# Beyond Schumpeter vs. Arrow: How Antitrust Fosters Innovation

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Antitrust enforcement surely keeps prices low and output high, but is it good for innovation? The question arises because the relationship between competition and innovation is the subject of a familiar controversy in economics. One view, often associated with Joseph Schumpeter, argues that monopolies favor innovation. An opposite view, often associated with Kenneth Arrow, argues that competition favors innovation. Taking their cue from this debate, some commentators qualify their support for antitrust policy, reserving judgment as to whether antitrust enforcement is good for innovation.[1]

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[1] *E.g.*, KEITH N. HYLTON, ANTITRUST LAW: ECONOMIC THEORY AND COMMON LAW EVOLUTION 20 (2003); SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 173 (2004); *see* Michael L. Katz & Howard A. Shelanski, *Mergers and Innovation*, 74 ANTITRUST L.J. 1, 3 (2007) ("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 the relevant market, a growing body of commentary has questioned the relationship of antitrust law to innovation."); *cf.* IIA PHILLIP E. AREEDA, HERBERT HOVENKAMP & JOHN L. SOLOW, ANTITRUST LAW ¶ 407D (1995) (size and market power contribute to progressiveness (innovative activity), which speaks against a ruthless atomistic structural policy but otherwise does not have important implications for antitrust policy); RICHARD POSNER, ANTITRUST LAW 20, 22 (2d ed. 2001) (monopoly is the source of significant social costs, although it cannot be condemned on the ground that the lack of price competition retards innovation); Massimo Motta, COMPETITION POLICY: THEORY AND PRACTICE 137 (2004) (Although "some intermediate levels of competition might be optimal for innovations and productive efficiency ... [t]he only sound and robust conclusion ... is that a monopoly (or a cartel) is worse than competitive market structures, because it fails to stimulate dynamic efficiency."):

Such misgivings are unnecessary. As will be discussed below, the modern economic learning about the connection between competition and innovation helps clarify the types of firm conduct and industry settings where antitrust interventions are most likely to foster innovation. Measured against this standard, contemporary competition policy holds up well. On the whole, as will be shown, antitrust rules and enforcement today are appropriately focused to promote innovation.

Underlying this discussion is a presumption that more innovation is good for society. It is worth pausing briefly on this point. From one generation to the next, innovation is undoubtedly a central determinant of the welfare of humankind. Economists studying individual projects, moreover, routinely find that the benefits of innovation to society as a whole greatly exceed the benefits to the firms that develop the innovation.[2] Although excessive innovative effort is a

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Jordi Gual, *Time to Rethink Merger Policy?* 3 COMPETITION POL'Y INT'L 24, 43 (2007) ("once we consider competition in a dynamic setting ... the link between increased rivalry ... and welfare becomes less clear-cut than is commonly assumed"). Many of these commentators support antitrust enforcement in general, notwithstanding their uncertainty as to the best way of applying antitrust rules in innovation contexts.

[2] Edwin Mansfield, *Microeconomics of Technological Innovation*, *in* TECHNOLOGY AND GLOBAL INDUSTRY 311 (Bruce R. Guile & Harvey Brooks, eds., 1987); Jeffrey Bernstein & M. Isaq Nadiri, *Interindustry R&D Spillovers, Rates of Return, and Production in High-Tech Industries*, 78 AM. ECON. REV. 429 (1988); Zvi Griliches, *The Search for R&D Spillovers*, 94 Scandinavian J. Econ. S29 (Supp. 1992); Charles I. Jones & John C. Williams, *Measuring the Social Return to R&D*, 113 Q. J. ECON. 1119 (1998). *Cf.* Timothy F. Bresnahan, *The Mechanisms of Information Technology's Contribution to Economic Growth*, *in* INSTITUTIONS, INNOVATION AND GROWTH: SELECTED ECONOMIC PAPERS 135-37 (Jean-Phillipe Touffut, ed., 2003) (providing examples where the aggregate social returns to information technology investment exceed private returns because the inventor cannot easily contract with the many firms that benefit, including complementors and co-inventors).

theoretical possibility[3] – the leading potential example is a wasteful patent race – it is safe to assume that broad regulatory policies promoting innovation are beneficial for society. Accordingly, when this essay explains why U.S. competition policy as practiced today – antitrust doctrines and enforcement priorities taken as a whole – fosters innovation, it is simultaneously providing an important reason why antitrust benefits society.

**Competition and Innovation**

Even a lemonade stand must respond to competition. If a nearby lemonade vendor cuts price, a lemonade seller that does nothing will lose too many of its customers. It may lower price to match; it may promise colder drinks; it may offer to vary the sweetness to match buyer tastes; it may add iced tea or cookies to its product line; it may play music to improve the ambiance. It must act to bring customers back.

Everyone understands that competition among firms creates powerful incentives for sellers to take steps to attract customers, most obviously by keeping prices low. A firm that does not reduce its price after a close rival cuts price risks losing its customers – so can be expected to lower price in response. Or the firm can attract buyers by making improvements in product attributes closely related to price and valued by consumers, like supplying more rapid delivery, offering higher product quality, offering more colors or styles or other additions to product variety, or providing additional post-sale services. Firms know that steps like these will help

[3] In the theoretical models, excessive innovation may arise when the innovator profits mainly by stealing business from its rivals, rather than by expanding the market.

them sell more, so they will cut costs and lower prices or improve quality in order to steal a march on their rivals. The result of competition is cheaper and better products and greater production – to the immediate benefit of buyers but also, importantly, to the benefit of society as a whole.[4] Competition is good because it leads firms to make more and better goods and sell them for less.[5]

While economists widely accept that competition encourages firms to improve product attributes closely related to price, economist have not been so quick to say that competition encourages innovation. When addressing whether competition fosters the development of new and different products, or new or improved production processes, the economics literature has historically been much more tentative.

The argument for skepticism has its roots in the writing of Joseph Schumpeter, an Austrian native and Nazi refugee who taught at Harvard during the 1930s and 1940s. Schumpeter is most famous today for describing capitalism as developing though gales of 'creative destruction," by which new technologies supplant the old.[6] Schumpeter also is well

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[4] The social benefits of competition arise through the incentives that competition creates, as emphasized in this paragraph; through selection, as the best products and most efficient producers tend to win out; and through R&D spillovers, as will be discussed below.

[5] For example, an expert economist working for antitrust defendant IBM concluded that firms supplying electronic data processing during the 1960s and 1970s felt "constantly compelled by competition both to improve both their products and to reduce prices – and to react to the improved products and lower prices of competitors." FRANKLIN M. FISHER, JOHN J. MCGOWAN & JOEN E. GREENWOOD, FOLDED, SPINDLED, AND MUTILATED: ECONOMIC ANALYSIS AND *U.S. V. IBM* 132 (1983).

[6] J OSEPH SCHUMPETER, CAPITALISM, SOCIALISM, AND DEMOCRACY 83 (1942).

known for suggesting that large firms and monopolists may be more innovative than firms in competitive markets.[7] There are a number of possible reasons. Large firms might be better able than small ones to fund large research and development (R&D) projects. It may be easier to explain to the suppliers of financial capital why research and development projects have promise (overcoming agency problems and information asymmetries) when the source of the financing is within the organization. Moreover, firms with a strong pre-existing market position, including monopolists, may be more willing to pursue R&D if, by virtue of their head start, they have less fear that rivals, lacking their installed base and reputation, would be able successfully to market products that emulate their new ideas or are produced using their improved processes. After all, the more that the returns to an innovation go to the firm that first develops the idea, the greater the incentive the firm will have to engage in R&D activity.

Another influential twentieth century economist, Kenneth Arrow, emphasized a competing logic by which competition rather than monopoly promotes innovation. Arrow, a Nobel Prize-winning economist who taught at Stanford and Harvard, explained in 1962 that a monopolist might innovate less than competitive firms because a monopolist has more to lose.[8]

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[7] *See id.* at 81-106; 1 MORTON I. KAMIEN, MARKET STRUCTURE AND INNOVATION REVISITED: JAPAN AND THE WORLD ECONOMY 331 (1989).

[8] Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, *in* THE RATE AND DIRECTION OF ECONOMIC ACTIVITIES: ECONOMIC AND SOCIAL FACTORS 609 (Richard Nelson, ed. 1962). Put differently, Arrow observed that a monopolist bears a cost when innovating that an innovating competitor does not, as it gives up the opportunity to continue to earn monopoly profits without innovating. In consequence, the incremental gains from innovation to the monopolist may be less than those of a firm in a competitive setting that would expect to earn similar post-innovation profits.

