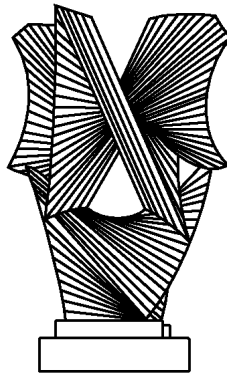


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Randal C. Picker

THE LAW SCHOOL
THE UNIVERSITY OF CHICAGO

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Regulating Network Industries:
A Look at *INTEL*

Randal C. Picker[†]

The question “Does Regulation Promote Efficiency in Network Industries?”—the topic for the panel discussion associated with this paper—can best be answered through an initial general orientation on the topic, followed by a careful consideration of a particular situation. To that end, Part I discusses ways of defining network industries, while Part II sets out briefly the patterns of regulation that we see in network industries. Part III turns to the Federal Trade Commission’s recently settled case against Intel. Part IV concludes.

To preview the conclusions, evaluating the FTC’s case against Intel turns on tricky issues regarding the dynamics of cross-licensing. That case appears to give very little weight to the benefits that arise from royalty-free cross-licenses. This practice reduces the royalty rates that will be charged to personal computer makers to the direct benefit of consumers. The settlement may very well make it more difficult for Intel to negotiate royalty-free cross-licenses. Indeed, from the FTC’s perspective, that is the main point. This make it possible for prospective PC makers who might otherwise decline to deal with Intel to do so—though this isn’t a point that appears to have figured in the FTC’s calculus—and may foster research and development on microprocessors, which was the chief focus of the FTC’s complaint. Still, there is little public evidence to suggest such an outcome, and in any event, this conclusion turns on the unexamined question of the relative importance for a licensor of cash returns versus the in-kind returns that are obtained from cross-licenses.

[†] Paul and Theo Leffmann Professor of Commercial Law, The University of Chicago Law School and Director, Olin Program in Law and Economics. I thank the Sarah Scaife Foundation and the Lynde & Harry Bradley Foundation for their generous research support, and Richard Epstein and Doug Lichtman for comments. This paper is based on remarks made on April 10, 1999 for a panel on “Does Regulation Promote Efficiency in Network Industries?” at The Federalist Society’s 18th Annual Symposium on Law and Public Policy: Competition, Free Markets, and the Law, held at The University of Chicago Law School.

As for the initial question about whether regulation promotes efficiency in network industries, the irony here is that the settlement is generally seen as quite narrow and that Intel settled to avoid much more stringent possibilities. That is certainly true, but the sharpness of the scalpel has little to do with the possible pain that it can inflict. Whether the settlement promotes efficiency turns on very subtle assessments, none of which are accessible from the public record in the case, if they were made at all.

I. Defining Network Industries

We should start by trying to define a network industry. For our purposes, two settings are relevant. In the first setting—where a network industry is defined by a physical network—a distribution grid typically is the backbone that defines the network and that in turn makes a network industry. Natural settings include telegraphs, railroads, telecommunications, oil and natural gas pipelines. These are all characterized by substantial fixed costs, natural uses and weak alternative uses, and an essential physical connectivity.

These industries often coexist physically, since the same connected set of rights-of-way can be used over and over. Telegraphs were strung up to parallel railroads from the very start. When Congress played amateur venture capitalist—giving cash and taking back no equity—and appropriated \$30,000 to allow Samuel Morse to test the “practicability and utility” of the “electro-magnetic telegraph,”¹ Morse turned to the Baltimore & Ohio Railroad to seek permission to string his wires along its rights-of-way, which he received in exchange for giving the railroad the right to use the telegraph for nothing.² Congress came to understand the natural relationship between railroads and the telegraph—one set of rights-of-way, two uses—and the land-grant program that led to the great railroads of the 19th Century, including the Union Pacific, called for joint development of railroads and the telegraph.³ This relationship con-

¹ “An Act to test the practicability of establishing a system of electro-magnetic telegraphs by the United States,” 27th Cong., Sess. III, Chapter 84, March 3, 1843.

² See Robert L. Thompson, *WIRING A CONTINENT: THE HISTORY OF THE TELEGRAPH INDUSTRY IN THE UNITED STATES, 1832-1866* 21-22 (1947).

³ See “An Act to aid in the Construction of a Railroad and Telegraph Line

tinues today: Qwest Communications, a recent entrant into the high-bandwidth communications business, built its network along the tracks of the Union Pacific,⁴ while Williams Communications, a like-minded entrant, installed fiber-optic cable next to its natural gas pipelines.⁵

The second setting is the virtual network industry, which typically is organized around an ubiquitous standard. The Wintel duopoly—Intel microprocessors coupled with the Microsoft Windows operating system—defines such a standard for PCs. The standard specification for DVDs is another example. Sun's recent attempt to offer Java as a universal platform for software is yet another. Again, we often have very large fixed costs—the R&D to develop a microprocessor or an operating system—and low marginal costs. These cost considerations will limit the number of standards that will be at work at any one time. In addition, though much less relevant for physical network industries, demand-side considerations—or network externalities in a phrase—will also apply pressure to limit the number of extant standards.

Tease these out a bit. Networks come and go as technology changes. For example, in an era in which generation of electricity was thought to be subject to substantial economies of scale and in which transmission losses precluded substantial distribution over a distance, the electricity business was characterized by local natural monopolies. These were traditional regulated industries—the quintessential public utilities. In time, we learned that bigger was not necessarily better for generating electricity. Very large nuclear

from the Missouri River to the Pacific Ocean, and to Secure to the Government the Use of the same for Postal, Military, and Other Purposes,” 37th Cong., Sess. II, Chapter 120, July 1, 1862; see also “An Act granting Lands to aid in the Construction of a Railroad and Telegraph Line from Lake Superior to Puget’s Sound, on the Pacific Coast, by the Northern Route,” 38th Cong., Sess. I., Chapter 217, July 2, 1864 (creation of the Northern Pacific Railroad), and, more generally, “An Act to aid in the Construction of Telegraph Lines, and to secure to the Government the Use of the same for postal, military, and other Purposes,” 39th Cong., Sess. I., Chapter 230, July 24, 1866.

⁴ See Lisa Brownlee, *Going the Distance: Joseph Nacchio Isn’t Relenting in his Qwest for U.S. West*, N.Y. POST, June 27, 1999, at 56.

⁵ See Jennifer Walsh, *Crossing Lines: Pipeline firms see the light in fiber optics*, THE HOUSTON CHRONICLE, June 23, 1999, at 1.

power plants had disproportionately larger downtimes than smaller plants.⁶ Large plants also had very long lead times and therefore locked generators onto a path that couldn't be responsive to changes in market conditions. In contrast, smaller plants could be brought on line in a much shorter time period, creating valuable flexibility.⁷ It thus becomes plausible that electricity in Chicago should be generated by multiple sources.⁸ That of course says nothing about the ownership of those sources—one company could build five 100-Megawatt plants rather than one 500-Megawatt plant—but this clearly makes it easier to have many companies in the generation business.

Shift from generation to transmission. Even if we want to have many companies *generating* electricity, it is less obvious that we want to have many companies *transmitting* electricity. Put differently, even if generation is no longer subject to natural monopoly characteristics, transmission may be, in the sense that it may make sense to have a single transmission grid. Again, the number of facilities says nothing about the ownership of the facilities. We could have a single owner of the transmission grid, or we could have shared ownership of the grid by all generators.

We can now step back and see how the electricity business has evolved into a network industry. Before, we had a single generator and a single owner of the transmission grid. Now, we have multiple generators, and we are going to match those generators with a single transmission grid. Ownership of the grid itself must be addressed—and the Federal Energy Regulatory Commission is doing exactly that through its independent system operator approach and its newly-proposed regional transmission organization plan.⁹ But

⁶ See Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities: Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, 61 Fed. Reg. 21540 (codified at 18 C.F.R. pts. 35 & 385) (“Order 888”).

⁷ For a precise method of valuing this flexibility using real options, see AVINASH K. DIXIT & ROBERT S. PINDYCK, INVESTMENT UNDER UNCERTAINTY, 51-54 (1994).

