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'Dynamic Competition' Does Not Excuse Monopolization

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I. Introduction

In the 2004 *Trinko* decision,¹ Justice Antonin Scalia, writing for the Supreme Court, depicted “monopoly power, and the concomitant charging of monopoly prices” as “an important element of the free-market system.”² Scalia argued that “[t]he opportunity to charge monopoly prices – at least for a short period . . . induces risk taking that produces innovation and economic growth.”³ According to Scalia, this benefit of monopoly explains a long-standing element of the antitrust prohibition against monopolization: “To safeguard the incentive to innovate, the possession of monopoly power will not be found unlawful unless it is accompanied by an

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* Professor of Law, American University Washington College of Law. The author is indebted to Andy Gavil, Jim May, Dave Reitman and Steve Salop for valuable comments and discussions, and to Michael Turner for research assistance. A revised version of this paper will appear in *Competition Policy International*.

¹ *Verizon Commc’ns Inc. v. Law Office of Curtis V. Trinko*, 540 U.S. 398 (2004). *Trinko* held that a regulated telephone company’s alleged refusal to share its network with rivals, as required by the regulatory scheme for the telecommunications industry, did not state an antitrust claim for monopolization where the regulatory framework provided for a non-antitrust means of deterring and remedying harm to competition. In a more recent decision, the Court expanded the antitrust immunity implied by the presence of a parallel regulatory scheme. *Credit Suisse Sec. (USA) LLC v. Billing*, 127 S.Ct. 2383 (2007).

² *Trinko*, 540 U.S. at 407.

³ *Id.*

element of anticompetitive *conduct*.”⁴

In that brief passage, Justice Scalia made two controversial claims, one about economics and the other about antitrust law. He argued first that the prospect of achieving monopoly fosters innovation, and, second, that this economic proposition explains one important aspect of antitrust doctrine. The provocative new article by David S. Evans and Keith N. Hylton offers a detailed justification for Scalia’s claims (though, surprisingly, without reference to Scalia’s views).⁵

Neither Justice Scalia nor Professors Evans and Hylton draws out the implication of these claims for antitrust policy.⁶ Indeed, it is difficult for Evans and Hylton to say more about how they would change antitrust law while simultaneously relying on the “revealed preferences” of policy-makers to infer the goals of antitrust, as that method subtly equates “is” with “ought.”⁷

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⁴ *Id.* This observation was unnecessary to reach the decision in the case.

⁵ David S. Evans & Keith N. Hylton, *The Lawful Acquisition and Exercise of Monopoly Power and Its Implications for the Objectives of Antitrust*, 4 *Competition Pol’y Int’l* – (2008). Professors Evans and Hylton do not limit their antitrust law discussion to the Sherman Act §2 rules prohibiting anticompetitive single firm conduct. But the rules regarding monopolization are the focus of much of their article and are emphasized here.

⁶ See Evans & Hylton, draft at 41 (“We are not advocating lower scrutiny for any particular practice.”)

⁷ The revealed preference approach is predicated either on the dubious assumption that the existing body of law – the product of the past choices of Congress, the enforcement agencies and the courts – successfully implements throughout the economic principles currently accepted by those policy-makers, or on the related and suspect claim that legal and political institutions evolve to capture efficiencies. For criticism of the efficiency view of political institutions, see, e.g., DOUGLASS C. NORTH, *INSTITUTIONS, INSTITUTIONAL CHANGE AND ECONOMIC PERFORMANCE* 7 (1990) (explaining that North abandoned the efficiency view of institutions when he recognized that rulers devised property rights in their own interests and that transactions costs typically resulted in typically inefficient property rights prevailing); Daron Acemoglu, *Why Not a Political Coase Theorem? Social Conflict, Commitment and Politics*, 31 J. COMP. ECON.

But it is evident that the argument will in practice be deployed to justify on innovation-promoting grounds the exercise of market power, and, consequently, to call for a relaxation in antitrust enforcement, particularly against monopolization.⁸

This implication was drawn by Assistant Attorney General Thomas Barnett, the current head of the Justice Department’s Antitrust Division. In a recent article on antitrust and innovation, Barnett endorsed Scalia’s economic argument from *Trinko*, stating that “the ability to charge monopoly prices, at least for a short while, can be what induces firms to take the risks that produce innovation and other efficiencies, which ultimately benefits consumers.”⁹ Barnett saw that argument as a reason to call for “appropriate caution in enforcement of the antitrust laws against single firm conduct.”¹⁰ Consistent with his views, the Justice Department has brought no

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620 (2003); cf. Richard E. Wagner, *Common Law, Statute Law and Economic Efficiency*, in 1 THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW 313 (Peter Newman ed. 1998) (reviewing arguments for and against the efficiency of the common law and statutes); Jürgen G. Backhaus, *Efficient Statute Law*, in 2 THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW 24 (Peter Newman ed. 1998) (same).

⁸ See Andrew I. Gavil, *Exclusionary Distribution Strategies by Dominant Firms: Striking a Better Balance*, 72 Antitrust L.J. 3, 44 (2004) (arguing that Justice Scalia’s “deliberate goal” in *Trinko* was “to build the case for a more tolerant monopolization standard”). It is hard to reconcile the recent concern about the impact of monopolization standards on innovation with the lack of evidence of successful Sherman Act §2 challenges directed at innovative dominant firm conduct.

⁹ Thomas O. Barnett, *Maximizing Welfare Through Technological Innovation*, 15 GEO. MASON L. REV. 1191, 1201 (2008). Barnett prefaced this aspect of his article with an explanation of how competition encourages innovation.