A monopolist could spend a great deal of money to make a dramatic improvement – whether by lowering cost, improving quality or creating a new product – and take over the market, only to find that it does not get much additional business because it already has most of the business there is to get. If a competitor had come up with the same innovation, by contrast, it would earn more because it would expect to take away much of the business previously conducted by rival firms. This limitation on the incentive of the monopolist to innovate is often termed the "Arrow effect" or the "replacement effect" (so-called because it arises to the extent the monopolist replaces itself rather than developing new business). It will likely be strongest when the new product or process can be expected to fully displace the old (a "drastic" innovation), and when the monopolist does not fear that some other firm (perhaps an entrant) will soon implement a similar new idea.

The opposing arguments of Schumpeter and Arrow sparked an extensive economics literature seeking to relate innovation in an industry to the extent to which firms in the market compete.[9] Through this later work, four important principles relating competition and innovation have emerged. These principles do not encompass every aspect of economic research

[9] For a rich and thoughtful recent survey of the economic literature relating competition and innovation, which paints the research with a finer brush than I use here, see Richard Gilbert, *Looking for Mr. Schumpeter: Where Are We in the Competition-Innovation Debate?*, *in* 6 INNOVATION POLICY AND THE ECONOMY 159 (Adam B. Jaffe, Josh Lerner & Scott Stern, eds. 2006). Gilbert's nuanced literature review highlights, among other things, the significance of distinctions between product and process innovation, and between drastic and non-drastic innovation, that are not emphasized here.

on the determinants of innovation[10] – far from it – but they do describe important aspects that are particularly relevant to antitrust.

*First, competition in innovation itself – that is, competition among firms seeking to develop the same new product or process – encourages innovation.* When firms see themselves in a tough race to innovate first, they try harder to win. This dynamic is particularly evident in the economic literature on research and development competition in "patent races."

*Second, competition among rivals producing an existing product encourages those firms to find ways to lower costs, improve quality, or develop better products.* Firms engage in research and development because innovation may allow them to escape competition, and so earn greater profits. This is one way of looking at Arrow's point: a firm that faces less pre-innovation competition, and thus faces a more steeply downward sloping demand curve, has a greater legacy flow of economic profits, which it has an incentive to protect by slowing its innovative effort. In other words, a firm that faces less competition has less need to work hard to escape competition.[11]

*Third, firms that expect to face more product market competition after innovating have*

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[10] For example, the size of the expected reward to innovation also depends on factors other than the competition considerations outlined below, including the size of the innovation, the size of the market, and the extent to which innovating eliminates the innovator's profit from its pre-innovation technology. For a review of the empirical evidence relating firm size with R&D intensity, see Richard J. Gilbert, *Competition and Innovation*, *in* ISSUES IN COMPETITION LAW AND POLICY (W. Dale Collins, ed., forthcoming 2007) (draft at 20).

[11] The "escape competition" formulation is used in the modern economic growth literature. *E.g.* Philippe Aghion, Christopher Harris, Peter Howitt & John Vickers, *Competition, Imitation and Growth with Step-by-Step Innovation* 68 Rev. Econ. Stud. 467, 468 n.4 (2001).

*less incentive to invest in R&D*. This is the flip side of the previous principle: if innovation would not allow a firm to escape competition, but would instead be expected to throw an innovating firm into a pool with sharks, the firm would anticipate profiting less from R&D. In consequence, the firm would have less incentive to pursue innovations in the first place.[12]

The widely-accepted observation that the social returns to innovation exceed the private returns, remarked upon above, reflects that competition among producers ensures that buyers share in the social benefits of new ideas, so living standards rise. In the language of the software industry, this is a "feature" of competition, not a "bug." Contrary to what is sometimes suggested, this observation does not imply that the key to more innovation is to allow firms to appropriate more of the social benefits of their new products and production processes, as through broadening intellectual property rights or relaxing post-innovation antitrust enforcement. Even in an industry in which innovators would expect to keep only a fraction of the benefits of

[12] The inhibition to innovation arising from post-innovation product market competition does not disappear if the potential innovator anticipates licensing its new product or production process rather than using it in production. If potential licensees expect to face product market competition when using the license, they would be expected not to compete aggressively to obtain the license and to pay less for it. Moreover, if the fear of product market competition with a dominant firm discourages potential rivals from purchasing the license, the only buyer may be the dominant firm, which may in consequence be able to drive a hard bargain with the innovator. For analysis of the complex interaction between the structure of the "market for ideas" (market for licensing innovations) and entrant incentives to innovate, highlighting conditions under which incumbent firms will engage in research more intensively than entrants, see Joshua S. Gans & Scott Stern, *The Product Market and the Market for "Ideas"*: *Commercialization Strategies for Technology Entrepreneurs*, 32 RES. POL'Y 333 (2003); Joshua S. Gans, David H. Hsu, & Scott Stern, *When Does Start-Up Innovation Spur the Gale of Creative Destruction?* 33 RAND J. ECON. 571 (2002); Joshua S. Gans & Scott Stern, *Incumbency and R&D Incentives: Licensing the Gale of Creative Destruction,* 9 J. ECON. & MGMT. STRATEGY 453 (2000). *See also*, ASHISH ARORA, ANDREA FOSFURI & ALFONSO GAMBARDELLA, MARKETS FOR TECHNOLOGY: THE ECONOMICS OF INNOVATION AND CORPORATE STRATEGY (2001).

their new ideas to society – perhaps because rival imitation would be rapid, brands are weak, first movers gain only limited benefits relative to followers,[13] new ideas are rapidly and widely disseminated, or intellectual property protections are narrow – innovation incentives may be strong.[14] This would occur if the incentive to escape current product market competition (the second economic principle) is more powerful than the fear of post-innovation product market competition (the third principle) in the decision-making calculus of potential innovators.

The fourth principle, the preemption incentive, is an important corollary of the third principle. The preemption incentive arises because an innovating firm may be able to benefit from its investments in R&D not simply from its ability to offer buyers better or cheaper products, but also by discouraging potential rivals from innovating. While the initial innovator has the field to itself, an innovating rival would anticipate competition. By application of the third principle, the rival will have less incentive to invest in R&D than the initial innovator. Accordingly, and *fourth, a firm will have an extra incentive to innovate if in doing so it can discourage potential rivals from investing in R&D.*[15]

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[13] First mover advantages might arise, for example, if buyers come to associate the first mover with the product, or if the first producer obtains cost savings from achieving greater scale or learns more rapidly.

[14] If innovators would keep literally none of the benefits of innovation, they would have no incentive to invest in new products and processes. Under such circumstances, in other words, the third economic principle would be likely to have an overwhelming influence on firm incentives to (not) invest in R&D. But the incentive to escape competition recognized in the second economic principle can be powerful so long as there is some, albeit incomplete, appropriability.

[15] The preemption incentive can be understood as an application of the game-theoretic literature on strategic entry deterrence to R&D competition. It is unlikely to be important if the

The preemption incentive arises in many contexts. For example, if a monopolist can make investments that guarantee that it will quickly emulate any innovation introduced by a new entrant – perhaps by creating an extensive research and development operation along with a strong distribution network and brand reputation – those investments will discourage potential rivals from innovating in ways that compete with the monopolist without reducing the monopolist's own incentives to innovate.[16] Or if a monopolist can use a new product innovation to discriminate in price (by sorting buyers between its existing product and the new one according to their willingness to pay), but a new entrant making the same new product innovation

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incumbent firm faces product market competition, if the incumbent cannot easily close off all plausible innovation paths for rivals, or if an incumbent firm is not likely to come up with an innovation quickly even with a head start on R&D. Gilbert, *supra* n. 10 (draft at 23). Some empirical studies find evidence of firm innovation consistent with a preemption motive. *E.g.*, Leemore S. Dafny, *Games Hospitals Play: Entry Deterrence in Hospital Procedure Markets,* 14 J. ECON. & MGMT. STRATEGY 513 (2005); Richard Blundell, Rachel Griffith & John Van Reenen, *Market Share, Market Value and Innovation in a Panel of British Manufacturing*, 66 REV. ECON. STUD. 529 (1999); Robert Smiley, *Empirical Evidence on Strategic Entry Deterrence*, 6 INT'L J. INDUS. ORG. 167 (1988). Moreover, John Sutton's wide-ranging demonstration that market concentration is related to the magnitude of sunk investments in research and development by market participants can be interpreted as demonstrating the importance of the preemption incentive. JOHN SUTTON, TECHNOLOGY AND MARKET STRUCTURE: THEORY AND HISTORY (1999). On the other hand, an empirical investigation of a related type of strategic entry deterrence, the possibility that incumbent firms strategically invest in excess capacity in advance of increases in demand in order to deter entry, concluded that in the industry studied (chemicals), such behavior was rare. Marvin B. Lieberman, *Excess Capacity as a Barrier to Entry: An Empirical Appraisal*, 35, J. INDUS. ECON. 607 (1987).

