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Mergers and Innovation

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Abstract

Merger review is the most active area of U.S. antitrust policy. It is now widely believed that merger policy must move beyond its traditional focus on short-run, price and output effects to account for longer-run effects on technological innovation. The question is, how should merger policy adapt to technological change? Some have argued that the right response is for antitrust authorities to reduce merger enforcement to prevent unintended harm to innovation. Others have suggested that the enforcement agencies analyze a merger's effects on innovation using the same framework they use to analyze a transaction's effects on prices and output levels. We argue that merger authorities should neither treat innovation like price and output under the existing framework nor retreat from enforcement in the name of innovation. We examine how merger policy should change both to accommodate the influence of innovation on traditional, static efficiency concerns and to recognize that innovation can itself be an important dimension of market performance affected by a merger.

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CONTENTS

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 1980's and 1990's, 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 1991 to 2002, the Antitrust Division of the U.S. Department of Justice conducted an average of 161 merger investigations each year, which is more than all of the division's other civil and criminal investigations combined.[2] Merger investigations constitute a 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 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

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1 *Economic Report of the President 1999* Washington: United States Government Printing Office, at 171.

2 An average of 131 other investigations were conducted per year (United States Department of Justice, Antitrust Division, Workload Statistics 1991-2002). Non-merger 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).

3 *See* Federal Trade Commission, Fiscal Year 2002 Congressional Budget Justification (April 9, 2001), available at http://www.ftc.gov/os/2001/04/2002budgetjustification.pdf, p. 46-60.

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, competition-oriented presumptions 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 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 competition.

In light of the potential tension between competition and innovation, and in 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.

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 Department of Justice's Antitrust Division observed that "the more important that innovation becomes to society, the more important it is to preserve economic incentives to innovate."[4] 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."[5] 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 static efficiency presumption that more competition (as measured by the degree of concentration) is generally better carry over to dynamic efficiency considerations?[6] 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

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4 Statement of Joel I. Klein, Assistant Attorney General, Antitrust Division of the U.S. Dept. of Justice before the Antitrust, Business Rights and Competition Subcommittee, Committee on the Judiciary, U.S. Senate, March 22, 2000. p.6. Available at http://www.usdoj.gov/atr/public/testimony/4381.pdf.

5 "Antitrust Considerations in International Defense Mergers," address by Robert Kramer, Chief, Litigation II Section, Antitrust Division, United States Department of Justice (May 4, 1999), p. 3.

6 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.

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.[7] Under Schumpeterian competition, there 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

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[7] Schumpeterian competition is named after Joseph Schumpeter, who asserted that it is a central feature of the modern economy. Joseph A Schumpeter (1942) *Capitalism, Socialism and Democracracy,* New York: Harper & Row, Chapters 7-8. For a discussion of antitrust policy toward single-firm conduct in markets characterized by Schumpeterian competition, see Evans, David S., and Richard Schmalensee (2002) "Some Economic Aspects of Antitrust Analysis in Dynamically Competitive Industries," in *Innovation Policy and the Economy,* Vol. 2, Jaffee, Lerner, and Stern (eds.), Cambridge, MA: MIT Press.

hinder innovation. And 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 systematic retreat from conventional enforcement guidelines and presumptions.[8] 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 paper, 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 competition can be appropriately treated in a manner wholly parallel to price competition. Instead, our analysis suggests that merger policy should strengthen its current framework by implementing a better understanding of the relationships between competition and innovation. We propose several specific ways to strengthen merger review, and we also discuss how merger policy can develop a more sophisticated approach for incorporating uncertainty about future economic events into enforcement decisions. [Please elaborate on policy recommendations here, or in next paragraph.]

We begin in Section I with a discussion of the conventional approach to merger review. In Section II, we discuss the challenges that innovation poses for the conventional analysis and examine the policy debate that has arisen in response to those challenges. In Section III, we examine how antitrust law's underlying presumption that consumer welfare increases with competition applies where consumer

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[8] Ronald W. Davis, "Innovation Markets and Merger Enforcement: Current Practice in Perspective," 71 *Antitrust L.J.* 677 (2003).

welfare may be affected by technological innovation. In Sections IV through VII, we examine the likelihood that the established framework for merger enforcement can successfully address the inter-relationship between market structure and innovation, and what changes would be necessary to improve merger review in technologically dynamic settings. Throughout Sections IV through VII, we develop a series of findings and recommendations about how merger policy can better accommodate innovation considerations. Those successive sections work through the major steps and assumptions of the established merger-review framework and identify the challenges innovation presents for them. To illustrate how these challenges are met in practice, in Section VIII we discuss and evaluate merger cases in which the antitrust agencies have focused on innovation. We conclude in Section IX with a set of policy recommendations. We then apply those recommendations to a recent merger case to illustrate how our proposed approach would affect enforcement in practice. [ALJ generally discourages this type of "prose table of contents." The effect may be mitigated, however, if a more substantive explanation of the arguments is added.]

I. 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.[9] The vast majority of mergers challenged by the U.S. antitrust agencies—the Antitrust Division of the U.S. Department of Justice (Justice Department) and the Federal Trade Commission (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 assets of a competitor where the effects "may be substantially to lessen competition, or to tend to create a monopoly."[10] The statute reflects the fundamental premise of merger policy, and of antitrust policy in

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[9] 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.

[10] 15 U.S.C. Section 18. Mergers can also be challenged under Section 1 of the Sherman Act, 15 U.S.C. Section 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.

general, that increased competition results in improved economic performance.[11] Specifically, 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.[12] 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.[13] 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.[14]

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.[15] In brief, merger analysis forms a prediction of a proposed transaction's effects on

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[11] See, e.g., *Antitrust Enforcement and the Consumer*, available at http://www.usdoj.gov/atr/public/div_stats/9142.pdf (2001), Sections 1, 2, 4; *Antitrust Guidelines for Collaborations Among Competitors* on the FTC web site (04/2000), available at http://www.ftc.gov/os/2000/04/ftcdojguidelines.pdf, p. 1, 4, 6.

[12] 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 Farrell and Katz (2006) and references therein.

[13] See, e.g., Neven, Damien J., and Lars-Hendrik Roller (2000) "Institution Design: The Allocation of jurisdiction in international antitrust," *European Economic Review* 44: 845-855.

[14] 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 greater discussion, see Farrell and Katz.

[15] See, e.g., Baker, Jonathan B. (2003) "Responding to developments in economics and the courts: Entry in the merger guidelines," *Antitrust Law Journal* 71:189-206, and Scheffman, David, Malcolm Coate, and Louis Silvia (2003) "Twenty years of merger guidelines enforcement at the FTC: An economic perspective," *Antitrust Law Journal* 71: 277-318.

consumer welfare by examining present characteristics of the parties to the transaction, the market setting in which those parties operate.[16]

The federal antitrust agencies have issued a set of *Horizontal Merger Guidelines* (*Merger Guidelines*) that purport to provide a blueprint for how the agencies will conduct their analysis of a merger.[17] These guidelines provide a specific market-definition methodology as well as benchmarks for the assessment of concentration.[18] 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

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16 See, e.g., *FTC v. University Health, Inc.*, 938 F.2d 1206, 1211 n. 12 (11th Cir.1991); *FTC v. PPG Industries, Inc.*, 798 F.2d 1500, 1503 (D.C.Cir.1986); *FTC v. Staples, Inc.*, 970 F.Supp. 1066, 1081-82 (D.D.C.1997).

17 United States Department of Justice and the Federal Trade Commission, *Horizontal Merger Guidelines*, rev. April 8, 1997 (hereafter, *Merger Guidelines*).

18 It is questionable whether the agencies actually use the benchmarks stated in the *Merger Guidelines*. See, e.g., John Kwoka, "Some Thoughts on Concentration, Market Shares, and Merger Enforcement Policy," presented at the FTC/DOJ Workshop on Merger Enforcement, Washington, D.C. , February 17, 2004. http://www.ftc.gov/bc/mergerenforce/presentations/040217kwoka.pdf.

19 *Merger Guidelines*, Section 0.1.

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

21 See, e.g., *Merger Guidelines*, Section 1; Toys R Us v. FTC, 221 F.3d 928 (7th Cir. 2000).

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 in the *Merger Guidelines*. The *Guidelines* adopt the Herfindahl-Hirschman Index (HHI), which one calculates 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 several smaller ones.

Depending on the level of 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

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[22] See, e.g., Parker, Richard G. (1998) "Trends in Merger Enforcement and Litigation, § 2," 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. Sections 151 et seq, seeks to promote competitive entry.

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.