¹⁰ *Id.* Others favoring relaxation of antitrust’s concern with market power and monopoly argue for less intervention on the ground that markets are self-correcting. See Frank Easterbrook, *The Limits of Antitrust*, 63 TEXAS L. REV. 1, 15 (1984) (making self-correction argument). For criticism of this argument, see Ariel Ezrachi & David Gilo, *Are Excessive Prices Really Self-Correcting?*, J. COMP. L. & ECON (forthcoming 2008) available at

monopolization cases during the George W. Bush administration.¹¹

This comment critically evaluates Evans and Hylton’s defense of Justice Scalia’s legal and economic claims, and the policy implication drawn by Assistant Attorney General Barnett. It shows, first, that the legal claim is at best only partially correct, as the conduct requirement for the monopolization offense was importantly prompted by concerns other than for innovation. Second, it shows that the economic claim misleads unless qualified by the observation that the push of competition generally spurs innovation more than the pull of monopoly. Third, it explains why greater attention to fostering innovation does not call for relaxing antitrust enforcement, contrary to the policy implication.

As Evans and Hylton emphasize, innovation is important, and an appropriate concern of antitrust policy. But considerations of “dynamic competition” do not argue against antitrust

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<http://ssrn.com/abstract=1237802> (working paper).

¹¹ Although the Justice Department’s workload statistics list one monopolization case brought in 2002, that figure appears to be an error. *See* Antitrust Division Workload Statistics, FY 1998-2007 *available at* <http://www.usdoj.gov/atr/public/workstats.htm> (last consulted Oct. 13, 2008). In 2007, one West Virginia newspaper’s acquisition of its rival and joint venture partner was challenged under the statutes prohibiting anticompetitive mergers and agreements (Clayton Act §7 and Sherman Act §1), along with a Sherman Act §2 count. *U.S. v. Daily Gazette Co.*, No. 2:07-0329 (S.D. W.Va. filed May 22, 2007). But this is only a technical monopolization case: the monopolization claim is not the gravamen of the violation, the Justice Department’s press release emphasizes the acquisition frame for the case, and the Antitrust Division’s workload statistics for 2007 do not record it (or any other case) as a monopolization filing. By contrast, the Justice Department brought at least seven monopolization cases during the Clinton administration. William E. Kovacic, *The Modern Evolution of U.S. Competition Policy Enforcement Norms*, 71 ANTITRUST L.J. 377, 449 (2003), reports seven cases and the Antitrust Division’s workload statistics as of mid-2001 record eleven Sherman §2 cases filed in district court between 1994 and 2000. *See* Antitrust Division Workload Statistics, FY 1991-2000 *available at* <http://web.archive.org/web/20010101000000-20011231235959/http://www.usdoj.gov/atr/public/7344.htm>.

enforcement. To the contrary: nothing is more important to economic welfare than innovation and growth, and competition and antitrust enforcement are essential for fostering them.

II. Why Monopolization is Not a Status Offense

Professors Evans and Hylton correctly observe that antitrust law does not make mere monopoly pricing illegal. Monopolization is a conduct offense, not a status offense: the monopolization prohibition applies only if the monopolist has also inappropriately obtained or maintained its monopoly power. This doctrinal point was made clear during antitrust’s structural era.¹² It was suggested in the seminal monopolization decision, *Alcoa*,¹³ and confirmed by the Supreme Court in the still-cited elaboration of monopolization doctrine in *Grinnell*.¹⁴

Evans and Hylton follow Justice Scalia’s *Trinko* dictum in explaining why mere monopoly power is insufficient to prove a Sherman Act §2 violation: they interpret this aspect of

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¹² Antitrust’s “structural era” lasted from the 1940s through the late 1970s. *See generally* Jonathan B. Baker, *A Preface to Post-Chicago Antitrust*, in POST CHICAGO DEVELOPMENTS IN ANTITRUST ANALYSIS 60, 63-64 (Roger van den Bergh, Roberto Pardolessi & Antonio Cucinotta, eds., 2002). Monopolization had previously been recognized as a conduct offense rather than a standard offense in *United States v. Standard Oil Co.*, 221 U.S. 1, 62 (1911) (noting “the omission of any direct prohibition against monopoly in the concrete” from the Sherman Act).

¹³ *United States v. Aluminum Co. Of America*, 148 F.2d 416, 430 (2d Cir. 1945) (*Alcoa*) (monopoly power not objectionable when acquired through “superior skill, foresight, and industry”). Ironically, *Alcoa* may have been the structural era monopolization decision that came the closest toward making monopolization a status offense, through an expansive definition of exclusionary conduct. *Cf. In re E.I. DuPont de Nemours & Co. (TiO₂)*, 96 F.T.C. 653 (1980) (declining to find monopolization with conduct similar to the basis for a violation in *Alcoa*).

¹⁴ *United States v. Grinnell Corp.*, 384 U.S. 563, 570-71 (1966) (distinguishing unlawful conduct from “growth or development as a consequence of a superior product, business acumen, or historic accident”).

the longstanding doctrinal rule as proof that antitrust accepts monopoly when doing so provides incentives for innovation.¹⁵ This interpretation of the mid-twentieth century case law is incomplete. While *Alcoa* recognized the potential for adverse incentive effects of a rule condemning monopoly pricing, it did not articulate clearly what those incentive concerns would be. It is hard to say whether the *Alcoa* court was more concerned that a sleepy monopolist would fail to minimize costs or that the monopolist would fail to pursue the development of new products and processes.¹⁶ Moreover, the no-fault deconcentration proposals of antitrust’s structural era – a mainstream idea during the 1970s (though ultimately not adopted by Congress or the courts) – suggest more of a concern with production efficiency than innovation incentives, as those proposals generally exempted large firms benefiting from substantial economies of scale without explicitly exempting firms in industries experiencing rapid innovation.¹⁷

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¹⁵ See Evans & Hylton, draft at 21.