[16] *See* Richard Gilbert & David Newbery, *Preemptive Patenting and the Persistence of Monopoly*, 72 AM. ECON. REV. 514 (1982). But if the dominant firm views such investments as too costly and risky, it may instead choose to take short-term profits and allow its market position to erode with rival entry. *See* Jennifer Reinganum, *Uncertain Innovation and the Persistence of Monopoly*, 73 AM. ECON. REV. 741 (1983). This latter dynamic may describe, for example, how Nintendo acted in its competition with Sega to develop and market video games. *See* ADAM M. BRANDENBERGER & BARRY J. NALEBUFF, CO-OPETITION 237-41 (1996).

would find itself competing with the former monopolist, the monopolist may expect to earn more from the new product than the entrant would, and consequently have a greater incentive to conduct R&D to develop it.[17] Similarly, a monopolist has a greater incentive than a firm facing competition to develop improved production process technologies when intellectual property rights do not permit the successful innovator to exclude its rivals.[18]

The interplay of the second and third principles is illustrated by events in the U.S. automobile industry during the 1970s. As I have explained more fully elsewhere, the second principle helps explain why Nissan and Toyota aggressively innovated in small cars during that decade, while the Big Three U.S. automakers did not.[19] In the large U.S. market, Nissan and Toyota saw themselves as little fish in a very competitive pond; their best way to escape competition was to make better and cheaper cars. By contrast the leading U.S. firms were not aggressively competing, and in particular were not competing hard in small cars, where profits were low. So their motive for escaping competition was weak. If the Japanese firms had instead

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[17] *See* Shane Greenstein & Gary Ramey, *Market Structure, Innovation and Vertical Product Differentiation*, 16 INT'L J. INDUS. ORG. 285 (1998) (highlighting monopolist's disincentive to licence an innovation when it expects to face post-licensing competition from a competitive fringe of suppliers of the older generation product; absent such competition, the monopolist would price the old and new products to maximize joint profits, recognizing the extent of differentiation between them).

[18] *Cf.* Partha Dasgupta & Joseph Stiglitz, *Industrial Structure and the Nature of Innovative Activity*, 90 ECON. J. 266 (1980) (presenting a model of process innovation in a Cournot oligopoly with free entry in which, among other things, cost reduction is greater in industries characterized by a higher degree of monopoly power).

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

thought that the Big Three would fight back more vigorously, with stronger efforts to improve their small car products and their production processes, the outcome might have been different. Then, as the third principle suggests, Nissan and Toyota, foreseeing stronger post-innovation competition, might not have been so eager to invest in improving their small cars.

These four economic principles help explain R&D investment and productivity growth in a wide range of industries. Economists studying the effects of competition on innovation empirically originally attacked the problem by looking for similarities across innovative industries, and for differences between more and less innovative ones. At one time, empirical economists had established a cottage industry relating market concentration in an industry (thought of as a proxy for product market competition) to research and development expenditures in the same industry (thought of as a proxy for innovation). Many found what was termed the "inverted U": innovation was greatest not in industries with a competitive market structure, but in those industries with oligopolistic market structures (a handful of firms, but more than a single producer).[20]

On its face, this result tended to suggest that the markets most congenial to innovation were less than fully competitive (albeit not monopolies either). But these studies were unconvincing.[21] The link between measured concentration and competition was weak, as was

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[20] For a survey, see WILLIAM L. BALDWIN & JOHN T. SCOTT, MARKET STRUCTURE AND TECHNOLOGICAL CHANGE 63-113 (1987).

[21] *See generally*, Wesley M. Cohen & Richard C. Levin, *Empirical Studies of Innovation and Market Structure*, *in* 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 1059, 1074-79 (Richard Schmalensee & Robert D. Willig, eds. 1989); P.A. Geroski, *Innovation, Technological Opportunity, and Market Structure*, 42 OXFORD ECON. PAPERS 586 (1990); Richard C. Levin,

the link between R&D expenditures and innovation. The most grave difficulty was in isolating the effect of competition. One industry might be particularly innovative for a number of reasons other than the extent of pre-innovation competition. Technological opportunities may be great: scientists and engineers may see ways to improve computer chips but not ways to improve potato chips. Or firms may have greater guarantees they will be free from post-innovation competition, for example because they expect broad intellectual property protections or because their prior success gives them an advantage in keeping customers. It turned out to be virtually impossible to separate out possibilities like these from differences in the extent of competition when comparing one industry with another, so researchers could not practically exploit cross-industry comparisons to tell whether and how competition mattered.[22]

Recently, several economists motivated by concerns among researchers working in the field of economic growth have made an heroic effort to address many of the problems with the earlier cross-industry studies, and in doing so appear to have resurrected the "inverted U" result.[23]

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Wesley M. Cohen & David C. Mowery, *R&D Appropriability, Opportunity and Market Structure: New Evidence on Some Schumpeterian Hypotheses*, 75 AM. ECON. REV. 20 (Papers & Proceedings, May 1985). A related project of empirical economists of the same era, comparing profits or prices in an industry to market concentration, also conducted through cross-industry comparisons, was equally unsuccessful.

[22] Moreover, a weak positive relationship between R&D intensity and concentration would be expected to appear simply because fewer firms can profitably "fit" in markets in which firms have high fixed costs resulting from R&D competition. JOHN SUTTON, TECHNOLOGY AND MARKET STRUCTURE: THEORY AND HISTORY 14, 474 (1999).

[23] Philippe Aghion, Nick Bloom, Richard Blundell, Rachel Griffith & Peter Howitt, *Competition and Innovation: An Inverted U Relationship*, 120 Q. J. ECON. 701 (2005); *see* Philippe Aghion & Rachel Griffith, COMPETITION AND GROWTH: RECONCILING THEORY AND EVIDENCE (2005).

But the modern studies still do not control satisfactorily for differences across industries in the extent and rate of growth of technological opportunity and in the conditions of appropriability.[24] In any case, one of the authors interprets this line of research as showing that in general, for the industries studied, "a strengthening of competition policy is likely to have a positive overall effect on innovation," in contradiction to Schumpeterian theories.[25]

An alternative strategy for studying the empirical relationship between competition and innovation discards the cross-industry study, and instead compares the performance of the same

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[24] In particular, the studies cited in the previous footnote are only able to control for industry effects in two-digit SIC industries, which are so broad as to be little better than no controls at all. *Cf.* Katz & Shelanski, *supra* n.1 at 22-23 (questioning implications of this line of research for merger policy). Another cross-industry study relating competition and innovation in British manufacturing by some of the same authors adopts a different strategy for controlling for industry effects: it does so indirectly, by using information on prior rates of innovation by each firm as a proxy for a range of factors that would influence that firm's incentives to invest in R&D (which presumably include industry-wide effects as well as firm-specific ones). Blundell, Griffith & Van Reenen, *supra* n.15. This study finds evidence that less competitive industries innovate less (consistent with the second principle) and that firms with a high market share have greater incentives to preemptively innovate (consistent with the fourth principle). The results are notable given that the study would be expected to be biased against finding any relationship, as industry concentration and firm market share are poorly measured. (Product markets are defined at broad three-digit industrial classification levels and geographic markets are presumed U.K.-wide without analysis.) Another study, a cross-sectional analysis using firm-level data, finds evidence that competition (as measured by more than five rivals or lower profit margins) is associated with greater rates of total factor productivity growth for individual firms. Stephen J. Nickell, *Competition and Corporate Performance*, 104 J. POL. ECON. 724 (1996).

