2003

Standards Setting and Antitrust

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In recent years, several high-profile cases have raised questions about the appropriate relationship between antitrust policy and enforcement and the standards-setting process. This Article uses the tools of economic analysis to address several aspects of this debate.

In Part I, we identify certain different types of standards, differentiate between standards and regulations, and offer a recent example of intellectual property issues arising in the standards-setting process. In Part II, we identify several ways in which intellectual property and antitrust regulations interact during the standards-setting process. Part III analyzes the interplay between antitrust and intellectual property, focusing on the various roles that firms play in standards-setting organizations (SSOs). In Part IV, we discuss SSO policies regarding intellectual property, including search, disclosure, and licensing rules. Finally, in Part V we argue that, to capture the social and economic benefits made available through standards, antitrust authorities must regulate sparingly, with no presumption that a "one size fits all" antitrust policy is appropriate. In our view, a better approach is for SSOs to establish clearly articulated rules or policies governing both members' obligations and the SSO's own actions.

I. TYPES OF STANDARDS AND REGULATIONS DIFFERENTIATED

A. DIFFERENT TYPES OF STANDARDS

Standards have become an increasingly significant aspect of many industries. But the term "standard" has a number of different meanings or uses, with fundamentally different implications for antitrust policy. In their recent treatise on *IP and Antitrust*, Professors Hovenkamp, Janis, and Lemley "define a standard rather broadly as any set of technical specifications which either does, or is intended to, provide a common design for a product or process."[1] They note that "standards" are not restricted to today's high-tech fields, but include such mundane matters as electrical plugs and outlets.[2] Other common examples of standardized products include nuts and bolts (Society of Automotive Engineering versus metric) and electrical voltage (110 volts versus 220 volts).

The Hovenkamp, Janis, and Lemley definition can be misleading in some contexts. Many standards (including many interoperability standards) do not specify a "design for a product" so much as they identify certain *features* of the product that are standardized, leaving many if not most other product features unspecified and unstandardized. For example, the design of a toaster includes the design of the plug at the end of the power cord. While the *plug* design needs to be standardized so that the cord fits into the electrical socket, and the toaster needs to be designed to run on common household current, the remainder of the design of the toaster per se does not need to be, and typically is not, standardized.

Similarly, in the semiconductor industry, one common standardization issue for new chips involves the physical chip size and shape (the "form factor") and pin assignment configuration[3] of the new chip.[4] Once these (and other)

1. HERBERT HOVENKAMP ET AL., IP AND ANTITRUST: AN ANALYSIS OF ANTITRUST PRINCIPLES APPLIED TO INTELLECTUAL PROPERTY LAW § 35.1a (2002 & Supp. 2003).

2. *Id.*

3. Chips (such as DRAMs or microprocessors) have numerous "pins" (small metal wires) that plug into receptacles in chip sockets. Different functions are assigned to different pins. Common functions include power, electrical ground, and various inputs and outputs. For chips from different manufacturers to be compatible with one another (and with the equipment in which they are installed), they must share the same pin assignment.

standards are set, different firms can compete among themselves to design different versions of the chip, all of which share the standardized features but which can differ significantly in cost and performance. Another common example involves automobile tires. Tire sizes are standardized so that tires from different manufacturers can be used interchangeably on (suitably sized) wheel rims.

In such cases, the standard serves to promote what is often termed "compatibility" or "interoperability."[5] Products that comport with the standard share common features so that they are compatible with other complementary products (e.g., tires must be compatible with wheels). In particular, interoperability standards govern how products interact with other products, not how they perform their functions. Many different designs can have the same interoperability features.

In many such cases, manufacturers compete vigorously *within* the standard along a number of dimensions such as non-standardized features, quality, and price.[6] It is all too easy to slip into the habit of assuming that, because certain product *features* have been standardized, the *product* itself has been standardized.

Adoption of a standard limits "standards wars" (in which different firms compete by offering mutually incompatible products, such as VHS and Beta VCRs), but frequently promotes competition *within* a given standard.[7] To take a well-known example, the IBM personal computer (PC) versus Macintosh "standards war" involved competition between Apple's Macintosh standard (which Apple kept proprietary, so that "Mac clones" were generally not available) and the "open" PC standard, which fostered competition between IBM and numerous brand-name (e.g., Compaq) and no-name "PC clone" manufacturers.[8]

Other standards do not involve "design" issues. One well-

4. *See, e.g.*, JEDEC SOLID STATE TECHNOLOGY ASSOCIATION, DOUBLE DATA RATE (DDR) SDRAM SPECIFICATION 3-7, http://www.jedec.org/download/search/JESD79R2.pdf (May 2002).

5. *See, e.g.*, PETER GRINDLEY, STANDARDS, STRATEGY, AND POLICY: CASES AND STORIES 22-23 (1995).

6. For example, there are certain technical standards for VHS VCRs to ensure their compatibility. *See* GRINDLEY, *supra* note 5, at 75-98. But manufacturers compete with one another by offering VCRs with a wide range of features at a wide range of prices. *See id.* at 86.

7. *See id.* at 75-98.

