencies could make the merger welfare-enhancing. Consequently, there seems to be no good reason to bar such efficiencies from consideration.

Given the history of agency skepticism about efficiencies, and the difficulty parties have had getting efficiency evidence credited by the courts, the murky standards raise the prospect that merger enforcement is driven by likely outcomes to the exclusion of unlikely outcomes, even if the less likely outcomes would have major impacts if they did occur. Such a focus on probabilities to the exclusion of magnitudes can lead to a merger being challenged and possibly blocked if it is found likely to give rise to consumer harm even if, for example, there were a 60 percent chance that consumers would suffer $100 million in harm and a 40 percent chance that consumers would reap $200 million in benefit. In effect, the probability-oriented approach acts as if consumers are extremely risk averse, even for products that account for a small percentage of consumer expenditures.[154] This central shortcoming of merger enforcement is magnified when innovation is involved.

We think that agencies and courts can improve merger analysis in the presence of uncertainty by applying the well-accepted body of economic decision theory that addresses how to make choices under uncertain conditions. Deciding whether to clear or block a merger involves uncertainty about the prospective costs and benefits of the transaction. A decision-theoretic approach to choice under uncertainty can be formalized as picking the course of action that yields the highest expected payoff to the decision maker, where the expected value of taking an action is equal to the payoffs associated with the different possible outcomes that can follow from that action weighted by the probabilities that those outcomes will occur if the action is taken. Rational decision making under this approach requires an understanding of the set of outcomes that can potentially follow from alternative courses of action; the probabilities that the different outcomes will arise conditional on the course of action taken; and the payoffs associated with the different potential outcomes.

Consider a simple hypothetical in which there are four possible outcomes: (a) a significant increase in market power with no efficiencies; (b) a significant increase in market power with efficiencies; (c) an

[154] Moreover, it is well known that a consumer who is risk-neutral with respect to income will be risk-loving with respect to prices.

insignificant increase in market power with no efficiencies; and (d) an insignificant increase in market power with efficiencies.[155] Suppose that the chances of the different outcomes arising are 36 percent for outcome (a), 24 percent for (b), 24 percent for (c), and 16 percent for (d). Finally, suppose that the respective payoffs for the different outcomes are: (a) −80 million; (b) 80 million; (c) −1 million; and (d) 160 million.

Under the probability-threshold approach, efficiencies would very likely be dismissed because they arise only under (b) and (d), which have a combined likelihood of 40 percent. However, significant increase in market power is more likely than not because outcomes (a) and (b) arise with a combined probability of 60 percent. Thus, the threshold approach would very likely reject the merger. In contrast, the decision-theoretic approach indicates that the antitrust authorities should approve the merger in order to promote consumer welfare. Specifically, the expected payoff from the merger measured in millions is found by multiplying each outcome's probability by the outcome's payoff and then taking the sum of those four products:

$$-80 \times .36 + 80 \times .24 - 1 \times .24 + 160 \times .16 = 15.76.$$

The above calculation reveals a positive expected welfare change from the merger—a benefit that could be lost if authorities followed the threshold approach and moved to block the transaction. In a separate paper we develop the expected value approach more formally and demonstrate how it can help antitrust agencies to improve the welfare results of merger review.[156] We also demonstrate that such a decision-theoretic approach is compatible with whatever balance of risks—e.g., between achieving benefits or avoiding harms—policy makers wish to incorporate into merger review.[157] The important point for current purposes is that a better approach exists for merger authorities to grapple with uncertain, future events than the often implicit probability thresholds and temporal cut-offs that agencies now use. As important as a better approach to uncertainty is to merger review in any case, it is particularly so where innovation and its attendant uncertainties are at issue.

Lastly, one might argue that expected welfare calculations under a decision-theoretic approach to merger review are too difficult for agencies and courts to implement. We agree that it will sometimes be difficult

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[155] In our example, either there are no efficiencies or efficiencies are fully realized. In practice, there may be several different levels of efficiencies that might be attained with positive probability. The expected-payoff readily generalizes to any number of possibilities.

[156] Katz & Shelanski, *supra* note 95.

[157] In addition, we discuss why the use of higher discount rates is a poor heuristic for capturing increased uncertainty over time.

for parties or reviewing authorities to assign probabilities or values to a merger's predicted effects. But this difficulty must be considered in light of current practice. Our recommended approach simply requires that implicit judgments of current practice be made explicit. A similar point applies to the treatment of innovation more broadly. The impact of market structure on innovation and of innovation on economic welfare will occur whether or not antitrust policy accounts for them. If the agencies choose to ignore innovation or to engage in a wholesale retreat from enforcement in the name of promoting innovation, judgments about the impacts for and from innovation would be made implicitly and without reflection.

VIII. REMEDIES AND POST-MERGER CONSIDERATIONS

Several public policy responses are available if analysis indicates that the net effect of a merger in its proposed form may be substantially to lessen competition or to tend to create a monopoly. These steps include blocking the transaction outright, forcing the divestiture of assets where competitive overlaps are particularly significant, requiring licensing of intellectual property to other firms to allow them to compete more effectively with the merging parties, and limiting the merged firm's conduct (e.g., imposing a requirement to offer the same prices to all customers to prevent the merged firm from targeting customers whose only practical options were the two merging suppliers).

A. The Role of Intellectual Property in Remedies for Traditional Concerns

When intellectual property rights are sufficiently strong that licensing is feasible, it can be used in fashioning a remedy to a proposed merger that raises significant concerns of harm to static price and output competition. Licensing remedies have become an important tool in the review and clearance of mergers in markets with considerable past innovation and significant intellectual property assets. For example, in 2001 the DOJ filed a complaint challenging the proposed acquisition of DTM Corporation (DTM) by 3D Systems Corporation (3D).[158] The firms competed in the sale of rapid prototyping (RP) systems, which transform a digitally encoded design into a three-dimensional object. The process can be used to produce models and even low-volume production quantities by what might be loosely thought of as three-dimensional laser printing.

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[158] Verified Complaint, United States v. 3D Sys. Corp., No. 1:01CV01237 (D.D.C. June 6, 2001), *available at* http://www.usdoj.gov/atr/cases/f8800/8896.htm.

Both 3D and DTM held extensive patent portfolios related to RP systems production that prevented firms that sold RP systems abroad from competing in the United States. As discussed below in Part IX, the DOJ was concerned that the merger would significantly reduce competition. The DOJ and the parties reached a settlement that required 3D and DTM to grant a nonexclusive license to manufacture and sell products under the defendants' RP patent portfolios within specific fields of use.[159] The idea was to allow a foreign supplier to enter the U.S. market as a replacement for the loss of an independent competitor through merger. The licensee was required to be a firm currently manufacturing industrial RP systems in a foreign market, so that it would have a demonstrated ability to compete.[160]

As a general matter, there are two antitrust rationales for compulsory licensing: (1) to remedy a refusal to license that itself is held to be exclusionary and to constitute an antitrust violation, and (2) to ameliorate the effects of another action that is illegal or—absent licensing—would be prohibited under the antitrust laws. Licensing as a remedy in a merger case falls into this second category.