¹⁶ *Alcoa*, 148 F.2d at 427 (“Many people believe that possession of unchallenged economic power deadens initiative, discourages thrift and depresses energy; that immunity from competition is a narcotic . . . that the spur of constant stress is necessary to counteract an inevitable disposition to leave well enough alone.”); see *Berkey Photo, Inc. v. Eastman Kodak Co.*, 603 F.2d 263, 273 (2d Cir. 1979) (recognizing that if monopolies were deemed unlawful *per se*, the antitrust laws would “compel the very sloth they were intended to prevent”).

¹⁷ See WHITE HOUSE TASK FORCE REPORT ON ANTITRUST POLICY, *reprinted in* 2 ANTITRUST L. & ECON. REV. 11 (1968-69) (Neal Task Force Report) (proposed “Concentrated Industries Act”); Industrial Reorganization Act, S. 1167, 93rd Cong. (1973) (Hart bill), *reprinted in* INDUSTRIAL CONCENTRATION: THE NEW LEARNING 444 (Harvey J. Goldschmid et. al, eds., 1974); Oliver E. Williamson, *Dominant Firms and the Monopoly Problem: Market Failure Considerations*, 85 HARV. L. REV. 1512, 1525 (1972) (persistent dominance should be presumptively unlawful under Sherman Act §2, rebuttable only by a showing of scale economies, an unexpired patent, or absolute managerial superiority). *But see* CARL KAYSEN & DONALD T. TURNER, ANTITRUST POLICY: AN ECONOMIC AND LEGAL ANALYSIS 111-13 (1959) (recommending deconcentration legislation, but allowing dominant firms to rebut a presumption

Evans and Hylton neglect another reason for the acceptance of a conduct predicate for the monopolization offense during the structural era that has nothing to do with incentives to innovate: if mere monopoly pricing were deemed a violation of the antitrust laws, the possible judicial remedies – divestiture and price regulation – would be unattractive, particularly in a private case.¹⁸ Price regulation is particularly troublesome, as courts are ill-suited for determining a reasonable price in the first instance, and, of equal importance, poorly-equipped to adjust the price over time as costs and other market conditions change.¹⁹

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of unreasonableness by showing that their market power flowed from scale economies or the introduction of new products or processes). *See generally* Harlan M. Blake, *Legislative Proposals for Industrial Concentration*, in *INDUSTRIAL CONCENTRATION: THE NEW LEARNING* 340 (Harvey J. Goldschmid et. al, eds., 1974); William E. Kovacic, *Failed Expectations: The Troubled Past and Uncertain Future of the Sherman Act as a Tool for Deconcentration*, 74 *IOWA L. REV.* 1105, 1137 (1989).

¹⁸ This concern was highlighted by Donald Turner, one of the most influential antitrust commentators during that period. *See* Donald F. Turner, *The Scope of Antitrust and Other Economic Regulatory Policies*, 82 *HARV. L. REV.* 1207, 1223-24 (1969). Turner saw no bar to a government monopolization case “based solely on the fact that the monopoly has been retained for a substantial period of time,” *id.* at 1223, but emphasized that “there is no public interest” in such a government case “unless an effective remedy is available,” *id.* at 1223. He saw restructuring through divestiture or dissolution as the best remedy, *see id.* at 1213-17, and preferred public to private actions against monopolists in part because private plaintiffs, which can seek damages, *id.* at 1223, “may well be biased toward relief” that impaired the efficiency of the surviving firms,” *id.* at 1224. Turner was skeptical about the utility of direct regulation of prices and entry, even when conducted by an expert administrative agency rather than a court. *Id.* at 1231. Moreover, Turner had previously rejected the idea that the Sherman Act could go farther, and simply make unlawful “the charging of a monopoly price by a monopolist” on the primary ground that Congress could not possibly have “intended the courts, under the Sherman Act, to act as price regulators,” Donald F. Turner, *The Definition of Agreement Under the Sherman Act: Conscious Parallelism and Refusals to Deal*, 75 *HARV. L. REV.* 655, 669-70 (1962) (stating that “the practical problems imposed on a court would of course be immense”).

¹⁹ These problems may well be particularly acute in rapidly changing markets where innovation is important, as the reasonable price will turn in part on an assessment that may

Evans and Hylton’s explanation for why monopolization law historically insisted on anticompetitive conduct along with monopoly power – their claim that antitrust law values monopolies for their role in promoting innovation – is far from the only serious candidate. In consequence, Evans and Hylton must argue for their view of appropriate antitrust policy on economic rather than legal grounds.

III.   Monopolization Discourages Innovation

Evans and Hylton view antitrust prohibitions as chosen by courts to balance the harms from the exercise of market power against the benefits to innovation that they expect market power to confer.²⁰ In their view, the exercise of market power creates both a social benefit, in the form of enhanced incentives to innovate, and a social harm, in the form of the cost to consumers resulting from the reduction of output and increase in price within the market.²¹ After making that tradeoff, they say, monopolization that may seem harmful when looking only to its effects on price and output within a relevant market might turn out on balance to be beneficial.²²

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frustrate judicial determination: identifying the economic cost of investments in research and development, including the competitive return on such investments in the industry at issue after accounting for their risk. But that is a different point from Evans and Hylton’s incentive claim.

²⁰ Evans & Hylton, draft at 21. They contend that the antitrust laws, like the intellectual property laws, are based on a “fundamental recognition that profits from securing significant market power serve as a reward for expending effort on things that will ultimately benefit society and that securing this effort is worth the price of deviations from the static competitive outcome.” Draft at 27.