[25] Peter Howitt, *Endogenous Growth, Productivity and Economic Policy: A Progress Report*, 8 INT'L PRODUCTIVITY MONITOR 3, 10 (2004); *see* Peter Howitt, *Innovation, Competition and Growth: A Schumpeterian Perspective on Canada's Economy* 1 (C.D. Howe Institute Commentary, No. 246, April 2007) ("Competition policy should not be relaxed in hopes of boosting innovation, because more competition actually strengthens the incentive to innovate").

industry across countries.[26] By limiting attention to a single industry, studies adopting this approach avoid the need to control for differences across industries in the extent and rate of growth of technological opportunity and in the conditions of appropriability.[27] For example, the tobacco industries in the United States and the United Kingdom were both monopolies around the start of the twentieth century, but during different decades. Although both had access to the same technologies for production improvements, technological innovation was more rapid for each during competitive periods.[28] More broadly, leading business consultants –Michael Porter, and a team from the McKinsey Global Institute – have independently found that in one important industry after another, including both manufacturing and services, greater product market

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[26] The success of this empirical strategy in controlling for cross-industry differences, in order to isolate the effect of competition on innovation, depends importantly on how well industries are defined. Still another empirical approach looks at the effect of entry or merger on R&D. But this literature has not yet yielded strong conclusions, according to Michael Katz and Howard Shelanski, and will not be discussed further here. Katz & Shelanski, *supra* n. 1 at 23-27.

[27] Both empirical strategies were followed by John Sutton, in his influential study of the relationship between R&D and market structure. Sutton, *supra* n.15. Sutton argued that market structure should be related to a parameter reflecting the extent to which a firm that outspends its rivals on R&D can thereby raise buyers willingness to pay for its products in comparison with those of its rivals. This "escalation parameter" depends on seller technology, the extent of product differentiation, and buyer tastes. In particular, if the escalation parameter is large, the leading firm in the market will spend heavily on R&D relative to its sales and achieve a larger market share. But if the escalation parameter is small, a range of market structures is possible. Sutton supported his theory first by analyzing statistically a cross-industry data set, and second through an informal narrative analysis of the relationship between R&D and observable features of market structure in selected industries across a number of nations. He cautioned that the value of his cross-country comparisons was limited by the fact that the R&D-intensive industries he studied were "essentially global." *Id.* at 480.

[28] Eric W. Zitzewitz, *Competition and Long-Run Productivity Growth in the U.K. and U.S. Tobacco Industries, 1979-1939*, 51 J. INDUS. ECON. 1 (2003).

competition among firms within a nation leads to higher productivity for firms in that country.[29]

It is possible that these results mistakenly attribute to differences in competition effects that are actually due to other important differences across nations affecting firm incentives to innovate (differences in national culture or the political power of various industries, perhaps). This does not seem very likely, however, given that the more innovative industries (and the more competitive ones) are sometimes found in one country and other times found in another. Moreover, this possibility is inconsistent with empirical studies that document productivity gains

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[29] WILLIAM W. LEWIS, THE POWER OF PRODUCTIVITY: WEALTH, POVERTY, AND THE THREAT TO GLOBAL STABILITY (2004) (survey of studies conducted by the McKinsey Global Institute); MICHAEL PORTER, THE COMPETITIVE ADVANTAGE OF NATIONS (1990). *See also* Chad Syverson, *Market Structure and Productivity: A Concrete Example*, 112 J. POL. ECON. 1181 (2004) (concrete producers in more competitive localized markets experienced higher average productivity, mainly because inefficient producers exited); *cf.* Eric Bartelsman, John Haltiwanger & Stefano Scarpetta, *Microeconomic Evidence of Creative Destruction in Industrial and Developing Countries* (Oct. 2004) (working paper) *available at* http://www.econ.umd.edu/~haltiwan/papers.htm (surveying sources of productivity gains). These studies might be expected to be biased against finding an effect, to the extent that firms in industries with less competitive market structures are induced by their nation's competition policy to behave as though they faced more competition. Irwin Stelzer, *Coping with Market Power in the Modern Era* 10 (Hudson Institute White Paper, Spring 2007). At the level of national aggregates, moreover, faster productivity growth appears to be associated with more effective competition policy enforcement. Aydin Hayri & Mark Dutz, *Does More Intense Competition Lead to Higher Growth?* (World Bank Policy Research Working Paper No. 2320, Nov. 30, 1999), *available at* http://ssrn.com/abstract=630693; Stefan Voigt, *The Economic Effects of Competition Policy – Cross-Country Evidence Using Four New Indicators* (Sept. 2006), *available at* http://ssrn.com/abstract=925794; *see* generally OECD, Directorate for Financial and Enterprise Affairs, Competition Committee, *Relationship Between Competition Policy and Economic Performance* (Feb. 7, 2007), *available at* http://lawprofessors.typepad.com/antitrustprof_blog/files/comp_econ_perf_8_feb_2007.pdf (survey of literature relating competition policy to output growth, productivity, productivity growth and employment); *but cf.* Keith N. Hylton & Fei Deng, *Antitrust Around the World: An Empirical Analysis of the Scope of Competition Laws and Their Effects* (Aug. 2006), *available at* http://ssrn.com/abstract=925670 (unable to identify confidently a relationship between the scope of a nation's competition laws and the intensity of competition).

in those individual industries within a nation that have grown more competitive over time for reasons unconnected with the past performance of the specific industry under study.[30]

Taken as a whole, this empirical evidence highlights the importance of the second principle. As a general rule competition does not just lead firms to produce more and charge less; it encourages them to innovate as well.[31] Competition supplies a powerful motive for

[30] James M. MacDonald, *Does Import Competition Force Efficient Production?*, 76 REV. ECON. STAT. 721 (1994); José E. Galdón-Sánchez & James A. Schmitz Jr., *Competitive Pressure and Labor Productivity: World Iron-Ore Markets in the 1980's,* 92 AM. ECON. REV. 1222 (2002). For a general survey of what can be learned about productivity from following individual firms over time, see Eric J. Bartelsman & Mark Doms, *Understanding Productivity: Lessons from Longitudinal Microdata*, 38 J. ECON. LIT. 569 (2000).

[31] The competitive incentive to innovate plays out on the ground through the role of entrepreneurs, viewed broadly. Competition requires, breeds, and rewards people that see opportunities and take steps to make their vision happen. Those steps are often fraught with risk, while simultaneously pregnant with the potential for gain. In the hypothetical lemonade stand example, innovation could take place in a range of activities, including the production process (squeezing lemons); product design (raspberry-flavored lemonade); marketing (creating a brand name); distribution (adding more sidewalk locations, or convincing a local coffee shop chain to place the lemonade stand's products on its menu); or finance (extending microcredit borrowing opportunities to ten year olds). The entrepreneurs developing and implementing new ideas could be located within an existing business, where a wide range of employees, including workers as well as managers, may play the entrepreneurial role, or outside an existing business; in the latter case, the risks and rewards are likely greater. Entrepreneurs often must convince co-workers, lenders, customers, and suppliers that risks are worth taking; this is a task that may require salesmanship and coordination. One point of the Toyota production system was to encourage workers to act as entrepreneurs in identifying ways of improving the production process, and one point of business education is to train executives in identifying and implementing entrepreneurial opportunities to innovate. But it is an open question in the economics literature how best to organize the firm internally to provide optimal incentives for entrepreneurial activity, managerial effort and worker effort. *See* Nickell, *supra* n.24 at 725-28 (surveying literature on effects of competition on performance of agents within firms).

innovation.[32] The immediate beneficiaries are typically the innovating firms themselves, which profit from product and process improvements, and their buyers, who can purchase better or cheaper products. The indirect beneficiaries include other firms, which can observe, emulate and improve on those innovations,[33] creating more direct benefits to buyers, more indirect benefits to other firms, and so on.[34]

To the firm, innovation is like solving a puzzle. Before introducing lemonade from freshly-squeezed lemons, a lemonade stand will evaluate the profit potential. It will investigate buyer preferences, gauging how many buyers would find the new product attractive, how much they would likely pay, and the costs and benefits of advertising. It will evaluate production costs,

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[32] Within the framework of calibrated economic growth models, the adverse effect on productivity that arises when firms can prevent their competitors from using knowledge spillovers to improve production processes and product designs has been recognized by Stephen Parente and Edward Prescott. They conclude that differences in living standards across nations emerge largely as a result of competition-reducing policies within less developed countries, put into place to protect the interests of groups that benefit from current ways of production, that prevent firms from adopting better production methods. Stephen L. Parente & Edward C. Prescott, Barriers to Riches (2000).