8. *Id.* at 131-55.

known example is product gradation standards for non-manufactured goods. Familiar examples include United States Department of Agriculture (USDA) size categories (Large, Extra Large, Jumbo) and quality categories (Grades AA, A, B) for eggs, USDA grade categories for beef (Select, Prime, Choice), and grading standards for gemstones such as diamonds (color and clarity). Of course, other product gradation standards (such as gradation standards for plywood, tire tread wear, or gasoline octane ratings) do involve manufactured products and, thus, affect certain aspects of product design.[9] The principal purpose of such product gradation standards is to provide customers with a way of comparing product features (such as size and quality) across different sellers.[10] As long as such gradation standards are provided for information purposes only, such gradation standards would not appear to raise competition policy concerns.[11]

In his 1982 book, now-Justice Stephen Breyer drew another key distinction between *performance standards* (which specify that goods must achieve certain performance characteristics, but which allow firms to achieve those performance levels in whatever fashion they can) and *design standards* (which specify particular features which goods must have if they are to conform with the standard).[12] Performance standards do not have the Hovenkamp, Janis, and Lemley "common design" feature.

Nevertheless, their definition captures the most common situation involving standardization disputes. And such "compatibility" (or "interoperability") standards represent perhaps the most important economic examples of standardization. Significant economic benefits accrue if the products of different manufacturers are compatible, even if they are not identical. Such compatibility or interoperability promotes consumers' ability to substitute among the products of different suppliers, avoiding customer "lock-in" to a

9. STEPHEN BREYER, REGULATION AND ITS REFORM 97 (1982).

10. *See, e.g., id.* (explaining that the purpose behind tire standards is to help consumers make rational decisions).

11. One possible exception is when participants in the SSOs manipulate the outcome so that the SSO refuses to draw a distinction that is important to consumers. *See* HOVENKAMP ET AL., *supra* note 1, § 35.5.

12. BREYER, *supra* note 9, at 105-06.

particular supplier.[13] For example, standardizing the physical configuration and input-output workings of computer chips allows computer makers to design their motherboards to accommodate chips from different suppliers. Standardization also helps create markets by enabling firms to achieve scale economies in production. For example, by standardizing on a relatively small number of different tire sizes, auto manufacturers facilitate the development of competition among tire manufacturers, competition that would be lessened (or absent entirely) if each car was custom designed to work only with a particular tire (and vice versa).

1. Formal Standards Versus De Facto Standards

Technical specifications for standards are typically formally adopted by an SSO.[14] Some SSOs are long-lived formal bodies and may have delegated authority. For example, the American National Standards Institute (ANSI) is a quasi-governmental, non-profit, "umbrella" organization comprising hundreds of different special-purpose SSOs. ANSI is the official United States representative to both the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO).[15] Such organizations often have numerous committees (or subcommittees) that adopt standards in particular fields.[16] Other SSOs are less structured, often ad hoc consortia of interested parties formed for a particular purpose. There are hundreds of such ad hoc consortia SSOs, especially in high-tech industries.[17]

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13. For an extended discussion of "lock-in" and its competitive and economic significance, see CARL SHAPIRO & HAL R. VARIAN, INFORMATION RULES: A STRATEGIC GUIDE TO THE NETWORK ECONOMY 103-34 (1999).

14. *See* GRINDLEY, *supra* note 5, at 61-70.

15. Am. Nat'l Standards Inst., *Annual Report*, 6, 17, http://public.ansi.org/ansionline/Documents/News%20and%20Publications/Brochures/ar_2001.pdf (last visited Mar. 13, 2003).

16. *Id.* at 9-10. For example, JEDEC (formerly the Joint Electron Device Engineering Council) is "the semiconductor engineering standardization body of the Electronic Industries Alliance (EIA), a trade association that represents all areas of the electronics industry," JEDEC, *About JEDEC*, http://www.jedec.org/Home/about_jedec.cfm (last visited Mar. 10, 2003). It has eleven committees and thirty-eight subcommittees (including "letter subcommittees"). JEDEC, *Roster of Committees*, http://www.jedec.org/service_members/Rosters/committee_roster.cfm (June 2001).

17. A recent survey by Professor Mark Lemley identified forty-three SSOs and consortia in the "telecommunications and computer-networking industries" alone. Mark A. Lemley, *Intellectual Property Rights and*

In addition, many "standards" are not set by SSOs at all. Rather, they reflect the market success of a particular product in competition with other competing products. Such "de facto" or "market" standards are common in what economists term "network industries" in which consumers benefit by adopting products or processes adopted by others.[18] Well-known examples include VHS VCRs (which "won" a "market standards" war with Sony's Betamax VCRs) and Microsoft's DOS and Windows operating systems.[19]

2. Standards Versus Regulations

Another important distinction is between private standards and government regulations. While many regulations are often described as "standards" (such as "clean air standards" or "health and safety standards"), in practice regulations often serve to limit the range of goods or services that can be sold, in ways that privately adopted standards do not. The principal antitrust concern with regulatory standards is that interested parties may be able to co-opt the regulatory process to protect their market position against potential competitors. For example, many local building codes routinely adopt (as regulations) standards promulgated by otherwise-private SSOs such as the National Fire Protection Association (NFPA).[20] The rationale for such delegation is that the SSO has specialized expertise in the area (especially with respect to safety issues involving changing technology) that local government bodies are likely to lack.