The two rationales can have very different effects on incentives to innovate. A general duty to deal under antitrust law weakens intellectual property rights and may create disincentives to engage in certain innovative efforts. In contrast, compulsory licensing as a remedy that allows a merger to go through may not weaken innovation incentives and theoretically could even increase them. For example, to the extent that licensing is a means of restoring competition that is less costly to the defendant than are alternatives (e.g., dissolving the merger), the defendant benefits from having created intellectual property that can be incorporated into a remedy. Although it is far from evident that these positive effects on R&D incentives are significant, the argument does at least suggest that any negative incentive effects from licensing remedies may be insignificant.

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[159] Stipulation and Order, United States v. 3D Sys. Corp., No. 1:01CV01237, 2001 WL 964343 at *4 (D.D.C. Aug. 16, 2001).

[160] *Id.* Intellectual property assets also were included in the divestitures required to settle *United States v. Premdor*. *See* Proposed Final Judgment, United States v. Premdor, Inc., Docket No. CV-01-01696 (D.D.C. Aug. 3, 2001), *available at* http://www.usdoj.gov/atr/cases/f8900/8908.htm. Similarly, *United States v. Miller Industries* involved acquisitions of tow truck companies holding important patents and led to a consent decree with mandatory licensing. *See* Complaint, United States v. Miller Indus., Inc., Docket No. 1:00CV00305 (D.D.C. Feb. 17, 2000), *available at* http://www.usdoj.gov/atr/cases/f4100/4188.htm; Stipulation and Final Judgment, United States v. Miller Indus., Inc., Docket No. 1:00CV00305 (D.D.C. Feb. 17, 2000) *available at* http://www.usdoj.gov/atr/cases/f4100/4187.htm.

B. Remedies for Innovation Concerns

Merger remedies can involve the divestiture or licensing of assets, including intellectual property, specifically to maintain innovation competition and not just price competition. The challenge for merger policy in crafting remedies for cases in which innovation is a central concern is to identify the right assets for divestiture or, where those assets are intellectual property, for licensing. In the case where, for example, two drugstore chains seek to merge, divestiture is relatively straightforward in principle: the parties must divest stores where the premerger firms have overlapping territories. To be sure, assuring that those stores are divested in a way that maintains their competitive viability against the merged entity may present challenges, but identifying which stores to divest tends to be easy.

The problem tends to be much harder when the assets to be divested are intended to maintain competition in innovation, particularly when those assets are human capital. It can be difficult to determine which personnel are central to an innovation effort and where in the company they are located. Although a firm can be ordered to sell some or all of a research unit, employees cannot be required to remain with that unit.[161] Beyond human capital issues, there may be questions regarding whether R&D is conducted in a way that it is severable for purposes of divestiture. Identifying the intellectual property rights that would be needed in order to make use of future innovation also can be very difficult. These problems are not necessarily insurmountable, but they do highlight some of the challenges that innovation creates for remedial merger policy. As the cases in Part IX demonstrate, enforcement agencies have been slowly grappling with issues of innovation-oriented remedies in merger cases over the past decade.

C. Post-Merger Considerations

Innovation considerations may also affect antitrust policy toward a merged entity after an acquisition is consummated. A detailed analysis of how innovation affects application of antitrust laws generally is beyond the scope of this article. But a brief discussion of the role antitrust might play in the post-merger environment demonstrates that the complexity innovation may introduce into the possibilities for later antitrust scrutiny of the merged firm lends particular importance to getting the merger review right in the first place.

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[161] In this regard, the divestiture of intellectual property to preserve product-market competition is more similar to the manufacturing/retailing paradigm than to the innovation paradigm.

In particular, there are several difficult challenges that may arise in determining when and how the antimonopoly provisions of Section 2 of the Sherman Act should apply to innovative firms.[162] Suppose a merged entity turns out to become dominant. Separating the degree to which the dominance flows from beneficial innovation or from anticompetitive actions can be difficult.[163] Even defining a violation can be particularly difficult. Is integration of increasingly advanced functions into a product efficient innovation or anticompetitive tying or bundling? Once a violation is proven, it can be especially difficult to design a remedy in fast-moving environments of technological change. Antitrust authorities will face the challenge of crafting remedies that constrain anticompetitive behavior without reducing innovation or network benefits that may have accrued to consumers.

IX. INNOVATION CASES

The U.S. antitrust agencies have by now reviewed several mergers in which innovation was an important consideration. A review of those cases helps to understand how far the agencies have been willing to incorporate innovation concerns into merger policy and also to assess the kinds of cases in which the agencies have been, or can be, successful in that enterprise.

Before examining actual cases, we lay out three canonical situations to frame some of the recurring issues. These situations illustrate both the different ways in which innovation can factor into merger policy and how those innovation-related inquiries differ from the traditional inquiry focused on short-term price and output effects. The first two cases represent the opposite ends of a continuum that begins with conventional considerations of actual or potential competition in product markets, where innovation serves as supporting evidence, and runs all the way to cases in which innovation is the sole or central concern of the merger analysis. The third case illustrates that situations can exist in the middle, where potentially there are significant trade-offs between static and dynamic competition or there is a need to evaluate alternative institutions in terms of both types of efficiency considerations simultaneously.

A. Canonical Situations

The concept of innovation can span a spectrum of activities ranging from pure research aimed at making discoveries in basic science, to

[162] For a discussion of the application of Section 2 to high-technology markets, see Evans & Schmalensee, *supra* note 8.

[163] Much of the public debate surrounding the DOJ's pursuit of Microsoft, for example, involved precisely that question.

developmental activities that apply known inventions and scientific results to the improvement of existing products or production processes. The closer the innovation at issue in a particular merger is to resulting in an identifiable, predictable product, the more likely the issue for merger review will be how the innovation will affect future structure and performance in the product market relevant to the transaction (i.e., the innovation impact effect). The farther the innovation is from a tangible result, the more likely the question for merger authorities will be how the transaction will affect the likelihood and level of continued investment in R&D (i.e., the innovation incentives effect). Three canonical situations illustrate this point.

Case 1: Innovation that is well underway to create or improve defined products and processes. We begin by considering situations in which the innovation efforts of the merging parties and their rivals are largely complete.[164] In some cases, the firms may already be product-market competitors, with ongoing R&D efforts aimed at improving existing products and processes. In other cases, the firms seeking to merge may not yet be competitors in any product market, but these firms may be developing products that will enable the firms to compete with one another in one or more product markets in the future.

In the settings just described, the potential harms from a merger arise not so much from the elimination of competing R&D as from the elimination of future product-market competition between the merging parties. Hence, the focus of merger analysis is the conventional one of product-market competition rather than anything specially to do with innovation. However, the presence of not-yet-complete innovative efforts complicates the inquiry into how the merger will affect product-market competition because the central task for merger analysis is to form predictions about what competition will look like in the future, with and without the merger. Where innovation efforts are well underway but have not yet resulted in a tangible product, the ongoing innovation may serve as evidence to support treating the merging firms as potential competitors: firms that have made substantial investment and progress toward entering a market are much more predictable entrants than are firms that could merely undertake such investment. When the merging firms do not yet compete in a product market, however, definitive evidence about cost and demand conditions on which to base predictions of the state of competition tends to be lacking. Even where firms are

[164] Admittedly, this case is somewhat artificial. Actual markets are likely to have ongoing waves of innovation.

already product-market competitors, ongoing R&D efforts may change the future competitive positions of one or more suppliers.

