New Antitrust Laws for the "New Economy"?

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Summary

Dynamic competition to develop new products and to improve existing products can have much greater impacts on consumer welfare than static price competition, and antitrust policy should take dynamic competition into account when evaluating mergers or conduct in innovation-intensive industries. This can be accomplished without re-writing the antitrust laws. Antitrust policy has served the interests of consumers by maintaining a level playing field for all sectors of the economy and by resisting a tendency to develop special rules and enforcement standards for different industries. Although the new economy has a number of distinct characteristics that should be taken into account when evaluating the competitive effects from mergers or other conduct, antitrust enforcement is sufficiently flexible to account for these features and preserve competition when it benefits consumers.

The relationship between competition and innovation is complex and neither economic theory nor empirical evidence supports a general conclusion that competition always increases or always decreases incentives for innovation. A presumption that competition promotes innovation is consistent with a large body of empirical evidence showing that competition and innovation are positively correlated. However, any such presumption should be rebuttable. Economic theory suggests that competition can discourage innovation under some circumstances, particularly in industries where it is difficult for firms to appropriate the value of their innovative efforts, and there is some empirical evidence that supports this view. A rebuttable presumption that competition promotes innovation would align antitrust policy with the bulk of empirical evidence that supports this conclusion, while preserving the ability to present contrary evidence when warranted by particular circumstances.

Thank you for the opportunity to testify before the Antitrust Modernization Commission regarding Antitrust and the New Economy. The antitrust laws have served our country well by protecting competition throughout the economy. Unlike many other forms of regulation, antitrust has been relatively free of capture by special interests, and antitrust enforcement has largely evolved over time in ways that promote aggregate consumer welfare. Rapid changes in the economy brought on by innovation and the emergence of "new economy" industries such as computers, communications and the Internet have led some to question whether the antitrust laws can deal with the challenges of today's dynamic markets. The Sherman Act, the foundation of our antitrust laws, was enacted in 1890. How can a statute that is more than 100 years old provide accurate policy guidance for today's new economy?

While the new economy has a number of distinct characteristics, antitrust enforcement is sufficiently flexible to account for the distinguishing features of the new economy and to preserve competition when it benefits consumers. I caution against promoting policies that would alter the principles of antitrust enforcement for new economy industries. While dynamic, innovation-driven industries have a number of characteristics that challenge conventional approaches to antitrust enforcement, there is nothing in antitrust policy that prevents a sound analysis of competitive effects in the new economy. The composition of the new economy, which we now associate with computers and the Internet, is likely to morph into new fields as innovations change the ways we think about old activities. In some respects, advocates of an antitrust exemption for the new economy represent another special interest group, whose members are ill-defined and likely to change, and antitrust policy has served our nation well by resisting the forces of special interests.

I have worked on issues related to the economics of innovation and the intersection of antitrust and intellectual property for most of my professional career. I served as the Deputy Assistant Attorney General in the Antitrust Division in the U.S. Department of Justice. While at the DOJ, I directed an effort that led to the publication of the joint DOJ/FTC *Antitrust Guidelines for the Licensing of Intellectual Property*. I will refer to these guidelines in my testimony. The guidelines deal directly with antitrust enforcement issues that often arise in dynamic, innovation-

driven industries and in my opinion the policies described in these guidelines have held up well since their publication ten years ago.

I have written extensively on the subject of competition and innovation. The relationship between competition and innovation is complex, however considerable progress has been made in understanding this relationship in recent years. As background for my comments, I have attached two recent surveys of the theoretical and empirical economic literature on the relationship between competition and innovation, one that I wrote for a forthcoming volume published by the National Bureau of Economic Research ("Looking for Mr. Schumpeter: Where Are We in the Competition-Innovation Debate?") and a shorter version on the same subject that is intended for antitrust scholars and practitioners ("Does Competition Promote Innovation?"). I have also included an article written with Willard Tom on "Is Innovation King at the Antitrust Agencies?: The Intellectual Property Guidelines Five Years Later," which was published in *The Antitrust Law Journal*.

I focus my remarks primarily on merger enforcement in dynamic, innovation-driven industries, because the enforcement agencies often consider innovation effects in their evaluations of mergers. However my remarks generally apply to antitrust issues that arise in other contexts, such as unilateral conduct and multi-firm coordination.