But by manipulating the actions of those SSOs, private parties can achieve an effect that would otherwise require lobbying thousands of different city councils. The best known example is *Allied Tube & Conduit Corp. v. Indian Head, Inc.*, where manufacturers of metal electrical conduit "stuffed the ballot box" (by recruiting new members to the NFPA) in order

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Standards Setting Organizations, 90 CAL. L. REV. 1889, 1903, 1973-80 (2002). He acknowledged that his list is "by no means comprehensive, even within the telecommunications and computer-networking industries" and that he "consolidated multiple working SSOs operating under the aegis of the same SSO and subject to the same policy." *Id.* at 1903 & n.45.

18. For a discussion of network industries, see SHAPIRO & VARIAN, *supra* note 13, at 173-225.

19. *See* GRINDLEY, *supra* note 5, at 75, 97, 151-52.

20. *See* National Fire Protection Association, *About NFPA*, *at* http://www.nfpa.org/catalog/home/AboutNFPA/index.asp (last visited Mar. 10, 2003).

to prevent the SSO from authorizing the use of competing polyvinyl chloride (PVC) conduit for electrical wiring.[21]

Similarly, product gradation standards have sometimes been used, in conjunction with government regulations, to limit competition, often by prohibiting the sale of (purportedly) "unsafe" products (e.g., PVC electrical conduit) or of products below a certain size or "quality" level. The latter is especially common in agricultural commodities. For example, certain agricultural marketing programs, relics of the New Deal, allow a marketing board to prevent the sale of "low quality" products.[22] Similarly, professional licensing requirements are often supported on the grounds that they prevent "unqualified" individuals from practicing the profession, albeit at the (often unstated) cost of restricting entry and raising prices.[23]

Just as "market" or de facto standards raise issues that do not arise in the context of formally adopted standards, regulations (or regulatory standards) also raise a host of new issues. For example, government agencies (unlike private entities) enjoy governmental immunity from suit.[24] Conversely, government agencies (unlike many private entities) are constrained by the requirements of due process generally and the strictures of administrative law, and often cannot adopt the sorts of streamlined procedures that private SSOs are able to adopt.

Perhaps the most significant difference between regulations and standards involves the coercive power of regulations. Most privately-set standards are voluntary; individuals and firms can, if they choose, elect not to adhere to the standard.[25] Unlike private standards, many regulations

21. Allied Tube & Conduit Corp. v. Indian Head, Inc., 486 U.S. 492, 495-97 (1988).

22. *See* Agricultural Marketing Service, U.S. Dep't of Agric., *Fruit and Vegetable Programs*, http://www.fred.ifas.ufl.edu/courses/AEB6383/Lectures 2001/mktorders.pdf (last visited Mar. 10, 2003).

23. For a discussion, see J.A.H. Maks and N.J. Philipsen, *An Economic Analysis of the Regulation of Professions*, EUROREGIONAL J. OF SCI. 17-19, *at* http://www.fdewb.unimaas.nl/Eurecom/professionalregul.pdf (last visited Mar. 10, 2003).

24. For a discussion of the state-action and petitioning immunity issues associated with regulatory agencies, see 1 PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITURST LAW ¶¶ 200-231 (2d. ed. 2000).

25. This clearly does not mean that doing so is without cost. To the contrary, the benefits associated with being compatible with the standard, and the costs associated with being "the odd man out," are often so great that firms frequently have little practical choice but to comply with the standard. But

are not "voluntary." Since compliance with government regulations is frequently not voluntary (unlike many privately-set standards), individuals and firms often have little choice but to try to influence whether a regulation will be adopted, the content of that regulation, or both. As such, individuals and firms have immunity under the *Noerr-Pennington* doctrine from antitrust liability for "petitioning" conduct designed to influence what regulations are adopted.[26]

B. A CASE STUDY: REFORMULATED GASOLINE

A recent well-known and controversial example of how a regulatory "standard" raises intellectual property issues involves reformulated gasoline.[27] It is widely recognized that air pollution is a significant social and environmental problem, and a major source of air pollution is automotive exhaust. In the early 1990s, the California Air Resources Board (CARB), a government entity, was under a legislative mandate to adopt regulations to reduce the level of pollution.[28]

While initial efforts to address the problem focused on changing the *car* (e.g., mandating the use of catalytic converters and requiring cars to pass periodic "smog checks"), it became apparent that progress could also be made by changing

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the source of the constraint is economic, not regulatory.

26. E. R.R. President's Conf. v. Noerr Motor Freight, 365 U.S. 127, 135-40 (1961); United Mine Workers v. Pennington, 381 U.S. 657, 670 (1965).

27. In March 2003, the Federal Trade Commission (FTC) filed an administrative complaint against Unocal Corporation, alleging that Unocal had violated section 5 of the FTC Act in connection with Unocal's patents on reformulated gasoline. Compl., *In re* Union Oil Co. of Cal. (Fed. Trade Comm'n Mar. 4, 2003) (No. 9305) [hereinafter FTC Unocal Compl.], http://www.ftc.gov /os/2003/03/unocalcmp.htm (last visited Mar. 10, 2003).