Case 2: Innovation-based race to market dominance. We next consider situations in which the innovation efforts of the merging parties and their rivals are the focus of the merger analysis and product-market competition is largely unaffected by the merger. One type of situation fitting this description is winner-take-all competition, where the firms undertake competing R&D efforts and the winner of this R&D competition achieves market dominance because of a patent, the realization of network effects, or some other phenomenon, such as the award of a major military procurement contract on a sole-source basis. If the innovation process literally is winner-take-all, then the question of how the merger affects product-market competition, which lies at the heart of conventional merger analysis, simply does not arise: the post-innovation product market will be monopolized whether or not the proposed merger occurs. The public policy concern here is whether the merger will diminish R&D competition and/or investment and, thereby, either retard the introduction of new products or result in products that offer consumers smaller net benefits.

Another type of situation in which innovation competition is the sole focus is one in which the firms proposing to merge produce similar products in several distinct geographic markets and are actual or potential competitors in only a proper subset of those markets. Specifically, suppose that only one of the two firms is present in a U.S. market. Then there would be no conventional concerns regarding a loss of price competition. But the reduced competition in other geographic markets could slow innovation and, thus, adversely affect U.S. consumers.

Case 3: Commercially rational delay in competitive innovation. Our final case illustrates the fact that there can be a tension, and hence the need to make a trade-off, between static and dynamic policy objectives. When successful innovation cannot be protected from replication or imitation by competitors, perhaps because of weak intellectual property rights, a firm may not race for the lead but instead wait for another firm to do the hard work that the waiting firm can then copy. If all firms reason this way, then no firm will want to take the lead and subsidize its competitor's R&D, and the result will be a waiting game. Innovation will be delayed, possibly forever. In this case, antitrust agencies may face a choice between (1) allowing the waiting firms to merge and internalize the free-riding problem, which would then hasten innovation but end product-market competition, and (2) blocking the merger, which would preserve product-market competition for existing products but might significantly

or permanently delay the development and introduction of new products. In other words, the choice is whether to promote long-run innovation or protect short-run price competition. Similar effects and issues arise when a merger would increase innovation by bringing together complementary assets but would harm short-run price competition.

Actual enforcement choices may not be as polarized as in this hypothetical. In particular, alternative institutions, such as research joint ventures, may allow firms to cooperate in the conduct of R&D while remaining product-market competitors. Hence, the evaluation of these alternative institutions may be an important component of merger analysis in certain situations where innovation is an important dimension of market performance.

Each of the three canonical situations implies a distinct kind of merger inquiry from the traditional case focused on static price effects. The sections below survey actual cases that to varying degrees reflect the three canonical situations and their associated concerns about the relationship between mergers and technological innovation.

B. Starting to Take Innovation Seriously

One of the first merger enforcement actions expressly motivated by innovation concerns was the FTC's 1990 challenge to Roche Holding's acquisition of Genentech on the grounds that consolidation of ongoing R&D efforts would affect the future product market and slow the pace of innovation.[165] The FTC's complaint asserted that Roche and Genentech competed in R&D for important therapies for the treatment of AIDS and HIV infection. Genentech was considered to be the leader in developing such treatments, and Roche was actively involved in a competing development effort.[166]

The FTC framed the issue with respect to AIDS/HIV therapies purely as one of innovation. The FTC's focus was on the race to develop products, not on competition in the market for existing products. Others also frame the *Roche/Genentech* case as one about preserving innovation incentives in the market for the drug therapies actually under development.[167]

In terms of the three canonical situations we discussed above, the *Roche/Genentech* case appears to fit Case 1, in which innovation is a

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[165] Roche Holding Ltd., 113 F.T.C. 1086 (consent order final, 1990).

[166] *See* Gilbert & Sunshine, *supra* note 104, for further discussion of this case.

[167] *See, e.g., id.*

concern principally because of substantial existing R&D efforts that were very likely to give rise to actual or potential competition in an identifiable product market.[168] First, with respect to treatments for human growth hormone deficiency, Roche appeared to have reached a point where its entry into the market was no longer speculative and the question was more a conventional one of price competition than of innovation. Second, although the potential product-market competition between Roche and Genentech in the AIDS/HIV therapy market was more speculative because both firms were still in the R&D phase, the competing R&D efforts were well underway, and the FTC found strong evidence to support its predictions that: (a) the relevant product market would develop, and (b) Roche and Genentech were the most promising of a small group of companies racing to develop certain AIDS/HIV treatments. Thus, even for AIDS/HIV therapies, the FTC did not have to rely on a prediction that the acquisition would have reduced the rival innovation efforts.

The DOJ first challenged a merger on innovation grounds in 1993, when it investigated ZF Friedrichshafen's (ZF) proposed—and later abandoned—acquisition of General Motors's Allison division.[169] Allison and ZF produced 85 percent of the world output of heavy-duty automatic transmissions for trucks and buses. The companies competed against each other in the European market for such transmissions, but not in the North American market, in which GM was dominant.[170] The DOJ nonetheless concluded that even consumers in markets whose concentration would be unaffected by the merger would be harmed by the transaction's reduction in Allison's and ZF's incentives to develop new designs and products.[171] This case was the first expressly to discuss possible R&D-related harms to consumers in geographic markets in which the merger would not directly affect price or output competition, and thus is an example of the scenario described in Case 2, above.

The *ZF/Allison* case can be seen as a precursor to the kind of analysis Richard Gilbert and Steven Sunshine later advocated in their proposed innovation-markets approach. In some respects, however, the case is weak precedent for the recognition of innovation markets in merger policy because it does not appear that the outcome turned on innovation

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[168] Some of the concerns raised by the transaction were traditional ones of product-market competition. For example, Roche was on the verge of becoming the major challenger to Genentech's dominant position in the market for human growth hormone deficiency treatments.

[169] United States v. Gen. Motors Corp., Civ. No. 93-530 (D. Del. filed Nov. 16, 1993), 6 Trade Reg. Rep. (CCH) ¶ 45,093.

[170] *Id.*

[171] *Id.*

concerns. The merger to an 85 percent market share of global industry sales of heavy-duty transmissions with a number of other overlapping product and geographic markets (including nontransmission products in the United States) probably raised enough conventional concerns about static allocative efficiency to justify blocking the merger. To be sure, in the *ZF/Allison* case, the traditional efficiency concerns were less salient because in some important geographic markets the companies did not compete with each other in the sale of relevant products. In those markets, the case against the merger was bolstered by the argument for preserving innovation incentives even absent concerns for product-market competition.

Even though there is no evidence that innovation considerations were decisive in the light of more conventional factors, in one important respect the *ZF/Allison* case was more aggressive in its emphasis on innovation than the Gilbert and Sunshine approach later counseled. Gilbert and Sunshine recommended using innovation markets only where specific R&D efforts that might be affected by the merger could be identified, as in the *Roche/Genentech* case. However, the DOJ's focus was not on preserving innovation tied to any particular product or identifiable line of research but instead on preserving conditions likely to be more conducive to any innovation in the sector generally. The DOJ's action suggests that, if a merger would leave an industry with near-monopoly concentration and without other likely sources of new developments, then harm to *potential* innovation could justify a challenge to the transaction.