⁸ See Steve Daniels, *ComEd Rival puts Money on the Barrel: Enron Offers First Glimpse at Pricing War; Others Expected to Follow*, CRAIN'S CHICAGO BUSINESS, July 19, 1999, at 1.

⁹ Regional Transmission Organizations, 64 Fed. Reg. 31390 (proposed June

ownership itself merely leads to the issues of more direct concern: generator access to the grid and its continued development.

Consider virtual network industries. In these industries, the existence of a universal standard defines the scope of the network. There may be multiple standards at work in such an industry, as there were in the early days of the VCR market and as there continues to be in the PC market, but the ultimate success of one standard over another—VHS over Beta and Windows over Macintosh—means that access to the successful standard becomes important for continuing success in the industry. Consider, for example, music distribution, which has moved from vinyl records to cassettes and 8-tracks to CDs, and now perhaps to online distribution over the Internet. A recording artist denied access to these media simply would not exist. The artist could be the greatest thing since Mozart, but if she were distributing her work on modified clam shells, it wouldn't matter. Access to the standard means of distribution is essential.

These standards do not arise through a single process. For example, in the beginning of the 1980s, when the original CD format was established, there were three competing approaches: a 12-cm optical compact disk system from Philips and Sony (the eventual winner); a 7-cm mini-disc system from Telefunken; and the much larger 26-cm audio high density system from JVC.¹⁰ Each of these represented a move into the world of digital music, but there were important differences among the systems. The Telefunken system used the prior generation of record-pressing equipment, thereby reducing switching costs for manufacturers. The JVC system was backwards compatible with JVC's proprietary videodisc machines.¹¹ A group formed in Japan, the Digital Audio Disc Council, provided the industry with a forum for evaluating these competing platforms, with the hope of agreeing on a single stan-

10, 1999) ("FERC RTO").

¹⁰ *Digital audio disc council disbands after three years*, Nihon Keizai Shimbun (Japan Economic Journal), April 21, 1981, at 9; see also '*Digital Audio' is Due to Become Popular in 2 yrs*, Nihon Keizai Shimbun (Japan Economic Journal), September 16, 1980, at 8.

¹¹ *The Digital Revolution Ahead for the Audio Industry*, BUSINESS WEEK, March 16, 1981, at 40.

dard. In January of 1981, before that group could act, Matsushita, the corporate parent of JVC, announced that it would support the Philips/Sony system and would sign appropriate cross-licenses with Philips and Sony. This decisively tilted the tables in favor of the now-standard 12-cm format.¹²

In the case of DVDs, an elaborate specification process¹³ has resolved differences between competing approaches backed by Sony-Philips, on the one hand, and Toshiba-Time Warner, on the other. This process has also led to the formation of two patent pools that facilitate the creation of the standards infrastructure necessary to make DVDs workable.¹⁴ In other cases—including that of the Wintel standard—a single provider emerges as the dominant source of the product and exercises strong control over the standard. The dominance of Intel over microprocessors has meant that Intel sets the standards, while its competitors, at best, attempt to replicate what Intel has done. In operating systems that use Intel microprocessors, Microsoft has simply set the standard.

Even in the case of a dominant standard owned by a single party, complete victory after the fact may just reflect the powerful combination of demand- and supply-side economies of scale, which obscures the reality that substantial competition existed at the standard-setting stage. It is easy to forget that Windows itself once

¹² See “Matsushita Electric Ind. will use Philips formula,” *Nihon Keizai Shimbun* (Japan Economic Journal), January 27, 1981, at 8. For an interesting look at the chicken-and-egg problem that exists with hardware and software complements, see Neil Gandal, Michael Kende & Rafael Rob, *The Dynamics of Technological Adoption in Hardware/Software Systems: The Case of Compact Disc Players* (unpublished manuscript, February 1, 1998). And now the fight has begun again, as it is now possible to make “warmer” CDs that should appeal to audiophiles. Matsushita has one version, Sony-Philips another, and so it goes. See Peter Landers, *Japanese Makers are Introducing Rival Successors to CD Player*, *THE WALL ST. J.*, July 29, 1999, at B1.

¹³ Martin Levine, *Single DVD Standard Reached: Market Debut Still a Question*, *digital video disc*, VIDEO BUSINESS, December 22, 1995, at 6. For the specifications, see <<http://www.licensing.philips.com/dvdsystems/dvdspecs.html>>, and for further background, see <<http://www.dvdforum.org/foruma.htm>>.

¹⁴ The Department of Justice has blessed both of the DVD patent pools through its business review process. See <http://www.usdoj.gov/atr/public/press_releases/1999/2484.htm> and <http://www.usdoj.gov/atr/public/press_releases/1998/2120.htm>.

competed in a crowded marketplace for the chance to determine the next step from the character-based, single-tasking world of DOS. Windows started as a DOS shell—an overlay that insulated the end-user from the cold, single-line character-based world of the DOS C:\ prompt. Microsoft announced its new product on November 10, 1983. The original *New York Times* story of November 11, 1983, is quite illuminating and is worth quoting in full:

The Microsoft Corporation, a leading personal computer software company, introduced a new program to allow computer screens to be divided into several windows, each displaying different tasks that can be performed with the aid of a handheld device called a mouse.

The new program will compete with Visicorp's new Visi-on program. Apple Computer Inc.'s Lisa computer also allows different programs to run in different windows.

Microsoft Windows, as the product is called, will become an optional part of Microsoft's MS-DOS operating system, which is used on several computers.¹⁵

Lest we forget, VisiCorp was the maker of VisiCalc, the first software killer app. VisiCorp's annual revenues exceeded those of Microsoft, which in 1982 were about \$35 million.¹⁶ Digital Research, the producer of CP/M, the DOS of its day, already had introduced its DOS shell, or "operating environment," as these were sometimes called. In addition, IBM had Topview, a character-based, multi-tasking environment. Quarterdeck was selling DesQ, and Apple was soon selling the Macintosh. Plus, leading applications sellers—Visicorp and Lotus—were offering their visions of the next step through comprehensive integrated products. We know that Windows won, but standards are often set through a substantial competitive struggle.

So, start with two basic ideas for network industries: physically connected grids distributing the three Ps—people, product and

¹⁵ *Microsoft Displays Window Program*, N.Y. TIMES, November 11, 1983, at D4.

¹⁶ *See Microsoft Opens its Windows*, THE ECONOMIST, November 19, 1983, at 85.

packets—and virtually connected business ecologies organized around a dominant standard. The physical grids are frequently described as natural monopolies, but to avoid that phrase, we might say that it simply makes more sense to have a single integrated facility. The virtual network could also be described as a natural monopoly, pushed into existence by both supply-side costs and demand-side spillovers. For this paper, what is interesting is that the patterns of regulation in these two industry types are completely different, and it is to that issue that I turn next.

II. Patterns of Regulation in Network Industries

The pattern of regulation in network industries ranges from none whatsoever to episodic intervention through antitrust litigation, and from there to comprehensive regulation in the form of statutes such as the Telecommunications Act of 1996. These may occur in sequence, as they did in telecommunications, where initially an antitrust action was brought against AT&T, resulting in substantial judicial oversight under the modified final judgment.¹⁷ Only later did Congress intervene directly through the 1996 legislation. Whether we are on that path now with regard to the regulation of Microsoft is obviously an open question.

Regulation through antitrust litigation can result in the type of narrow injunctive relief that emerged from the Department of Justice's original action against Microsoft.¹⁸ To an outside observer at least, the judgment had few important consequences for Microsoft, unlike the complete restructuring of an industry that resulted from the action against AT&T. This form of regulation is obviously in some basic sense anti-democratic, since it is implemented by agencies, parties, and a randomly chosen judge, but is also quite tailored to the needs of the situation. This tailoring is an important benefit of regulation through antitrust. When we regulate through antitrust, though, we are also stuck with its most essential feature, namely, that it is monopolization that is bad, not monopoly, cap-

¹⁷ *United States v. American Telephone and Telegraph Co.*, 552 F. Supp. 131 (D.D.C., 1982), *aff'd sub nom.*, *Maryland v. United States*, 460 U.S. 1001 (1983). For discussion, see MICHAEL K. KELLOGG, JOHN THORNE AND PETER W. HUBER, *FEDERAL TELECOMMUNICATIONS LAW* Ch. 4 (1992).