The following factual discussion is drawn from a number of sources, including the FTC Complaint. For background information and an extensive discussion of various issues, including links to various briefs filed in the cases, see Unocal's patent website, http://www.unocal.com/rfgpatent/index.htm (last updated Mar. 4, 2003). See also the various reported opinions, including: Union Oil Co. of Cal. v. Atl. Richfield Co., No. CV-95-2379-KMW, 1998 U.S. Dist. LEXIS 22847 (C.D. Cal. Mar. 10, 1998); Union Oil Co. of Cal. v. Atl. Richfield Co., 34 F. Supp. 2d 1208, 1222 (C.D. Cal. 1998); Union Oil Co. of Cal. v. Atl. Richfield Co., 208 F.3d 989 (2000), *cert. denied*, 531 U.S. 1183 (2001), and sources cited therein. Further factual discussion (and additional citations) is found in Janice M. Mueller, *Patenting Industry Standards*, 34 J. MARSHALL L. REV. 897 (2001), and Scott H. Segal, *Fuel For Thought: Clean Gasoline and Dirty Patents*, 51 AM. U. L. REV. 49 (2001). (We should note that, based on our first-hand familiarity with the matter, we disagree with many of the factual contentions and conclusions reached by those authors.)

28. CAL. HEALTH & SAFETY CODE § 43018(a) (West 1996).

the nature of the *gasoline* that cars burned.[29] CARB was considering adopting strict regulations requiring that gasoline sold in California meet certain technical criteria governing gasoline composition and/or characteristics.[30]

A research group (Auto/Oil) comprised of representatives of the gasoline industry (refiners) and the automobile industry, conducted research on how to change gasoline formulations to reduce pollution.[31] One participant in Auto/Oil was Unocal Corporation, at the time a major gasoline refiner and marketer in California.[32] Unocal scientists believed that the Auto/Oil research was too limited in scope (and, in the Unocal scientists' opinions, aimed in the wrong direction) and proposed a more extensive research project.[33]

In particular, Unocal believed that CARB's proposed "strict limits" approach to permissible gasoline reformulations was unduly restrictive and that it would be possible to adopt a more flexible approach involving what became known as a "predictive model" (whereby one would measure certain gasoline characteristics and predict the level of pollution that would result from burning gasoline with those characteristics).[34] In Justice Breyer's terminology (discussed above), CARB was proposing a *design* standard, requiring that gasoline meet certain fixed limits on various characteristics, while Unocal was advocating a (limited) *performance* standard, whereby refiners would be allowed to make and sell other gasoline formulations that did *not* meet the fixed limits so long as the predictive model suggested that the other formulations would generate no more pollution than the fixed-limit gasoline formulations.

Auto/Oil rejected the Unocal proposed research agenda.[35]

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29. Both the federal Environmental Protection Agency and CARB ultimately adopted regulations for reformulated gasoline. *See* Segal, *supra* note 27, at 51-54.

30. *Id.* at 55-56.

31. *See id.* at 55; Unocal, *Auto/Oil Study Provisions*, *at* http://www.unocal.com/rfgpatent/rfgao.htm (last visited Mar. 10, 2003).

32. Unocal subsequently sold its refining and marketing operations to Tosco. *See* Press Release, Unocal, Tosco Sign Agreement for Sale of Unocal's West Coast Downstream Assets, http://www.unocal.com/uclnews/96htm/121696a.htm (Dec. 16, 1996).

33. Unocal, *RFG Emissions Research*, *at* http://www.unocal.com/rfgpatent/rfgresch.htm (last visited Apr. 17, 2003).

34. *See* FTC Unocal Compl., *supra* note 27, ¶¶ 37, 44, 47.

35. Unocal, *RFG Emissions Research*, *at* http://www.unocal.com/rfgpatent/

The terms of the Auto/Oil research collaboration agreement made it clear that, while group-sponsored research would be made freely available to all participants, participants were free to conduct their own proprietary research and to patent the results.[36] Unocal funded a significant research effort, which demonstrated both (1) that air pollution could be reduced significantly by reformulating gasoline in previously unexplored ways and (2) that it was possible to generate a predictive model.[37]

Unocal scientists filed for a patent on their invention, and then disclosed the results of their research (but *not* the fact that they had applied for a patent) both to Auto/Oil and CARB.[38] Some four months later, CARB adopted regulations (to go into effect several years later) requiring California gasoline refiners to make and sell reformulated gasoline.[39] In response to the regulations, California refiners had to spend billions of dollars to upgrade their refineries to make it possible to produce adequate quantities of reformulated gasoline.[40]

Notably, the Unocal research was apparently instrumental in persuading CARB to use a flexible—"predictive model"—approach.[41] The key economic benefit of such a "predictive model" approach was that it would give refiners more flexibility to produce acceptable gasoline, thus significantly reducing the cost of complying with the new regulations.

In February 1994, between the date that the CARB regulations were adopted (in November 1991) and the date that the regulations went into effect (in March 1996), Unocal's first patent issued.[42] The claims of the patent were such that many (though *not* all) of the gasoline formulations that satisfied the

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rfgresch.htm (last updated June 15, 2001).