The *ZF/Allison* action is, thus, novel because it preserves separate entities not only for reasons of price competition (in some geographic markets) but also for reasons of future innovation (in all geographic markets) on the grounds that it is better to have two potential innovators rather than one to preserve the possibility for future competition in the sale of new technology or for future product-market competition. In the context of a merger to near-monopoly, the idea does not seem so radical. But, in principle, this reasoning represents an important change in traditional merger analysis. It remains to be seen how deep this change runs. The case gives little insight into how the agencies would evaluate a transaction in which the post-merger market share was less dominant or in which only innovation, and not product-market competition, was at stake.

C. Transitional Cases: Innovation Moves to the Fore

The two factors central to the *Roche/Genentech* and *ZF/Allison* cases—high levels of concentration and competing innovation efforts—have

also formed the basis for several more recent enforcement actions through which the relationship between merger policy and innovation has further developed.

Aerospace Mergers. The aerospace industry is one of the most innovative economic sectors in the United States. The market is characterized by high concentration levels but also (outside of the defense sector) by international competition. In the late 1990s the FTC and the DOJ approved one major aerospace merger and blocked another, respectively. Innovation considerations were central to these enforcement decisions.

In 1997 the FTC approved the merger of Boeing and McDonnell Douglas, the two largest commercial aircraft manufacturers in the United States.[172] In that case, analysis of innovation in the aerospace industry supported the merger, not because the transaction was expected to increase R&D, but because the analysis showed that McDonnell Douglas had fallen behind technologically and no longer could exert competitive pressure on its rivals.[173] Acquisition by Boeing would, therefore, not reduce future competition and would allow McDonnell Douglas's assets to be put to better use by a more technologically advanced enterprise.

Concerns about technological progress in aerospace led to a different conclusion with respect to Lockheed Martin's proposed acquisition of Northrop Grumman. The DOJ's challenge to the merger explained that Lockheed and Northrop were two of the leading suppliers of aircraft and electronics systems to the U.S. military.[174] The DOJ concluded that the merger would give Lockheed a monopoly in systems for airborne early-warning radar, electro-optical missile warning, fiber-optic towed decoys, and infrared countermeasure systems.[175] In addition, the merger would reduce the number of competitors from three to two in high-performance, fixed-wing military airplanes, on-board radio countermeasures, and stealth technology.[176] The DOJ contended that consolidation in these markets would lead to higher prices, higher costs, and reduced innovation for products and systems required by the U.S. military.[177]

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[172] *See* Robert Pitofsky et al., Statement of Chairman Robert Pitofsky and Commissioners Janet D. Steiger, Roscoe B. Starek III and Christine A. Varney in the Matter of The Boeing Company/McDonnell Douglas Corporation, FTC File No. 971-0051 (July 1, 1997), *available at* http://www.ftc.gov/opa/1997/07/boeingsta.htm.

[173] *Id.* at 2.

[174] Complaint, United States v. Lockheed Martin Corp., No. 1:98CV00731 (D.D.C. Mar. 23, 1998).

[175] *Id.* at 2.

[176] *Id.* at 3.

[177] *Id.*

Although traditional concerns about adverse effects on price competition were an important part of the DOJ's challenge to Lockheed's acquisition of Northrop, innovation concerns were central. For example, the DOJ noted that Lockheed and Northrop had both started R&D programs for advanced airborne early-warning radar systems, and the DOJ concluded that consolidation of the two R&D efforts would harm future military procurement.[178] The DOJ also found evidence that competition is particularly important for technological advances in high-performance military aircraft and that important innovations have often been made by firms other than the incumbent suppliers of particular systems. Thus, it concluded that "competition is vital to maximize both the innovative ideas associated with each military aircraft program, as well as the quality of the processes used to turn innovative ideas into cost-effective, technically sound, and efficiently produced aircraft."[179]

The DOJ's conclusion in the *Lockheed/Northrop* case that preserving competition in the relevant markets would enhance innovation was based principally on two factors that weighed against permitting the transaction: (1) evidence that Lockheed and Northrop were either actually conducting competing R&D on important products or were the leading contenders to conduct such R&D in the future, and (2) evidence that consolidation would lead to either monopoly or substantial dominance in relevant product markets, not just reducing, but in large part eliminating, competitive pressure to innovate.

Thus, to a large extent, *Lockheed/Northrop* fits the parameters of Case 2—what was at stake was the race to develop technology that would win a major government contract. The DOJ found, at least implicitly, that the benefits of faster innovation and a choice of alternative technologies offset possible costs of effort duplication in the aerospace/defense sector. In addition, it was possible that, if the two technologies that the competitors developed were truly substitutes (that is, both companies developed viable products), then the government would also get the benefit of conventional product-market competition between bidders for the contract. In other words, mixed with the innovation concern central to the case was also a more conventional, static pricing concern.[180]

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[178] *Id.* at 7–8.

[179] *Id.* at 26.

[180] Similar issues arose and conclusions were reached in the DOJ's challenge to a proposed merger of the only two companies that manufacture nuclear submarines for the United States. *See* United States v. Gen. Dynamics Corp. (D.D.C. filed Oct. 23, 2001), *available at* http://www.usdoj.gov/atr/cases/indx337.htm.

Biotechnology and Pharmaceuticals. In the mid-1990s innovation concerns played a central role in the FTC's crafting of a consent agreement with Ciba-Geigy and Sandoz that allowed them to merge into a new company, now known as Novartis. The FTC had raised several objections to the merger.[181] Along traditional merger policy lines, the FTC was concerned that the combination would give the merged entity power to raise prices in the markets for herbicides used in growing corn and for flea-control products for pets.[182] The more novel parts of the FTC's challenge, however, had to do with R&D and the prospects for future innovations in the market for gene therapy products—products that allow treatment of diseases and medical conditions by modifying genes in patients' cells.

At the time of the FTC's investigation in 1996 and 1997, no gene therapy products were on the market, or even approved by the Food and Drug Administration.[183] Conventional merger analysis, therefore, did not apply because no product market existed in which to analyze the merger's effects on prices and output. The FTC instead adopted a dynamic perspective and, looking to the future, it found long-run competitive concerns. The sales of gene therapy products were expected to grow rapidly, with projections for a $45 billion market by 2010.[184] Ciba and Sandoz were either among the few or the only firms with the technological capabilities and intellectual property rights necessary to develop gene therapy products commercially. The FTC stated in its complaint against the proposed merger that Ciba and Sandoz together would control essential patents, know-how, and proprietary commercial rights without which other firms—even if capable of developing gene therapy products—would be unable to commercialize them. The FTC was concerned that the post-merger company, Novartis, might not adequately license its gene therapy intellectual property to ensure that other firms would be able to close the R&D gap. The FTC concluded that "preserving long-run innovation in these circumstances is critical."[185]

The FTC did not, however, block the merger. Instead, it crafted a consent decree designed to correct those aspects of the transaction that raised concerns for current and future competition and innovation. As noted above, the FTC had conventional product-market competition

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[181] *See* Decision and Order, Ciba-Geigy Ltd. et al., FTC Docket No. C-3725 (Mar. 24, 1997), *available at* http://www.ftc.gov/os/1997/04/c3725.do.htm.

[182] *See* Complaint, Ciba-Geigy Ltd. et al., FTC Docket No. C-3725 (Apr. 8, 1997), *available at* http://www.ftc.gov/os/1997/04/c3725cmp.htm.