2. *Competitive Effects Analysis*. The typical next step in the antitrust analysis of a proposed merger is to go beyond presumptions to predict its 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 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] The increased risk a merger creates for collusive behavior among would-be competitors gives rise to coordinated effects.

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

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[24] John Kwoka, "Some Thoughts on Concentration, Market Shares, and Merger Enforcement Policy," presented at the FTC/DOJ Workshop on Merger Enforcement, Washington, D.C., February 17, 2004 (available at http://www. ftc.gov/bc/mergerenforce/presentations/040217kwoka.pdf).

[25] *Merger Guidelines* at __. A recent example of a unilateral effects case is *U.S. v. Oracle Corp.*, 2004 U.S. Dist. Lexis 18063 (N.D. Cal. Sept. 9, 2004).

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 examine efficiencies and 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]

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. 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

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[26] *Merger Guidelines* at __. 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] The *Merger Guidelines* 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." [Section 4, internal footnote omitted.]

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 relative little role.[28] This lack of a dynamic approach may cause merger 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. [I think that this previous section could be cut back even further, if you have any suggestions.]

II. 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 pre-merger 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 examine the

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[28] Innovation considerations were raised in some early non-merger cases. *United States v. Aluminum Co. of Amer.*, 148 F.2d 416, 427 (2d Cir. 1945) recognized the effects of market power on innovation, although innovation concerns did not play a significant role in the decision. Innovation played a more central role in *United States v. Automobile Manufacturers Ass'n*, 307 F. Supp. 617, 618 (C.D. Cal. 1969), in which the court found 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 Section 1 of the Sherman Act (aff'd in part and appeal dismissed in part, 397 U.S. 248 [1970]).

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.[29] 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 incentive 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?

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[29] 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.

III. THE CONCENTRATION-COMPETITION-WELFARE PRESUMPTION

As summarized above, in conventional merger review, the courts presume that higher concentration leads to less competition and that less competition leads to lower levels of consumer welfare and efficiency— a chain of reasoning sometimes referred to as the "concentration-competition-welfare presumption."[30] 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. And, 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—whether one is talking about current markets, or is looking ahead at the relationship between future competition and future welfare, as measured by price and output. However, the linkage between *current* concentration and *future* competition and 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, may make future market structures hard to predict, or may alter products in ways that create consumer benefits that offset any harmful changes to price and output over time. 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.

Consider first the traditional presumption concerning short-run price or output competition. No general theorem of economics proves that higher concentration leads to higher prices or lower output.

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[30] For the most part, economic theory and antitrust policy have long favored more competition over less 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. Sections 151 et seq, seeks to promote competitive entry.

However, absent innovation, one can expect this relationship for several reasons. First, many (but not all) formal economic models of markets likely to attract merger scrutiny (i.e., those markets in which only a few firms compete) 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.[31]

Although the presumption that increased competition leads to increased consumer welfare or greater efficiency is is on generally firm footing, there is also need for caution.[32] In other models and under specified conditions, increased concentration may not lead to higher quality-adjusted prices and entry may not lead to lower quality-adjusted prices. To generate sensible predictions of the effects of a merger, the measurement and analysis of market shares should be tied to a coherent theory of competitive effects that fits the facts of the industry under consideration.[33] Put another way, the analysis of market shares can most confidently be used to predict adverse competitive effects of a merger when one has an empirically supported theory that market shares are informative of competitive conditions and that an increase in concentration will harm competition and consumers. In this regard, we note an unfortunate irony. Market share analysis is central to the analysis of unilateral effects analysis 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.

Current enforcement practice recognizes that, even absent significant innovation, market share data should be interpreted with caution. Merger enforcement is forward looking; the agencies predict the likely effects of a transaction. Conventional market share measures, however, are backward-

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31 See, e.g., Schmalensee, Richard (1989) "Inter-Industry Studies of Structure and Performance," in *Handbook of Industrial Organization*, Vol. II, Schmalensee and Willig (ed.s), Amsterdam: North Holland.

32 There are some exceptions. 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.

33 Under the process described by the *Merger Guidelines,* "Market shares will be calculated using the best indicator of firms' future competitive significance." *Merger Guidelines,* Section 1.41.

looking. This is one important reason why the Guidelines make clear that high market share is not, in itself, sufficient to establish market power.[34]

Innovation complicates the interpretation of market share data because this potential shortcoming is particularly critical in industries characterized by ongoing innovation and technological change. Innovation may render market shares unstable and hard to predict. 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 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 and leave the merged entity behind.[35]

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. Market shares may be altogether irrelevant in some cases because there may be markets in which innovation is so characteristic and sustained that firms compete not just for increments of market share but for markets as a whole. 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.[36] 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.

Similar issues arise 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

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34 Of course, in some circumstances, firms current positions are good predictors of their future positions and past positions can shed light on the extent of installed-base or related advantages.

35 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.

36 *Merger Guidelines*, Section 1.521. The extent to which the agencies are willing to adopt forward-looking views of competition is the subject of some debate.

are included in the market only when certain conditions of imminence and probability are met. 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 the dynamic effects of, and on, innovation. It is to that question we now turn.

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 two fundamental issues. The 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.[37] Concentration of R&D capabilities may thus provide a better measure. The 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.[38] Indeed, even R&D programs that never succeed in developing new products or processes may nonetheless benefit consumers by stimulating potential rivals to innovate.

Although the above considerations are important, they are similar to those just discussed in the context of market definition.[39] 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, that concentration may affect innovation incentives differently from how it affects static economic variables like 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 innovation. 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

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[37] See, e.g., Kamien, Morton I., and Nancy Schwartz (1972) "Timing of Innovations under Rivalry." *Econometrica* 40: 43-60, at 20, ("concentration 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 and Schmalensee (2002, supra note ___, at 16-18) and Hartman, Teece, Mitchell, and Jorde (1993, supra note 79, at 322-3). 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.

[38] 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 Section V below.) 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.

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.[40] 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 fifty 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."[41] 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.[42]

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 the benefits of market power suggest that his ideal innovators were not only large but dominant 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.[43] Subsequent theoretical research has shown that, depending on various

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39 We also return to the issue of potential competition in Section V below.

40 For example, in their 1975 survey of work on innovation and market structure, Kamien and Schwartz stated that "Few, if any, economists maintain that perfect competition efficiently allocates resources for technical advance." (Kamien, Morton I., and Nancy L. Schwartz (1975) "Market Structure and Innovation: A Survey." *Journal of Economic Literature*, XIII: 1–37, at 2.) 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.

41 Schumpeter, supra note ___, at 106.

42 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 result in different contexts and thereby reduced rigid adherence to the perfectly competitive model. Because of its benefits for allocative efficiency, competition nonetheless remained the touchstone of antitrust policy.

43 Fellner, William (1951) "The Influence of Market Structure on Technological Progress," *Quarterly Journal or Economics* 65: 556-577, and Arrow (1962), supra note 84.

conditions, either monopoly power or competition may lead to greater total innovation.[44] And other research suggests that oligopoly—competition among a few firms—is the market structure most conducive to development of new products and processes.[45]

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.[46] There are two opposing sets of forces shaping the relationship between market structure and innovation. One, 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. At the other pole of market structure, Sir John Hicks famously remarked that "[the] best of all monopoly profits is a quiet life."[47] Considerable anecdotal evidence suggests that competition drives organizations to be more innovative than do protected monopoly positions. Further, a monopolist may bring product innovations slower to market than would a competitor because the monopolist is concerned about cannibalizing its existing business.[48] Therefore, a monopolist might be an inferior innovator from the perspective of consumers.[49]

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

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[44] Scherer, Frederick M. (1992) "Schumpeter and Plausible Capitalism," *Journal of Economic Literature* 30:1416-1433.

[45] Scherer, Frederick M. (1967) "Market Structure and the Employment of Scientists and Engineers." *American Economic Review*, 57: 524-531, Scherer, Frederick M. (1967) "Research and Development Resource Allocation Under Rivalry," *Quarterly Journal of Economics* 81:359-394, Kamien and Schwartz (1972), supra note 37, and Kamien, Morton I., and Nancy Schwartz (1976) "On the Degree of Rivalry for Maximum Innovative Activity," *Quarterly Journal of Economics* 90: 245-260.

[46] *See* Scherer (1992), supra note 44, and Reinganum, Jennifer F. (1989) "The Timing of Innovation: Research, Development, and Diffusion," in *Handbook of Industrial Organization*, Vol. I, Schmalensee and Willig (eds.), Amsterdam: North Holland.