¹⁸ *United States v. Microsoft Corp.*, 56 F.3d 1448 (D.C. Cir. 1995).

tured most memorably by Judge Hand in *Alcoa*, where he wrote that “[t]he successful competitor, having been urged to compete, must not be turned upon when he wins.”¹⁹ If you are fortunate enough to have a monopoly thrust upon you and do not take too many steps to maintain it, but somehow magically continue to maintain that monopoly, you are outside the purview of antitrust. Nonetheless, we lose deadweight-loss triangles whenever we have a monopoly, regardless of the manner in which that monopoly is obtained, whether as manna from heaven or through cunning worthy of the greatest robber baron bogeyman of that day.

In contrast, legislation aimed at a network industry can address the monopoly issue quite directly. Indeed, traditional regulation of so-called regulated industries has addressed exactly that problem. This regulation has taken the form of controls directed at prices of outputs—rate of return regulation coupled with price setting or price caps—coupled with a public interest standard for building new inputs. These regulations were designed to control the market power associated with natural monopoly, while ensuring an appropriate return for investors.

Modern regulation builds on changes in these industries. If we still need one electric grid but it makes sense to have many electricity producers sharing that grid, we need a new approach to regulation. We move from price regulation directed at the output market—electricity—to interconnection and unbundling rules aimed at inputs—transmission service—with regulated prices at that input level. A new electricity merchant producer generates electricity but buys transmission service from the grid owner. In physical network industries, the grid remains the one-of-a-kind facility, and access to it is the key regulatory issue. To put the matter most simply, we have reallocated the interconnection property right away from the facility owner to third parties. An entrant can jump into the electricity market just by building a new power plant—and tons of firms are doing this²⁰—without needing to build an additional (and redundant) transmission grid.

Access regulations shift the interconnection property from the grid owner to the entrant. Why should this matter? After all, a

¹⁹ *United States v. Aluminum Co. of Am.*, 148 F.2d 416, 430 (2d Cir. 1945).

²⁰ *See FERC RTO*, *supra* note 9, at 31393.

potential entrant could have negotiated for access before, so if it really made sense for the entrant to be in business, shouldn't a deal have been made? The grid owner could have voluntarily given access to the grid to merchant generators, just as it was forced to give limited access to "green" electricity generators through the PURPA legislation.²¹ Voluntary access was always an option, so the bastardized version of the Coase Theorem suggests that sensible deals should have been made even when the interconnection property right was held by the grid owner.

Should we think this is right? Probably not. It is worth noting that the facts seem to suggest, for example, that there has been an explosion in the independent power production business after the adoption of Order 888.²² It is difficult to see how an independent developer could have negotiated for access to the grid, or built a plant to be sold to the grid owner. These are single-use assets with only one purchaser. Plants built on spec would probably be sold for next to nothing to the grid owner. Deals negotiated up front would really look much more like outsourcing arrangements, where we have a monopoly purchaser. These would only make sense if the outsider had a comparative advantage in building plants. In any event, the monopolist has no reason to want to create a competitor. Under the new approaches, access to the monopoly input makes it possible for the entrant to marry its new generating facility with the old grid and to compete directly with the grid owner.

Creating an access regime is far from easy. The first iteration of the key rules in the electricity industry, FERC Order 888, ran for nearly 200 pages of dense, triple-column text in the *Federal Register*.²³ Three years later—and with an additional 54 pages of text—FERC has now proposed a substantial evolution of those rules.²⁴ We have seen a partial iteration on the telecommunications

²¹ Public Utility Regulatory Policies Act of 1978, Pub. L. No. 95-617, 92 Stat. 3117. For discussion, see Peter S. Fox-Penner, *Cogeneration After PURPA: Energy Conservation and Industry Structure*, 33 J. Law & Econ. 517 (1990).

²² See FERC RTO, *supra* note 9, at p. 31393.

²³ See *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities*, 61 Fed. Reg. 21540 (May 10, 1996).

²⁴ See *Regional Transmission Organizations*, 54 Fed. Reg. 31390 (proposed

rules with the Supreme Court's recent decision in *Iowa Utilities*.²⁵ This will require the FCC to rewrite its unbundling regulations, and also sets up the next challenge to its TELRIC pricing regulations. We also have to address ownership of the key facility. We might tolerate a single owner if we couple that with mandatory access—this is the path we have gone down in telecommunications—or we might insist instead on joint ownership, as we are doing in electricity through independent system operators today.²⁶ Of course, joint ownership of bottleneck facilities was precisely the solution offered by the Supreme Court in the great antitrust case of *United States v. Terminal Railroad Association of St. Louis*²⁷ when Jay Gould had acquired the Eads and Merchant Bridges and the Wiggins Ferry to seize control over railroad crossing of the Mississippi River at St. Louis.

III. The *INTEL* Case and the Regulation of Network Industries

The antitrust case against Intel provides a natural context in which to discuss the appropriate scope of regulation in network industries. This case is fundamentally about access and distribution in the context of a dominant standard. The FTC and Intel have settled the original action, but other investigations are ongoing. The key point here is to contrast a purely antitrust focus with one that considered Intel as part of a regulated industry.

A. FTC Action against Intel

On June 8, 1998, the Federal Trade Commission issued a complaint against Intel.²⁸ The FTC complaint alleged that Intel had monopoly power over general-purpose microprocessors. Intel was alleged to have entrenched its monopoly power by refusing to continue to deal with certain customers as a means of coercing in-

June 10, 1999).

²⁵ AT&T Corp. v. Iowa Utils. Bd, 119 S.Ct. 721 (U.S., 1999).

²⁶ See generally Order 888, *supra* note 6.

²⁷ 224 U.S. 383 (1912).

²⁸ The complaint and other documents in the case are available at <<http://www.ftc.gov/os/adjpro/d9288/index.htm>>.

tellectual property licenses relating to potentially competitive microprocessor technology. Three particular instances of such abuses were alleged relating to dealings with Digital Equipment Corporation, Intergraph Corporation, and Compaq.

On May 12, 1997, Digital had sued Intel for patent infringement, claiming that the Pentium Pro microprocessor infringed Digital patents relating to its Alpha microprocessor. The FTC complaint alleged that Intel responded to the Digital lawsuit by cutting Digital off from access to relevant information relating to Pentium microprocessors. In similar fashion, according to the FTC complaint, Intel demanded a royalty-free license for Intergraph's Clipper microprocessor technology as a condition of its willingness to continue disseminating technical information and advance chips to Intergraph. At this time, Intergraph was a leading seller of Intel-based Windows NT workstations. Intel's refusal to distribute information to Intergraph was followed by a substantial decline in Intergraph's business.²⁹ Finally, in November, 1994, Compaq sued computer manufacturer Packard Bell, alleging that Packard Bell's systems infringed Compaq's patented technology. The parts in question had been supplied by Intel to Packard Bell, and therefore Intel intervened in the lawsuit. Again, according to the FTC complaint, Intel stopped sending Compaq technical information in an effort pressure Compaq to resolve its lawsuit against Packard Bell.

In the FTC's view, these refusals to deal entrenched Intel's monopoly in general-purpose microprocessors. Intel "willfully maintained its monopoly power in the general-purpose microprocessor market."³⁰ The complaint further alleged that Intel had the requisite intent to attempt to monopolize the current generation and future generation general-purpose microprocessor markets. As a consequence, in the Commission's view, Intel's activities constituted unlawful monopolization, unlawful attempted monopolization, and unfair competition, all in violation of Section 5 of the

²⁹ Intergraph filed a private antitrust suit against Intel alleging that Intel had violated the Sherman Act by cutting it off from access to key information and microprocessors, and received a preliminary injunction in its favor. *Intergraph Corp. v. Intel Corp.*, 3 F. Supp.2d 1255 (N.D. Ala. 1998), appeal pending.

³⁰ Complaint, ¶ 40.