[183] *See* Analysis of Proposed Consent Order to Aid Public Comment at 3, Ciba-Geigy Ltd. et al., FTC Docket No. C-3725 (Dec. 17, 1996), *available at* http://www.ftc.gov/os/1996/12/ciba.pdf.

[184] *Id.*

[185] *Id.*

concerns with respect to the overlapping herbicide and flea-control businesses. The FTC accordingly ordered one party to divest those businesses.[186] More notable, however, was the fact that the FTC did not require divestiture of either firm's gene therapy division. Instead, Ciba and Sandoz agreed that they would license technology and patents sufficient for one of its major rivals to compete against the merged entity in the development of gene therapy products.[187]

The FTC's remedy steered between the potentially conflicting economic effects that a merger might have on R&D. On one hand, coordinating two entities' innovation efforts and possibly consolidating complementary capabilities can enhance innovation and allow the combination of entities to achieve what the entities individually could not do as easily.[188] On the other hand, concentrating markets to near-monopoly levels can dampen the pressure to innovate and reduce the enhanced probability of success that comes from multiple R&D efforts. Both concerns are reflected in the FTC's enforcement action. The FTC declined to order either Ciba or Sandoz to divest its gene therapy subsidiary because it found that R&D efforts between the parent companies and their respective subsidiaries were closely coordinated, making divestiture disruptive and counterproductive for innovation. The decision instead to order compulsory licensing to a capable competitor was designed to preserve both competition and the benefits of the merging parties' relationships with each other and their respective gene therapy subsidiaries.

The market context in which the FTC's focus on innovation occurred is significant. The merger did not simply change the degree of competition within a middling range of market concentration. Rather, the combination of Ciba and Sandoz concentrated nearly all innovation efforts and essential inputs for commercialization of gene therapy under one corporate roof. Innovation concerns were sufficient to motivate enforcement because the facts showed a combination of monopoly market structure and reduction in the number of actual (as opposed to potential) innovation efforts. To some degree, this was a traditional potential-entry case with respect to product-market competition. But the action also broke important new ground: it expressly recognized that a merger could be challenged on grounds of the effects it would have on future innovation and competition in a product market that does not yet—but likely will—exist.

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[186] *Id.*

[187] *Id.* at 9.

[188] There are, however, significant issues concerning whether a merger is necessary, or whether firms could instead rely on intellectual property licensing, contract research, or research joint ventures. *See* discussion of merger specificity *supra* Part VII.

The contrast between the *Ciba/Sandoz* action and the *ZF/Allison* action is an interesting one. In *ZF/Allison,* the issue concerned a product market with (as yet) nonexistent innovation; in *Ciba/Sandoz,* the issue was innovation for an (as yet) nonexistent product market.

D. Recent Case Developments: More Nuanced Analysis?

The antitrust agencies' focus on innovation in merger review, which became evident in the 1990s, has continued to develop. Although most innovation cases involve advanced stages of innovation—so that the issue is more one of potential product-market competition than innovation for its own sake—the DOJ and the FTC have both also expressed interest in protecting innovation for its own sake, as the following cases illustrate.

The proposed $16 billion merger of Hoechst and Rhône-Poulenc into the pharmaceutical company known as Aventis raised both potential and actual competition concerns for the FTC.[189] Innovation was central to the potential competition aspects of the merger. Hoechst had an existing anticlotting product and Rhône-Poulenc was close behind, with a product almost through the FDA review process. As in *Ciba/Sandoz,* the FTC was also concerned about a combination of patent portfolios, in this case, patents related to anticlotting agents. In December 1999 the FTC entered into a proposed consent agreement settling its charges that the merger would violate Section 7 of the Clayton Act. The parties were allowed to merge on the condition, among others, that they divest intellectual-property assets relating to Rhône-Poulenc's direct thrombin inhibitor drug Revasc to preserve competition and the opportunity for innovation in direct thrombin inhibition as a superior treatment for blood-clotting diseases.[190]

The FTC again faced a mix of product- and innovation-based potential competition issues in its challenge to the Amgen/Immunex merger in 2002.[191] At the time Amgen and Immunex proposed to merge, Amgen had the only IL-1 inhibitor (which is used to treat rheumatoid arthritis) on the U.S. market. Immunex and one other firm, Regeneron, were the only other companies with IL-1 inhibitors in U.S. clinical trials. The FTC feared that the combination of the Amgen and Immunex patent portfolios might allow the merged firm to block entry by Regeneron by eliminating potential competition in the sale of intellectual property by the merging parties to Regeneron or other third parties. The FTC

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[189] Hoechst AG & Rhone-Poulenc S.A., FTC Docket No. C-3939 (2000), *available at* http://www.ftc.gov/os/caselist/c3919.htm.

[190] *Id.*

[191] Amgen Inc. & Immunex Corp., FTC Docket No. C-4056 (2002), *available at* http://www.ftc.gov/os.caselist/c4056.htm.

expressed concern not only that the merger would harm potential product-market competition but also that the combination would reduce R&D competition for related new products.[192] The FTC nonetheless allowed the merger to proceed based on a consent decree that required the licensing of certain patents to Regeneron. The FTC reached a similar result in its review of the Glaxo/SmithKline Beecham merger in 2001.[193]

The cases discussed so far may leave the impression that innovation has been salient only in megamergers where billions of dollars are at stake in the transaction and/or in particular industry sectors, notably pharmaceuticals and defense aerospace. But that is not the case. As noted in our earlier discussion of remedies in Part VIII, the DOJ sued in 2001 to block 3D's proposed $45 million acquisition of DTM, alleging that the transaction as originally structured would have resulted in higher prices and less innovation for industrial RP systems in the United States.[194] The complaint alleged that "3D and DTM offered the most sophisticated systems in the industry and competed directly against each other in the development, manufacture, and sale of industrial rapid prototyping systems and materials."[195] The acquisition would have combined the two largest manufacturers of RP systems in the United States; reduced the number of competitors in the U.S. market for industrial RP systems from three to two; and resulted in the combined company having a U.S. market share, by revenue, of 80 percent.[196] The DOJ settled the case through a consent decree that required 3D and DTM to license their RP-related patents to a firm that would compete against the merged enterprise in the U.S. market. The district court's decision entering the decree expressly discussed the merger's potential impact on innovation as well as price competition in the market for rapid prototyping systems, although the licensing remedy seems more directly aimed at potential product-market competition than at innovation.[197]

Taken together, the merger cases in which the U.S. antitrust agencies have made innovation a central issue fall mostly into the first of the abstract cases we set out at the beginning of this section: they have

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[192] Complaint, Amgen Inc. & Immunex Corp., FTC Docket No. C-4056, 5-6 (Sept. 6, 2002), *available at* http://www.ftc.gov/os/caselist/c4056.htm.

[193] Decision and Order, Glaxo Wellcome plc. & SmithKline Beecham plc., FTC Docket No. C-3990 (Dec. 18, 2000), *available at* http://www.ftc.gov/os/2000/12/glaxodo.pdf. *See also* Complaint, Glaxo Wellcome plc. & SmithKline Beecham plc., FTC Docket No. C-3990 (Dec. 15, 2000), *available at* http://www.ftc.gov/os/2000/12/glaxosmithklinecmp.pdf.