36. Unocal, *Auto/Oil Study Provisions*, *at* http://www.unocal.com/rfgpatent/rfgao.htm (last visited Mar. 10, 2003).

37. *See* Unocal, *RFG Emissions Research*, *at* http://www.unocal.com/rfgpatent/rfgresch.htm (last updated June 15, 2001); FTC Unocal Compl., *supra* note 27, ¶ 37.

38. FTC Unocal Compl., *supra* note 27, ¶¶ 32, 61-62, 66.

39. *Id.* ¶ 44; Unocal, *Timeline of RFG Patent Issues*, *at* http://www.unocal.com/rfgpatent/rfgtime.htm (last visited Mar. 4, 2003).

40. Western States Petroleum Association, *California Petroleum Industry Overview*, *at* http://www.wspa.org/factcpio.htm (last visited Mar. 10, 2003); FTC Unocal Compl., *supra* note 27, ¶ 93.

41. *See* FTC Unocal Compl., *supra* note 27, ¶¶ 37, 39-40, 43, 45.

42. Five such patents have now been issued. Unocal, *Unocal's RFG Patents*, *at* http://www.unocal.com/rfgpatent/patents.htm (last visited Mar. 10, 2003).

CARB regulations were also covered by the patent.[43] Unocal announced that it would license other refiners to use its patent.[44] Before the licensing terms were announced, a group of California refiners sued Unocal, seeking a declaratory judgment that the Unocal patent was invalid.[45] After a jury trial, Unocal's patent was upheld, and Unocal was awarded significant damages for patent infringement.[46]

One commentator cites Unocal's conduct as an example of "patenting industry standards."[47] This claim ignores the fact that what was at issue in the Unocal example was not an "industry" or SSO setting a "standard," but a *government* body adopting a *regulation* that imposed billions of dollars of costs on the regulated California refiners (including Unocal). Unocal's disclosure of its research apparently played a significant role in CARB's adoption of a "predictive model" that reduced refiners' costs of complying with the regulations by millions of dollars per year.[48] Moreover, the regulations at issue did not implicate the sorts of "compatibility" (or "interoperability") standardization issues that are at the core of many standards.

As such, the CARB/Unocal situation raises a wide range of issues not present in the context of private SSOs. In particular, the CARB/Unocal situation raised constitutional takings

43. The jury concluded that only 29% of the reformulated gasoline made and sold by California refiners infringed the Unocal patent. Unocal, *Data on Patent Infringement*, *at* http://www.unocal.com/rfgpatent/rfgdata.htm (last visited Mar. 10, 2003).

44. Unocal, *Timeline of RFG Patent Issues*, *at* http://www.unocal.com/rfgpatent/rfgtime.htm (last visited Mar. 10, 2003).

45. Union Oil Co. of Cal. v. Atl. Richfield Co., 208 F.3d 989, 994 (Fed. Cir. 2000), *cert. denied*, 531 U.S. 1183 (2001). The refiners also claimed that the invention arose out of the Auto/Oil research, thus challenging Unocal's claim that its scientists were responsible for the patented invention. *Id.* at 995-96. The refiners also claimed that Unocal had failed to adequately disclose the patented invention, thus not complying with the patent law's "written disclosure" and "enablement" requirements. *Id.* at 996-1001. The trial court and court of appeals both rejected the refiners' arguments. *Id.* at 991.

46. Unocal, *Testing the Patent in Court*, *at* http://www.unocal.com/rfgpatent/rfgsuit.htm (last visited Mar. 10, 2003). David Teece testified as Unocal's damages expert at that trial. The discussion in this paper is based solely on publicly available information (including the public transcript of that trial) and does not reflect any confidential or proprietary information learned during the course of that engagement. The views expressed in this paper are those of the authors, and do not necessarily reflect Unocal's position.

47. *See* Mueller, *supra* note 27, at 897-901.

48. *See* FTC Unocal Compl., *supra* note 27, ¶¶ 37, 39-40, 43, 45.

concerns,[49] *Noerr-Pennington* immunity issues,[50] and issues of administrative law regarding the obligations (if any) of participants in a regulatory process to disclose confidential proprietary information (i.e., the fact that Unocal had pending patent applications[51]) to the regulatory agency. Moreover, the CARB regulations were *not* coextensive with the scope of the Unocal patent. Indeed, the jury concluded that only some 29% of the reformulated gasoline made and sold by California refiners infringed the Unocal patent.[52] As such, firms could and did comply with the regulations without thereby infringing the patent.[53]

Finally, as noted above, the first Unocal patent issued (and Unocal's plans to license the patent were announced) before the CARB regulations were slated to go into effect. CARB continues to maintain its regulations even after a jury ordered the other California refiners to pay Unocal substantial damages for patent infringement.[54] If CARB believes that Unocal improperly "captured" the CARB regulations, it has

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49. Professor Mueller proposes,

> When government mandates a technological standard, particularly a standard pertaining to public health and safety, any entity holding patent rights in the subject matter of the standard should be required to license all users at reasonable commercial terms. If the patent owner fails to meet this requirement, the government *should consider the exercise of eminent domain* over the patent.