Federal Trade Commission Act.³¹

On March 8, 1999, a proposed settlement was issued; on August 3, 1999, by a 3-1 vote, the Commission approved that settlement without any changes.³² In the settlement, Intel agrees not to withhold key information or access to microprocessor in intellectual property disputes for a period of ten years. This is limited only in that if the customer has not agreed in writing that it will not seek an injunction barring Intel from selling its key microprocessors, then Intel is entitled to withhold such information. Most importantly, Intel generally maintains the right to refuse to deal with customers or to withhold information for virtually any other business reason. Put differently, the proposed order does not impose a compulsory licensing scheme on Intel. In the FTC's view, this order facilitates competition in microprocessor technologies. Companies that might have been chilled from developing competing technologies or from defending their existing intellectual property rights can do so, secure perhaps in the knowledge that Intel will not be able to cut them off for that reason.

The FTC's published analysis of the consent order³³ identified three allegedly harmful consequences of Intel's behavior. First, Intel was said to receive preferential access to industry technologies through royalty-free licenses. This put Intel in a superior position in the microprocessor market. Note that this idea really wasn't made clear in the complaint. Second, the FTC argued that the royalty-free licenses that Intel received reduced the returns on the competing patents, which in turn should reduce innovation. The third consequence is more complex:

Finally, Intel's conduct tends to make it more difficult for an OEM [original equipment manufacturer] to serve as a platform for microprocessors that compete with Intel's. Intel's actions ensure that Intel can act as a conduit for

³¹ 15 U.S.C. § 45 (1994).

³² The settlement itself and FTC commentary on it are available at <<http://www.ftc.gov/alj/D9288/index.htm>>. The press release announcing the final approval of the settlement is available at <<http://www.ftc.gov/opa/1999/9908/fyi-21.99.htm>>.

³³ <<http://www.ftc.gov/os/1999/9903/d09288intelanalysis.htm>>.

technology flows from one OEM to another. ... The result is that OEMs find it more difficult to differentiate their computer systems from their competitors through patented technology.

It is worth noting that the FTC's analysis assumes that more innovation is always better, or, perhaps more precisely, that innovation should never be discouraged through exclusionary acts by monopolists. This ignores the fact that it is next to impossible to assess whether we as a society are doing the right level of research. Two fundamentally conflicting ideas—too much research in a tragedy of the commons scenario and too little research due to the inability of the inventor to grab a big enough chunk of the benefits of a new idea—suggest the difficulty with making this assessment. The tragedy of the commons notion suggests that too many researchers are pursuing the same ideas. No one has a property right, getting there first produces huge gains to the winner, and lots of people rush in, ignoring the fact that in so doing they are just re-cutting the pie, and at best expanding it only slightly. Some researcher would find the new idea—there is lots of nearly simultaneous discovery when an idea is ready to emerge—and adding another researcher may push up the date of discovery slightly, but not more than that if many are already pursuing it. On this view, we need devices that actually *weaken* the incentive to do research (or at least we need to coordinate research). Intel would be performing a social good by reducing the incentive to do research.³⁴

The alternative vision is driven by the empirical fact that innovators seem to capture a relatively small share of the benefits of new ideas.³⁵ For this purpose, what matters is that the figure is not 100%. If I have to invest \$1 in something that makes society better off by \$2, I need to get at least \$1 back for me to move forward. If I

³⁴ Intel claimed that no evidence was produced to show that its behavior had *any* consequence for innovation. See Intel Corporation's Trial Brief, Public Version ("Intel Brief"), available at <<http://www.ftc.gov/alj/D9288/intelbrief.pdf>>, at 14-19.

³⁵ See Michael L. Katz and Janusz A. Ordover, *R&D Cooperation and Competition*, BROOKINGS PAPERS ON ECONOMIC ACTIVITY, MICROECONOMICS 137-139 (1990).

would only get 75 cents, and the rest of society would get \$1.25, I am not going to undertake the investment. Any figure less than 100% means that the private sector will pass on some projects that make sense for a society as a whole. This tells us that we have too little research, and that we need to take steps to bolster research (subsidies to universities perhaps). Intel's behavior would just make a bad situation worse.

And to complete the list, it is also bizarrely possible that we are getting it just right. The fact that value seeps away from the innovator into society at large means the patent race is much less winner-take-all, and that may discourage individuals from jumping into the race. If our IP system leaks at just the right rate—optimal seepage or leakage—we may just counteract the tragedy of the commons problems. The key point is that how we are doing is unknown and perhaps unknowable. The FTC's case accepts, largely blindly, the idea that more innovation is always better. To be fair, the FTC would probably say that even if we were confident that we needed to adjust innovation incentives, we would probably not want to delegate that decision to Intel. Fair enough. So I will assume, as does the FTC, that more innovation is a good thing.

B. An Antitrust Look at Intel

The settlement of the FTC's suit against Intel prevented us from learning more about the case from the witnesses and its ultimate decision. We can do no more than speculate about how the complex issues posed by the case would have been resolved. My purpose now is not to try to resolve these issues, but instead to just lay clear the analytical path that an antitrust analysis would require.³⁶ For that purpose, the heavily redacted, public pretrial briefs filed by the FTC and Intel will suffice.³⁷

The FTC stated its case quickly. Intel was a monopolist in the market for general purpose microprocessors. It used its position to maintain market dominance, and did so by creating a “privately-

³⁶ For an early, careful antitrust analysis of the case, see Ronald W. Davis, *The FTC's Intel Case: What are the Limitations on "Throwing Your Weigh Around" Using Intellectual Property Rights?*, 13 ANTITRUST 47 (1999).

³⁷ For Intel's brief, see *supra* note 34. The FTC's brief is available at <<http://www.ftc.gov/alj/D9288/990225ccpb.pdf>>.

administered compulsory licensing regime” through which it extracted beneficial licenses of competing technology. This bolstered Intel’s monopoly position directly, by providing access to its own technology as well as that of its competitors, and indirectly, by discouraging competitors from developing technology, since the benefits would just flow to Intel anyhow.

The FTC brought its claim under Section 5 of the Federal Trade Commission Act, 15 U.S.C. § 45, which declares unlawful “unfair methods of competition.” That expansive language is quite open-ended, but permits the FTC to pursue illegality under the standards of the Sherman Act.³⁸ This took the FTC to monopolization and attempted monopolization claims under Section 2 of the Sherman Act, 15 U.S.C. § 2. In *United States v. Grinnell Corp.*, the Supreme Court announced the test that still applies today: “The offense of monopoly under § 2 of the Sherman Act has two elements: (1) the possession of monopoly power in the relevant market and (2) the willful acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident.”³⁹ Under the test of *Spectrum Sports, Inc. v. McQuillan*,⁴⁰ attempted monopolization under Section 2 turns on a showing that “(1) that the defendant has engaged in predatory or anticompetitive conduct with (2) a specific intent to monopolize and (3) a dangerous probability of achieving monopoly power.”

From there we move to a definition of monopoly power—under *Grinnell*, “the power to control prices or exclude competition”⁴¹—a definition of the relevant geographic market—the world—and a definition of the relevant product market—“general purpose microprocessors used as central processing units (‘CPUs’) in reprogrammable digital computers.” The FTC’s brief spends some time segmenting that market: x86 instruction set computers (Wintel) are differentiated from non-x86 (Macintosh);

³⁸ See *Federal Trade Comm’n v. Indiana Fed’n of Dentists*, 476 U.S. 447, 454 (1986).

³⁹ 384 U.S. 563, 570-571 (1966). See also *Aspen Skiing Co. v. Aspen Highlands Skiing Co.*, 472 U.S. 585, 596 n. 19 (1985).

⁴⁰ 506 U.S. 447, 456 (1993).

⁴¹ 384 U.S. at 571.

high-end workstations (often based on RISC chips (reduced instruction set chips) from powerful Intel CISC chips (complex instruction set chips); low-end machines where Intel's Celeron chip competes with chips from Advanced Micro Devices, Inc. and Cyrix Corporation. The FTC's brief sets out Intel's share of revenues from CPUs for 1993 through the first half of 1998, but these figures were redacted from the public version of the brief. The FTC contended that these figures were buttressed by the fact that chip production was subject to substantial barriers to entry. These barriers arose from the expense of fabrication plants—the brief cited a \$2 billion 1997 figure—and the lead-time required to build these plants; economies of scale driven by learning-by-doing; network externality effects; intellectual property rights; and reputation. The brief then detailed the individual cases involving Intergraph, Digital and Compaq described above.