A. *Antitrust analysis of industries in which innovation, intellectual property, and technical change are central features*

1. *Does antitrust doctrine focus on static analysis, and does this affect its application to dynamic industries?*

A market is inefficient in the static sense if price exceeds the minimum social marginal cost of production or if consumers face different marginal prices. These are distortions in resource allocation that create a deadweight loss, meaning that the economy is operating at a point below its static production possibility frontier. A market is inefficient in a dynamic sense if prices fail to provide adequate incentives for investments that create new products or lower the costs of

producing existing products.[1] The antitrust laws are not limited to static economic efficiency concerns and nothing prevents their application to dynamic industries. The courts have clearly noted that market dominance attained through innovation is not a violation of the antitrust laws. In *United States v. Grinnell Corp.*, the Supreme Court distinguished unlawful monopoly power from "growth or development as a consequence of a superior product, business acumen, or historic accident."[2] In evaluating the potential conflict between antitrust and intellectual property laws, the Court of Appeals for the Federal Circuit concluded in *Atari Games v. Nintendo* that "…the two bodies of law are actually complementary, as both are aimed at encouraging innovation, industry and competition."[3] While tensions sometimes exist between the antitrust laws, which promote competition, and intellectual property laws, which grant exclusive property rights, the antitrust laws and the courts recognize that consumers benefit from conduct and arrangements that promote innovation.

2. *What features, if any, of dynamic, innovation-driven industries pose distinctive problems for antitrust analysis, and what impact, if any, should those features have on the application of antitrust analysis to these industries?*

Dynamic, innovation-driven industries have several features that pose challenges for antitrust analysis, although I would not say they are insurmountable problems. By definition, R&D is significant in these industries, and dynamic competition to develop new products and to improve existing products can have much greater impacts on consumer welfare than static price competition. Table 1 shows the ratio of non-Federal R&D expenditures to net sales in 2001 for selected industries.[4] The most R&D-intensive industries include those we normally associate with the "new economy": software, communications, computers and semiconductors. These industries generally have large fixed costs (most of which are sunk R&D expenditures) and low marginal costs, giving rise to economies of scale over a wide range of output. Because average

[1] There is no standard definition of dynamic economic efficiency for antitrust enforcement. I define a market to be dynamically efficient if it achieves a level of capital investment (including investment in R&D) that maximizes the present value of economic surplus given the information available at the time the investments are made.

[2] 384 U.S. 563, 571 (1966).

[3] U.S. Court of Appeals for the Federal Circuit, 897 F.2d 1572, 1576 (1990).

[4] Although 2001 coincides with the collapse of the Internet bubble, aggregate R&D intensities have been relatively stable in recent years in most of these industries.

cost is much larger than marginal cost in many of these innovation-driven industries, markets cannot be perfectly competitive and generate profits sufficient to cover the cost of R&D. The products sold in these industries sometimes have powerful network effects, which means that consumer valuations of the product depend on the number of other consumers who choose the product and the participation of "complementors" – other firms or activities that add value to the product. These network effects give rise to economies of scale that originate from the demand side of the market. Patent protection, standardization, and compatibility choices are also key factors that determine market acceptance in many of these industries and these features can pose challenges for antitrust policy. Standardization may require cooperation among actual or potential competitors, a hot-button topic for antitrust enforcement. Increasing returns to scale, network effects and switching costs can combine to create high barriers to entry for new firms, particularly for firms that offer products that are incompatible with established systems.

Markets with strong network effects have the property that a successful product or standard often wins all or most of the market demand. For example, personal computers using the Windows operating system currently account for more than 90 percent of all personal computer sales. Antitrust policy should, and generally does, recognize that in network industries market dominance can reflect innovation, superior business acumen, or just plain pure luck, with no necessary element of exclusionary conduct that would justify a finding of unlawful monopolization. Entry barriers in industries with powerful network effects can be self-enforcing and sustaining.

Competition in markets with powerful network effects may involve conduct that could appear "predatory" in old-economy industries, such as giving away products to build market share, yet this conduct is a natural consequence of competing to win a market that confers substantial advantages. Once the leader has been determined, competition may be limited in the absence of a significant shift in technology that would allow a new competitor to displace the current market leader. At the same time, the fact that markets with network effects can "tip" and create a bandwagon effect that selects a dominant system or platform means that antitrust enforcement must be diligent to prevent conduct that would promote one system or platform over another for reasons that are not the result of innovation or superior business acumen.

Intellectual property is an important source of competitive advantage and a significant determinant of firm value in dynamic, innovation-driven industries. Although most patents have little commercial value, some patents can be a source of market power because they protect an important area of commerce or because they can block another firm from exploiting its own technology. These valuable patents extend the boundaries of strategic conduct that is available to firms in an industry and can raise challenging antitrust issues. For example, whether the owner of a patented pharmaceutical can lawfully exclude a generic competitor depends on whether the patent is valid and infringed, an inquiry that can be very difficult for courts and antitrust enforcers. Consumers may bear the costs of settlements that sustain otherwise invalid or narrow intellectual property rights. Nonetheless, even settlements of patent disputes have efficiency benefits.[5] Weighing the efficiency benefits of patent settlements against the competitive risks is a complex undertaking. Similarly, whether a patent pool is pro-competitive or anti-competitive depends on whether the patents cover technologies that are complements or substitutes for each other, a difficult inquiry for courts and antitrust enforcers.