[47] Hicks, John R. (1935) "Annual Survey of Economic Theory: The Theory of Monopoly," *Econometrica* 3:1-20, AT 8.

[48] Kenneth J. Arrow, "Economic Welfare and the Allocation of Resources to Invention," in R.R. Nelson (ed.), *The Rate and Direction of Economic Activity* (Princeton, 1962).

[49] 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.

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 may make it possible and profitable to 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 monopoly in a given case.

Empirical data do not resolve the ambiguous theoretical relationship between competition and innovation. Many analyses supported the Schumpeterian view by finding a positive correlation between

market concentration and R&D investment.[50] Other analyses, however, found data to show concentration to have a negative effect on innovation.[51] 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 fall off as market structure approaches monopoly.[52] Several studies replicated and confirmed Scherer's results.[53]

Later work, however, raised serious doubts about these findings and identified several reasons why one should be cautious in the interpretation of the empirical literature. First, questions surround the statistical significance of the parameter estimates leading to a U-shaped relationship and whether they are, in fact, picking up the effects of omitted variables such as technological opportunity.[54] Second, extreme care must be taken in interpreting cross-sectional studies because the causality between market

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50 See, e.g., Mansfield, Edwin (1968) *Industrial Research and Technological Innovation*, New York: Norton.

51 Williamson, Oliver E. (1965) "Innovation and Market Structure." *Journal of Political Economy* 73: 67-73, Bozeman, B., and A.N. Link (1983) *Investments in Technology: Corporate Strategy and Public Policy Alternatives*. New York: Praeger, and Mukhopadhyay, A.K. (1985) "Technological Progress and Change in Market Concentration in the U.S., 1963-1977." *Southern Economic Journal* 52: 41-149.

52 Scherer (1967).

53 Levin, Richard C., Wesley Cohen, and David Mowery (1985) "R&D Appropriability, Opportunity, and Market Structure: New Evidence on Some Schumpeterian Hypotheses," *American Economic Review Papers and Proceedings* 75: 20-4, and Scott, J.T. (1984) "Firm Versus Industry Variability in R&D Intensity," in *R&D, Patents and Productivity*, Zvi Griliches (ed.), Chicago: University of Chicago Press.

54 *See* Kamien and Schwartz (1975, supra note 40, 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" (p. 22), and "Our 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." (p. 24). Somewhat surprisingly, they then concluded their survey with "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." (p. 32).

structure and innovation rates can run in both directions.[55] 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.[56] 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. In their review of the empirical literature, Cohen and Levin concluded that "[t]ogether, these results leave little support for the view that industrial concentration is an independent, significant, and important determinant of innovative behavior and performance."[57]

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 analog 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 (as well as variables related to a firm's regulatory status, products, and technologies). 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 economic 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

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55 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. (Boone, Jan (2001) "Intensity of competition and the incentive to innovate," *International Journal of Industrial Organization* 19:705-26.)

56 Geroski, Paul A. (1990) "Innovation, Technological Opportunity, and Market Structure," *Oxford Economic Papers* 42: 586-602.

57 Cohen, Wesley M., and Richard C. Levin (1989) "Empirical Studies of Innovation and Market Structure" in *Handbook of Industrial Organization*, Vol. II, Schmalensee and Willig (eds.), Amsterdam: North Holland, citing Cohen, Wesley M., Richard Levin, and David Mowery (1987) "Firm Size and R&D Intensity: A Re-Examination," *Journal of Industrial Economics* 35: 543-65.

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.

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 also show that one can often make 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.

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 it is extremely counterintuitive to many people, a large body of economics literature has established theoretical reasons why profit-maximizing firms may invest more in R&D than is socially efficient.[58] 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 amounts of 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.[59] 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

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[58] For a survey, see Reinganum (1989), supra note 46.

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

(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.[60]

The theoretical possibility of excessive private incentives notwithstanding, as an empirical matter, private incentives to invest in R&D typically are too low.[61] This situation arises because private firms are generally unable to appropriate fully the benefits that their R&D generates for the economy.[62] Of course, "typically" is not synonymous with "always." Under specific conditions, firms can have socially excessive innovation incentives, and one can examine any particular market to determine if those conditions are present.

Whether enforcement authorities would want to act when such conditions for overinvestment in innovation exist, however, raises the 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

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60 A firm might also engage in predatory innovation (see, e.g., Janusz A. Ordover, A.O. Sykes, and Robert D. Willig (1985) "Nonprice Anticompetitive Behavior by Dominant Firms toward the Producers of Complementary Products" in *Antitrust and Regulation: Essays in Memory of John J. McGowan*, MIT Press, Cambridge, MA.), although this is likely to more an issue of monopolization or attempted monopolization rather than merger. Business stealing effects might also be a more important source of distortion than in the case of price competition because the real resource costs of innovation mean that the rivals' losses to 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.

61 See, e.g., Griliches, Zvi (1992) "The Search for R&D Spillovers," *Scandinavian Journal of Economics* 94(Supp.): 29-47, and Jones, Charles I., and John C. Williams (1998) "Measuring the Social Return to R&D," *Quarterly Journal of Economics* 113: 1119-35.

62 Carlton and Gertner (2003) point out that empirical studies generally compare *average* private and social returns, while the privately and socially optimal R&D levels 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 pre-emption incentives are of empirical significance in many industries. (Carlton, Dennis W., and Robert H. Gertner (2003) "Intellectual Property, Antitrust and Strategic Behavior" in *Innovation Policy and the Economy*, Vol. 3, Jafee, Lerner, and Stern (ed.s), Cambridge, MA: MIT Press.)

even faster.[63] 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 combine. Moreover, in the face of potential entry, such a firm is more like 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.[64]

It is important to recognize that the general lack of a presumption in one direction does not imply a presumption in the opposite direction. Although the evidence does not support a general claim that consolidation reduces innovation, it also does not support the opposite presumption that consolidation will increase innovation. Hence, the lack of a presumptive link between market structure and innovation (outside of the monopoly context) undermines not just the conventional presumption in merger cases, but also the "Schumpeterian" argument against merger enforcement where innovation is at stake.

Our analysis therefore suggests that the claim for systematic laissez 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.[65]

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[63] 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.

[64] In terms of welfare effects, our earlier caveats regarding cannibalization (supra notes ___ and ___) stands.

[65] Indeed, case 2 in section II, infra, is one in which a merger would be challenged precisely because it would otherwise undermine Schumpeterian competition.

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 current dominant firm should be allowed to merge with essentially no other firm because any other firm might 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. 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.

IV. 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 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 long-standing 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.[66] A similar logic is used for geographic scope. To give more 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.[67] 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.[68]

A price increase will raise a hypothetical monopolist's profits unless unit sales volume falls sufficiently to offset the higher price received for the units sold.[69] Thus, the hypothetical monopolist test indicates that a set of products or a geographical area constitutes a relevant market if the hypothetical monopolist could make a small but significant and non-transitory increase in price without causing enough consumers to switch to substitute goods so that the price increase becomes unprofitable. The

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66 See, e.g., Stocking, George W., and Willard F. Mueller (1955) "The Cellophane Case and the New Competition," *American Economic Review* 45: 29-63, at 44-8.

67 *Merger Guidelines*, Section 1.0; *FTC v. Swedish Match*, 131 F. Supp. 2d 151, 160 (D.D.C. 2000); *California v. Sutter Health Systems*, 130 F. Supp. 2d 1109, 1120 (N.D. Cal. 2001). See, also, Katz, Michael L., and Carl Shapiro (2003) "Critical loss: Let's tell the whole story," *Antitrust* Spring: 49-56.

68 *Merger Guidelines*, Sections 1.0 and 1.11.

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

hypothetical monopolist test is used both by enforcement agencies and by the courts that review agency actions.[70]

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

Consider first the role of market definition in the analysis of traditional, static price and output effects. 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.

Indeed, the very question asked by the hypothetical monopolist test raises issues about this separation. Under the *Merger Guidelines*' approach, the answer to the following question provides the basis of 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? That is the question whose answer matters for consumer welfare.[71] If one possesses the answer to that question, then the answer to the hypothetical monopolist question is completely superfluous.

Courts have agreed that market definition is an indirect way of showing a merger's effects that should not stand in the way of considering direct evidence of competitive harm, although generally in antitrust contexts outside of merger review. For example, the United States Court of Appeals for the

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[70] 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 (8th Cir. 1999).

[71] 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.

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."[72] The Supreme Court held in *FTC v. Indiana Federation of Dentists* that

> [s]ince 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.'[73]

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 non-merger cases and not that direct evidence of market power shouldn't have the same priority in merger cases where such evidence is available.