The FTC's complaint then turned to characterizing Intel's conduct as "exclusionary," citing the *Aspen Skiing* standard that conduct is unlawful when it "exclude[s] rivals on some basis other than efficiency." In the FTC's view, Intel had no legitimate reason for declining to provide advance technical information and chip samples. Instead, Intel was using its monopoly position to gain superior access to competing technologies and to deter innovation by its competitors, all with the hope of preserving its CPU monopoly.

Intel responded, opening with a drumbeat based on the deposition of the FTC's chief economics expert, Prof. F.M. Scherer: "Dr. Scherer acknowledges that there is no evidence that [competitor's] innovation efforts have been impaired as a result of the conduct alleged in the Complaint." If harm to innovation was at the heart of the FTC's case, Intel would try to cut that heart out by showing that the FTC had not been able to adduce *any* direct evidence of harm to innovation. Intel went through competitor after competitor—IBM, Compaq/Digital, Motorola, Hewlett-Packard, Sun, AMD, Cyrix, and on and on—each time ending with the statement "Dr. Scherer acknowledges" Intel stood ready to dispute the FTC's conclusion that Intel had monopoly power in the general CPU market, and emphasized repeatedly that the FTC had offered no evidence of harm to consumers.

On the key issue of duty to deal/refusal to deal, Intel argued that only extraordinarily narrow circumstances justify compulsory

access of the sort characterized by the essential facilities doctrine. (It is worth noting that the FTC had avoided the language of essential facilities, if not the idea itself, perhaps because of the skepticism with which the doctrine is met.⁴²) Intel characterized successful claims under the essential facilities doctrine as only arising in the context of horizontal relationships. *Aspen Skiing* was seen as exactly such a case, one in which joint marketing was seen as necessary. Finally, Intel argued that it had an abundance of legitimate business reasons for not giving advance information and chips to the three companies. Intel held patent, copyright, and trade-secret rights in this property which it had a strong right to control. Moreover, in this situation, the private litigation against Intel made it more important for Intel to restrict access to its intellectual property. Additional access might give information that would otherwise be non-discoverable and this might make it easier for the litigant to prosecute its action against Intel. In addition, the point of giving advance information and chips to customers is to make it possible for the customer to produce new machines, but also to give important feedback to Intel about its new chips. There was every reason to think that that feedback would suffer given the litigation between the companies.

Putting to one side key factual questions that are difficult to assess without access to the information that would have come out in a trial, from an antitrust perspective, this case turns on the breadth of the mandatory dealing obligation, addressed most recently by the Supreme Court in *Aspen Skiing*, with the additional layer of the federally-created rights of the holder of intellectual property. It is important to recognize that this case is really quite different from *Aspen*. *Aspen* was a we-don't-want-you case. The affiliated mountains thought that they were sufficient synergies among those mountains that they did not need to strike a deal with the excluded mountain/competitor, going so far as to omit the name of the excluded mountain from the billboard map of the mountains at the Denver airport. In contrast, the FTC's claim here is that Intel needed access to the patents of Intergraph, Digital and

⁴² See Phillip Areeda, *Essential Facilities: An Epithet in Need of Limiting Principles*, 58 ANTITRUST L.J. 841 (1990); Abbott B. Lipsky, Jr. & J. Gregory Sidak, *Essential Facilities*, 51 STAN. L. REV. 1187 (1999).

Compaq to maintain its dominant position in the microprocessor market. Intel wanted to strike a deal with these companies; the only questions were whether they would do so and at what price and whether Intel could somehow use its position to enhance the terms of trade. *Intel* is a case where *both* sides want access to valuable intellectual property.

The idea that this was about preservation of Intel's monopoly isn't very clear here. Intergraph exited the CPU business when it switched over to Intel chips. Nothing suggests that Intergraph is in a position to produce competing chips today. Intergraph will get a bunch of money if the Pentium line is found to infringe Intergraph's Clipper patents, but it is hard to imagine that the operations of the Pentium will be changed in any fundamental way, as we should expect Intergraph and Intel to strike a deal. Digital's Alpha chip was already competing with Intel's chips—rather unsuccessfully—when the dispute between Digital and Intel arose. The resulting lawsuits back and forth were resolved through a settlement, which, after FTC-imposed modifications, ensured that Alpha production and development would continue.⁴³ In both cases, if you believed the underlying lawsuits against Intel, Intel was using ideas patented by another company. It needed either to stop using the ideas—possibly disrupting the Pentium edifice—or to get a license to use the patents.

Indeed, given that there is little reason to think that competition in CPUs would increase in the short-run, the most likely immediate effect of forcing Intel to pay royalties to Intergraph or Digital would be to raise the price of Pentium processors to customers. Intel would face a monopoly supplier of an input for its Pentium, or PC makers would need to acquire licenses directly from both Intel and Intergraph. If you believe the FTC's complaint, Intel has a monopoly in general-purpose CPUs. Layering one monopoly on a second—or placing one monopoly next to another when both inputs are required—gives rise to double-marginalization—monopoly profits taken out at two levels—raising

⁴³ See FTC Press Release of April 23, 1998, "FTC Ensures that Digital's Alpha Chip—A Key Rival to Intel's Chips—Remains Competitive," available at <<http://www.ftc.gov/opa/1998/9804/digitala.htm>> ("FTC Alpha Press Release").

prices to Intel's customers and making those customers and society worse off. The key idea here is that Intel and Intergraph would impose externalities on each other through their royalty decisions.⁴⁴ With integration—and the royalty-free cross-license is equivalent to integration for these purposes—these externalities vanish. Prices of chips to PC makers should be lower with the royalty-free cross-licensing than they would be otherwise.

To see this more formally, suppose that demand for PCs is given by $p = a - bq$. Assume that PC makers face an own marginal cost of c , and royalty rates set by, say, Intel and Intergraph, of r_1 and r_2 . Assume further that the PC business is competitive. Then we can work our way back quickly to determine the royalty rates that will be set, the price of PCs, the quantity of PCs, and overall social welfare. Competition in the PC business imposes a zero-profits condition:

$$0 = pq - c(q) = (a - bq - r_1 - r_2 - c)q \quad (1)$$

This gives industry output and the market-clearing price, as a function of the royalty rates:

$$q^* = \frac{a - c - (r_1 + r_2)}{b}, \quad p^* = c + r_1 + r_2 \quad (2)$$

Intel and Intergraph would set royalty rates to maximize their individual profits, respectively, $r_1 q^*$ and $r_2 q^*$. The Nash equilibrium of their simultaneous decisions—Intel is content with its royalty given Intergraph's and vice versa—gives royalty rates of:

$$r_1^* = \frac{a - c}{3} \quad \text{and} \quad r_2^* = \frac{a - c}{3} \quad (3)$$

Plugging these back into the quantity and price formulas gives us:

$$q^* = \frac{a - c}{3b}, \quad p^* = c + \frac{2}{3}(a - c) \quad (4)$$

Now suppose that Intel has a royalty-free license from Intergraph, so that Intel can deliver both patents to PC makers. Competition in PCs again would be as before, except the single royalty rate of r would replace $r_1 + r_2$. Intel would maximize rq^* , and this would give a royalty-rate of:

⁴⁴ Intel makes this point as well. See Intel Brief, *supra* note 37, at 42 n.19.

$$r^* = \frac{a-c}{2} \quad (5)$$

The total royalty rate has dropped by 1/6 (from 2/3 to 1/2 (a-c)), so final market output goes up, and prices drop:

$$q^* = \frac{a-c}{2b}, \quad p^* = c + \frac{1}{2}(a-c) \quad (6)$$

Royalty-free cross-licensing means that we do a better job of getting private costs in line with social costs. The FTC's brief characterizes Intel's behavior as creating a "privately-administered compulsory licensing regime." This ignores the fact that royalty-free cross-licensing is a common industry practice. Both parties to the deal benefit from free access to the patent portfolio of both parties. These are in-kind benefits from R&D that should in turn translate into dollars when each company sells to its customers. And, as the above analysis shows, royalty-free cross-licensing would result in lower prices in the chip market and increased benefits to the public.⁴⁵

This lets us look at the special issues posed by an IP overlay on *Aspen*. Notwithstanding how we casually talk about patents or copyrights, the immediate goal of the patent law or copyright law is not to confer a monopoly on the rights holder. The point of IP law is to create a scheme of meaningful property rights for a particular slice of IP. The IP rights holder should have the same right to intangible property that I have for my tangible property. I exclude you from my watch by possessing it, but I cannot exclude you from my IP in the same way. Hence, IP rights law creates the power to exclude others, a power implemented through an infringement action. We could say that we have given you a monopoly over your IP, but that wouldn't be any more meaningful than saying that I have a monopoly over my watch.