Cases involving failure to disclose patents by participants in standard-setting organizations, such as those brought by the Federal Trade Commission against Dell, Rambus and Unocal, represent new ground for antitrust policy. In these cases, the Commission alleged that the absence of disclosure distorted competition because the patents were necessary to practice a standard selected by the standard-setting organization, and the organization may have selected a different standard if the patents were disclosed in the first place. These cases raise a host of complex issues. What are the obligations of an intellectual property rights holder to disclose its property rights? Typically, it is the responsibility of parties whose actions may infringe intellectual property rights to research the existence of those rights. Should a standard-setting organization or its participants have the same responsibilities? Should a disclosure requirement apply to all standard-setting organizations? Should the requirement apply only to existing patents, or also to pending and planned patent applications?

[5] See, e.g. Judge Posner's analysis of the benefits from settlements in Asahi Glass Co. v. Pentech Pharmaceuticals, 289 F. Supp. 2d 986 (ND Ill. 2003) ("The general policy of the law is to favor the settlement of litigation, and the policy extends to the settlement of patent infringement suits.").

A crucial feature of the new economy is the importance of innovation competition. The antitrust agencies recognize this and have identified innovation as a competitive issue when analyzing mergers in R&D-intensive industries. Indeed, over the past decade, innovation has risen from an afterthought to a central aspect of agency merger enforcement decisions. Until the mid-1990s, the Department of Justice and the Federal Trade Commission rarely mentioned innovation as a reason to challenge a merger. From the start of fiscal year 1990 until the end of fiscal year 1994, the DOJ and the FTC challenged 135 mergers (excluding bank mergers) and alleged adverse impacts on innovation in only four cases, or about 3% of all merger challenges. (Table 2) From FY 1995 to FY 1999, the DOJ and FTC cited adverse innovation effects as a reason to challenge at least 47 proposed mergers. Together, the agencies cited adverse innovation effects in 17.5% of the mergers they challenged during this period. (Table 3) From the beginning of FY 2000 until the end of FY 2003, the DOJ and FTC challenged a total of 109 mergers and mentioned innovation effects as a reason to challenge the merger in 41 cases, which is about one out of every three merger challenges. (Table 4)

In the past several years the DOJ and FTC cited innovation concerns in most of the mergers that the agencies challenged where the parties to the merger made significant investments in research and development. For example, the DOJ challenged 15 mergers in FY 2003 and filed complaints in district courts in nine of these mergers. In six of these complaints the DOJ alleged that the merger, if allowed to proceed, would have adverse effects on innovation. The three mergers in which the DOJ did not allege innovation effects were in waste hauling, television programming, and dairies, all industries with negligible R&D expenditures. The FTC challenged a total of 21 mergers in FY 2003 and issued complaints in nine cases, of which three alleged adverse effects on innovation. The affected industries were process engineering simulation software, high performance organic pigments, and pharmaceuticals, all industries with significant R&D expenditures. The mergers in which the FTC did not allege innovation effects were in food processing and retailing, natural gas distribution, clinical lab testing services and the marketing (but not research, development or manufacture) of pharmaceuticals. Research and development was insignificant in these industries where the FTC did not allege innovation effects.

There are two polar views of the effects of competition on innovation. One view, typically associated with the writings of Joseph Schumpeter in *Capitalism, Socialism and Democracy* published in 1942, is that large and dominant firms provide a superior platform for innovation and that innovations arriving in "gales of creative destruction" make market power in dynamic and innovation-intensive industries a fleeting phenomenon. The other view is that competition promotes innovation, both because firms in competitive industries have more to gain by innovating and because protection from rivalry in monopolistic industries makes managers slow to adopt new technologies. The pattern of merger enforcement by the DOJ and the FTC reflects the latter view. Their enforcement actions imply a belief that if a merger adversely affects product market competition, it is also likely to reduce innovation. Is such a presumption warranted? A large body of economic evidence is consistent with this presumption. Many empirical studies show a positive relationship between product market competition and innovation, whether measured by counting actual innovations or patents, or by estimating factor productivity. However, most of these studies only measure correlations; they do not prove that competition *causes* greater innovation. Economic theory is ambiguous on the relationship between competition and innovation. Competition can reduce innovation incentives, particularly in markets where property rights are weak and it is difficult for firms to appropriate the value of their innovations. Appropriation can be difficult for process innovations even when protected by patents, because it is often difficult for an intellectual property rights holder to detect when a process innovation is infringed. Thus, in markets with weak appropriation, or where process innovation is critical, a merger can increase innovation incentives by increasing the scale of operations in which an innovation is used. There is also some empirical support for the theoretical result that competition can reduce innovation incentives in markets with weak appropriation.