[33] If a lemonade stand develops a better way of squeezing lemons, rival lemonade stands might improve upon the new approach, firms in other industries using fresh fruit (producers of frozen juice concentrate, perhaps) might adopt its new process, and firms that produce the equipment used in juice-squeezing might develop modifications to their equipment to make squeezing less costly or more rapid. The lemonade stand itself may, on its own or working with suppliers and customers, see ways of making its process improvement even better. Any of these firms might further recognize that a new lemon-squeezing process makes possible a new and better form of business organization, such as creating a centralized squeezing operation to service all lemonade stands in the area.

[34] The economy-wide benefits of these spillovers are emphasized in the endogenous growth literature. For a non-technical survey and guide to the literature, *see generally*, Elhanan Helpman, THE MYSTERY OF ECONOMIC GROWTH (2004).

the expense of adopting alternative production processes, the likely cost savings from learning or producing at scale, and the costs and benefits of more research and development. It will assess the likely responses of rivals, and it will consider what happens if they innovate and it does not. Many pieces must fall into place before a new lemonade product appears in the market. Competition is not a piece of the puzzle; it is the spark that leads a lemonade stand to open the puzzle box and make the effort to solve it. And every innovation puzzle that one firm solves helps it, and other firms, identify and solve others.

**Antitrust and Innovation**

It might appear that these economics principles do not take antitrust policy beyond the competing perspectives of Schumpeter and Arrow. After all, the second and third economic principles would seem to point in opposite directions with respect to promoting product market competition. Greater product market competition, as would result from antitrust enforcement, would seem to encourage innovation directly, through application of the second principle. But it would simultaneously seem to discourage innovation indirectly, through application of the third principle, as prospective innovators come to worry that they will not fully benefit from their new ideas.[35] This line of thinking would suggest continuing to reserve judgment as to whether antitrust enforcement is good for innovation.

This reasoning misleads because it ignores our ability to focus antitrust intervention on

[35] If incentives for preemptive innovation are important, moreover, they might lead a dominant incumbent to innovate more and rival entrants to innovate less (applying the fourth principle).

industry settings and categories of behavior where enforcement can promote innovation.[36] The modern economic understanding about the relationship between competition and innovation goes beyond Schumpeter and Arrow by suggesting ways for antitrust rules and enforcement efforts to target types of industries and types of conduct. Through such selection, antitrust intervention can systematically promote innovation competition and pre-innovation product market competition, which will encourage innovation, without markedly increasing post-innovation product market competition, and thus without detracting from the pro-innovation benefits.[37] Indeed, as will be demonstrated, current U.S. antitrust rules and enforcement priorities are on the whole well-targeted to foster innovation.[38]

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[36] The institutional design problem for policy-makers can be framed in terms of the optimal provision of public goods. On the one hand, information is a public good. Absent property rights, private firms will underinvest in developing and implementing new products and production processes (consistent with the third principle). On the other hand, competition is a public good too. When it is lacking in innovation markets (first principle) or product markets (second principle), private firms will also underinvest in innovation. From this perspective, antitrust rules can the thought of as one way of tailoring the breadth and scope of property rights to assure the optimal mix of the two types of public goods.

[37] *Cf.* Ilya Segal & Michael Whinston, *Antitrust in Innovative Industries* (NBER Working Paper No. 11525, August 2005), *available at* http://ssrn.com/abstract=776013 (identifying settings in which a more protective antitrust policy raises the rate of innovation); Michael A. Carrier, Two Puzzles Resolved: Of the Schumpeter-Arrow Stalemate and Pharmaceutical Innovation Markets 5 (2006) (unpublished manuscript) ("the absence of process innovation and presence of high appropriability and technological opportunity demonstrate the superiority of competition in bringing about pharmaceutical innovation").

[38] The problem of devising policies that promote innovation by enhancing innovation competition and pre-innovation product market competition (the first and second economic principles), without simultaneously discouraging innovation by fostering post-innovation competition (the third economic principle) also arises in the design of rules and procedures for intellectual property rights enforcement. Broader and longer intellectual property rights implement the idea of the third economic principle – reducing post-innovation product market

Demonstrating this claim raises a methodological problem. It would be nice to evaluate the argument of this essay with case studies examining whether and when specific instances of antitrust intervention encouraged innovation in the industry where they took place.[39] That kind of retrospective is made difficult, however, by the problems understanding likely industry evolution with respect to research and development but-for the antitrust intervention. Suppose, for example, the F.T.C. sought to evaluate whether its late-1990s monopolization case against Intel enhanced innovation in microprocessors.[40] In that case, the F.T.C. alleged that Intel had

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competition in order to increase the incentives for innovation. But once those intellectual property rights are granted, incentives for further innovation are reduced through the operation of the second principle, as pre-innovation product market competition going forward may be lessened. Initial innovation may be encouraged, but successive (sequential) innovation discouraged. Because much innovation is successive, building on and improving what has gone before, it is possible that broader and longer intellectual property rights can on balance reduce incentives to innovate. *See generally,* Robert Merges & Richard R. Nelson, *On Limiting or Encouraging Rivalry in Technical Progress: The Effect of Patent-Scope Decisions*, 25 J. ECON. BEHAVIOR & ORG. 1 (1994); Scotchmer, *supra* n.1 at 127-59. Critics of current intellectual property enforcement have suggested revisions to patent rules and procedures intended in part to reduce the likelihood that they would reduce post-innovation competition and successive innovation. Fed. Trade Comm'n, *To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy* (Oct. 2003), *available at* http://www.ftc.gov/opa/2003/10/cpreport.htm; A PATENT SYSTEM FOR THE 21ST CENTURY (Stephen A. Merrill, Richard C. Levin, & Mark B. Myers, eds., 2005) (Nat'l Academy of Sciences report); ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT (2004).

[39] A full accounting would also require analysis of the deterrent effect of enforcement on the conduct of firms in all other industries. *See generally*, Jonathan B. Baker, *The Case for Antitrust Enforcement*, 17 J. ECON. PERSPECTIVES 27 (2003).

[40] This administrative case was brought in 1998, when I was Director of the Bureau of Economics, and settled in 1999, after I had left the F.T.C. Intel Corp., FTC Dkt. No. 9288 (June 8, 1998) (Complaint); Intel Corp., FTC Dkt. No. 9288 (March 17, 1999) (Agreement Containing Consent Order). These documents are available at http://www.ftc.gov/alj/D9288/index.htm.

diminished the incentives of Intel customers generally to innovate in microprocessor technology by refusing to deal with three customers (Compaq, Digital Equipment Corp., and Intergraph) that were also rivals of Intel. The F.T.C. alleged that Intel cut off the firms' access to technical information about upcoming Intel microprocessor products that the customers needed to design complementary products like personal computers, as a means of gaining bargaining leverage in unrelated commercial disputes involving the scope of competing intellectual property rights. The "natural and probable effect of Intel's conduct," according to the F.T.C.'s complaint, was to reduce the incentives of those three firms and other firms that were Intel customers or otherwise commercially dependent upon Intel to develop new technologies relating to microprocessors. Intel defended by denying that the conduct alleged in the complaint diminished the incentives of any firm to develop new innovations of any kind. The settlement prohibited Intel from impeding customer access to technical information for reasons related to an intellectual property dispute or basing microprocessor supply decisions on the existence of such a dispute.

The F.T.C. presumably expected that this settlement would encourage rival innovation to take on Intel in microprocessors without markedly discouraging Intel's own innovation, so that innovation was promoted in the industry as a whole. It is not easy to tell whether that in fact happened. Intel has continued to innovate in microprocessors and Intel's most important rival, AMD, a much smaller firm, has done well recently. But those observations, however suggestive, do not settle the issue. To determine the effects of the settlement on innovation rigorously, it would be necessary to identify the likely evolution of the microprocessor industry absent the settlement, and determine whether AMD and Intel would have innovated as rapidly and in the

same way there. This would be a difficult task.[41] Most retrospective efforts instead examine whether the case and the relief obtained are consistent with a reasonable theory of how antitrust enforcement would increase innovation, grounded in economic analysis and industry facts, and then look at the subsequent industry evolution to see whether firms undertook vigorous innovative efforts.[42] The latter approach is most convincing as a way of gauging the effect of antitrust cases on industry innovation when it is possible to identify changes or differences in innovation strategies among firms following the enforcement action, and tie that variation to changing incentives created by the antitrust case.[43]

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[41] One possible approach would require compulsory process, which the F.T.C. is permitted to employ for this kind of study pursuant to Section 6(b) of the F.T.C. Act. The F.T.C. could review the R&D and marketing plans of Intel, AMD and other industry participants, before and after the complaint and settlement (assuming those old documents are still available), and depose key executives, in order to determine whether Intel and its rivals changed how they thought about innovation.