This suggests that the generally applicable anti-competition policy should apply equally to rights tangible and intangible. We want individuals to write songs and build watches. If we would im-

⁴⁵ The FTC and the Department of Justice do recognize that cross-licenses can have pro-competitive effects. See *Antitrust Guidelines for the Licensing of Intellectual Property*, April 6, 1995 available at <<http://www.usdoj.gov/atr/public/guidelines/ipguide.htm>>

pose a mandatory dealing obligation under antitrust law relating to tangible property, we should not pause when we switch our gaze to intellectual property.

The royalty-free cross-licensing analysis suggests that there would be a substantial downside to that access here. I have not tried to model the bargaining issues that arise between IP rights holders, but we can be sure that the analysis is quite complex. There is every reason to think that it would be more difficult for Intel to get access to the patents of others if it lacked the power to withhold its own intellectual property. Indeed, that is the basic premise of the FTC's action. We could therefore lose the substantial benefits that we get under royalty-free cross-licensing.⁴⁶

C. Intel's Contracting Incentives

Turn from the pure antitrust look to a focus on Intel as the center of a regulated industry-to-be. To get a handle on the critical question of mandatory access, start by trying to understand Intel's private access incentives. Intel faced a number of basic choices. Intel could have vertically integrated into computers and sold microprocessors to no one; vertically integrated into PCs but also sold chips; or stayed out of the PC market altogether and just sold chips. If Intel sells chips to outsiders, it must decide whether to sell to all-comers or to only a selected few. These decisions determine the precise sense in which the Intel situation might have tracked a more conventional regulated network industry. If Intel sells to all, we have a universal access regime, one reached voluntarily rather than through regulation. If Intel also integrates vertically, we have the electricity model, where grid owners generate electricity but are required to sell access to competing generators.

The extent to which Intel has vertically integrated has changed over time, as Intel has gone from producing microprocessors to adding motherboards, but Intel has never gone into the PC market. Instead, it sells components to the PC manufacturer.

⁴⁶ There are more wrinkles here than the analysis so far suggests. We need to consider what happens to innovation when ex-post cross-licensing is anticipated ex ante. For analysis, see Michael L. Katz, *An Analysis of Cooperative Research and Development*, 17 RAND J. ECON. 527 (1986) (arguing that royalty-free cross-licensing will reduce innovation under some circumstances).

There are any number of reasons why Intel might have pursued this strategy. The conventional wisdom is that the open architecture scheme of the Wintel platform has decentralized decisions about PCs, while ensuring that a basic uniform standard is met. Apple, in contrast, has been much more vertically integrated, having a stake in the PowerPC chip while serving—for most of its life—as the sole source of Macintosh computers. Intel gets the benefits of having many companies producing innovation and value to supplement its chip.

How many PC makers should/will Intel sell to? If Intel stands ready to sell to everyone on non-discriminatory terms, we are close to a voluntary version of the mandatory access regime, save for the important point that Intel will set prices that reflect its monopoly power, while the government will set prices through administrative proceedings. If the government price would be lower than the monopoly price—which obviously would be the goal if not the result—effective access would be improved.

To begin at the most basic level, think of Intel as having three instruments to work with: a fixed licensing fee, a per-chip royalty rate, and the number of permitted PC manufacturers (licensees). Intel would set each of these to maximize its profits. The general learning of the patent licensing literature is that the patent owner should auction a fixed number of licenses, or if an auction is unrealistic, set a fixed fee for a fixed number of licenses. If that too does not work, the patent owner should license to anyone at a fixed royalty rate.⁴⁷ But this conventional wisdom is fuzzy, and with good reason, since this literature spends little time on the risk allocation issues that create uncertainty and that might push in one direction or another. The other point to note is that the patent case is not perfectly analogous here. Intel spends billions a year on R&D⁴⁸ and then spends billions more to build the fabrication plants for the chips.⁴⁹ So even after R&D, Intel incurs a substantial marginal cost to produce each chip it sells. An auction at a fixed amount or a flat-

⁴⁷ See MORTON I. KAMIEN, *Patent Licensing*, in 1 HANDBOOK OF GAME THEORY WITH ECONOMIC APPLICATIONS (eds. Robert J. Aumann & Sergiu Hart) (1992).

⁴⁸ FTC Brief, *supra* note 37, at 15 (citing the Intel 1997 Annual Report).

⁴⁹ *Id.* (quoting Albert Yu, an Intel senior vice president).

fee purchase for access would not send PC makers the right price signals, as the PC makers would ignore Intel's marginal costs in producing a chip. We should think that Intel should engage in two-part pricing, with a royalty rate set at Intel's marginal cost, and with the fixed-licensing fee set to extract profits fully from the PC makers.

If, as probably tracks the facts, Intel looks principally to royalty rates—per-chip prices—to make its money, then Intel should be willing to license anyone at the profit-maximizing royalty rate. A quick look at the relevant equations from the standard Cournot model will make this clear. Suppose that demand for PCs is given by $p = a - bQ$. Assume that production costs are given by $z + cq$, where z is the fixed cost of producing PCs and c is the marginal cost of production. Profits for a given PC maker are given by $(p - c - r)q - z - F$, where r is Intel's royalty rate, and F is Intel's fixed licensing fee. Maximizing profits in a Cournot equilibrium means that each producer chooses its q for given rest-of-the-industry output. With a little work,⁵⁰ we can establish that industry output Q is given by:

$$Q = \frac{N(a - c - r)}{b(N + 1)} \quad (7)$$

This is total industry output under Cournot competition with N licenses and a royalty rate of r .

With marginal costs of c_p , profits for Intel are given by

$$\Pi_p = (r - c_p)Q + NF \quad (8)$$

or, in equilibrium,

⁵⁰ Differentiate with respect to individual firm quantity, the profit function for each of the N producers to get:

$$\frac{\partial \Pi_i}{\partial q_i} = (a - bQ - c - r) + q_i(-b).$$

We have N of these equations, where N is the number of Intel licensees. To solve this, set the N first order conditions to zero and sum across the N firms to get:

$$N(a - bQ - c - r) = bQ$$

$$\Pi_p = (r - c_p) \frac{N(a - c - r)}{b(N + 1)} + NF \quad (9)$$

Intel sets r , F and N .

If we constrain F to be 0—the idea being that other reasons, probably uncertainty, push towards revenues through chip prices—Intel chooses r and N . Differentiating Intel's profits with respect to r and solving the first-order maximization condition for r gives

$$r^* = \frac{a - c - c_p}{2} \quad (10)$$

Plug this into the formula for Intel's profits, and we get:

$$\Pi_p = \frac{N(a - c - c_p)^2}{4b(N + 1)} \quad (11)$$

This is rising in N , so under these assumptions, Intel wants as many PC makers as possible. A zero-profits condition in the PC market will determined ultimate entry.

This crude starting point gives some sense of how we should expect Intel to behave. Intel would offer licenses to everyone, but would set a monopoly price. If the government had the will and the information, it might do better by lowering the price to that which would maximize overall welfare. This is no more a universal access regime than the one that Intel would set up privately, only the price is different, so effective access is higher. In any event, we know that this analysis ignores many issues that we should expect to be relevant. Our PC makers are identical, boring zeros, making only the Cournot quantity decision. Intel doesn't care at all about the identity of the PC makers, it just wants as many licensees as possible. We have not yet given any reason that Intel should prefer one licensee to another, or why it should have any interest in cutting off a licensee.