Unfortunately, the separation of market definition from the analysis of actual competitive effects in merger analysis leads to interpretation of the plaintiff's burden to establish boundaries of relevant markets 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 Justice Department 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.[74] Interestingly, the trial judge 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.[75] But the court's recognition of the

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72 *Todd v. Exxon Corp.*, 275 F.3d 191, 206 (2nd Cir. 2001).

73 *FTC v. Indiana Federation of Dentists*, 476 U.S. 447, ___ (1986) (partly quoting 7 P. Areeda, Antitrust Law ¶ 1511, p.429 (1986)).

74 *U.S. v. Oracle Corp.*, 2004 U.S. Dist. Lexis 18063 (N.D. Cal. Sept. 9, 2004).

75 Ibid at 41.

difficulty of defining such clear 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.

It is important to distinguish between different uses of bright lines in antitrust enforcement. We are not objecting to the use of bright lines used 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.

A more rational approach would recognize the inherent uncertainty and take it into account.[76] One way to do so would be to ask where the dividing line matters, allow the 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, and then assess the potential competitive harms in the light of the uncertainty the fuzzy market definition creates for predicting that harm will occur. Plaintiffs would not be held to a standard of establishing a unique, bright-line boundary with a high degree of certainty.[77] In a separate article we explain in detail how moving away from such a certainty requirement can improve market definition. [CITE].

The presence of significant innovation exacerbates the strains already present in market definition 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. Significant innovation also raises at least two new issues with respect to market definition 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. Second, rapid innovation can make it difficult to define relevant product markets because business executives and government officials alike may not yet know what the future products will be.

Consider first the issue of the price changes used in conducting the hypothetical monopolist test. Under American and European Union 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 to 10

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[76] As we discuss in Section VI.D below, there is a general failure of merger enforcement to address uncertainty in a rational manner.

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

percent.[78] 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.[79]

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 routinely changing by much greater amounts.[80] This criticism would be appropriate if enforcement authorities took current prices as the baseline. For instance, if innovation is driving costs down significantly, then merely holding prices constant at the pre-merger baseline could be indicative of the exercise of substantially increased market power because profit margins would have in 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 pre-merger 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

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[78] *Merger Guidelines*, Section 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, 1997, *Commission Notice of the Definition of the Relevant Market for the Purposes of Community Competition Law*. (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, pre-merger prices are taken at the benchmark. In cases where pre-merger prices reflect coordinated behavior, some measure of a competitive price is used instead. *Merger Guidelines,* Section 1.11.

[79] In addition to the issues in the text, 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*. write that "During [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, Raymond, David Teece, Will Mitchell, and Thomas Jorde (1993) "Assessing Market Power in Regimes of Rapid Technological Change," *Industrial and Corporate Change* 2: 317-350, at 323.) The hypothetical monopolist test, however, is based on the effects of price *changes*, not existing price differentials.

[80] See, e.g., Pleatsikas, Christopher, and David Teece (2001) "The Analysis of Market Definition and Market Power in the Context of Rapid Innovation," *International Journal of Industrial Organization,* 19:665-693, at 671, who argue that markets will be too narrowly defined.

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 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).[81]

Put differently, the issue is that 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.

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[81] 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." Pleatsikas and Teece 2001, supra note 80, at 687. See also Teece, David, and Mary Coleman (1998) "The Meaning of Monopoly: Antitrust Analysis in High Technology Industries," *Antitrust Bulletin*, 43: 801-857, at 826-828).

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 difficulties of forming reliable projections are not 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. 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.[82] Their short-range perspective is in part a reaction to practical difficulties but, as we discuss below in Part VI.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.

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)

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[82] For example, the *Merger Guidelines* (Section 3) indicate that the agencies generally will to look only two years forward in considering entry, although the *Merger Guidelines* provide no rationale for this cutoff.

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 commonality if not (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 of these concerns is ultimately about potential competition in the particular product market(s) at issue in the merger. The second concern, however, is squarely about innovation and arises even when—in the non-merger 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.[83] 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 price or output levels.

In response to these difficulties and to 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 such 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 highlighting the importance of innovation by focusing enforcement attention on a set of products that results from the process of research and development 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

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[83] 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." (*United States v. Marine Bancorp,* 418 U.S. 602, 617, 623 (1974); *Tenneco, Inc. v. FTC,* 689 F.2d 346, 352 (2d Cir. 1982); *In re B.A.T. Industries,* 104 F.T.C. 852, 919-928 (1984).)

which the marginal costs are very low relative to average costs (or first-copy costs) and there can be well-known difficulties selling information, such as those related to protection against expropriation.[84]

Technology markets may also have quite different geographical 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.[85] 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 (proximity to specific scientists, information about consumer wants, etc), and intellectual property may be useful only in certain locations because of the need for complementary products or due to differences in legal regimes.[86] In 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

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84 For a seminal analysis, see Arrow, Kenneth (1962) "Economic Welfare and the Allocation of Resources for Invention," in *The Rate and Direction of Inventive Activity,* R.R. Nelson (ed.), New York: Princeton University Press.

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

86 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 and Steven C. Sunshine, "Incorporating Dynamic Efficiency Concerns in Merger Analysis: the Use of Innovation Markets," 63 *Antitrust L.J.* 569 (1995).

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.

As discussed above, R&D and technology are quite different. 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.[87]

To shift the focus or merger review further from product markets and more directly to investment in research and development, Richard Gilbert and Steven Sunshine, both at the time working at the Department of Justice, developed the concept of "innovation markets."[88] 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, "[t]he innovation markets framework provides a methodology for identifying mergers that are likely to affect competition in output markets through a lessening of innovation."[89] 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

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87 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.

88 Richard J. Gilbert and Steven C. Sunshine, "Incorporating Dynamic Efficiency Concerns in Merger Analysis: the Use of Innovation Markets," 63 *Antitrust L.J.* 569 (1995).

89 Ibid at ___.

concentration in R&D would affect investment in R&D; and (5) evaluate how the merger would affect the efficiency of R&D.

Although each of those steps is in the abstract a tall order, Gilbert and Sunshine limited the scope of their proposal 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."[90] 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.[91]

Despite the cautious way Gilbert and Sunshine recommended using innovation markets, the idea has met with substantial skepticism and criticism.[92] 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.[93] Professor 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."[94] Yet others have

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90 Ibid at ___.

91 Similarly, former FTC Chairman Tim Muris has warned against using the innovation market concept unless it is obvious who the potential innovators are. See Statement of Chairman Timothy Muris on Genzyme Corp's Acquisition of Novazyme Corp. (2004).

92 See Ronald W. Davis, "Innovation Markets and Merger Enforcement: Current Practice in Perspective," 71 *Antitrust L.J.* 677 (2003) for a useful survey of arguments for and against the use of innovation markets.

93 Richard T. Rapp, "The Misapplication of the Innovation Market Approach to Merger Analysis," 64 *Antitrust L.J.* 19 (1995).

94 Dennis W. Carlton, "Antitrust Policy Toward Mergers when Firms Innovate: Should Antitrust Recognize the Doctrine of Innovation Markets?" Testimony before the Federal Trade Commission Hearings on Global and Innovation-based Competition, Oct. 25, 1995, www.ftc.gov/opp/global/carlton.htm.

questioned the legal basis on which enforcement agencies and courts could base decisions on non-price effects like innovation.

In the light of such criticism, it is perhaps not surprising that the innovation markets concept has not to date significantly affected the outcomes of merger cases, although it has affected the agencies' analysis and discussion in a growing number of investigations.[95] If nothing else, innovation has become a focal point that has aided in understanding the potential product-market effects of mergers in dynamic markets, and the innovation-markets approach has 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 product markets with their current structures.

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 potential-competition parameters that Gilbert and Sunshine established for their innovation-market framework.[96] 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 restriction of focus to innovation tied to actual or imminent product markets in the respective approaches does 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

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95 See Davis, supra note___ at; Richard J. Gilbert and Willard K. Tom, "Is Innovation King at the Antitrust Agencies? The Intellectual Property Guidelines Five Years Later," 69 *Antitrust L.J.* 43 (2001).

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

provides guidance on what, if anything, a finding of increased competition means for innovation, or of what welfare presumptions enforcement officials should apply once they have defined markets for innovation or technology. As we discussed above in Part III.A.1 of this article, 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 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.

We turn now to the next step in the merger review framework, in which the *Merger Guidelines* turn to that more specific factual inquiry, and examine how innovation affects the further analysis, beyond market share, of a merger's likely competitive effects.