[194] Complaint, United States v. 3D Sys. Corp., No. 1:01CV01237 (D.D.C. June 6, 2001), *available at* http://www.usdoj.gov/atr/cases/f8800/8896.htm. *See also* Final Judgment, United States v. 3D Sys. Corp., 2002-2 Trade Cas. (CCH) ¶ 73,738 (D.D.C. 2002).

[195] *See* Complaint, United States v. 3D Sys. Corp., *supra* note 194, ¶ 21.

[196] *Id.*

[197] *See* Final Judgment, United States v. 3D Sys. Corp., *supra* note 194, at 11.

involved innovation efforts sufficiently well underway that one of the merging parties can convincingly be considered a potential product-market competitor of the other. Review of those mergers has, thus, fit relatively comfortably into the existing framework for merger policy. But at least some cases have paid lip service to, or even purported to base enforcement on, the preservation of innovation for its own sake in a particular industrial sector. In these cases—for example, *ZF/Allison* and *3D/DTM*—the agencies did not undertake a detailed analysis of the market structures in the relevant industries that would be most conducive to innovation, nor did they examine the welfare consequences of reduced innovation in the industries at issue. In the *ZF/Allison* case, the DOJ appears implicitly to have assumed that one larger firm would be worse for innovation than two already quite large enterprises would be. In the *3D/DTM* case, the consolidation from three to two major U.S. firms raised concerns about innovation, although those concerns were deemed to have been allayed by the consent decree.

In a recent case that exemplifies our abstract Case 2, the FTC in the *Genzyme/Novazyme* merger took a significant step toward erasing the key presumption—that very high levels of concentration would likely be bad for innovation—that appears to have informed the *ZF/Allison* case. The case is also notable because it focused solely on innovation impacts rather than static price and output concerns. We will return to *Genzyme* in our conclusion and argue that the case is a mixed bag under our recommendations; it does some things right but other things we think would constitute unfortunate precedent. The case does make one thing clear: innovation is becoming an increasingly central issue in merger analysis at the antitrust agencies and, importantly, has now become an issue that itself can determine the outcome of an enforcement decision.

X. CONCLUSION: IMPLEMENTING DYNAMIC MERGER POLICY

We conclude by summarizing our policy recommendations and discussing the application of these recommendations to *Genzyme* as an example of how they might apply in real cases.

A. Policy Recommendations

We begin by observing that recommendations for a general reduction in antitrust enforcement in the name of innovation are neither well-grounded in economic theory nor supported by facts. There is no evidence that ignoring innovation in the conventional framework or retreating from conventional enforcement will benefit either long-run or short-run consumer welfare.

Although there is much that we are still learning about market dynamics and innovation, antitrust enforcers possess the statutory and analytical tools necessary to incorporate innovation concerns into merger analysis. Indeed, the DOJ and the FTC have addressed innovation effects in several cases. That said, most cases to date have involved innovations that were essentially complete and often undergoing trials and/or seeking regulatory approval. The use of information about innovation to evaluate a merger's effects on relatively imminent product-market competition does not require fundamental change to the existing merger-policy framework. But some transactions warrant a more dynamic view of potential competition. The need for changes in the merger evaluation framework becomes greater and the issues become harder as one moves to predicting a merger's effects on future product-market competition through its effects on innovation efforts still far from completion. The issues become harder still as one moves to predicting the effects of a merger on innovation projects that have not even begun.

Our analysis suggests several recommendations for improving merger review as the analysis is extended to effects on the level and timing of innovation. First, the antitrust agencies should develop and articulate guidelines for drawing inferences of potential product-market competition from evidence of ongoing innovation. Doing so would extend the existing framework to cover several situations in which innovation plays an important role in competition and economic welfare and, we argue, should, therefore, play an important role in merger analysis.

As we discussed, moving the analysis of innovation effects to consider the level and timing of future R&D investments is a difficult task in the existing merger enforcement framework because the concentration-competition-welfare presumption that informs the Merger Guidelines, which holds that a significant increase in concentration is likely to harm product-market competition and consumers, does not consistently carry over to innovation. We find the evidence to support instead a very limited presumption that a reduction in the number of competing innovators reduces innovation in the absence of any efficiency effects. Specifically, the presumption of harm to innovation would apply only in the case of merger to monopoly. In other cases, there would be a weak presumption that a merger's effects on innovation were neutral. Either the plaintiff or the defendant could rebut this presumption by presenting appropriate factual evidence. Instead of presumptions, detailed case-by-case analysis will be needed.

Therefore, a second recommendation is that the agencies develop the expertise that would allow case-by-case, fact-intensive inquiries to assess

the welfare effects posed by mergers where innovation is at stake.[198] Merger-policy enforcers should recognize that innovation will depend more heavily on factual inquiries specific to a given case and less on systematic presumptions of the kind merger policy has long applied to static, product-market competition. Thus, while we do not urge antitrust enforcers to retreat from markets with significant innovation, we do urge that they proceed with great caution.

Because, to date, the agencies have taken innovation into account primarily in markets in which there is a tight link between current R&D efforts and imminent product-market competition, the agencies have not had to make explicit trade-offs between innovation and short-term product-market competition. As one considers a longer time horizon and broader set of markets, sometimes the static price effects and innovation effects of a merger will go in the same directions, but at other times the merger might be bad for the former and good for the latter. The need to make trade-offs between innovation and short-term product-market competition may, therefore, arise. Our third recommendation is that the agencies should provide guidance on how they would make these trade-offs. This is not a matter of developing innovation guidelines; rather, it is a matter of stating agency objectives clearly and explicitly.

Our fourth recommendation is that antitrust policy makers rethink both the emphasis on market definition and the insistence on bright-line market boundaries in merger cases, particularly in dynamic markets. There are well-known pitfalls in the determination of relevant markets and the use of market share to predict even static competitive effects. The dangers of these pitfalls are made worse by the presence of significant innovation. The agencies and, particularly, the courts should be especially careful in an innovation case not to let the mechanics of market definition and market share calculations stand in the way of conducting sound economic analysis of the merger's likely effects. We find that emphasis instead on direct evidence of probable effects of the merger will likely produce better results in mergers involving innovation, even though that inquiry may at times be very difficult.

Although consistent with the theoretical underpinning of current merger policy, a movement away from a predominant focus on market

[198] Academic researchers can make an important contribution to this effort by conducting industry-specific studies that provide a deeper understanding of the history and conditions for innovation in different economic sectors regularly at issue in mergers. As observed in Part IV above, empirical research demonstrates that industry-specific factors play important roles in mediating the relationship between concentration and firm size, on the one hand, and the pace of innovation, on the other. Additional studies of the sort we recommend might lead to the identification of fact patterns that allow clearer understanding of how to treat innovation in the context of different kinds of transactions that come up for review.

shares and toward a more refined analysis of industry conditions and the nature of competition would represent a change in the practice of merger litigation by reducing the primacy of market definition in merger cases. We do not advocate dispensing with the Merger Guidelines or eliminating market definition from merger review. Properly applied, these tools are useful and, moreover, they provide some predictive guidance for businesses. Our point is that insistence on rigid, bright-line market boundaries will fail to capture the realities of dynamic industries in which innovation shifts and blurs those boundaries over time. A broader approach that takes into account more evidence about how competition is evolving in an industry might give a better picture of a merger's likely effects and avoid the errors that could result from the rigid, in-or-out view of the hypothetical monopolist approach to market definition that dominates conventional merger review.