Based on the totality of economic theory and empirical evidence, it is my view that a presumption that competition promotes innovation is warranted, however that presumption should be rebuttable. Parties should be permitted to demonstrate that a merger or other arrangement promotes innovation in their industry and that the increase incentive for innovation offsets any adverse static product market effects.

3. *Are different standards or benchmarks for market definition or market power appropriate when addressing dynamic, innovation-driven industries, for example, to reflect the fact that firms in such industries may depend on the opportunity to set prices above marginal costs to earn returns? Or, are existing antitrust principles sufficiently flexible to accommodate the facts relevant to dynamic industries?*

The standards or benchmarks for market definition or market power should be the same for all industries, although the conclusions certainly can depend on the importance of innovation and dynamic competition in the industry. I support the principle expressed in the DOJ/FTC *Antitrust Guidelines for the Licensing of Intellectual Property* ("IP Guidelines") that "for the purpose of antitrust analysis, the Agencies regard intellectual property as being essentially comparable to any other form of property".[6] I would also apply this principal to the analysis of market definition and market power in dynamic, innovation-driven industries.

One measure of market power is the ability to sustain prices above marginal production costs. The gross production margin, also called the Lerner Index, is equal to price less marginal cost, divided by the price. A high gross margin is a natural feature of dynamic, innovation-driven industries and its mere existence is not a basis to conclude that there is unlawful monopolization. R&D is expensive with distant and uncertain payoffs. As a result, R&D-intensive investments require an expectation of high payoffs from successful R&D to make the activity worthwhile. Pharmaceutical R&D is a case in point. A recent study estimates that on average it costs about $800 million to research, develop and test a successful new drug.[7] After a drug is introduced, its marginal production cost is typically a small fraction of its price, and pharmaceutical companies often enjoy high margins. If we look only at the pricing of patented pharmaceuticals, drug companies appear to have considerable market power, but a different picture emerges if we account for the very large costs required to research, develop and test these products.

Gross margins are generally higher in more R&D-intensive industries, because R&D is a fixed (and typically sunk) cost, marginal production costs are often low in R&D-intensive industries, and firms will not invest unless they expect to cover their total costs. Figure 1 compares 1995

[6] IP Guidelines at §2.0.

[7] Joseph DiMasi, Ronald Hansen, and Henry Grabowski, "The Price of Innovation: New Estimates of Drug Development Costs," 22 J. Health Econ. 151 (2003).

gross margins to R&D intensities for a sample of 2 and 3-digit SIC code manufacturing industries.[8] On average, industries that invest more in R&D have higher gross margins; a 1 percent increase in R&D intensity correlates with an increase in gross margin of 2.8 percentage points. Of course high margins are not unique to industries in the new economy and can exist in any industry with high fixed costs and imperfect competition.

The relatively high gross margin in R&D-intensive industries does not mean that firms that spend more on R&D are necessarily more profitable – it does not even mean that R&D covers its costs. The lesson for antitrust analysis is that we should expect firms in R&D-intensive industries to have high gross margins, and high margins do not imply that these firms have monopoly power in the antitrust sense. These profits are a return to R&D and could evaporate overnight if new technological developments cause a firm's current technology to become obsolete.

B. *Specific issues at the interface of intellectual property, innovation and antitrust*

1. *Should there be a presumption of market power in tying cases when there is a patent or copyright? What significance should be attached to the existence of a patent or copyright in assessing market power in tying cases and in other contexts?*

The DOJ/FTC *Antitrust Guidelines for the Licensing of Intellectual Property* state that "the Agencies do not presume that intellectual property creates market power in the antitrust context". There should be no presumption that a patent or copyright is a source of market power in tying cases or in other antitrust contexts. More specifically, with regard to tying cases involving a patent or copyright, the IP Guidelines state that "In the exercise of their prosecutorial discretion, the Agencies will consider both the anticompetitive effects and the efficiencies attributable to a tie-in. The Agencies would be likely to challenge a tying arrangement if: (1) the seller has market power in the tying product, (2) the arrangement has an adverse effect on competition in the relevant market for the tied product, and (3) efficiency justifications for the arrangement do not outweigh the anticompetitive effects. The Agencies will not presume that a patent,

[8] The gross margin is calculated by subtracting wages from total value added, and dividing the result by the value of industry shipments. This is an average gross margin for the industry, based on average variable (not marginal) costs. R&D intensity is the ratio of non-federal R&D expenditures to net sales, averaged over the five-year period 1991-1995.

copyright, or trade secret necessarily confers market power upon its owner."[9] This rule of reason approach is an important element of agency antitrust policy for intellectual property. Patents and copyrights are often bundled or tied to other products or services for many pro-competitive reasons. Intellectual property is often complementary to other intellectual property, products or services, making it convenient for users to license intellectual property in a bundle. Licensing a bundle of patents that are essential to practice a technology reduces the potential for hold-up that could occur if a licensee had to license the patents individually. The marginal cost of intellectual property is low, so there is little reason not to include a patent or a piece of software protected by a copyright in a licensed bundle. And new economy business models, where revenues often come from sales in ancillary markets, make bundling particularly attractive. The flexible approach to tying arrangements involving intellectual property described in the IP Guidelines was a significant change in antitrust enforcement policy in the right direction.