For better or worse, we know that that runs contrary to the facts. Like many manufacturers of complex products, Intel segments its customers into many categories.⁵¹ Intel customers who qualify as Intel Product Dealers receive training, rebates and techni-

⁵¹ See <<http://channel.intel.com/business/programs/uscanada.htm>>.

cal information from Intel.⁵² This category applies to systems integrators building fewer than 20,000 PCs per quarter. Customers can take the additional step of seeking to become an Intel Authorized Solution Provider.⁵³ These customers must already be in a program such as the product dealers program, and they must also satisfy Intel certification tests and other requirements. More steps mean more benefits, including early information and controlled use of the Intel logo. These programs are separate from the highly secretive deals struck by Intel with original equipment manufacturers. The FTC has an ongoing investigation into this program, including the very visible “Intel Inside” advertising program.⁵⁴ Of course, Intel could be acting just in its private interests through this program, but there is every reason to think that broader interests are at stake as well.

The formula for Intel’s profits in equilibrium gives us some sense of why Intel—and society as well—should care about Intel’s customers. Intel’s profits are bigger if c is smaller. Imagine a setting in which the marginal cost of production of the PC maker is not known, to either the company or Intel, before production starts. Operations give information. Intel will want to swap high-cost producers for low ones and could push exit through its termination policy. The marginal cost of production is just a proxy for any value that might be added by the PC manufacturer. This would include innovations by a PC maker that would make the computer more attractive for consumers. To return to the antitrust argument for a moment, whatever the merits of the FTC’s position on competition in microprocessors, it is hard to see without a much more complex story why Intel would want to thwart innovations in products complementary to its CPUs. This was a key claim regarding Intel’s behavior as to Compaq. As should be clear intuitively, Intel cares about the quality of its licensees; this shows up in equation (11) through the marginal cost c , but applies more generally as well.

⁵² See <<http://channel.intel.com/business/america/ipd/progsumm.htm>>.

⁵³ See <<http://channel.intel.com/business/authorization/who/index.htm>>.

⁵⁴ See Lisa Dicarlo, *Inside Intel: Chip maker’s restrictive marketing program—and millions in subsidies—shackle PC makers*, PC WEEK, April 5, 1999, at 1.

D. Strategic Licensing

We still have not approached anything like the facts as seen by the FTC. Intel did not allegedly cut off or threaten to cut off Intergraph, Digital or Compaq because they were bad at what they did. So turn instead to two possible strategic and anti-competitive uses of licensing. First, Intel might license potential competitors in order to reduce incentives to develop competing microprocessors. Suppose that Intel refused to license those who might be best situated to compete with it and just vertically integrated into computer production, or, more realistically, licensed its microprocessors only to those firms who were unlikely to enter the microprocessor market. Firms left outside the PC market would need to enter the microprocessor market first to get into the PC market. Entry of this sort might ultimately put at risk Intel's market position in microprocessors. In this scenario, Intel chooses to keep its enemies close at hand by licensing those firms that would be its strongest competitors, giving them a chunk of the returns in the PC market, and thereby reducing their incentive to develop independently competing microprocessors.⁵⁵ So Intel would license to strong potential competitors and would refuse to license weak potential competitors, all in an effort to perpetuate its market position in microprocessors.

How would we tell whether that happened here? Intergraph initially built its workstations using the Clipper chip, a RISC chip sold by the advanced processor division of Fairchild Semiconductor.⁵⁶ In 1987, Intergraph vertically integrated by purchasing the division and the chip. Five years later, in 1992, Intergraph decided to consider switching to Intel processors. The next year, it made the change, and dropped further development of the Clipper chip. According to Intergraph's complaint, in July 1996, Intel started discussing the patents covering the Clipper. Intergraph's lawsuit resulted in a preliminary injunction against Intel. That litigation is still pending, with the judge having ruled most recently that Intel

⁵⁵ See Nancy T. Gallini, *Deterrence by Market Sharing: A Strategic Incentive for Licensing*, 74 AMER. ECON. REV. 931 (1984) for development of this idea.

⁵⁶ These facts are taken from the Intergraph's Amended Complaint, originally filed November 17, 1997 available at <<http://www.intergraph.com/intel/complnt.htm>> ("Intergraph Amended Complaint").

does not have a license for the Clipper patents,⁵⁷ and a jury trial on the patent infringement issue is scheduled for February, 2000.⁵⁸

This is not what the FTC's complaint addressed. Instead, the second strategic use of licenses and information is threatened withdrawal after the customer has become dependent on access to Intel technology. The customer invests heavily in Intel chips; in the words of the Intergraph complaint:

As a result of the assurances of Intel, and the transition to Intel-based workstations, Intergraph is now technologically and economically "locked in" to the use of Intel's CPUs. Intergraph has designed its products and systems based on Intel's CPUs and, because there are no high performance alternatives, Intergraph cannot economically or feasibly switch to other CPUs.⁵⁹

With the customer completely dependent on Intel technology, Intel has the upper hand and can expropriate value from its customer through the threat of withdrawal. Intel therefore could demand, and did, a royalty-free license to the Clipper technology.

This story only works so well. Intergraph's lock-in must have been anticipated by both sides. This is a simple case of specific investments with the threat of after-the-fact hold-up. There is nothing particularly interesting there; indeed, the more interesting side is the set of institutional responses, such as second-sourcing, which are designed to make the hold-up more difficult.⁶⁰ Hold-up

⁵⁷ See *Intergraph Corp. v. Intel Corp.*, Memorandum of Opinion (CV 97-N-3023-NE, N.D. Ala. June 4, 1999) available at

< <http://www.intergraph.com/intel/integra.htm> > ("June 4th Order").

⁵⁸ See Lisa DiCarlo, *Judge finds for Intergraph in patent spat; Intel vs Intergraph; Company Business and Marketing*, PC WEEK, June 7, 1999 at 6.

⁵⁹ Intergraph Amended Complaint, *supra* note 56, ¶ 13.

⁶⁰ See Joseph Farrell & Nancy T. Gallini, *Second-Sourcing as a Commitment Monopoly Incentives to Attract Competition*, 103 Q. J. ECON. 673 (1988); Michael H. Riordan & David E.M. Sappington, *Second Sourcing*, 20 RAND J. ECON., No.1, Spring 1989. Indeed, second-sourcing had been a key element of Intel's early success. See Tim Jackson, *INSIDE INTEL: ANDY GROVE AND THE RISE OF THE WORLD'S MOST POWERFUL CHIP COMPANY*, ch. 10 (1997).

could have taken the form of demanding higher payments for chips down the road, or separate fixed-fee cash payments, or virtually anything else.

Hold-up after specific investment is completely generic. It is a risk that would be faced by any Intel licensee—not just those with possibly competing IP rights. The threat of expropriation is determined by the size of the investment and the cost of switching to competing technology. If Intel asks for value and gets it, the form in which tribute is paid may depend on whether the target has valuable IP rights, but as a first cut, the amount itself should be independent of those rights.

We therefore need to say something more refined for the FTC's story to work. Compare, for example, a royalty-free license sought before dependence on Intel's technology with one sought afterwards. When it first dealt with Intergraph, Intel could have sought a royalty-free license for any patented Clipper technology arguably infringed by the Pentium line.⁶¹ Licensing of this sort is the order of the day in the high-tech business. Recall that the FTC action focused on patents of Intergraph, Digital and Compaq. Digital's original suit against Intel—and the resulting countersuit by Intel—resulted in a complex settlement, one piece of which was cross-licensing of the relevant patents.⁶² Intel intervened in Compaq's suit against Packard Bell, but that suit was ultimately settled with undisclosed payment terms but with a license running in favor of Packard Bell.⁶³ Indeed, Compaq eventually stood ready to license its patent portfolio to other PC manufacturers, including Gateway, and entered into a cross-licensing program with Intel itself.⁶⁴

So suppose that Intergraph and Intel had discussed licenses

⁶¹ Indeed, Intel believed that it had such a license, a position ultimately rejected by the district court. See June 4th Order, *supra* note 57.

⁶² See FTC Alpha Press Release, *supra* note 43.

⁶³ See "Compaq & Packard Bell Settle Patent Litigation," Edge: Work-Group Computing Report, June 24, 1996; see also Intel press release of January 18, 1996, "Compaq and Intel Corporation Announce New Agreements in Engineering and Marketing" (available at <<http://www.intel.com/pressroom/archive/releases/cpqii.htm>>).