V. 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."[97] 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, pre-merger 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 research and development efforts relevant to the product market at issue may constitute such evidence. Investments in research and development, as well as in specialized 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 pre-merger prices. These situations raise subtle issues even in the absence of innovation. When entry is contingent on the pre-merger behavior of the merging suppliers, the threat of entry—as opposed to actual entry—can induce incumbents to keep their prices at pre-merger 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-

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[97] *Merger Guidelines*, Section 2.0.

maximizing prices.[98] 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 (so-called "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" post-entry rivals and of driving down pre-entry prices.[99] In some cases, these effects will make it profitable for merging parties to forego large price increases even if doing so would be profitable in the short run. Such pre-entry investments may include research and development 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.[100] 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 merge, would other

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98 For a fully worked out theoretical analysis, see Milgrom, Paul, and John Roberts (1982) "Limit Pricing and Entry under Incomplete Information: An Equilibrium Analysis," *Econometrica* 50: 443-460.

99 See, e.g., Dixit, Avinash K. (1979) "A Model of Duopoly Suggesting a Theory of Entry Barriers," *The Bell Journal of Economics* 10: 20-32, and Spence, A. Michael (1977) "Entry, Capacity, Investment and Oligopolistic Pricing," *The Bell Journal of Economics* 8: 534-544.

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

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 back 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.[101]

However, the Schumpeterian dynamic does more than extend the analysis of price effects beyond presumptions based on market concentration. Instead, 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 Section III, 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. Despite the impossibility of making definitive general statements about the linkage between market structure and

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[101] 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 on in litigation the parties address the issue of whether 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.

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 of competitors (oligopolies), enforcement officials may worry firms will tacitly collude on price.[102] 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.[103] 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 difficult for firms tacitly to coordinate innovation strategies.[104] 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 that they provide competitive discipline to the merged entities. The primary, new issue raised by innovation is

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102 *Merger Guidelines*, section 2.1.

103 Id. at section 2.11.

104 Kamien and Schwartz (1975, supra note 40, at 15), attribute this general idea to Galbraith.

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 compete credibly in the R&D for the patent. In other instances, a wide range of firms may be capable of innovating, 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 the course of action that will stimulate improvements in the latter; in favor of innovation. But it cannot be the case that innovation will always be so likely or beneficial that it will outweigh harmful price 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 section.

VI. 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. Simply put, 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.[105] These cost savings are referred to as "efficiencies."[106] 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.[107]

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 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 Department of Justice 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."[108] In other words, there is a danger that the "savings" in R&D expenditures merely represent a reduction in

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105 For a seminal economic analysis of merger efficiencies, see Williamson, Oliver E. 1968. "Economies as an antitrust defense: the welfare trade-offs." *American Economic Review* 58: 18-36.

106 The *Merger Guidelines* 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." [Section 4, internal footnote omitted.]

107 *See, Merger Guidelines,* Section 4.0.

108 *Merger Guidelines,* Section 4.

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 effect 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 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, Professor Oliver Williamson has shown that under some conditions, merged ownership may reduce transaction costs of exchanging goods and services compared to less integrated forms of governance like contracts or joint ventures.[109] Available research shows, however, that the issue needs careful attention on a case-by-case basis.[110]

Turning to the second type of effect, considerable debate surrounds the relevance of firm size for innovation.[111] Following Schumpeter, some observers have praised large enterprises for their

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109 Oliver E. Williamson, Markets and Hierarchies (1975).

110 For a general comparison of alternative institutional arrangements, including merger, see Katz, Michael L. (1995) "Joint Ventures as a Means of Assembling Complementary Inputs," *Group Decision and Negotiation* 4: 383-400. For a survey of empirical research testing transaction-cost hypotheses see Shelanski, Howard A. and Peter G. Klein (1995) "Empirical Research in Transaction Cost Economics: A Review and Assessment," *J. L. Econ. & Org.* 11: 335-361.

111 For an overview of the ambiguous relationship between firm size and innovation, see Cohen, Wesley M., and Steven Klepper (1996) "A Reprise of Firm Size and R&D," *The Economic Journal* 106: 925-51.

superior ability to attract financial and human capital, bear the risk, and recoup the investment required for sustained R&D activities.[112] Other analysts tout small firms as being more creative than larger, more bureaucratic enterprises.[113] 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.[114] 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,[115] others have found that, when other firm and industry characteristics are factored in, firm size does not significantly affect R&D investment.[116] 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.[117] Data matching R&D investment with patent output have in fact shown that smaller firms produce more innovations per R&D dollar and per employee than do large firms.[118]

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

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112 Galbraith, John Kenneth (1952) *American Capitalism: The Concept of Countervailing Power,* Boston: Houghton Mifflin, and Nordhaus, William D. (1969) *Invention, Growth, and Welfare: A Theoretical Treatment of Technological Change,* Cambridge: MIT Press.

113 Morton I. Kamien and Nancy L. Schwartz (1982) *Market Structure and Innovation,* Cambridge: Cambridge University Press, and Cohen and Levin (1989, supra note ___, at 1067).

114 Scherer, Frederick M. (1965) "Firm Size, Market Structure, Opportunity, and the Output of Patented Inventions," *American Economic Review* 55: 1097-1125.

115 Cohen and Levin (1989), supra note ___.

116 Cohen, Levin, and Mowery (1987), supra note ___, and Cohen and Levin (1989), supra note ___.

117 Fisher, Franklin, and Peter Temin (1973) "Returns to Scale in Research and Development: What Does the Schumpeterian Hypotheses Imply?" *Journal of Political Economy* 81: 56-70, Kohn, M.T., and J.T. Scott (1982) "Scale Economies in Research and Development: The Schumpeterian Hypothesis," *Journal of Industrial Economics* 30: 239-49, Acs, Zoltan, and David Audretsch (1990) *Innovation and Small Firms,* Cambridge: MIT Press, and Acs, Zoltan, and David Audretsch (1991) "R&D, Firm Size, and Innovative Activity," in *Innovation and Technological Change: an International Comparison,* Acs and Audretsch (eds.), Ann Arbor: University of Michigan Press.

118 Acs and Audretsch (1991), supra note 117.

predictable reluctance—to engage in innovation, and that small, fringe firms may play important roles over time in technologically advancing markets.[119]

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 Section III, 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."[120]

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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[119] See, e.g., Baker, Jonathan B. (1995) "Fringe Firms and incentives to Innovate." *Antitrust Law Journal* 63: 621-41.

[120] Kamien and Schwartz (1975, supra note 40, at 26).

B. MERGER SPECIFICITY

If a simple, arms-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—will sometimes 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.[121] 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

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[121] 15 U.S.C. §§ 4301-05

firms in that industry achieve valuable innovation efficiencies through joint ventures that are comparable to the benefits that would be achieved though mergers but without the product market inefficiencies mergers can create.[122] 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 joint ventures will not always suffice. Sometimes governance of the comparatively arms-length transactions of a joint venture may be more costly than where a single owner can intervene to set the terms of collaboration.[123] 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 merger,s 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

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122 Gugler, Klaus, and Ralph Siebert (2004) "Market Power versus Efficiency Effects of Mergers and Research Joint Ventures: Evidence form the Seminconductor Industry," National Bureau of Economic Research Working Paper 10323.

123 Howard A. Shelanski, "Transaction-Level Determinants of Transfer-Pricing Policy: Evidence from the High-Technology Sector," 13 *Indust. & Corp. Change* 953 (2004).

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 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. 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.

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 extremely 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 at least elusive, and more likely, impossible. 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.

The current approach to merger enforcement unfortunately does not make explicit the process by which the agencies weigh and consider the several variables—price effects, efficiencies, innovation benefits, competitive entry—that the *Merger Guidelines* factor into predictions about a merger's effects and whose values are uncertain. This central shortcoming of merger enforcement is magnified when innovation is involved. To make the issue 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 does the less-than-likely efficiency 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 systematic way to account for uncertainty.

In its 1996 report, "Competition Policy in the New High-Tech, Global Marketplace" ("1996 FTC Report"), the Federal Trade Commission ("FTC") came out squarely in favor of taking into account both the magnitudes and probabilities of potential, merger-related efficiencies. That position appears consistent with an expected value approach and contrary to an approach that would drop 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 Department of Justice 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.[124]

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.[125] Such a stringent evidentiary standard has the practical effect of imposing a probability threshold on efficiencies that has to be cleared before a 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* stated that such a standard would impose on defendants "the

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[124] See David Balto, "The Efficiency Defense in Merger Review: Progress or Stagnation," *Antitrust ABA* **16:**74-81, n.39 and accompanying text (2001).