2. *In what circumstances, if any, should the two-year time horizon used in the Horizontal Merger Guidelines to assess the timeliness of entry be adjusted? For example, should the time period be lengthened to include newly developed products when the introduction of those products is likely to erode market power? Should it matter if the newly developed products will not erode market power within two years? Is there a length of time for which the possession of market power should not be viewed as raising antitrust concerns?*

Entry can mitigate and sometimes neutralize adverse competitive effects from a merger. The timeliness of entry is an issue as is the extent of new competition from entry. Entry that drastically changes the competitive landscape 30 months after a merger occurs can be far more significant than marginal entry that occurs after 18 months, and drastic entry is more likely in dynamically competitive industries that are subject to the forces of Schumpeterian creative destruction. For this reason I would recommend a flexible timeline for evaluating entry in dynamically competitive industries. However, if a merger clearly has an anticompetitive effect, one must ask why antitrust policy should tolerate that effect, even if it lasts for only a relatively short period of time before it is eliminated by the entry of a significant new competitor. For example, suppose there is a confident prediction that a merger would increase prices in a market by 20 percent. Should it matter if entry is likely to occur in 30 months that would neutralize the price increase? It could matter for two reasons. First, entry would make the price increase and

[9] IP Guidelines at §5.3. (Footnotes omitted.)

therefore the social costs of the merger temporary. Perhaps the short duration of anticompetitive effects would not justify antitrust enforcement to prevent the merger. Second, the merger-created price increase may stimulate entry and inject new and perhaps more disruptive competition into the industry that would not have occurred absent the merger. In this event, entry would be a merger-specific efficiency and may offset the expected anticompetitive effects from the merger. This type of merger efficiency may be more likely in dynamic innovation-driven industries and in my opinion could justify a longer time horizon to evaluate entry in these industries.

3. *Should antitrust law be concerned with "innovation markets"? If so, how should antitrust enforcers analyze innovation markets? How often are "innovation markets" analyzed in antitrust enforcement?*

A merger or market conduct has significant economic effects only to the extent that it changes the prices or outputs of goods or services. Consumers do not purchase research and development (except in circumstances involving contract R&D) and for this reason one may reasonably wonder why innovation markets should play any role in antitrust analysis. Innovation markets do have value in antitrust analysis as an analytical tool to predict changes in the price or output of goods and services. Although research and development is far "upstream" from the production of goods and services that people buy, it is common for antitrust analysis to focus on changes in competition in upstream markets for inputs as a way to estimate downstream impacts on the prices of final goods and services. For example, suppose two firms each own a patent that covers a technology to broadcast high definition television signals. They assign the patents to a single firm, which sets the royalty and license terms for both patents. Antitrust enforcers may be concerned that the joint marketing will lead to higher prices and may analyze the combination in an upstream technology market. The concern is not specifically about higher royalties, but rather about the price and supply of the final product: the delivery of high definition television signals to consumers. Analysis of competitive effects in the upstream technology market can be a convenient tool to address the ultimate concern of higher prices in the downstream market, just as it is convenient to analyze the effects of mergers on prices of intermediate goods when the ultimate concern is the price and supply of final goods and services to consumers.

An innovation market analysis can provide a useful screen to assess whether an arrangement may have a significant impact on R&D directed to a new product or process, much as product market definition can provide a useful screen to assess static market power. Some assert that an innovation market cannot be a valid element of an antitrust analysis because R&D is not an accepted market under Section 7 of the Clayton Act, except perhaps for R&D performed under contract. From an economic perspective, the key issue is not whether describing an innovation market is an abuse of legal principles of antitrust market definition, but rather whether a focus on market structure and R&D is useful to assess competition and its effects on the output of innovation, and ultimately to assess the effects of competition on the price and output of future goods and services.