Mueller, *supra* note 27, at 945 (emphasis added).

50. E. R.R. President's Conference v. Noerr Motor Freight, 365 U.S. 127, 138 (1961); United Mine Workers v. Pennington, 381 U.S. 657, 670 (1965).

51. At the time, pending patent applications were confidential. Congress has since amended the patent statute to publish most (though not all) patent applications eighteen months after filing. *See* 35 U.S.C. § 122(b)(1) (2001).

52. Unocal, *Patent Infringement Data*, *at* http://www.unocal.com/rfgpatent/rfgdata.htm (last visited Mar. 24, 2003). The percentage varied significantly by refiner. Because the patent claims were different for higher-octane gasoline than for lower-octane gasoline, the infringement percentage was also significantly higher for premium gasoline than for regular gasoline. *See* Unocal, *Infringement Data from the Trial*, *at* http://www.unocal.com/rfgpatent/rfgsuit.htm (last visited Mar. 10, 2003).

53. A subsequently adopted industry-wide reduction in the octane level of premium gasoline in California is likely to reduce the infringement percentage significantly from the 29% figure on a going-forward basis, making the claim that the patent "captured" the standard even less credible. *See Lowered Octane Fuels Debate*, *at* http://www.geocities.com/njvorc/loweroctan.html (last visited Mar. 10, 2003). Similarly, a number of refiners have contended that they are able to "blend around" the Unocal patents and thus do not need to take a license.

54. *See* Unocal, *Testing the Patent in Court*, *at* http://www.unocal.com/rfgpatent/rfgsuit.htm (last visited Mar. 24, 2003).

clearly had the opportunity to address the issue by rescinding its regulations. The fact that it has not done so casts doubt on any suggestion that CARB would have adopted different regulations had it known ex ante that Unocal had applied for a patent.[55]

These issues, though significant, are not implicated in most standards-setting contexts and are thus tangential to our main concerns. Therefore, this Article will focus on formal standards set by private (non-governmental) SSOs, with particular focus on compatibility/interoperability standards.

One point is worth noting, however. There is no dispute that Unocal disclosed its research results to CARB and Auto/Oil.[56] But research results do not grow on trees. The revelation of the results ipso facto implied that research was done to discover those results. Such research is costly. For-profit firms such as Unocal presumably conduct research, despite the cost, because they believe that they will benefit by doing so. One common way to benefit from research is to seek (and hopefully receive) a patent on the results of that research. By granting the Unocal patents, the Patent and Trademark

55. One possible caveat here is that, in response to the adoption of the CARB regulations, California refiners spent over four billion dollars upgrading their refineries to make reformulated gasoline. *See* Western States Petroleum Ass'n, *California Petroleum Industry Overview*, *at* http://www.wspa.org/factcpio.htm (last visited Mar. 10, 2003). Since those costs have already been incurred and cannot be recovered (i.e., they are what economists term "sunk" costs), CARB *may* have reasoned that there was no point in rescinding the regulations once the investment had already been made.

This argument ignores the fact that CARB anticipated that the adoption of the CARB regulations would add twelve to seventeen cents per gallon to the cost of gasoline, while the actual price increase following the implementation of the regulations was only five to eight cents. CARB, *Final Statement of Reasons to Rulemaking, Including Summary of Comments and Agency Response*, 85 (Nov. 1991) (document on file with authors). In other words, CARB was willing to adopt the regulations in the belief that the benefits to the public as a whole (in terms of reduced air pollution) exceeded the costs to automobile users (in the form of higher prices), even when it anticipated that the costs would be significantly higher than they in fact turned out to be.

As such, it is unlikely that the relatively small amount of royalties collected (of 5.75 cents per gallon on the infringing 29% of gasoline production, which amounts to 1.67 cents per gallon on all gallons) would have been the "straw that broke the camel's back" in CARB's decision to adopt the regulations. *See* Unocal, *Testing the Patent in Court*, *at* http://www.unocal.com/rfgpatent/rfgsuit.htm (last visited Mar. 24, 2003).

56. *See* Segal, *supra* note 27, at 58-59; Unocal, *Unocal Patent Issues Timeline*, *at* http://www.unocal.com/rfgpatent/rfgtime.htm (last visited Mar. 24, 2003).

Office (PTO) agreed that the Unocal's scientists' invention was worthy of being patented. And in upholding Unocal's patent against a variety of challenges to validity and inequitable conduct, the trial court judge ruled (in effect) that Unocal had acted properly in obtaining its patent.[57]

The Auto/Oil rules explicitly allowed members (including Unocal) to conduct their own independent research and to patent the results.[58] The other Auto/Oil members presumably knew or should have known that the Unocal research results were the result of a Unocal-funded research effort—indeed, the research program that Auto/Oil had been offered but had previously rejected. No one should have been surprised that Unocal, having invested in the research and having discovered a better way to make reformulated gasoline, applied for a patent on that invention.