[125] See, e.g., U.S. v. Country Lake Foods, 754 F. Supp. 669, 680 n.13 (D. Minn. 1990); U.S. v. Rockford Memorial Corp., 717 F.Supp. 1251, 1289 (N.D. Ill. 1989).

nearly impossible task of rebutting a possibility with a certainty."[126] The court's statement accords not just with common sense, but with decision theory as well. In contrast, the Department of Justice'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: "defendants 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."[127]

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."[128] 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.[129] 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.[130] 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 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 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-

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126 970 F. Supp. 1066, 1089 (D.D.C. 1997).

127 Ibid.

128 246 F.3d 708, 721 (D.C. Cir. 2001).

129 Ibid. at 720.

130 Ibid.

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 hard time 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 leads a merger to be 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.[131]

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 insignificant increase in market power with no efficiencies; and (d) an insignificant

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[131] Moreover, as discussed below, it is well known that a consumer who is risk neutral with respect to income will be risk loving with respect to prices.

increase in market power with efficiencies.[132] 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:

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

It is useful to describe this approach more formally to allow generalization. Let $\{X_1, X_2, ..., X_n\}$ denote the set of possible outcomes, such as different prices that might arise if a merger were consummated. Let r_i denote the probability that outcome X_i will arise if the merger is approved. Note that the values of $\{r_1, r_2, ..., r_n\}$ are derived from the agencies and courts' analysis of the observable market conditions. Finally, let $u(X_i)$ denote the payoff associated with outcome X_i. Then, by definition, the expected payoff associated with allowing the merger is:

$$\sum_i u(X_i) r_i .$$

If one measures payoffs so that the baseline of blocking the merger gives rise to an expected payoff of zero, then the decision-theoretic approach will call for the merger to be blocked if the expected payoff from the merger is negative and approved if the expected payoff is positive.

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[132] 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.

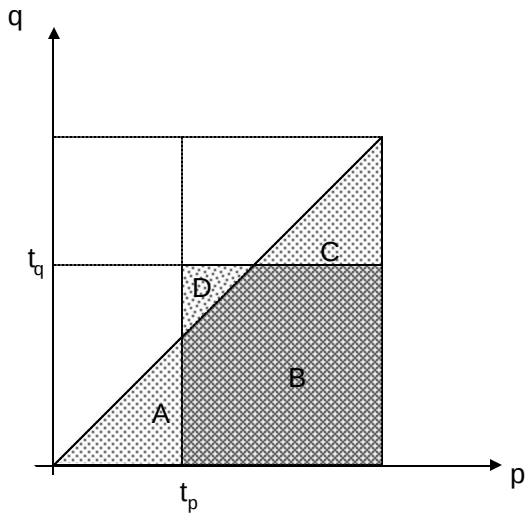
The fundamental point for policy is that the magnitude of each possible outcome (i.e., the size of $u(X_i)$) and not just whether it is likely (i.e., whether r_i is above some threshold) must be taken into account if the welfare implications of a merger are to be fully understood. Arbitrary thresholds for probabilities could rule out consideration of events with major implications for consumers and that, in the repeated exercise of merger review, could add up to major welfare costs across transactions.

Some commentators on a draft of this article have expressed concern that our recommended approach is too complicated and that judges are incapable of calculating expected values with any degree of reliability or accuracy. We believe this criticism misses the mark. Our approach does not create additional burdens or the need to form judgments about quantities that could otherwise safely be ignored. Instead, our approach calls for the court to be explicit about the judgments and projections that it is making.

It is useful to explore this point further within the context of a stylized example. Suppose that there are objective or "true" probabilities of harm and efficiencies about which the judge is asked to form beliefs. Specifically, there is an objective probability p that the merger has harms, H, and probability $1-p$ that the merger has no harms. Similarly, with probability q the merger has efficiencies, E, and with probability $1-q$ it has no efficiencies. For ease of exposition, assume $E = H$.

If one could observe the values of the probabilities, the merger should be blocked if and only if $pH - qE \geq 0$. In the simple case of $E = H$, the rule comes down to blocking the merger if and only if the probability of harm is greater than the probability that efficiencies would be realized. This corresponds to the sum of areas A, B, and C in the Figure 2 below.

Figure 2: Balancing competitive harms against efficiencies in a world of incomplete information.



The current litigation process entails alternating burdens of proof that require probability thresholds to be met. That is, the government first has the burden of convincing the judge that $p \geq t_p$ and, if the government succeeds, the defendant then has the burden of showing that $q \geq t_q$. In theory, if both parties meet their burdens, then the court weighs the relative magnitudes of the expected harms and efficiencies. In practice, courts appear to ask whether the expected competitive harms are substantial and, if so, to conclude that the efficiencies are smaller, without giving much consideration to the likely magnitude of the efficiencies.

Under the most favorable interpretation of the current process, a merger is blocked if and only if the government meets its burden of convincing the judge that $p \geq t_p$ and the defendant fails to meet its burden of convincing the judge that $q \geq t_q$, or both parties meet their burdens but the judge concludes

that the expected harms are greater than the expected efficiencies. This process corresponds to rejecting mergers falling in areas *B*, *C*, and *D* in Figure 2.[133]

The threshold approach will typically fail to lead to socially optimal decisions. There are two types of distortion. First, mergers falling in area *A* should be blocked but are not. These mergers are ones for which the expected competitive harms are low, but the expected efficiencies are even lower. Second, mergers falling in area *D* should be accepted but are blocked. These mergers are ones for which the probability of efficiencies is below the threshold but the expected value of the efficiencies exceeds the expected competitive harms.

The existence of these errors raises the question of whether the rule might nonetheless be justified on "practical grounds." Intuitively, one might argue that a judge will not form precise beliefs about *p* and *q* or will be unwilling to make public statements about the specific values of these probabilities. The latter is not, however, required by the approach we advocate. Instead, the judge need state only whether he or she believes *p* is greater than *q* (or, more generally, whether the ratio of *p* to *q* exceeds some value). We cannot think of a good reason why doing so would be inherently more difficult than stating whether he or she believes that $p \geq t_p$ and $q < t_q$. Moreover, if both parties meet their threshold burdens, then the judge is ostensibly called upon to weigh the expected values in any event.

If one thinks that thresholds have some special claim on practicability, then one could frame the expected value approach in this simple example as asking whether the judge believes that the *net* effect of the merger is more likely to be harmful than not. Of course, when the distribution of likely net harms is asymmetric, this need not be an optimal rule. We favor more explicit calculation of expected values in such cases, and we see little reason to expect the alternating-thresholds approach to be an optimal shortcut. That said, the design of a simplified decision rule is an area that deserves further exploration by antitrust scholars and practitioners. We observe, however, that, as a practical matter, it would not be easy to determine the optimal thresholds under the alternating-thresholds approach. One source of difficulty is that the thresholds create strategic decisions for the parties. Specifically, faced with a

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[133] Under a more cynical interpretation of current practice, the merger is blocked if the government meets its burden. This interpretation corresponds to blocking mergers for which $p \geq t_p$.

probability threshold, a party has to decide what magnitude of harm or efficiency to assert before the court. If one assumes that courts are more willing to credit evidence of modest claims than of grand ones, then each party faces a tradeoff: the larger the magnitude of the claimed effect, the more difficult it is to convince the judge that the likelihood threshold is met. We find no evidence that these strategic considerations have been taken into account in determining the probability thresholds currently applied by the agencies and courts.

Another common objection to the use of expected values is the mistaken belief that this approach rigidly imposes a specific objective on the court. In fact, use of a payoff function gives this approach a high degree of flexibility. The payoff function gives a score to each possible outcome, and that score can capture a variety of different factors. One is the decision maker's attitude toward risk. Suppose that X_i is the realized value of consumer surplus under outcome *i*. If the antitrust enforcer's objective is to maximize consumer welfare and the enforcer is risk neutral, then the enforcer will seek to maximize the expected value of X_i, which is $\sum_i X_i r_i$.