⁶⁴ Lisa DiCarlo, *Compaq Licenses Patents to Gateway; PC Giant Expects to Forge Deals with other Manufacturers; Gateway 2000 Inc.*, PC WEEK, December 26, 1994, at 100.

before Intergraph tied itself to the Pentium line. Assume that the Pentium chips actually infringed the Clipper technology. What matters for the negotiation is what the parties know about this. Think through four rough combinations on the infringement information: both know the chips infringe; neither knows; Intel does and Intergraph doesn't; and vice versa. If both know, nothing interesting happens; the price associated with the infringement action is just that, and will either be paid by Intel to Intergraph or netted out if they do a deal. If neither knows whether the Pentium line infringes the Clipper patent, whatever terms the parties strike represent a bet over their ignorance.

If Intel is worried about potential infringement claims, Intel might use the offer of a royalty-free license from the customer as a way of smoking out lurking infringement claims.⁶⁵ Customers without competing technology could grant the license easily, while possible competitors, such as Intergraph, would be giving up something of value. Intel would effectively be charging different prices to different customers as a function of the value of their technology, a form of price discrimination. You would expect knowing potential customers to separate out, with those with the best technology refusing to become Intel customers and being forced to compete with Intel. That makes clear the risk to Intel of this approach. Much like the story described above, Intel might very well prefer to have its strongest competitors dump their technology and switch to Intel. The upfront royalty-free license has just the opposite effect with potential customers who have valuable patents and knowledge.

In the fourth case—Intel knows and Intergraph doesn't—if Intel usually seeks royalty-free licenses from customers, Intergraph learns nothing from the request. Obviously, an Intergraph-specific request should convey information to Intergraph about what Intel knows. Indeed, the facts suggest that Intel added the royalty-free license to a particular non-disclosure agreement it presented to Intergraph, after Intel faced indemnification claims from Intel customers who in turn faced patent infringement claims from Inter-

⁶⁵ This is a genuine possibility, as the patent appears to allow patent holders to wait to assert their claims for as much as six years. *See Wanlass v. General Elec. Co.*, 148 F.3d 1334, 1337 (Fed. Cir. 1998).

graph.⁶⁶

Thus, the possibility of upfront licensing turns on the state of the parties' knowledge. Intel should find it difficult to get an upfront license from a company that knows that it has valuable patent rights. Intel might choose not to pursue such a license if it thought that that would merely push away companies that would then be forced to compete with it. Intel might turn instead to after-the-fact licenses of the sort alleged in the FTC complaint.

There is no general claim that Intel tries to rip off all of its customers. That fact might be explained through a standard repeat play/reputation story, or, if worse came to worst, common sense. The more interesting question is to ask why Intel grabs only from those customers with competing technologies, and why this might be perceived as legitimate by Intel's customers as a group. This takes us back to the double monopolization problem described before. Absent the royalty-free license, we will have two licensors for the relevant technology, in this case, Intel and Intergraph. In this scenario, both technologies would be required to use the Pentium chip. As we saw before, separate royalty rate-setting by Intel and Intergraph would result in higher royalty rates than would be set by a single owner of both patents. This will make Intel's customers as a group worse off. Intel's threat, if successful, restores single ownership of the patents at stake.

In this framework, potential customers who know that they have valuable patents will decline to deal with Intel. They will fear the after-the-fact grab alleged in this case. Potential customers who don't know that they have valuable patents will go ahead and deal with Intel, and then face the after-the-fact grab. This will make their patent rights less valuable and should discourage innovation at the margin. If the law forbids after-the-fact grabs from customers with competing patents, customers with knowledge who would not otherwise deal with Intel will do so, and customers without knowledge will deal with Intel and receive a greater return on their patents.

E. Access and Pricing Regimes

Put differently, the standard approach of network industry

⁶⁶ See Intergraph Corp., *supra* note 57, at 1266-67.

regulation—non-discriminatory, open access—makes it possible for knowing potential customers to do business with Intel when they would otherwise decline and should increase returns to the ignorant with patents who would blithely contract with Intel and risk after-the-fact plunder. This all comes on top of whatever benefits, if any, are achieved by substituting government price-setting for access for Intel's monopoly price-setting of access.

It also would come at the price of substantial government oversight of an unbelievably dynamic industry. We can slice and dice the access and pricing rules to get a better sense of the possibilities:

1. *None*. No regulation at all. This is the world prior to the FTC's action.
2. *Context-Specific Negative Duties*. Intel cannot bar for specified reasons access that it would otherwise grant absent those reasons. This is what comes out of the settlement itself, as Intel cannot use an IP dispute as a basis for refusing to deal with a customer.
3. *Mandatory Access with Private Prices*. Intel can adopt whatever price schedule it wants, but must deal with everyone at these prices.
4. *Mandatory Access with Regulated Prices*. This is the contemporary scheme of mandating access to inputs and regulating the price of those inputs.⁶⁷

Take these in reverse order. The fourth possibility is now familiar to us. It has the virtue of controlling the exercise of monopoly power, but comes at the cost of forcing the government to make repeated, difficult calculations of appropriate prices. This would be especially challenging for the government given the speed of change in the CPU industry. The third possibility is rarely used, if ever, but has the benefit of eliminating the asymmetric information and bargaining issues described above. It means accepting monopoly pricing. It also risks disturbing the voluntary process of negotiated, royalty-free cross-licenses. We need to know much more

⁶⁷ I will ignore a fifth possibility, namely, that the FTC could regulate prices and leave the access decision to Intel.

about those dynamics before we can confidently say that we improve matters by taking away from Intel the right to withhold its IP rights as part of an effort to get IP rights from others.

The second possibility could be imposed either through anti-trust litigation as occurred here or through legislation. These preserves some dealing and pricing flexibility for the target of the regulation, but also solves, at least in theory, the asymmetric information problem. I say in theory, because as Commissioner Swindle noted in his comments on the settlement,⁶⁸ negative duties are very difficult to enforce. Intel could deny access for a pretextual business reason, when in reality it was driven by IP motives. If you were to believe that such a negative duty was essentially unadministrable, this would drive you towards scheme 1 or 3. The second approach, like the third approach, may make it for Intel to strike socially-beneficial royalty-free cross-licenses. Finally, the first possibility—no regulation at all—speaks for itself.

IV. Conclusion

As noted before, the FTC's case against Intel turns on tricky issues regarding the dynamics of cross-licensing. These are essentially barter transactions, and we have only a weak understanding of when firms will turn to barter. Interfering with cross-licensing will make it more difficult for these transactions to take place, and to understand the importance of that, we need to have a better handle on the relative importance for a licensor of cash returns versus the in-kind returns that are obtained from cross-licenses.

We can say with more confidence that the FTC's case appears to give very little weight to the benefits that arise from royalty-free cross-licenses. These licenses eliminate the double monopoly problem that can arise when two patent holders hold essential patents. Royalty-free cross-licensing eliminates through a contract an externality between the patent holders that would otherwise push up prices, to the detriment of the patent holders and their customers. The settlement may very well make it more difficult for Intel to negotiate royalty-free cross-licenses and may harm society in doing so.

⁶⁸ Available at <<http://www.ftc.gov/os/1999/9904/swindle.htm>>.

But, from the FTC's perspective, that is the main point of the settlement. This should have the benefit of making it possible for prospective PC makers who might not deal with Intel to do so—though this point does not appear to have figured in the FTC's calculus. These prospective PC makers will have less reason to fear that Intel will later pressure them into a cross-license. This will increase the pool of PC makers, though the benefits of this are quite speculative. Equally speculative is whether the settlement will foster R&D on microprocessors—the chief focus of the FTC's complaint—though there is little public evidence to suggest that outcome.

As to the question of whether regulation promotes efficiency in network industries, the irony here is that the settlement is generally seen as quite narrow and that Intel settled to avoid much more draconian outcomes. That is certainly true, but that is not to say that small steps necessarily do little harm. What matters is precisely how close you are to the cliff when you start taking steps, small or large. On that score, whether the settlement promotes efficiency turns on quite subtle assessments, none of which are accessible from the public record in the case, assuming that they were made at all.

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Readers with comments should address them to:

Randal C. Picker
Paul and Theo Leffmann Professor of Commercial Law
Director, John M. Olin Program in Law and Economics
University of Chicago Law School
1111 East 60th Street
Chicago, IL 60637

r-picker@uchicago.edu

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