Measuring R&D is difficult, for several reasons. R&D has high strategic value and information about firms' R&D activities may be clouded in secrecy. Innovations sometimes come from entirely unexpected sources. Major advances in the fabrication of integrated circuits came from optics manufacturers; advances in magnetic film technology enabled enormous increases in storage capacity for computer disk drives; and developments in nanotechnology could be the source of new innovations in applications ranging from medicine to space exploration. The Guidelines note that "The Agencies will delineate an innovation market only when the capabilities to engage in the relevant research and development can be associated with specialized assets or characteristics of specific firms."[10] This limitation makes sense, because otherwise the sources of innovation may be impossible to identify. The practical effect is that innovation market analysis is useful for pharmaceuticals, where the nature of innovation and the drug approval process makes it relatively easy to identify the most likely innovators, but may not be particularly useful in some of the most dynamic innovation-driven industries, where the sources innovation are varied and unexpected.

R&D may be measured in dollars, by counting the number of R&D programs or patents, or by estimating the value of assets required to engage in R&D. The appropriate choice depends on the firms' capacities to innovate, much as the appropriate choice of product market share depends on the competitive significance of each firm's output or capacity. Of course research

[10] IP Guidelines at §3.2.3.

and development is not the same as the actual production of new products or processes. R&D is an *input* to innovation, not an *output* of innovation. R&D expenditure and innovative output need not even move in the same direction. A change in the market that leads to more R&D can result in less innovation if firms are merely duplicating each other's innovative efforts. This fact does not negate the value of an innovation market analysis. Similarly, an increase in market concentration does not necessarily imply an increase in prices, but this fact does not negate the value of using product market concentration as a screen to analyze market power.

Understanding the effects of a change in the composition of R&D on innovation requires an analysis of competitive effects, just as an analysis of competitive effects is necessary to understand the effects of a change in product market structure on market prices. The theory of innovation competition is complex and does not lead to an unambiguous conclusion that competition promotes innovation. There is, however, technological progress in the economics of innovation and we are gaining a clearer understanding of the relationship between innovation and competition. Innovation incentives depend on market and technological characteristics. To the extent that the return to innovation is proportional to the scale of a firm's operations, a merger can *increase* innovation incentives by increasing the payoff to R&D. Both economic theory and empirical evidence suggest that this is more likely to occur in markets where it is difficult for firms to appropriate the value of their innovations. Furthermore, a merger may increase the efficiency of R&D by making it easier for the parties to combine complementary assets and know-how. This too depends on the nature of intellectual property rights, which may facilitate alliances or R&D joint ventures short of merger. A merger could also increase the efficiency of R&D by eliminating duplicative investments or by allowing a firm to reduce the risk of R&D by diversifying its R&D portfolio.

Changes in the structure of an innovation market can be likened to changes in actual potential competition, and some have argued that potential competition theory should be used instead to assess the effects of an arrangement on the future supply of goods and services. Suppose that two firms, X and Y, are engaged in research to develop a new drug to treat type 2 diabetes and agree to merge their operations. Neither firm has a therapy to treat this disease. The arrangement could be analyzed using the tools of actual potential competition theory. Each firm

is a potential entrant into the market for drugs that treat type 2 diabetes. The merger eliminates one of these potential entrants and thus could result in higher prices or lower output. The analysis would have to consider the competitive conditions in the market for type 2 diabetes therapies and the likelihood that each firm would independently develop a new drug. The analysis also would have to consider possible efficiency advantages from the merger, such as improvements to their R&D programs from combining their activities.

Analysis of actual potential competition typically supposes that one of the firms is already an established supplier of the relevant good and service. Here neither firm is established in the relevant market. Furthermore, for firms that are engaged in R&D, markets for the products they are developing may not presently exist. Suppose we modify the example and assume that firms X and Y are developing an altogether new type of therapy, such as a new treatment for macular degeneration of the retina based on in vivo gene transplantation, for which no defined antitrust market currently exists. Potential competition theory would not directly apply to a merger of X and Y, because there is no market in which one firm exists and another firm is a potential competitor. This does not mean it would be impossible to perform a potential competition analysis; it would, however, require a probabilistic analysis in which competitive effects would be evaluated under different scenarios of successful drug development, weighted by the probabilities that each scenario would occur.

I use the term "one-sided" potential competition theory to refer to a situation in which firm X has an established product and firm Y is an actual potential entrant into the market occupied by firm X. I use the term "two-sided" potential competition theory to refer to a situation in which firms X and Y are actual potential entrants into a market that neither firm currently occupies. Potential competition theory is more difficult, but not impossible, to apply to two-sided potential competition. Furthermore, some innovation effects cannot be captured using the tools of potential competition theory. For example, potential competition theory would not be useful to evaluate the possibility that a merger of the two firms would *delay* the introduction of the new drug, as opposed to changing the structure of the new market by eliminating one of the potential suppliers of the new therapy.