Enforcers may, however, be averse to variations in consumer welfare. That is, faced with two actions that have the same expected level of consumer surplus, the enforcer may prefer the one that involves less uncertainty about the resulting level. Enforcers with this aversion to risk might be willing to accept a lower expected level of consumer surplus in return for less variability in the realized level of consumer surplus. Enforcers' risk aversion can be captured by a payoff function that tends to fall faster in response to losses than it rises from gains (a so-called concave function).[134]

Suppose that allowing a merger gives rise to a ½ chance that consumers will gain $100 million in surplus and a ½ chance that they will lose $100 million in surplus. The expected value of the merger's effects on consumer welfare is zero. Suppose, however, the difference between $u(0)$ and $u(100{,}000{,}000)$ is less than the difference between $u(-100{,}000{,}000)$ and $u(0)$. Then the expected

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[134] David M. Kreps, *A Course in Microeconomic Theory* (1990) at 82-83.

payoff associated with allowing the merger, $\frac{1}{2}u(-100{,}000{,}000) + \frac{1}{2}u(100{,}000{,}000)$ will be less than the expected payoff associated with blocking it, $u(0)$.[135]

A decision-theoretic approach does not dictate policy preferences regarding how much, and what kinds, of risk to accept in making enforcement decisions. If policy makers decide, for example, that it is important to avoid the risk of impeding the efficiency of domestic firms in a globally competitive market, they can factor a discount on price effects or a premium on cost-saving effects into the payoff function of their expected-value framework; they can do the opposite if the market is one in which there is aversion to risk of short-run price increases. Similarly, if—as a policy choice—only efficiencies that get passed through to consumers are to be counted in favor of a merger, the probability and magnitude of pass-through can be variables that factor into the decision analysis. The expected-welfare, decision-theoretic approach is beneficial because it requires that any policy preferences be made explicit; increasing (one hopes) the likelihood that those choices will be well thought out.

The fact that both competitive harms and merger benefits accrue over time also challenges the current approach to merger analysis. Here, too, the agencies often adopt a threshold approach; the agencies are particularly likely to be dismissive of events that they do not project to take place in the very near future. For example, the *Merger Guidelines* tend to consider entry only within a limited time horizon.[136] Thus, similar to the treatment of uncertainty, the treatment of inter-temporal weights is often rather unsophisticated. Indeed, the two problems are linked. Partly in response to concerns that the future is highly uncertain, the antitrust agencies tend to take a relatively short-run perspective. For instance, the *Merger Guidelines* state that efficiency benefits that are predicted to be realized only with a lag are "given less weight because they are less proximate and more difficult to predict."[137]

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135 For a more detailed and complete discussion of uncertainty analysis in merger review, *see* Michael L. Katz and Howard A. Shelanski, "Merger Analysis and the Treatment of Uncertainty: Should we Expect Better?" forthcoming in W. Dale Collins (ed.) ISSUES IN COMPETITION LAW AND POLICY (2006).

136 Specifically, for non-durable goods the agencies tend to look only two years forward, although the *Merger Guidelines* provide no rationale for this cutoff. (*Merger Guidelines*, § 3.2.) In our experience, 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.

137 Ibid, footnote 37.

In terms of meaningfully projecting effects on consumers' economic welfare, however, it makes little sense to put almost no weight on the future. Entry four years in the future has less value than entry one year in the future, but it does not have zero value. Arbitrarily cutting off from consideration entry that occurs more than two years hence, as the *Merger Guidelines* often do, truncates the proper welfare analysis. The lesson from decision theory is to factor in magnitudes in addition to probabilities and to discount those magnitudes over the relevant time periods.

In this regard, it should be observed that, for at least two reasons, simply using a higher discount factor to deal with uncertainty is likely to be a very poor heuristic. First, it is not the case that events farther in the future are always less certain. Second, even where events do become less certain over time, there is no reason to believe that the expected values will always fall proportionately with time or the degree of uncertainty, as the following example illustrates. Consider a project that lowers costs by 20 percent with probability p, by 0 percent also with probability p, and by 10 percent with probability $1 - 2p$. Higher values of p correspond to greater uncertainty (there is a greater chance that one of the extreme values of 0 percent or 20 percent is realized), but the expected size of the cost reduction remains constant at 10 percent. If the decision maker is risk neutral with respect to the cost reductions or to consumer welfare, then it makes no sense to discount the cost reduction as a means of handling uncertainty.[138] Doing so, in effect, throws out much of the information about the nature of the uncertainty and the shape of the probability distribution over possible outcomes.

Issues of inter-temporal trade-offs under uncertainty also arise when a merger's projected competitive effects on static pricing and innovation run in opposite directions. In terms of consumer welfare effects, antitrust enforcers may face an uncertain trade-off between higher prices in the short run and lower (quality-adjusted) prices in the long run. In such situations, it would be particularly valuable for the agencies and the courts to make greater use of the standard tools of decision theory (e.g., developing subjective probability distributions for critical parameters and utilizing decision tress to calculate expected values) to make rational calculations of the expected net present value of benefits or harms.

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[138] Indeed, because consumer welfare tends to be convex in prices, decision makes who were risk neutral with respect to consumer welfare would be risk loving with respect to price reductions.

VII. 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 U.S. Department of Justice filed a complaint challenging the proposed acquisition of DTM Corporation (DTM) by 3D Systems Corporation (3D).[139] 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.

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 Section VIII, the Department of Justice was concerned that the merger would significantly reduce competition. The Department of Justice 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.[140] 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

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[139] *United States v. 3D Systems Corp. and DTM Corp.*, (CCH) ¶ 73,738 (D.D.C. 2002) Verified Complaint.

required to be a firm currently manufacturing industrial RP systems in a foreign market, so that it would have a demonstrated ability to compete.[141]

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.

It is useful to distinguish between a duty to deal with competitors and licensing as a remedy because they may 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. It essentially tells firms they will have to share the results of their R&D investments with rivals who have shared none of the risks of that investment. 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, suppose that the licensing allows a merger to be completed that would otherwise be blocked. 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.

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

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140 *United States v. 3D Systems Corp. and DTM Corp*., (CCH) ¶ 73,738 (D.D.C. 2002) Final Judgment Proposed).

141 Intellectual property assets also were included in the divestitures required to settle *United States v. Premdor U.S. Holdings, Inc. International Paper Company, and Masonite Corporation*. Similarly, *United States v Miller Industries* involved acquisitions of tow truck companies holding important patents and led to a consent decree with mandatory licensing.

example, two drugstore chains seek to merge, divestiture is relatively straightforward in principle: the parties must divest stores where the pre-merger 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.[142] 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 the Section VIII 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 paper. 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.

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.[143]

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[142] 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.

[143] For a discussion of the application of Section 2 to high-technology markets, see Evans and Schmalensee, supra note ___.

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.[144] 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.

VIII. 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 one 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 there potentially 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. CANNONICAL SITUATIONS

The concept of innovation can span a spectrum of activities ranging from pure research aimed at making discoveries in basic science, to developmental activities that apply known inventions and

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

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). To illustrate how the question for merger policy changes as the nature of the innovation changes along the continuum from pure research to market production, we next discuss three abstract cases showing the different problems that different forms of innovation present for merger review.

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.[145] 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 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 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 geographical 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

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

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 of 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.[146] The FTC's complaint asserted that Roche and Genentech competed in R&D for important therapies for the

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146 *Roche Holdings, Ltd.*, FTC No. C3315 (filed November 18, 1990).

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.[147]

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.[148]

In terms of the three canonical situations we discussed above, the Roche/Genentech case appears to fit Case 1, in which innovation is a 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.[149] 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 Justice Department first challenged a merger on innovation grounds in 1993, when it investigated ZF Friedrichshafen's (ZF) proposed—and later abandoned—acquisition of General Motors' Allison division.[150] 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

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147 *See* Gilbert and Sunshine (1995, p. 580) for further discussion of this case.

148 See, e.g., Gilbert and Sunshine (1995).

149 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.

150 *United States v. General Motors Corp.,* No. 93-530 (D. Del., filed November 16, 1993).

European market for such transmissions but not in the North American market, in which GM was dominant.[151] The Justice Department 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 and ZF's incentives to develop new designs and products.[152] 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 levels, 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 Gilbert and 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 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 non-transmission 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 Department of Justice'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 Department's action suggests that, if a merger would leave an industry with near-monopoly

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151 Ibid.

152 Ibid.

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 doesn't seem so radical; the merger to near monopoly certainly reduced the potential for competition between the two major firms. 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 Department of Justice 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.[153] In that case, analysis of innovation in the aerospace industry supported the merger, not because the transaction was expected to increase R&D,

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[153] *See* Pitofsky, Robert, et al. (1997) *Statement In the Matter of the Boeing Company/McDonnell Douglas Corporation*, FTC file no. 971-0051, July 1, 1997.

but because the analysis showed that McDonnell Douglas had fallen behind technologically and no longer could exert competitive pressure on its rivals.[154] 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 Justice Department'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.[155] The Justice Department 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.[156] 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.[157] The Justice Department 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.[158]

Although traditional concerns about adverse effects on price competition were an important part of the Justice Department's challenge to Lockheed's acquisition of Northrop, innovation concerns were central. For example, the Department noted that Lockheed and Northrop had both started R&D programs for advanced airborne early-warning radar systems, and the Department concluded that consolidation of the two R&D efforts would harm future military procurement.[159] The Justice Department 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

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154 Ibid at 2.