²¹ Evans & Hylton, draft at 21.

²² See Evans & Hylton, draft at 40 (arguing that the optimal penalty for monopolization could turn out to require no penalty at all, or even a subsidy, if the monopolist creates a new

The idea that monopoly could be beneficial on innovation-promoting grounds has limited policy relevance for two reasons. First, in practice, even the most aggressive antitrust enforcement regime would not remove entirely the ability of firms, whether dominant or not, to profit from their new ideas, and thus would not completely destroy incentives to innovate. There are in general many important sources of appropriability for innovating firms – including first-mover advantages, intellectual property rights, brand reputation, and the sale of complementary products and services – and it is unlikely that enforcement against monopolization would subvert them all. Even when appropriability is weak, innovation incentives may be strong.²³ With other important sources of appropriability, moreover, the monopolist’s incremental incentive to innovate arising from the challenged conduct may be small or even non-existent; one cannot simply assume it is substantial relative to the other welfare losses the same conduct creates.

Second, the economic analysis proffered by Evans and Hylton ignores the possibility – indeed, the likelihood – that the exercise of market power harms aggregate innovation incentives rather than enhancing them. In the particular case of monopolization, if a dominant firm finds a way to raise its expected reward from successful innovation, that conduct may increase the dominant firm’s incentive to invest in research and development (R&D). But as a guide to antitrust policy, this proposition is incomplete. Whether total industry R&D and the aggregate likelihood of innovation success rise depends on the magnitude of the effect and on the extent to

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product or invests to expand a market).

²³ Jonathan B. Baker, *Beyond Schumpeter Vs. Arrow: How Antitrust Fosters Innovation*, 74 ANTITRUST L.J. 575, 580-81 & 581 n.14 (2007).

which the dominant firm’s conduct simultaneously reduces the incentive of rival firms to invest in R&D. The available empirical evidence resolves the question in favor of competition by showing that as a general rule, greater product market competition strongly encourages innovation and productivity, its close cousin.²⁴ Hence, even if antitrust is concerned solely with innovation – even if antitrust enforcement is undertaken without regard for the static welfare losses that Evans and Hylton point to as antitrust’s justification – antitrust law should still be concerned with monopolization and other exercises of market power.

Antitrust enforcement against monopolization most obviously benefits innovation when it targets “cheap exclusion” – exclusionary practices by a dominant firm that are inexpensive for the dominant firm to implement and have no efficiency justification.²⁵ When such conduct impedes rival innovation, as by limiting the rival’s access to key inputs or the post-innovation market, it reduces the aggregate industry probability of innovation success. The government cases against Microsoft²⁶ and Rambus,²⁷ for example, can be understood as challenging cheap exclusion.²⁸

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²⁴ See generally *id.* at 583-86 (2007) (surveying literature). Additional empirical work on this topic would be useful. Cf. Evans and Hylton, draft at 46 (encouraging academic economists working on antitrust-related issues to pay more attention to dynamic competition).

²⁵ Susan A. Creighton, D. Bruce Hoffman, Thomas G. Krattenmaker & Ernest A. Nagata, *Cheap Exclusion*, 72 ANTITRUST L.J. 975 (2005).

²⁶ See *United States v. Microsoft Corp.*, 253 F. 3d 34 (D.C. Cir. 2004).

²⁷ *Rambus Inc.*, 2007-1 Trade Cas. (CCH) ¶75,585 (2006), *rev’d Rambus Inc. v. FTC*, 522 F.3d 456 (D.C. Cir. 2008).

²⁸ See Baker, *supra* note 23, at 592-93.

Cheap exclusion benefits an innovative dominant firm by increasing the reward to that firm from its own success in developing new products or processes. But that greater reward makes no difference to the probability of successful dominant firm innovation; it is simply the by-product of conduct that impedes rival innovation with no countervailing efficiency benefit. Accordingly, antitrust enforcement attacking cheap exclusion increases the aggregate probability of industry innovation.²⁹

Suppose instead that the greater reward to the dominant firm from its successful innovation raises the incentive of the dominant firm to invest in research and development, consistent with the dynamic Justice Scalia and Professors Evans and Hylton emphasize. Antitrust enforcement can still lead to greater industry innovation, notwithstanding some reduction in the dominant firm’s incentive to invest in R&D, because enforcement may simultaneously increase the R&D investment incentives of the dominant firm’s rivals.³⁰

Even if enforcement reduces a dominant firm’s reward from innovation substantially, moreover, the marginal benefit of that firm’s R&D investments need not decline markedly, so

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²⁹ For a technical statement of this argument, see the appendix.

³⁰ Increased product market competition, as may result from antitrust enforcement, affects every firm’s incentives to innovate in two ways: greater pre-innovation competition encourages innovation by feeding each firm’s desire to escape product market competition, but it also discourages innovation by increasing firm fears that post-innovation competition will limit the profits from investment in R&D. The latter force is emphasized by Justice Scalia and Professors Evans and Hylton, but the desire to escape competition is often more important. *See generally* Baker, *supra* note 23. Antitrust enforcement may also encourage innovation by protecting competition in innovation markets (that is, by fostering competition in innovation itself). *Id.*

enforcement may not greatly lessen the dominant firm’s likelihood of innovation success.³¹ This idea may explain why antitrust enforcers have paid attention to monopolization allegations in “winner take all” (or “winner take most”) markets, such as operating system software or microprocessors.³² In those markets, the “prize” for successful innovation by the dominant firm is likely to remain large even after a monopolization case, so antitrust enforcement is likely to make little difference to the dominant firm’s incentive to innovate.³³

At the same time, the increased product market competition that results from antitrust enforcement may provide strong encouragement to R&D by the dominant firm’s rivals, and consequently generate a substantial increase in rival prospects for innovation success. If so, the greater competition resulting from antitrust enforcement against monopolization would increase the aggregate odds of innovation success in the market as a whole.³⁴ This outcome would be contrary to what Evans and Hylton suppose, but it is consistent with the empirical evidence that competition spurs innovation.