The use of an innovation market may facilitate analysis of the competitive effects of a merger when the market for a new product does not yet exist, because the firms are present in the activity of R&D. However, innovation analysis does not sweep away the difficulties raised by a potential competition analysis; it merely shifts the burden to the upstream activity of R&D aimed at developing the new products. The question is not whether innovation market analysis is correct. Both an innovation market analysis and a potential competition analysis would require a probabilistic evaluation of the likely effects of a merger on the future prices of final products. Asking whether innovation market analysis is better than potential competition theory is like asking whether a hammer is better than a screwdriver. They are both tools. Each has its place and can be used properly or improperly.

Although innovation effects have been cited in many recent merger challenges by the antitrust agencies, most formal innovation market analysis has been limited to pharmaceutical R&D, where the participants in the R&D activities and the likely outcomes are relatively easy to identify. I am unaware of any court that has explicitly endorsed an innovation market theory. Furthermore, my review of 49 merger challenges by the DOJ and the FTC from January 1995 through December 1999 led me to conclude that innovation was central to the enforcement decision in only about six to eight of these cases. Most of these mergers would have been challenged based solely on their likely adverse effects on product market competition, and others could have been challenged based on a theory of "one-sided" potential competition in which the merger eliminated a likely potential entrant into an existing product market. The remaining six to eight cases arguably involved "two-sided" potential competition, in which the merger eliminated a potential competitor in a market that did not presently exist. As I noted above, these are the types of competitive environments in which an innovation market analysis may be most useful.

A relevant question for antitrust enforcement in the new economy is whether there should be a *presumption* that at an increase in the concentration of production and R&D will increase or decrease incentives for innovation. Ardent followers of Joseph Schumpeter might argue that an increase in product market concentration would increase incentives for innovation, and might call for relaxed antitrust enforcement for mergers and perhaps other conduct in dynamic

innovation-driven industries. While there is some economic theory and evidence to support this conclusion in markets with weak appropriability, a good deal of empirical evidence concludes that competition and innovation are positively correlated, and this presumption is a good starting point for antitrust analysis. Antitrust enforcers should, however, be open to theoretical and empirical economic arguments that would rebut this presumption in particular market circumstances. In particular, parties should be allowed to defend a merger that would otherwise be unacceptable due to a reduction in static economic efficiency by demonstrating the positive effects of the merger on incentives for dynamic efficiency.

I will close my remarks with a quote from William Baxter:

> There are two parts to Schumpeter, and I am an enthusiastic rooter of one part and mild skeptic on the other …What Schumpeter had to say about the comparative importance of static allocative efficiency, as opposed to dynamic productive efficiency – the greater importance of the latter – I am inclined to agree with. … I am far less convinced, and I do not think we have any empiric evidence that enables us to predict with any confidence, that you really need high levels of concentration in order to get rapid technological development. That is a fairly major theme of Schumpeter that he did not attempt to defend as based upon more than his own horseback empiricism. I think he rather overdid it. But then, I do not have much evidence to the contrary, either.[11]

We now have better economic evidence about the relationship between competition and innovation than was available to William Baxter when he made these remarks more than twenty years ago. The new evidence generally supports his intuition, although there is also evidence to support a Schumpeterian-based defense of mergers or other conduct in some circumstances that may otherwise offend the antitrust laws, particularly in industries with weak appropriability.

[11] William F. Baxter, "The Definition and Measurement of Market Power in Industries Characterized by Rapidly Developing and Changing Technologies," 53 Antitrust L.J. 717, 726 (1984).

Table 1. Ratio of non-Federal R&D expenditures to net sales for several industries, 2001 (percent).

Software	19.3
Communications equipment	16.6
Semiconductor and other electronic components	10.5
Medical equipment and supplies	9.0
Pharmaceuticals and medicines	7.8
Computers and peripheral equipment	7.6
Navigation, measuring, electro-medical & control instruments	7.3
Resin, synthetic rubber, fibers, and filament	4.5
Machinery	4.2
Motor vehicles, trailers, and parts	3.5
Other chemicals	3.2
Aerospace products and parts	3.0
Electrical equipment, appliances, and components	2.9
Plastics and rubber products	2.9
Nonmetallic mineral products	2.3
Basic chemicals	2.2
Paper, printing, and support activities	2.1
Fabricated metal products	1.6
Furniture and related products	0.9
Primary metals	0.7
Food	0.5

Source: National Science Foundation, *Science & Engineering Indicators – 2004*

Table 2. Challenges to Mergers and Acquisitions: FY 1990 – FY1994*

	DOJ	FTC	TOTAL
Merger Challenges	64	71	135
Challenges alleging innovation effects	2	2	4
Percentage of challenges alleging innovation effects	3%	3%	3%