155 *United States v. Lockheed Martin Corp. and Northrop Grumman Corp.,* Complaint (D.D.C., filed 3/23/98).

156 Ibid at 2.

157 Ibid at 3.

158 Ibid at 3.

of the processes used to turn innovative ideas into cost-effective, technically sound, and efficiently produced aircraft."[160]

The Justice Department'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 Justice Department 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.[161]

Biotechnology and Pharmaceuticals. In the mid-1990s, innovation concerns played a central role in the FTC's crafting of a consent agreement 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.[162] 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-

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159 Ibid at 7-8.

160 Ibid at 26.

161 Similar issues arose and conclusions were reached in the Department of Justice's challenge of a proposed merger of the only two companies that manufacture nuclear submarines for the United States. (*United States of America v. General Dynamics Corporation and Newport News Shipbuilding, Inc.*, Verified Complaint, United States District Court for the District of Columbia, October 23, 2001.)

162 *See In the Matter of Ciba-Geigy Ltd., et al.,* Decision and Order, FTC Docket No. C-3725, March 24, 1997.

control products for pets.[163] The more novel parts of the FTC's challenge, however, had to do with research and development 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 (FDA).[164] 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.[165] 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."[166]

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 concerns with respect to the overlapping herbicide and flea-control businesses. The FTC accordingly ordered one party to divest those businesses.[167] More notable, however, was the fact that the FTC did not require

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163 Ibid.

164 See FTC, *In the Matter of Ciba-Geigy Ltd, et al.*, Analysis of Proposed Consent Order to Aid Public Comment, at 3.

165 Ibid.

166 Ibid.

167 Ibid.

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.[168]

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.[169] 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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168 Ibid at 9.

169 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 the discussion of merger specificity in Section VI above.

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 Department of Justice and 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. [170] 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.[171]

The FTC again faced a mix of product- and innovation-based potential competition issues in its challenge to the Amgen/Immunex merger in 2002.[172] At the time Amgen and Immunex proposed to

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170 *Hoechst AG*, FTC Docket No. C-3939 (2000), available at http://www.ftc.gov/os/caselist/c3919.htm. See, also, Arquit, Kevin J., and Richard Wolfram (2001) "Mergers and acquisitions: United states government antitrust analysis and enforcement," PLI Order No. B0-00Z6 May 10-11, 2001 - New York City May 17-18, 2001 - Chicago May 31-June 1, 2001 - San Francisco 42nd Annual Antitrust Law Institute, at 453.

171 *Hoechst AG*, FTC Docket No. C-3939 (2000), available at www.ftc.gov/os/caselist/c3919.htm

172 *Amgen Inc.*, FTC Docket No. C-4056 (2002), available at http://www.ftc.gov/os/caselist/c4056.htm.

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 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.[173] 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.[174]

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 Section VII, the Department of Justice 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.[175] 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."[176] 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.[177] The Department of Justice settled the case through a consent decree that required 3D and

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173 Complaint, *Amgen Inc.*, FTC Docket No. C-4056 (2002), at 5-6. available at http://www.ftc.gov/os/caselist/c4056.htm.

174 http://www.ftc.gov/os/2000/12/glaxosmithklinecmp.pdf.

175 *United States v. 3D Systems Corp. and DTM Corp.*, C.V. No. 1:01CV01237 (D.D.C. filed June 6, 2001), available at http://www.usdoj.gov/atr/cases/f8800/8896.htm (Complaint). See, also, *United States v. 3D Systems*, 2002-2 Trade Cas. (CCH) ¶ 73,738 (D.D.C. 2002) (Final judgment).

176 *United States v. 3D Systems Corp. and DTM Corp.*, Complaint, Section 21.

177 Ibid.

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.[178]

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 involved innovation efforts sufficiently well underway that one of the merging parties can convincingly be considered a potential 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, 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 Department of Justice 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 Federal Trade Commission 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 enforcement decisions.

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[178] *United States v. 3D Systems Corp. and DTM Corp.*, Final judgment, at 11.

IX. CONCLUSION: IMPLEMETING 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

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 in merger analysis. Indeed, the Department of Justice 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.

Basing merger review on whether a merger will distort the amount or timing of innovation raises issues that are more difficult and fundamental for the existing framework on both conceptual and practical levels. Antitrust agencies could decide not to address these issues and could instead to retain their focus on more conventional product-market concerns. Or, as the "Schumpeterian" school advocates, the agencies could refrain from quantifying innovation effects and simply reduce enforcement—even when it is warranted according to conventional criteria—in the name of not impeding innovation. But 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.

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. Hence, we conclude that the antitrust agencies and the courts should neither systematically retreat from merger enforcement nor shy away from taking innovation more affirmatively into account in the course of merger review. Instead, the agencies should continue to extend their consideration of mergers' effects on innovation and consumer welfare to cases in which the concern is with the degree and timing innovation itself, including potential R&D projects that are not already underway but that would increase economic welfare. [condense; or cut, repetitive of earlier sections]

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 limited presumption that a reduction in the number of competing innovators reduces innovation in the absence of any efficiency effects. We emphasize, however, that this presumption should be fairly weak except in the case of merger to monopoly, and even there it would be rebuttable. 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.[179] 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.

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[179] 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 Section III, 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.

Although consistent with the theoretical underpinning of current merger policy, a movement away from a predominant focus on market 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 relates to that difficulty, and is that the agencies use the tools of decision theory to deal with uncertainty, particularly with respect to innovation. 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.[180] Similarly, efficiency benefits that are realized only with a lag are "given less weight because they are less proximate and more difficult to predict."[181] Standard decision theory indicates, however, that these approaches are poor heuristics for calculating expected payoffs in the face of uncertainty. For example, these approaches to entry 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.[182] More broadly, the effects of mergers on innovation

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180 *Merger Guidelines*, Section 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.

181 Ibid, footnote 37.

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

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 competition in a relevant product market, and to 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. (Plaintiff wins on presumption if it proves concentration in relevant market and all other evidence of harms and benefits is equal.)	Plaintiff's burden to show harm, defendant's burden to show gain, with very limited presumption of harm. (Except in cases of merger to monopoly, defendant wins if evidence of harms and benefits is equal.)
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 ultimate 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 allow the merger of Gemzyme Corp. and Novazyme Corp., the only two companies developing therapies for a rare disorder known as Pompe disease. *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 (the very considerations that blocked a merger to monopoly in ZF/Allison) 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.

The FTC's 3-1 vote to allow the Genzyme/Novazyme merger is accompanied by three written statements, one by Chairman Muris in support of the majority's position, one by Commissioner Thompson in dissent, and one by Commissioner Harbour. 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' 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.[183] Implicit in the Chairman's statement is 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. The agency should instead consider innovation on a fact-intensive, case-by-case inquiry.

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[183] No other members of the majority signed Chairman Muris' 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. [CITE].

Muris finds inquiry into the facts of *Genzyme* to show that innovation would not suffer and could benefit from the merger.

The dissenting statements take greatest issue with the latter points. 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. 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.

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.

In *Genzyme*, there were three separate statements from FTC Commissioners, one from then-Chair Timothy Muris in support of the majority's decision to approve the merger and two, from Commissioners Thompson and Harbour, in dissent. We focus primarily on Muris's statement and his analysis of the merger.

As a preliminary matter, Muris analyzed the merger solely in terms of its impact innovation and not in terms of its effects on product-market competition. The first step of his analysis of innovation effects was to eliminate any broad presumption about the effects of a merger on parties' incentives or ability to invest in innovation. The second step was, in the absence of a general presumption about the relationship between market structure and innovation, 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 pharmaceuticals industry as a

whole. The third step was to consider both theories of harm and theories of benefits from the merger in the light of the case-specific facts. Finally, Muris's fourth step was to attach probabilities to the potential harms and benefits and to calculate the expected, net effect of the merger. [Yellow paragraphs are a bit repetitive and should be consolidated: green paragraph should be cut]

Muris does several things in the four steps listed above 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.

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) x (large benefit) – (.75) x (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 whether the large benefit in the first state of the world is merger-specific. To the extent that a joint venture with either Genzyme of 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' analysis involves a step he did not take. He nowhere analyzes the product-market effects of the merger, although from 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 potential competition to develop 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 Section III, 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' 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.