IV. Conclusion

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³¹ Cf. Gavil, *supra* note 8, at 43 (most innovation is encouraged by the prospect of profits rather than the prospect of monopoly profits). Similarly, the granting of intellectual property rights does not equate to the award of monopoly profits. It is now well established in antitrust, for example, that patents do not necessarily confer monopoly power.

³² See, e.g. *United States v. Microsoft Corp.*, 253 F. 3d 34 (D.C. Cir. 2004) (exclusionary conduct by dominant firm in operating system software); *In the Matter of Intel Corp.* 128 F.T.C. 213 (1999) (exclusionary conduct by dominant firm in microprocessors).

³³ See Baker, *supra* note 23, at 593-94.

³⁴ For a technical statement of this argument, see the appendix.

Justice Scalia, supported by Professors Evans and Hylton, essentially argues that monopolization cases are brought in spite of their deleterious effects on incentives to innovate. That argument reflects an incomplete view of antitrust history, economic theory and the empirical literature. It takes one side of an old debate between Schumpeter and Arrow that today’s antitrust policy can and should go beyond.³⁵

As a general matter, current antitrust rules target conduct and industries where antitrust intervention will tend to encourage innovation – as by attacking cheap exclusion, for example, or monopolization in winner-take-all markets.³⁶ Greater attention to “dynamic competition,” as Professors Evans and Hylton recommend, provides no justification for relaxing antitrust’s longstanding concern with monopolization.

Appendix

This appendix sets forth two economic models that illustrate how antitrust enforcement against monopolization can enhance innovation.

The first model demonstrates the innovation benefits of enforcement that targets “cheap exclusion” – exclusionary practices by a dominant firm that are inexpensive for the dominant firm to implement and have no efficiency justification.³⁶ Such conduct may impede rival innovation, as by limiting the rival’s access to key inputs or the post-innovation market. In the model, cheap exclusion benefits the dominant firm by increasing the reward to that firm from its

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³⁵ See generally Baker, *supra* note 23.

³⁶ See generally *id.* at 588-600. Cf. Dennis W. Carlton & Ken Heyer, *Appropriate Antitrust Policy Towards Single-Firm Conduct* (U.S. Department of Justice, Economic Analysis Group Discussion Paper EAG 08-2 March 2008) (arguing that current U.S. antitrust policy toward monopolization properly allows dominant firms to extract monopoly rents so long as those firms do not impair the competitive constraints imposed by rivals) *available at* <http://www.usdoj.gov/atr/public/eag/231610.pdf>.

³⁶ Susan A. Creighton, D. Bruce Hoffman, Thomas G. Krattenmaker & Ernest A. Nagata, *Cheap Exclusion*, 72 ANTITRUST L.J. 975 (2005).

own successful innovation. But that greater reward makes no difference to the probability of successful dominant firm innovation; it is simply the byproduct of conduct that impedes rival innovation with no countervailing efficiency benefit. Accordingly, antitrust enforcement attacking cheap exclusion increases the aggregate probability of industry innovation.

In the second model, the greater reward to the dominant firm from its successful innovation raises the incentive of the dominant firm to invest in research and development (R&D). The model shows that antitrust enforcement can still lead to greater industry innovation, notwithstanding some reduction in the dominant firm’s incentive to invest in R&D, because enforcement may simultaneously increase the R&D investment incentives of the dominant firm’s rivals. In particular, even if enforcement reduces a dominant firm’s reward from innovation substantially, it may not greatly lessen the marginal benefit of that firm’s R&D investments, so may not greatly lessen the dominant firm’s likelihood of innovation success. But the increased product market competition that results from antitrust enforcement may simultaneously provide strong encouragement to R&D by the dominant firm’s rivals, and consequently generate a substantial increase in rival prospects for innovation success. If so, the greater competition resulting from antitrust enforcement against monopolization would increase the aggregate odds of innovation success in the market as a whole. This outcome is consistent with the empirical evidence that competition spurs innovation.³⁷

The setting for both models is an industry with two firms, a dominant firm and a rival. There are two periods (implicitly in the first model, explicitly in the second). In the first period, the firms invest in research and development (R&D). In the second period, the firms learn which, if any, has successfully developed a new product or process improvement. Both firms are aiming to develop the same type of innovation.

The dominant firm succeeds in innovating with probability p and its rival succeeds with probability q . The probabilities depend on the R&D investments each firm makes: $p(I)$ for the dominant firm and $q(J)$ for its rival (with $p, q \in (0,1)$, and $I, J \geq 0$). The probabilities increase with investment but at a decreasing rate ($p' > 0$, $p'' < 0$, $q' > 0$, and $q'' < 0$).

Model 1: Cheap Exclusion

The first model shows that the aggregate probability of innovation is maximized by antitrust enforcement against the dominant firm conduct targeting exclusionary practices that are inexpensive for the dominant firm to implement and have no efficiency justification.

In the model, the dominant firm’s investment level is an exogenous constant $I = I^*$, but

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³⁷ See generally, Jonathan B. Baker, *Beyond Schumpeter Vs. Arrow: How Antitrust Fosters Innovation*, 74 ANTITRUST L.J. 575 (2007).

its rival's investment also depends on the extent to which the rival has been excluded by the dominant firm's conduct: $J = J^* (1-\theta)$, with $J^* > 0$. The parameter θ is assumed to fall between zero (no exclusion) and one (complete exclusion). It is costless for the dominant firm to exclude (exclusion is cheap) and the dominant firm's expected profits are greatest if its rival does not innovate, so in the absence of antitrust enforcement, we would observe $\theta = 1$ and $J = 0$. Antitrust enforcement is understood as generating a reduction in θ .