Table 3. Challenges to Mergers and Acquisitions: FY 1995 – FY 1999*

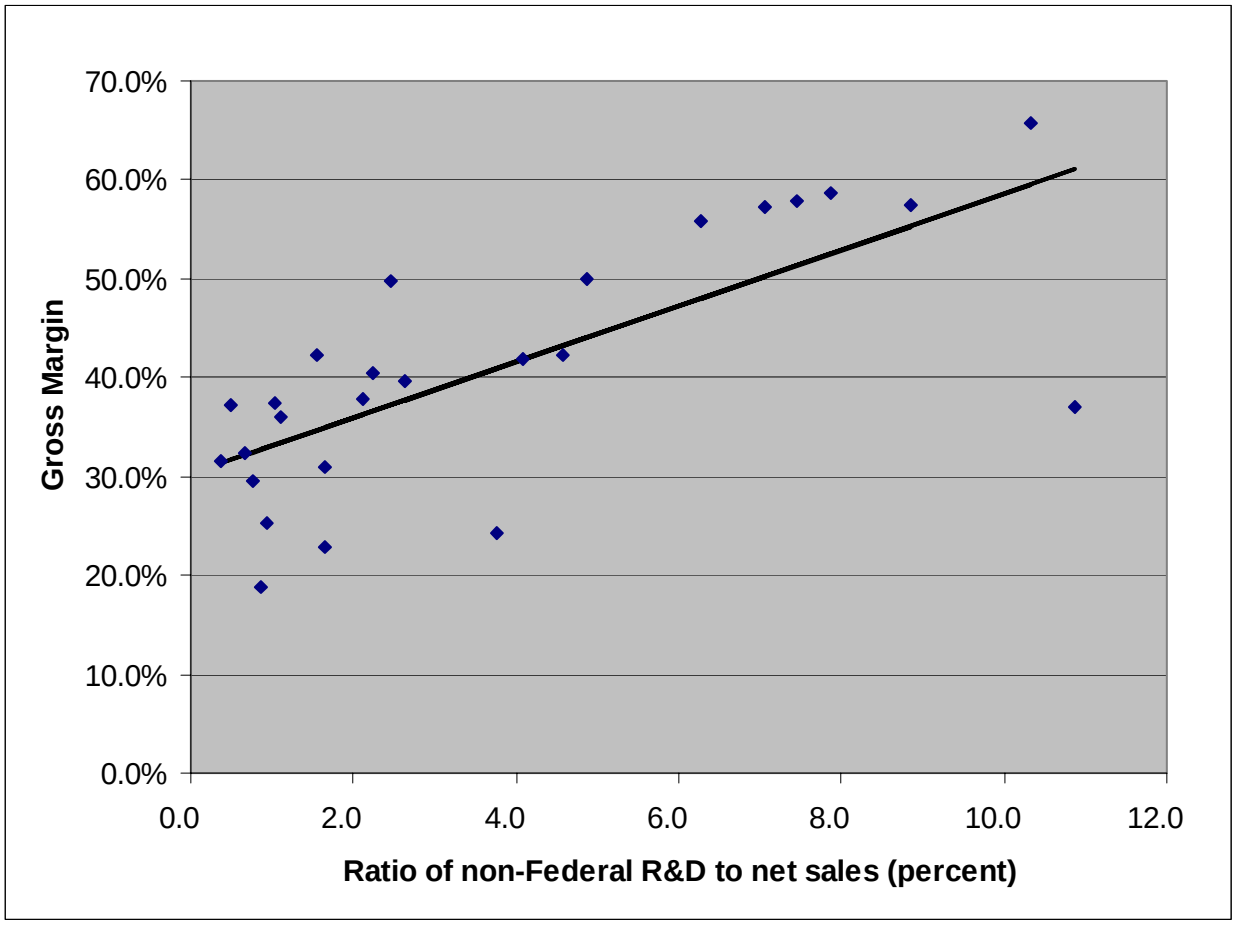
	DOJ	FTC	TOTAL
Merger Challenges	121	148	269
Challenges alleging innovation effects	11	36	47
Percentage of challenges alleging innovation effects	9.1%	24%	17.5%

Table 4. Challenges to Mergers and Acquisitions: FY 2000 – FY 2003*

	DOJ	FTC	TOTAL
Merger Challenges	41	67	108
Challenges alleging innovation effects	17	24	41
Percentage of challenges alleging innovation effects	41.5%	35.3%	38.0%

*Sources: DOJ/FTC Annual Reports to Congress; Agency complaints and news releases.

Figure 1. Ratio of Gross Margin to R&D Intensity for several manufacturing industries



Sources: National Science Foundation and Census of Manufacturers. Gross margin is calculated by subtracting wages from total value added, and dividing the result by the value of industry shipments. R&D intensity is the ratio of non-federal R&D expenditures to net sales, averaged over the five-year period 1991-1995.