[42] For examples involving the F.T.C.'s *Intel* case, see Carl Shapiro, *Technology Cross-Licensing Practices:* FTC v. Intel *(1999)*, *in* THE ANTITRUST REVOLUTION: ECONOMICS, COMPETITION, AND POLICY 350 (John E. Kwoka, Jr. & Lawrence J. White, eds., 4th ed. 2004); Richard J. Gilbert & Willard K. Tom, *Is Innovation King at the Antitrust Agencies? The Intellectual Property Guidelines Fiver Years Later*, 69 ANTITRUST L. J. 43, 66-74 (2001); Randal C. Picker, *Regulating Network Industries: A Look at* Intel, 23 HARV. J. L. & PUB. POL'Y 159 (1999). For examples involving other cases, see F. M. Scherer, *Technological Innovation and Antitrust* (AAI Working Paper 05-07, July 3005), *available at* http://www.antitrustinstitute.org/recent2/431.cfm (reviewing the history of seven major U.S. monopolization cases in high-technology fields). Scherer concludes, among other things, that "dominant firms have accumulated far more monopoly power than is necessary to motivate and sustain the most rapid and beneficial rate of technological progress," but that courts often take "far too long ... to come to grips with the problem." *Id.* at 62-63.

[43] *E.g.* Timothy F. Bresnahan, *Post-Entry Competition in the Plain Paper Copier Market*, 75 AM. ECON. REV. 15 (May 1985) (Papers and Proceedings) (describing how 1975 FTC consent decree with Xerox fostered innovation in the plain paper copier industry). Bresnahan identified the effect of that settlement on innovation by analyzing differences in the process and product

The remainder of this essay will evaluate the effects of antitrust policy on innovation in still another way: by examining whether antitrust enforcement is targeted at industries and practices that have particular promise for promoting innovation, given the four economic principles set forth above. The focus will be on the kind of industries and practices where enforcement is concentrated, rather than on specific outcomes in individual cases.

Consider first antitrust enforcement in product markets (as opposed to innovation competition or technology licensing). An antitrust policy aimed at fostering innovation would in part target enforcement efforts at types of industries where protecting product market competition is likely to encourage innovation. To begin, antitrust intervention to foster product market competition in so-called "winner-take-most" or "winner-take-all" markets, including many high-tech markets, can be expected in general to benefit innovation.[44] In winner-take-most markets, a

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improvements developed by the incumbent firm and new entrants after the settlement. He found that firms innovated in different ways, reflecting differences in their resources and market position, consistent with what would be predicted by economic theory. This research strategy would be more difficult to employ in the Intel example because fewer firms were involved.

[44] Antitrust cases in winner-take-most industries commonly involve challenges to horizontal mergers or allegations of exclusionary conduct by a dominant firm. *See, e.g.,* Intel Corp., FTC Dkt. No. 9288 (June 8, 1998) (Complaint), *available at* http://www.ftc.gov/alj/D9288/index.htm (exclusionary conduct by dominant firm in microprocessors); *United States v. Microsoft*, 253 F.3d 34 (2004) (exclusionary conduct by dominant firm in operating system software); Catherine Fazio & Scott Stern, *Innovation Incentive, Compatibility, and Expropriation as an Antitrust Remedy: The Legacy of the Borland/Ashton-Tate Consent Decree*, 68 ANTITRUST L.J. 45 (2000) (horizontal merger in relational database software); Gilbert & Tom, *supra* n.42 at 55-58 (horizontal merger in gene therapy treatments); *cf.* Gilbert, *supra* n. 10 (draft at 2-4) (documenting increased importance of innovation concerns in enforcement agency analysis of mergers). Shane Greenstein has emphasized the importance of using competition policy to encourage multiple commercial visions, even when fringe firm innovations have only modest probabilities of success. "[C]ommerical failure should not be thought of as an obvious waste of resources" because of

successful innovator can expect to capture a large market share because of factors like intellectual property rights, scale economies in production, or network effects,[45] and would reasonably continue to expect to do so if antitrust enforcement enhances post-innovation competition as well as pre-innovation competition.[46] Under such circumstances, meritorious antitrust intervention to protect product market competition in winner-take-most industries is likely to enhance pre-innovation competition without making much difference to post-innovation competition.[47] Any resulting disincentive to dominant firm innovation would likely be small and

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what it can teach others working on their own innovations. Shane Greenstein, Market Structure and Innovation: A Brief Synopsis of Recent Thinking (Feb. 20, 2002) *available at* http://www.ftc.gov/opp/intellect/greenstein.htm. *Cf.* Timothy F. Bresnahan & Shane Greenstein, *Technological Competition and the Structure of the Computer Industry*, 47 J. INDUS. ECON. 1 (1999) (describing platform competition in the computer industry over three decades).

[45] When a product or service exhibits network effects (or demand-side scale economies) its value to a buyer rises when some other buyer also purchases it.

[46] Consideration of preemption incentives (the fourth principle) does not change this conclusion, even if the innovation is not drastic (decreasing the strength of the Arrow effect disincentive facing an innovating monopolist). The possibility of pre-innovation preemption by a dominant firm in a winner-take-most industries might make it more difficult for antitrust enforcers to foster innovation by encouraging greater pre-innovation product market competition, but does not detract from the benefits of enhancing product market competition. Similarly, the possibility that a successful innovator in a winner-take-most industry would undertake further innovation in order to preempt rivals might be a reason for antitrust concern about exclusionary conduct limiting innovation in the post-innovation industry, but is again does not detract from the benefits of enhancing product market competition (in order to implement the second principle).

[47] For example, incentives to innovate are likely enhanced by antitrust enforcement in winner-take-most markets against exclusionary conduct by dominant firms lacking a legitimate business justification, such as challenges to sham product improvements that create incompatibilities for rivals without benefitting buyers. Consistent with this approach, courts have found that product design decisions can constitute monopolization if they are not ways of lowering costs or improving product performance. *United States v. Microsoft Corp.*, 253 F. 3d 34, 64-67 (D.C. Cir. 2001); *California Computer Prods., Inc. v. IBM Corp.*, 613 F.2d 727, 744

outweighed by the improved innovation incentives facing fringe rivals. Fostering product market competition in winner-take-most industries enhances innovation incentives on the whole, by in effect threading the needle between the second and third economic principles set forth above.[48]

This is not to say that antitrust complaints charging harms to product market competition in winner-take-all industries are invariably meritorious. In any individual case, it will be important to account for procompetitive business justifications as well as potential anticompetitive harms.[49] The point is simply that we should not worry that antitrust enforcement actions in such industries will systematically chill innovation. To the contrary, such cases are likely to promote innovation.[50]

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(9th Cir. 1979); *Berkey Photo, Inc. v. Eastman Kodak Co.*, 603 F. 2d 263, 287 n. 39 (2d. Cir. 1979). Shane Greenstein has described how Microsoft's insistence in 1995 that personal computer manufacturers not alter the "first screen" had "consequences for other firms' innovative behavior by raising distribution costs to application firms," some of which undoubtedly competed with Microsoft, without affecting the incentives for the programmers at Microsoft to design a good product. Greenstein, *supra* n. 44. Although this aspect of Microsoft's conduct was later found to support a finding of monopolization in the operating system market, the court did not address Greenstein's concern about harm to innovation in applications markets.

[48] *Cf.* Ilya Segal & Michael Whinston, *Antitrust in Innovative Industries* (NBER Working Paper No. 11525, August 2005), *available at* http://ssrn.com/abstract=776013 (antitrust enforcement against a range of exclusionary and collusive practices increases aggregate incentives to innovate in a model in which only potential entrants conduct R&D, or else incumbents also conduct R&D with a large prize to successful R&D (such as avoiding displacement by an entrant)).

[49] I do not mean to suggest that an unstructured rule of reason must invariably be applied to decide cases in preference to *per se* rules or structured (quick look) inquiries under the rule of reason.