The social planner is concerned only with maximizing the aggregate probability of innovation, so chooses θ to maximize the expected probability of innovation (regardless of the firm that innovates). That is, the planner maximizes $p + q(J^*(1-\theta)) - p q(J^*(1-\theta))$. The analysis below demonstrates that the social planner selects $\theta = 0$, by enforcing the antitrust laws against any cheap exclusion.

The social planner selects θ to maximize the aggregate probability of innovation Ψ , as indicated in equation (A.1).

$$(A.1) \quad \max_{\theta} \Psi = p + q((1-\theta)J^*) - pq((1-\theta)J^*)$$

The derivative $d\Psi/d\theta$ is specified as equation (A.2).

$$(A.2) \quad d\Psi/d\theta = -q'J^*(1-p)$$

With $J^* > 0$, $p \in (0,1)$, and $q' > 0$, $d\Psi/d\theta < 0$. There is no interior solution to the planner's optimization problem; the planner chooses the corner solution $\theta = 0$. Accordingly, the planner encourages competition by attacking cheap exclusion to the full extent possible.

Model 2: Product Market Competition

The second model shows why antitrust enforcement against monopolization can promote innovation. The model recognizes a tradeoff: greater product market competition can lessen the innovation incentives of the dominant firm while increasing those of its rival. When the rival's investment is much more responsive to changes in competition than the dominant firm's investment, the model shows, the social planner can boost the aggregate probability of innovation through antitrust enforcement that attacks dominant firm exclusion of its rival.

Again a dominant firm competes with a single rival over two periods. In the initial period, the dominant firm earns profits $\pi^1(\theta) \geq 0$ and its rival earns profits $\omega^1(\theta) \geq 0$. Per period profit for each depends on the parameter $\theta \in [0,1]$, which indexes the degree competition on a dimension running from competition (0) to dominant firm monopoly (1). More aggressive antitrust enforcement is interpreted as a reduction in θ . For the dominant firm, profit is greater if competition is lessened ($\pi^1_{\theta} > 0$). The reduction in competition takes the form of exclusionary

conduct by the dominant firm. Hence, for the rival, profit is reduced if competition is lessened ($\omega^1_\theta < 0$). In this model, therefore, one key difference between the dominant firm and the fringe firm lies in the differential effect of lessened competition on profits.

Initial period profits are assumed to take a particular functional form, in which profits are proportional to market shares, which can differ. That is, $\pi^1 = s(\theta)M$ and $\omega^1 = (1-s(\theta))M$, where the dominant firm's market share is $s(\theta)$ and M represents the aggregate profits available in the market. Under this assumption, competition policy affects the split of joint profits (market shares) but not the total profits to producers.³⁸ Hence $\pi^1_\theta = s_\theta M$ and $\omega^1_\theta = (1-s_\theta)M$, with $s_\theta > 0$.

During the first period, the dominant firm undertakes R&D investments, denoted $I > 0$. Those investments are directed at creating a new product to supplant the firm's current product. They have a probability $p(I)$ of success, where $p \in (0,1)$. The probability increases with I but at a decreasing rate ($p' > 0$, $p'' < 0$). The function $p(I)$ accounts for the influence of technological opportunity on levels of investment. Similarly, the rival firm invests J in R&D during the first period, and succeeds with probability $q(J)$, where $q \in (0,1)$, with $q' > 0$ and $q'' < 0$.

Two additional assumptions about the probability of success functions are made in order to focus the model on the effects of product market competition on incentives to innovate. First, strategic innovation competition is excluded by assumption. In particular, each firm treats the other's probability of innovation success as exogenous and does not alter its R&D investments in response to changes in the other firm's R&D investments. Increased investment by one firm neither makes the other firm more aggressive nor more accommodating. Second, the two firms are assumed to have access to the same technology, which relates R&D investment to the likelihood of innovation in the following way: $p = [1 - \exp(-\mu I)]$ and $q = [1 - \exp(-\mu J)]$, with $\mu > 0$. This technology means that regardless of I and J , $p' = \mu(1-p)$, $q' = \mu(1-q)$, and $p'/(-p'') = [q'/(-q'')] = 1/\mu$.

There are four possible states of the world during the second period. In the first, the dominant firm successfully innovates while its rival does not. This state arises with probability $p(1-q)$. Then the dominant firm earns second period profits π^2 , which do not vary with changes in the competition parameter θ . If innovation allows a firm to escape competition, the reward could be large, but however large, it does not vary with antitrust enforcement. The rival is assumed to remain in the market and develop a copycat product. But the rival cannot obtain first mover, reputational, and intellectual property advantages that the first firm obtains through successful innovation, and earns zero economic profits.

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³⁸ Greater competition might also be expected to reduce total industry profits, through its effect on industry output and price. This possibility is treated as second order in a model focusing on innovation and is ignored.

In the second possible outcome, arising with probability $(1-p)q$, the rival successfully innovates while the dominant firm does not. Now the shoe is on the other foot; in the second period, the rival earns profits ω^2 and the first firm's profits are zero.

Third, neither firm succeeds in innovating with probability $(1-p)(1-q)$. Under such circumstances, second period profits equal first period profits for each firm: $s(\theta)M$ for the dominant firm and $(1-s(\theta))M$ for its rival. By assumption $\pi^2 > sM$ and $\omega^2 > (1-s)M$.