Our fifth recommendation is that the agencies use the tools of decision theory to deal with uncertainty, particularly with respect to innovation. Under current practice, the agencies and courts often make use of a variety of heuristics (e.g., temporal cutoffs with little or no discounting within the horizon and complete discounting of anything beyond, high discount rates as proxies for uncertainty, and probability thresholds that place no weight on unlikely events regardless of their potential significance). Standard decision theory indicates, however, that these approaches are poor ways to calculate expected payoffs in the face of uncertainty. For example, these approaches tend to underestimate the effects of potentially revolutionary innovations that have some probability of having large effects over a period of several years. The conventional decision-theoretic approach would be to estimate probability distributions for alternative potential outcomes and then use those probabilities as weights in projecting an expected net present value of a merger's effects on consumer welfare.[199] More broadly, the effects of mergers on innovation are uncertain and occur over time, and the agencies and the courts have not made full use of established decision theory to structure their analyses of consumer-welfare effects.

B. How Our Polices Might Work in Practice and Make a Difference

Our analysis finds that an antitrust agency reviewing a merger in which innovation is important should take several steps. First, the agencies should examine whether innovation is underway that is likely to affect

[199] We observe in passing that there are difficult legal issues concerning whether the courts can appropriately aggregate welfare effects across different generations of consumers.

competition in a relevant product market, and account for the likely effects. For example, if one of the merging parties is engaged in innovation that would make it a likely new, or better existing, competitor to the other merging party, then the transaction would appear to reduce likely product-market competition. If, on the other hand, two competitors are merging but a third party has undertaken innovation that makes it a likely new entrant into the relevant market, then that innovation may make the future impact of the merger less harmful than it would seem absent incorporation of the third party's innovation efforts into the merger review. In this first step, innovation is a factor in the analysis of future product-market competition. The conventional concentration-competition-welfare presumption applies here and, if the transaction will decrease potential competition, it will be deemed presumptively harmful.

Second, antitrust agencies should ask whether a merger is likely to have effects on innovation itself. Will the merger create beneficial coordination in R&D, prevent wasteful R&D, and/or raise incentives to undertake innovation that are not likely to occur absent the merger? Or, will the merger create disincentives to invest in current or future R&D efforts? In this second step, a fact-intensive inquiry will be needed and, except in the case of merger to monopoly, we advocate that no presumption of harm to innovation follow from a finding that the merger will reduce the number of firms competing to undertake a particular line of R&D. In this step we thus counsel against the agencies' reliance on the conventional Merger Guidelines' approach when it comes to innovation, but also counsel against the anti-enforcement presumption of the Schumpeterian approach. The differences in the presumptions applicable to conventional product market analysis and innovation analysis in merger review are summarized in the table below.

Table: Comparative Burdens and Presumptions in Conventional vs. Innovation-Based Merger Review

	Static Price and Output Effects	*Innovation Effects*
Change in Competition	Plaintiff's burden to show harm with a rebuttable presumption of harm based on concentration.	A rebuttable presumption of harm in the case of merger to monopoly. In other cases, a rebuttable presumption that the merger's effects are neutral.
Efficiencies	Defendant's burden	Defendant's burden

Third, once an agency determines the effects of the merger on product-market competition and on innovation, the agency decides whether approving (perhaps with conditions) or blocking the merger will have the higher net benefit for consumer welfare. In some cases a merger's effects on product-market competition and innovation will run in the same direction and the welfare-enhancing course of action will, thus, be clear. In other cases, there may be trade-offs between static and dynamic benefits, and the case for enforcement or clearance will be more ambiguous. In ambiguous cases, we recommend the agency adopt a careful analysis of the comparative probabilities and values of the various costs and benefits from the merger, rather than relying on overly simple heuristics, such as simply asking whether harm is likely.

We illustrate these steps and how they differ from current practice by examining a recent case in which innovation concerns featured prominently in agency decision making. Because we do not have access to the complete files considered by the agencies and courts, we reserve judgment on whether following our recommendations would have changed the final conclusion.

The case, the *Genzyme/Novazyme* merger, is interesting because some—but not all—of the steps in the FTC's review are consistent with our recommendations. The case, therefore, provides, in a single example, an opportunity to see how some of our recommendations might work in practice and also to show how other of our proposals might have led to a different analysis.

In 2004 the FTC decided by divided vote to close its investigation into the merger of Genzyme Corp. and Novazyme Corp., the only two companies developing therapies for a rare disorder known as Pompe disease.[200] *Genzyme* was unusual in that the government approved a merger to monopoly. But the case was even more exceptional because the FTC appears to have based its decision solely on analysis of the transaction's effects on innovation, rather than its effects on price and output. After many mergers in which the agencies addressed innovation in an ad hoc manner, and without expressly stating the presumptions they were applying in the innovation context, *Genzyme* was the first case in which authorities expressly found the flow of new technology to be determinative, and tried to establish principles for when and how antitrust enforcers should analyze innovation effects when reviewing mergers.

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[200] Closing Letter, Investigation of Genzyme Corporation Acquisition of Novazyme Pharmaceuticals, Inc., FTC File No. 021 0026 (Jan. 13. 2004), *available at* http://www.ftc.gov/os/2004/01/040113genzyme.pdf.

The FTC's 3–1 vote to allow the Genzyme/Novazyme merger is accompanied by three written statements, one by Chairman Timothy J. Muris in support of the majority's position, one by Commissioner Mozelle W. Thompson in dissent, and one by Commissioner Pamela Jones Harbour.[201] Commissioner Harbour's statement is unusual in that she did not participate in the vote, having been confirmed to the Commission after argument occurred, but nonetheless wrote a statement expressing her views and supporting Commissioner Thompson's dissent.

Chairman Muris's statement, which has the legal status of persuasive rather than binding authority, advocates several principles for merger cases in which innovation is a central issue.[202] It is implicit in the Chairman's statement that the FTC can base a merger enforcement decision solely on innovation effects. This in itself is an important step. Muris argues that two principles should guide any such analysis of innovation effects. First, he states that enforcement agencies should take innovation into account only when the relevant innovators are few in number and readily identifiable. Second, and critically, Muris writes that the FTC should neither adopt any presumption about the relationship between market structure and innovation nor, therefore, presume that increased consolidation will harm innovation.[203]

Given his rejection of any broad presumption about the effects of a merger on parties' incentives or ability to invest in innovation, Muris's approach was to undertake a fact-intensive inquiry into how R&D related to Pompe disease treatments has worked and is likely to work in the future, taking into account both facts specific to the merging parties and facts related to the pharmaceutical industry as a whole. He considered both theories of harm and theories of benefits from the merger in the light of the case-specific facts. He then attached probabilities to the potential harms and benefits, and he calculated the expected net effect of the merger. Muris finds that inquiry into the facts of *Genzyme*

[201] Statement of Chairman Timothy J. Muris in the Matter of Genzyme Corporation/Novazyme Pharmaceuticals, Inc., FTC File No. 021-0026 (Jan. 13, 2004), *available at* http://www.ftc.gov/os/2004/01/murisgenzymestmt.pdf.; Dissenting Statement of Commissioner Mozelle W. Thompson, Genzyme Corporation's Acquisition of Novazyme Pharmaceuticals Inc., FTC File No. 021-0026 (Jan. 13, 2004), *available at* http://www.ftc.gov/os/2004/01/thompsongenzymestmt.pdf; Statement of Commissioner Pamela Jones Harbour, Genzyme Corporations's Acquisition of Novazyme Pharmaceuticals Inc., FTC File No. 021-0026 (Jan. 13, 2004), *available at* http://www.ftc.gov/os/2004/01/harbourgenzymestmt.pdf.