[50] An antitrust challenge to exclusionary conduct by a dominant firm is perhaps most naturally brought as a monopolization case under Sherman Act §2. Monopolization requires proof of both monopoly power and a bad act to obtain or maintain that power. The legal

Antitrust enforcement to protect product market competition is also likely to benefit

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standards for identifying bad acts when the exclusionary conduct does not involve price have been the subject of recent debate. In brief overview, the current dispute is between advocates of two positions. Under one view, a bad act should be identified through a reasonableness or balancing test, perhaps structured as a set of quick look presumptions. *United States v. Microsoft Corp.*, 253 F. 3d 34, 58-59 (D.C. Cir. 2001) (identifying bad acts through a structured reasonableness test); *see* Steven C. Salop, *Exclusionary Conduct, Effect on Consumers, and the Flawed Profit-Sacrifice Test*, 73 ANTITRUST L. J. 311 (2006) (defending consumer welfare test in preference to profit-sacrifice test). According to the other view, the legal standard should instead place a thumb on the scales to make it more difficult for plaintiffs to succeed. A variety of approaches for doing so have been proposed, including the "profit-sacrifice" test, the "no economic sense" test, and the "disproportionate impact" test. *See* Andrew I. Gavil, *Exclusionary Distribution Strategies by Dominant Firms: Striking a Better Balance*, 72 ANTITRUST L. J. 3, 52-65 (2004) (surveying range of proposed standards). *See also* Einer Elhauge, *Defining Better Monopolization Standards*, 56 STANFORD L. REV. 253, 323, 330 (2003) (recommending focus on whether conduct harmed rivals only through efficiency); A. Douglas Melamed, *Exclusive Dealing Agreements and Other Exclusionary Conduct – Are There Unifying Principles?*, 73 ANTITRUST L. J. 375 (2006) (defending sacrifice test); Gregory J. Werden, *Identifying Exclusionary Conduct Under Section 2: The "No Economic Sense" Test*, 73 ANTITRUST L. J. 413 (2006) (defending no economic sense test); *cf.* Mark S. Popofsky, *Defining Exclusionary Conduct: Section 2, the Rule of Reason, and the Unifying Principle Underlying Antitrust Rules*, 73 ANTITRUST L. J. 435 (2006) (surveying proposed tests and recommending different tests for different types of cases). The analysis in the text makes clear that from the perspective of fostering innovation, a reasonableness or balancing standard for identifying bad acts is preferable to any test that deviates from that standard to favor defendants when the monopolization allegation involves a winner-take-most market – the setting where monopolization cases most commonly raise concerns about innovation. To be sure, antitrust courts have arguably adopted a rebuttable presumption that new products or processes do not harm competition so long as they confer some benefits to buyers. Consistent with this view, an innovation is unlikely to constitute a bad act in support of monopolization unless it is a sham, *see supra* at n.47 (citing cases), and a monopolist's unilateral refusal to licence its intellectual property or sell its patented or copyrighted products carries with it a presumptively valid business justification for harm to consumers. *Image Technical Serv., Inc. v. Eastman Kodak Co.*, 125 F.3d 1195 (9th Cir. 1997); *Data Gen. Corp v. Grumman Sys. Support Group*, 36 F.3d 1147 (1st Cir. 1994). Such a presumption is not inconsistent with a reasonableness standard. It is better understood as a bright line rule (or quick look rule) implementing the reasonableness standard when monopolization allegations involve R&D or innovation, which recognizes the social benefits of innovation and the particular difficulty of assessing the long term benefits and harms of R&D investments and the new products and processes they create.

innovation in a second type of industry: one in which the extent of future product market competition is likely to be unaffected by the extent of current product market competition because of probable technological or regulatory developments or rapid growth in demand. Suppose, for example, that traditional telephone service providers should reasonably expect to face future competition for many of their current services from cable and wireless providers, and possibly wireline competition from the electric company as well. Then antitrust enforcement to protect competition in the provision of telephone services in the current product markets where such future competition is likely would be expected to enhance innovation incentives for telephone companies, relative to a "but-for" world in which there is less competition among telephone service providers but the same anticipated future competition from cable and wireless.

Similarly, the prospect of rapid market growth would tend to make research and development investment attractive, even if rivals are also seeking to capture sales in the same industry. If the market will likely be much larger in the near future, many firms can be expected to invest in R&D, in order to try to capture a share of the anticipated growth.[51] An exception might arise if one firm is thought to have a lead in developing a substantially better product or production process, and if its rivals expect that the leader would be able to obtain a substantial first-mover advantage in the product market (for example, from strong network effects or scale economies). Then rival R&D might be discouraged by the prospect of future competition with

[51] This point is similar to the observation in the Horizontal Merger Guidelines that an entrant's ability to capture a share of reasonably anticipated market growth makes entry more likely, by increasing the "sales opportunities" available to entrants. U.S. Dep't of Justice and Fed. Trade Comm'n, Horizontal Merger Guidelines § 3.3 (1992, revised 1997).

the leader – that is, through the application of the third economic principle. Another exception might arise if an innovation leader would reasonably anticipate obtaining broad intellectual property protection that precludes as a practical matter a rival's ability to invent around its innovation.[52] In this setting, an incumbent may be able to discourage entry through preemptive R&D – that is, through the application of the fourth economic principle. But these exceptions are at most situations in which the third or fourth economic principle might operate to limit the benefits to innovation of efforts to enhance product market competition (and so to qualify the benefits of applying the second economic principle). They might be relevant to deciding where to allocate scarce enforcement resources, but they are not reasons to avoid antitrust enforcement in rapidly growing markets.[53]

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[52] Similarly, if an initial research and development success confers a large advantage in undertaking further R&D, a first-mover advantage in R&D might operate to discourage rival research and development investments.

[53] Again, the antitrust complaints must be meritorious. In any individual case, it will be important to account for procompetitive business justifications as well as potential anticompetitive harms. It is worth remarking on one conceivable business justification involving innovation for exclusionary conduct that allows a dominant firm to obtain or maintain a product market monopoly. That possibility arises when the firm needs a large scale of production (or substantial cumulative production, to generate low marginal costs through learning-by-doing) in order to make profitable a potential innovation. For example, a lemonade stand owner may wish to conduct research on a new kind of lemon press, but would not find it worthwhile to undertake the R&D unless she could reasonably expect to use it on a large volume of lemons. (Or a telephone firm may wish to develop a new type of switch.) If the only practical way for the firm to obtain the necessary scale is to obtain a dominant position in the product market before investing in R&D, this could provide a justification for conduct that might tend to reduce product market competition (which might or might not outweigh the harm from the loss of product market competition). But this justification should not be accepted if there are reasonable and practical less restrictive alternatives. For example, the innovative lemonade firm may reasonably expect that if its R&D succeeds, it could to obtain the necessary scale through internal growth (and obtain financing from investors impressed with the cost-saving potential of

An antitrust policy aimed at fostering innovation would also target enforcement efforts at those types of anticompetitive practices that are likely to impede innovation, regardless of industry. This approach includes challenging practices that directly reduce innovation competition; this is an application of the first economic principle. Such practices would include agreements among innovation rivals not to conduct R&D, undertaken with no legitimate justification.[54] In addition, antitrust promotes innovation by challenging horizontal mergers that reduce the number of likely innovators when there are few, absent countervailing efficiencies.[55] Moreover, antitrust challenges to conduct that raises the transactions costs to firms of engaging in standard-setting encourages innovation by discouraging conduct that would makes new product development costlier for all.[56] Innovation competition can also be promoted by antitrust

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its new production process). Or it may be practical for the firm to enter into input supply agreements with rival lemonade stands, by which the innovator presses lemons for the industry and sells the resulting raw juice to many lemonade stands.

[54] *United States v. Auto. Mfrs. Ass'n*, 307 F. Supp. 617 (C.D. Ca. 1969) (consent decree settling allegations of conspiracy to suppress automotive pollution control R&D).

[55] *See generally*, Richard J. Gilbert & Steven C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 63 ANTITRUST L.J. 569 (1995); Katz & Shelanski, *supra* n.1 at 41-44; Carrier, *supra* n. 37 at 40-63 (evaluating F.T.C. pharmaceutical innovation market merger challenges).