The final possibility is that both firms successfully innovate; this possibility arises with probability pq . Here it is assumed that both firms earn a multiple λ (for $\lambda \geq 1$) of first period profits: $\lambda s(\theta)M$ for the dominant firm and $\lambda (1-s(\theta))M$ for its rival. The multiple recognizes that the innovation may take the form of a product improvement, expanding the market and increasing aggregate producer profits. By assumption, those additional profits are split in the same proportions that obtained during the first period.

Antitrust enforcement increases the degree of competition, lessening θ . In this setup, antitrust enforcement reduces the dominant firm's expected profits from innovation. It does so by lessening the dominant firm's profits in the case in which the rival firm also innovates. By contrast, antitrust enforcement increases the expected profits that the dominant firm's rival obtains from successful innovation. This differential effect of competition on incentives to innovate creates a possible tradeoff that the social planner must evaluate.

The dominant firm decides how much to invest in order to maximize the discounted present value of expected profits. The discount factor is denoted $\delta \in [0,1]$. The dominant firm's investment decision solves the optimization problem (B.1).

$$(B.1) \quad \max_I \quad s(\theta)M - I + \delta \{p(I)(1-q)\pi^2 + (1-p(I))(1-q)s(\theta)M + p(I)q\lambda s(\theta)M\}$$

The dominant firm chooses I as the solution to equation (B.2), the first order condition. (The arguments of the variables have been suppressed).

$$(B.2) \quad I \text{ s.t. } 1 = \delta p'[(1-q)(\pi^2 - sM) + q(\lambda sM - 0)]$$

The first order condition (B.2) recognizes that the dominant firm values R&D investment to the extent it raises the present value of expected future profits. It equates the marginal investment dollar with the discounted marginal expected profit from that investment. The marginal expected profit, in turn, equals the marginal change in the probability of innovation success (p') times the expected profit conditional on innovation success (the $[(1-q)(\pi^2 - sM) + q(\lambda sM - 0)]$ term). If the rival does not innovate (probability $(1-q)$), then successful innovation by the dominant firm allows it to increase profits by $(\pi^2 - sM)$ relative to what it would earn if it too did not innovate (and thus if it continued to earn first period profits). If the rival also

innovates (probability q), then successful innovation by the dominant firm increases dominant firm profits by $(\lambda sM - 0)$ relative to what it would earn if the rival innovated but it did not.³⁹

Equation (B.3) makes the substitution $p' = \mu(1-p)$ and simplifies the first order condition (B.2) algebraically.

$$(B.3) \quad I \text{ s.t. } 1 = \delta \mu(1-p) \{ (1-q) \pi^2 + [q(\lambda+1)-1]sM \}$$

The rival chooses its investment level by solving a similar optimization problem, equation (B.4).

$$(B.4) \quad \max_J \quad (1-s(\theta))M - J + \delta \{ q(J)(1-p)\omega^2 + (1-p)(1-q(J))(1-s(\theta))M + pq(J)\lambda(1-s(\theta))M \}$$

Rival investment J is defined by the first order condition (B.5).⁴⁰

$$(B.5) \quad J \text{ s.t. } 1 = \delta \mu(1-q) \{ (1-p) \omega^2 + [p(\lambda+1)-1](1-s)M \}$$

Equations (B.3) and (B.5) implicitly determine each firm's optimal investment level as a function of the degree of competition. The influence of small changes in the degree of competition on dominant firm R&D investment is signed by totally differentiating the first order condition (B.3) and simplifying, as indicated in equation (B.6).

$$(B.6) \quad I_0 = dI/d\theta = [q(\lambda+1)-1] s_0 M / \mu \{ (1-q) \pi^2 + [q(\lambda+1)-1]sM \}$$

Equation (B.6) can be interpreted as having two components. The expression $[q(\lambda+1)-1] s_0 M / \{ (1-q) \pi^2 + [q(\lambda+1)-1]sM \}$ equals the dominant firm's incremental profit from a small reduction in the degree of competition (the numerator) divided by the expected profit to the dominant firm if it innovates (the denominator). It thus represents the percentage in increase in the dominant firm's expected profit from successful innovation arising from a small reduction in competition. The second component, $1/\mu$, equals $((-p'')/p')$, or the inverse of the absolute value of the percentage reduction in the marginal probability of innovation success arising from the associated increase in dominant firm investment. This term identifies how much investment should rise in order to make it just worthwhile to obtain that incremental expected profit.

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³⁹ The second order condition for an interior maximum requires that $\delta p''[(1-q)(\pi^2 - sM) + q(\lambda sM - 0)] < 0$. This condition is satisfied given that $p'' < 0$, $(\pi^2 - sM) > 0$, $\lambda \geq 1$, $sM \geq 0$, and $q \in (0,1)$.

⁴⁰ The second order condition parallels that for the dominant firm and is also satisfied.

Equation (B.6) implies that if the rival’s optimal investment level J (the J that solves equation (B.5)) is sufficiently high so that the probability of innovation success is not small (specifically, if J is high enough so that $q > 1/(\lambda+1)$), then $I_\theta > 0$. Under such circumstances, the dominant firm’s expected incremental profit from a reduction in competition is driven by the incremental profit in the event both firms innovate ($s_\theta M$), which is positive.

The marginal effect on the rival’s investment in R&D of a reduction in competition is derived similarly, and set forth in equation (B.7).

$$(B.7) \quad J_\theta = - [(p(\lambda+1)-1) s_\theta M / \mu \{ (1-p)\omega^2 + [(p(\lambda+1)-1)(1-s)M] \}]$$

This equation implies that $J_\theta < 0$ if the dominant firm’s optimal investment level is sufficiently high so that the probability of innovation success is not small (specifically, if I is high enough so that $p > 1/(\lambda+1)$). Under such circumstances, the rival’s incremental profit from a reduction in competition when both firms innovate is negative.