[202] Statement of Chairman Timothy J. Muris in the Matter of Genzyme Corporation/Novazyme Pharmaceuticals, Inc., *supra* note 201. No other members of the majority signed Chairman Muris's statement. As such, under Commission practice the decision is not binding, although as the sole written statement for the majority it is due some deference as persuasive authority.

[203] *Id.* at 3–4.

show that innovation would not suffer and could benefit from the merger.[204]

The dissenting statements take issue with both principle and practice. Commissioners Thompson and Harbour argue that the Commission should presume that increased concentration will harm innovation just as the antitrust agencies presume increased concentration will harm product-market competition and raise prices.[205] Commissioner Thompson, moreover, argues that regardless of the presumption, the majority's factual analysis was incorrect and the merger should be challenged as likely to harm research and development of Pompe disease therapies.[206]

Genzyme serves as an interesting marker for the current state of debate of antitrust and innovation in the agencies. The FTC, at least, has now clearly accepted that innovation is an objective that antitrust agencies can pursue in merger review even where product-market competition is not at issue. Moreover, the majority, at least, treated the innovation analysis quite differently from a standard analysis of product market prices and output levels. It clearly rejected the conventional concentration-competition-welfare presumption and opted instead for a direct analysis of the case-specific facts, similarly jettisoning market definition on the grounds that, on the facts of this case, the direct effects were able to be analyzed without the formalities of conventional "hypothetical monopolist" kinds of tests. But the contrary position of two Commissioners that conventional product-market presumptions should apply in the innovation context indicates how alive the debate remains.

Muris took several steps that fit well with our framework. To begin with, we agree with his threshold finding that a merger's effects on innovation are a valid, central issue for antitrust enforcement. Our proposals are broadly consistent with Muris's abandonment of the standard concentration-competition-welfare presumption and his corresponding emphasis on case-specific, factual inquiry of likely effects on innovation is the correct approach. Similarly, Muris's assessment of the comparative probabilities of harms and benefits leads him toward the decision-theoretic approach we advocate for addressing the uncertain outcomes of mergers in dynamic markets.

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[204] *Id.* at 5–20.

[205] Dissenting Statement of Commissioner Mozelle W. Thompson, Genzyme Corporation's Acquisition of Novazyme Pharmaceuticals Inc., *supra* note 201, at 3; Statement of Commissioner Pamela Jones Harbour, Genzyme Corporations's Acquisition of Novazyme Pharmaceuticals Inc., *supra* note 201, at 3.

[206] Dissenting Statement of Commissioner Mozelle W. Thompson, Genzyme Corporation's Acquisition of Novazyme Pharmaceuticals Inc., *supra* note 201, at 3–4.

Our framework would, however, approach each of the steps above somewhat differently from the way Muris does in his statement. First, although we counsel weakening the presumption of harm from concentration in the context of innovation effects, we do not abandon it to the extent Muris does. In particular, we preserve a presumption of harm in the case of merger to monopoly, whereas in *Genzyme*, Muris abandons any presumption of harm even in a merger to monopoly. Our factual determination and assessment of harms would, therefore, proceed against that backdrop and with a burden on the merged parties to show a lack of harm.

Second, our use of decision theory would work differently. Muris sets out two possible states of the world: one in which Genzyme's internal R&D effort fails, and one in which that internal R&D effort succeeds. He attaches a probability of 25 percent to the first outcome and a probability of 75 percent to the second. If the first state of the world results, Muris argues the merger benefits will be very high because the transaction provides the incentive and ability for the merged entity to accelerate the development of Novazyme's alternative. In the second state of the world, there is some possibility of harm because with its own successful Pompe therapy, the merged Novazyme entity might retard further development of Novazyme's alternative therapy. Muris argues the likelihood of such conduct is slim, however. His cost-benefit calculation therefore, looks like (.25) × (large benefit) − (.75) × (small harm), leading Muris to conclude there is a net benefit to be expected from the merger.

We have two concerns about this calculation, even while applauding the general approach. Our first concern is that there is no inquiry in the Chairman's analysis into whether the large benefit in the first state of the world is merger-specific. To the extent that a joint venture with either Genzyme or a different R&D partner could accelerate Novazyme's R&D, that benefit should be discounted in the cost-benefit assessment of the merger. Our second concern is that the low value Muris assigns to the harms in the second state of the world is not well justified by his analysis. Muris finds a high probability, 75 percent, that Genzyme's internal R&D effort will succeed. He then finds that if Genzyme succeeds there is a small chance that Genzyme will pull back efforts on Novazyme's product. From that small chance, Muris infers a small harm. But Muris nowhere discusses what the *magnitude* of that harm would be if the small chance came to pass. He says only that the conditional *likelihood* of the harm—reduced development of Novazyme's alternative therapy—is low and, multiplying the high probability of the second state of the world by that small likelihood, concludes that the expected magnitude of harm

in that state is low. But the calculation misses an important ingredient, which is the fact that the harm from slowing innovation in an alternative therapy could be very high, even if the likelihood is low. So, Muris's harms calculation needs an additional, intermediate step: multiplication of the low likelihood of harm in the second state of the world by the magnitude of that harm. It is the product of that calculation that should, under a correct decision-theoretic approach, in turn, be multiplied by the .75 probability of the second state of the world. In principle, the net result of the corrected welfare calculation could be quite different from Muris's result.

Our final concern with Muris's analysis involves a step he did not take. Nowhere does he analyze the product-market effects of the merger, although based on the facts, it is far from clear that there are no such effects. Although his statement does not offer an explanation for the gap, it is possible that the winner-take-all nature of the race to develop a Pompe therapy made the product market appear to be unaffected. But a longer-run view of product-market competition might reveal that the merger could have very real effects on future competition, particularly between first- and second-generation Pompe therapies, by leaving only one rather than two firms in the market to engage in follow-on R&D. As we discussed in Part IV, it is particularly for second-generation innovation that monopoly brings comparative disadvantages to competition. Absent inclusion of potential product-market effects, the ultimate welfare calculation for the majority's approval of the Genzyme/Novazyme transaction appears incomplete.

Although we are critical of some aspects of Chairman Muris's analysis, we support his general approach and believe the decision to be significant. We do not support the view of the dissenting statements that the conventional merger enforcement framework and presumptions should apply without engaging the different and complex ways that innovation might interact with the goals and presumptions of that framework.

How salient a precedent *Genzyme* will be remains to be seen. Time will tell whether the case marks a turning point in antitrust law after which innovation will be the central focus of many agency and court decisions, and whether it sets out principles for innovation analysis that will endure. Nevertheless, the *Genzyme* case leaves us hopeful. It represents a continued willingness of the antitrust agencies to adapt merger review to the task of better accounting for and preserving innovation. Our goal has been to strengthen the argument in favor of undertaking that task, and to offer improved tools with which to complete it.