Absent some explicit CARB rule or regulation requiring disclosure of pending patent applications—and there was *no* such rule; indeed, CARB did *not* ask Unocal (nor, apparently, any other firm) whether it had relevant patents or patent applications—Unocal's "failure" to disclose its patent application (especially given that pending applications were confidential under then-current PTO rules) should *not* have deluded anyone into believing that Unocal would *not* seek to patent its invention.[59] Others may have believed or assumed that no patent would ever *issue*, but that mistaken belief was not due to any conduct by Unocal.

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57. *See* Union Oil Co. v. Atl. Richfield Co., 34 F. Supp. 2d 1208, 1210 (C.D. Cal. 1998); Union Oil Co. v. Atl. Richfield Co., No. CV-93-2379-KMW, 1998 U.S. Dist. LEXIS 22847, at *5 (C.D. Cal. Mar. 6, 1998); Segal, *supra* note 27, at 66-67.

58. *See* Unocal, *Independent Research Provision of the Auto/Oil Study*, *available at* http://www.unocal.com/rfgpatent/rfgsuit.htm (last visited Mar. 10, 2003).

59. In its Complaint, the FTC (correctly) notes that Unocal agreed with CARB to make its research *data* and *equations* public and non-proprietary. *See* FTC Unocal Compl., *supra* note 27, ¶¶ 39-42. The FTC alleges that this meant that Unocal "created the materially false and misleading impression that Unocal had relinquished or would not enforce any proprietary interests in its *emissions research results*." *Id.* ¶ 78.b (emphasis added).

The Unocal patents cover various low-emissions formulations of gasoline. Gasoline formulations are not *data* (or equations). The FTC's Complaint effectively transforms Unocal's statement that its *data* was not proprietary into a statement that *patent claims* derived from the research program that yielded that data were non-proprietary.

II. ANTITRUST ISSUES IN STANDARDS SETTING

There are two main classes of antitrust issues in the context of standards setting: *procedural* issues, which address the *method* by which the standard was set, and *substantive* issues, which go to the *content* of the standard adopted.

Procedural issues include both the prospect that the SSO will exclude interested parties who are thus denied a stake in setting a standard that affects them, and concerns about manipulation of the standards-setting process, including "stuffing the ballot box."[60] One common class of issues involves SSO procedural rules that give some participants undue influence over the outcome of the standards-setting process, or that bias the outcomes of the process in particular ways.[61] Substantive issues tend to arise less frequently, if only because the antitrust authorities rarely have the expertise to evaluate whether the "appropriate" standard was chosen.

A. STANDARDS, INTELLECTUAL PROPERTY, AND MARKETS

One area that has received much attention of late has been the interplay between standards and intellectual property rights that "read on" the standard.[62] Before addressing this issue in detail, it is worth drawing some important background distinctions.

Perhaps the most common context in which standards are set involves the development of new products (or aspects of products, such as interfaces between different products) for which standardization is seen to be desirable. Often, the SSO contains representatives from both those who will make the product and those who will use the product. For example, when setting a pin-assignment standard for a new generation of computer chips, the SSO will often involve representatives of both chipmakers and computer (or motherboard) makers.[63] In other words, both the *supply side* and the *demand side* of the potential market for the standardized product will typically be represented. From an economic perspective, this is not

60. *See* HOVENKAMP, ET AL., *supra* note 1, §§ 35.3-35.4, at 35-18 to 35-33.

61. *See id.*, § 35.5a, at 35-34 to 35-37.

62. *See id.*, *supra* note 1, § 35.1b, at 35-6 to 35-7. See also the articles cited in Lemley, *supra* note 17, at n.11.

63. The JEDEC website indicates, "Presently there are about 300 member companies in JEDEC including both manufacturers and users of semiconductor components and others allied to the field." *See* JEDEC, *at* http://www.jedec.org/Home/about_jedec.cfm (last visited Mar. 10, 2003).

surprising, because the standard the SSO adopts will often affect both suppliers and customers. Both sides of the market strive to ensure that the chosen standard reflects their concerns.

But when considering the relationships between standards and intellectual property, there are two fundamentally different "markets" at issue. The first is the *product* market: the market for the products (e.g., the computer chips whose features are being standardized) themselves. The second is the *technology* market: the market for the technology (whether patented or unpatented) used to design and manufacture the product. In the technology market, patent holders license their technology to manufacturing firms, which then use that licensed technology (and other inputs) to make and sell the standardized products.[64] Economists call demand for technology a "derived demand," derived from the demand for the products.[65] As noted above, many SSOs include both suppliers (manufacturers) and customers in the *product* market.[66] And the fact that the manufacturers may need to use intellectual property belonging to others in order to make and sell the standardized product means that the *demand* side of the *technology* market is represented in the standard-setting process. But there is often little or no assurance that the *supply* side of the technology market—the *owners* of the relevant intellectual property—will be adequately represented in the standard-setting process.

In some contexts—especially in some high-tech industries such as semiconductors—many, but not all, patent holders are also manufacturers. Such firms "wear three hats," often participating in the relevant markets in three fundamentally different roles. First, as patent holders, they may *out*-license their patented technology to others, and, as such, they are sellers in the technology market. Second, as manufacturers they manufacture and sell the standardized products (i.e., they are sellers in the product market). Third, they may also *in-*

64. For a discussion of the distinction between product markets and technology markets, see, for example, U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, ANTITRUST GUIDELINES FOR THE LICENSING OF INTELLECTUAL PROPERTY 8 (1995).