Aggregate investment in R&D falls as the industry grows less competitive ($(I_\theta + J_\theta) < 0$) if the dominant firm invests more in R&D than its rival (if $I > J$), assuming that neither p nor q is “small” (that is, $q > 1/(\lambda+1)$ and $p > 1/(\lambda+1)$). To see why, equation (B.8) evaluates the sign of $(I_\theta + J_\theta)$.

$$(B.8) \quad I_\theta + J_\theta = [1/\mu] \{ [q(\lambda+1)-1] s_\theta M / \{ (1-q)\pi^2 + [q(\lambda+1)-1]sM \} - [p(\lambda+1)-1] s_\theta M / \{ (1-p)\omega^2 + [p(\lambda+1)-1](1-s)M \} \}$$

Suppose that after solving the first order conditions (B.3) and (B.5), the dominant firm invests more in R&D than its rival. If $I > J$, then $p > q$, implying that $(1-p) < (1-q)$. Then the first order conditions imply that the dominant firm has greater expected profits conditional on innovation.⁴¹ Hence $[p(\lambda+1)-1] s_\theta M > [q(\lambda+1)-1] s_\theta M$ and $\{ (1-p)\omega^2 + [p(\lambda+1)-1](1-s)M \} < (1-q)\pi^2 + [q(\lambda+1)-1]sM \}$. In consequence, equation (B.8) implies, $I_\theta + J_\theta < 0$.

The social planner’s problem in this framework is to choose a level of competition θ in order to maximize the probability of successful innovation in the industry as a whole ($\Psi = p + q - pq$), recognizing that its choice affects both the dominant firm’s investment decision $I(\theta)$ and its

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⁴¹ The first order conditions (B.3) and (B.5) imply that the firm with the greater expected profits conditional on its own innovation makes greater investment in R&D, so has the higher probability of innovation success. In particular, these equations imply that $(1-p)/(1-q) = \{ (1-p)\omega^2 + [(p(\lambda+1)-1)(1-s)M] \} / \{ (1-q)\pi^2 + [(q(\lambda+1)-1)sM] \}$, where the right hand side of the equality is the ratio of expected profits for the rival conditional on its innovation to the expected profits for the dominant firm assuming it innovates.

rival's decision $J(\theta)$. In particular, the planner picks the level of competition to solve equation (B.9).

$$(B.9) \quad \max_{\theta} \Psi = p(I(\theta) + q(J(\theta))) - p(I(\theta))q(J(\theta))$$

The optimal level of competition satisfies the first order condition (B.10).⁴²

$$(B.10) \quad \theta \text{ s.t. } 0 = \Psi_{\theta} = p' I_{\theta} (1-q) + q' J_{\theta} (1-p)$$

After substituting in the expressions for p' and q' from above, the planner's first order condition takes the form set forth in equation (B.11).

$$(B.11) \quad \theta \text{ s.t. } 0 = \Psi_{\theta} = \mu(1-p) (1-q) [I_{\theta} + J_{\theta}]$$

It is possible that the social planner would select a value for θ that lies between 0 and 1. An interior solution to equation (B.11) could arise if $I_{\theta} + J_{\theta} = 0$, which is possible given that I_{θ} and J_{θ} have opposite signs (so long as neither p nor q is “small”). But equation (B.11) could also have a corner solution – and in particular the corner solution at $\theta = 0$ (competition). This outcome requires that J_{θ} be larger in absolute value than I_{θ} . Under such circumstances, a marginal change in the direction of more competition encourages aggregate investment in R&D. If this relationship ($(I_{\theta} + J_{\theta}) < 0$) holds over the entire range of $\theta \in [0,1]$, the planner would choose competition to the extent possible ($\theta = 0$).

As previously noted, if $I > J$ and neither p nor q is “small”, then the planner, solving first order condition (B.11), concludes that $\Psi_{\theta} < 0$ and reduces θ . Assuming that Ψ_{θ} remain negative as θ falls to zero,⁴³ the planner's problem (B.10) has a corner solution at $\theta = 0$.⁴⁴ Under such

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⁴² With the first order condition stated in the general form of equation (B.10) (that is, before substituting for p' , q' , I_{θ} and J_{θ}), the second order condition becomes $p'' I_{\theta} (1-q) + p' I_{\theta\theta} (1-q) - p' I_{\theta} q' + q'' J_{\theta} (1-p) + q' J_{\theta\theta} (1-p) - q' J_{\theta} p' < 0$. Here $I_{\theta\theta}$ and $J_{\theta\theta}$ represent the second derivatives of the investment functions. Written this generally, the second order condition cannot easily be signed, and could vary over the range of θ . Accordingly, the function determining the optimal degree of competition may have a corner solution. If it has an interior solution, moreover, the optimal value of θ could lie outside the $[0,1]$ range for that variable, again leading the planner to select a solution at an endpoint of the permissible range, or there even be multiple local maxima within the permissible range, complicating the identification of a global optimum.

⁴³ This assumption puts aside the possibility that the reduction in θ leads to a large enough increase in the rival's market share to raise I_{θ} and lower the absolute value of J_{θ} to the

circumstances, the planner would adopt a strong antitrust enforcement policy to protection competition in order to foster innovation.

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point where $\Psi_\theta = 0$ before θ falls to zero.

⁴⁴ If instead $I < J$, so $q < p$, the conclusion is reversed. The planner prefers to avoid antitrust enforcement, select $\theta = 1$, in order to encourage dominant firm innovation. If $I = J$, then the planner's decision is indeterminate.