[56] *In re Rambus Inc.*, – F.T.C. – (2006); *Dell Computer Corp*, 121 F.T.C. 616 (1996) (consent order). Exclusionary conduct, involving innovation or otherwise, is particularly suspect when it is both inexpensive to undertake and lacks cognizable efficiencies. Susan A. Creighton, D. Bruce Hoffman, Thomas G. Krattenmaker & Ernest A. Nagata, *Cheap Exclusion*, 72 ANTITRUST L.J. 975 (2005). In principle, innovation could also be promoted by challenges to another form of exclusionary conduct involving innovation competition: preemptive R&D expenditures by dominant firms. Such expenditures benefit the dominant firm largely by discouraging rival innovation rather than by leading to ways of lowering costs or improving product performance. (Firm incentives to innovate preemptively are recognized by the fourth

challenges to restraints on competition in technology markets,[57] particularly dominant firm conduct that makes it more difficult for small innovative firms to commercialize their own products or sell out to a large incumbent.[58]

An antitrust enforcement program can also promote innovation by challenging a range of practices harming product market competition. These include enforcement against "naked" horizontal agreements to fix prices or allocate customers. They also include challenges to agreements among rivals to engage in conduct facilitating coordination with no plausible business justification, such as exchanges of information on future plans (when not required to make operational a legitimate joint venture) or on current transactions (beyond what is necessary to inform customers of what is available for sale). Preventing these types of collusive arrangements enhances competition in pre-innovation product markets, consistent with the second economic principle. By contrast, antitrust enforcement against such agreements is generally unlikely to implicate the third economic principle, at least if the innovation is drastic,

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principle.) But the problems of proof – showing that the harm to innovation from preemption of rival innovative efforts exceeds the legitimate benefit – are likely to be insurmountable in practice unless the incumbent's innovative efforts create incompatibilities for rivals without benefitting buyers. *See supra* at n.47 (citing sham product improvement cases).

[57] Technology markets give innovators options for commercializing their new ideas through licensing or joint ventures (for example, with firms that control important complementary assets), so that the innovators have choices for profiting from their new ideas beyond creating a new business on their own. Technology markets are distinguished from innovation markets and product (goods) markets in U.S. Dep't of Justice & Fed. Trade Comm'n, Antitrust Guidelines for the Licensing of Intellectual Property § 3.2 (1995). The promotion of competition in technology markets fosters innovation by increasing the reward to the innovator.

[58] Greenstein, *supra* n. 44.

because a firm that creates a dramatically better or cheaper product would reasonably expect its introduction to destabilize any such agreement even in the absence of enforcement.[59] Under such circumstances, the post-innovation product market would likely be comparably competitive regardless of whether the pre-innovation cartel was challenged.

Challenges to horizontal mergers likely to reduce product market competition – that is, meritorious merger cases focused on product market competition – are also in general unlikely to reduce incentives to innovate. After all, it is hard to believe that much R&D is undertaken with the specific goal of eventually selling the firm to a horizontal rival.[60] For horizontal merger enforcement to undermine the incentives to innovate by discouraging start-ups, the start-up would have to anticipate that its innovation would be more valuable to a horizontal rival than to an established firm with complementary product lines, and to anticipate that it would not be able commercialize its product about as well by licensing its new idea.[61] In consequence, it is

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[59] The Code of Fair Competition devised by the steel industry pursuant to the National Industrial Recovery Act during the Great Depression prohibited secret, selective price cutting and the erection of new production capacity. But it exempted from the latter ban two areas of ongoing technical progress: new electric furnaces and improvements in steel finishing capacity. Jonathan B. Baker, *Identifying Cartel Policing Under Uncertainty: The U.S. Steel Industry 1933-1939*, 32 J. L. ECON. S47, S58 n.31 (1989). One interpretation is that the industry recognized that an agreement restricting pre-innovation product market competition would not discourage colluding firms from introducing drastic innovations.

[60] Start-up innovators do at times merge with established firms. A start-up innovator can choose whether to compete with established rivals – as is common in electronics – or whether instead to cooperate with them through licensing, alliance or merger – as is common in biotechnology. *See generally*, Gans, Hsu & Stern, *supra* n.12.

[61] The antitrust enforcement agencies evaluate patent licenses under the rule of reason, examining factors that include whether the patent holder possesses market power in the relevant market, whether the practice encourages unlawful coordination among competitors, whether the

unlikely that firms would refrain from efforts to innovate for fear that later merger enforcement would significantly reduce the value of their new idea. Moreover, the antitrust enforcement agencies routinely consider efficiencies involving both the production of current products and innovation in horizontal merger analysis, limiting the danger that merger enforcement would chill innovation.[62]

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practice inhibits entry of other firms through the licensing regime's exclusivity or exclusion, and whether the practice reduces the incentive to innovate in the future. U.S. Dep't of Justice & Fed. Trade Comm'n, *Antitrust Enforcement and Intellectual Property Rights: Promoting Innovation and Competition* Ch. VI (2007), *available at* http://www.usdoj.gov/atr/public/hearings/ip/222655.htm. In practice, antitrust law rarely objects to licensing transactions undertaken before the new idea has been commercialized, to create product market competition for an incumbent, even if the licensee is the incumbent firm. For a recent economic discussion of the appropriate scope of antitrust restrictions on patent licensing, see Stephen M. Maurer & Suzanne Scotchmer, *Profit Neutrality in Licensing: The Boundary Between Antitrust Law and Patent Law*, 8 AM. L. & ECON. REV. 476 (2006).

[62] For example, Michael Katz and Howard Shelanski raise the possibility of a market in which firms are deterred from innovating by the prospect of post-merger product market competition. (Their example concerns a market in which the third economic principle happens to dominate the second.) Under such circumstances, a merger could enhance incentives to innovate by reducing that competition, but merger review would need to trade off that social benefit against the social cost of reduced post-merger price competition. Katz & Shelanski, *supra* n.1 at 66-67 (Case 3). More generally, efficiency benefits involving innovation count in favor of proposed mergers if they are merger-specific and problems of proof can be overcome. U.S. Dep't of Justice and Fed. Trade Comm'n, Horizontal Merger Guidelines § 4 (1992, revised 1997) ("Other 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."). Mergers can generate efficiency benefits involving innovation in many ways. For example, they may help speed R&D by allowing firms to share complementary research (e.g. if one firm has a good approach to one step of the process, the other a good approach to another step); speed the introduction of a new product by connecting a firm with promising R&D with a rival that has a strong distribution system; increase the scale of production in order to make production process R&D more profitable; create cost reductions by allowing firms to avoid duplicative R&D; improve coordination among complementary products by facilitating the adoption of a standard interface; or speed R&D by allowing firms to share information about whether certain approaches are dead ends. But merging firms would not be

As detailed above, the four economic principles relating competition and innovation suggest where to focus competition policy in order to foster innovation. In particular, an antitrust enforcement program crafted to promote innovation would seek to protect product market competition in "winner-take-most" or "winner-take-all" markets; protect product market competition in markets in which probable technological or regulatory developments or rapid growth in demand largely determine the extent of future product market competition; attack direct reductions in innovation competition; challenge "naked" horizontal agreements to fix prices or allocate customers; prevent agreements among rivals to engage in conduct facilitating coordination with no plausible business justification; and challenge horizontal mergers likely to reduce product market competition.

Measured against this standard, contemporary competition policy holds up well. These areas account for the great bulk of antitrust enforcement at the federal agencies, as well of much of what goes on in the states and in private suits.[63] There are other areas of antitrust enforcement, including cases challenging vertical restraints, vertical mergers, and restrictions imposed by legitimate horizontal joint ventures in industries not characterized by winner-take-most competition, likely technological or regulatory change or rapid growth. In these remaining areas, antitrust enforcement is on the whole measured. In theory, antitrust intervention in these

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permitted to justify their transaction on the ground that the profits they earn from reducing competition in the product market would enhance their ability to fund R&D. *See generally*, Katz & Shelanski, *supra* n.1 at 49-54.

[63] Most federal enforcement resources go into investigation of cartels, unreasonable agreements among rivals, and mergers among rivals. Private enforcement attacks a broader array of possible violations.

other areas could simultaneously enhance pre-innovation product market competition and reduce post-innovation competition, with the net effect on innovation incentives ambiguous. In practice, however, the great majority of such conduct is likely not to be found to harm competition under current antitrust standards, so these kind of cases in aggregate would present little threat to innovation in the economy even if the incentives at issue in the third and fourth economic principles turned out to be particularly important. Accordingly, it is unlikely that antitrust enforcement to protect product market competition in areas outside those that would be emphasized by a policy focused on innovation would systematically affect the level of post-innovation competition reasonably anticipated by firms conducting research and development throughout the economy.

**Conclusion**

Antitrust commentators and enforcers need not be defensive about the benefits of competition policy for innovation. Today's antitrust institutions support innovation by targeting types of industries and practices where antitrust enforcement would enhance research and development incentives the most. It is time to move beyond the "on-the-one-hand Schumpeter, on-the-other-hand Arrow" debate, and to embrace antitrust as essential for fostering innovation. The benefits of antitrust rules and enforcement extend beyond lower prices, greater output and higher product quality; they also include increased innovation.