65. For a discussion of the concept of derived demand, see the survey article, J.K. Whitaker, *Derived Demand*, *in* 1 THE NEW PALGRAVE DICTIONARY OF ECONOMICS 813-14 (John Eatwell et al. eds., 1998) [hereinafter PALGRAVE].

66. *See supra* note 63 and accompanying text.

license other firms' patented technology (i.e., they are buyers in the technology market).[67]

Moreover, there are some firms in many industries that do not fit this three-role model. For example, some manufacturing firms have no significant patented technology of their own. As such, they are not sellers in the technology market. If (as is common in the semiconductor industry) they need to use patented technology belonging to others in order to make and sell products in the product market, they will be buyers in the technology market, needing to obtain the necessary in-licenses. Firms without patented technology of their own to "swap" (barter) with other patent-holding manufacturers (in the form of out-licenses), often pay royalties that are significantly *greater* than the *net* "balancing payment" royalties paid by other firms that *do* have valuable patents.[68] Finally, some firms are what might be termed "pure play" technology companies and do not participate in the product market. They out-license their patented technology for cash to manufacturing firms. Because they are not manufacturers, they do not need in-licenses for other firms' patents.

B. STANDARDS SETTING AND DIVERGENT ROLES

Many of the tensions involved in standard-setting, and many of the most complicated public policy issues, can best be understood by recognizing two key implications of the multiplicity of roles. First, because different firms play different roles in the technology and product markets, the interests of different participants in the standard-setting

67. It is rare that such firms also play a fourth role, as a buyer in the product market, for the simple reason that firms are rarely both buyers and sellers of the same commodity. Some buyers in the product market (e.g., computer manufacturers who buy chips), however, may also own relevant patents and, thus, may be sellers in the technology market.

In some standards-setting contexts, the SSO is trying to develop standards for the next-generation of products. As such, the products at issue do not yet exist and thus are not yet part of the product market. But some of the technology to make and sell the next-generation products presumably already exists. What is being standardized are certain aspects of that technology (e.g., certain design features of the next-generation of computer chips). What is at issue in connection with the standards-intellectual property issue is manufacturers' access to the technology that they will need to make the next generation of products.

68. *See* Peter C. Grindley & David J. Teece, *Managing Intellectual Capital: Licensing and Cross-Licensing in Semiconductors and Electronics*, 39 CAL. MANAGEMENT REV. 8, 9, 18-19, 33 (1997).

process are frequently *not* aligned. Second, because some firms play multiple roles (e.g., a firm can be a seller in the technology market and a buyer in the product market), there are often internal conflicts within the firm when the firm's different roles conflict with one another.

Further, because of the technical nature of many standards, SSO participants tend to be technical people, often engineers, who rarely are familiar with their firms' patent portfolios.[69] Moreover, in our experience, engineers tend to have a negative attitude toward intellectual property (IP) rights generally, seeing IP claims as "getting in the way" of choosing the "best technological solution." To some extent, this may be a consequence of three key facts. First, the patent prosecution process takes time. Professors Allison and Lemley estimate that the mean time lag between the application and the issuance of patents issued between 1996-98 was 2.77 years, and the median was 2.22 years.[70] Second, inventors often disclose their inventions to the public (whether by publishing papers or by marketing products incorporating the innovation) after filing their patent applications but while the applications are still pending. Consequently, others know of the invention before the patent issues; they know of the technology but not of the patent claims associated with that technology. Third, many patented innovations are independently discovered by others. The patent system grants the patent to the first to invent,[71] but another inventor may have already independently discovered the technology before the patent issues.

The confluence of these three factors, coupled with the engineering mentality of many SSO participants, suggests that SSOs often downplay the technological contributions that presumably led to the issuance of the patent in the first place. By the time the patent issues, the patented technology is often seen as "old hat" or is already widely known in the industry, and the patent's grant of exclusivity is thus seen as merely taking away others' ability to do what they already know how

69. The authors have obtained this information from conversations with senior management at several major semiconductor manufacturers. *See also* Lemley, *supra* note 17, at 1907 ("A company's representative to such an SSO is normally an engineer with little or no understanding of patent law.").

70. John R. Allison & Mark A. Lemley, *The Growing Complexity of the United States Patent System*, 82 B.U. L. REV. 77, 98 (2002).

71. *See* ROBERT MERGES, PATENT LAW AND POLICY: CASES AND MATERIALS 37-38 (2d ed. 1997).

to do.[72] This attitude is exacerbated by two commonly held beliefs: (1) patents are frequently issued for trivial inventions and (2) the scope of the issued patent is often much broader than the contribution of the inventor.

One major public policy issue thus involves *balancing* the interests of intellectual property owners and the users of that intellectual property. Almost by definition, the latter are likely to outnumber the former; a patent has only one owner, but multiple manufacturers may need to use the patented technology. Hence, SSOs tend to be dominated by the demand side of the technology market, and they are likely to adopt procedural and substantive rules that favor IP users over IP owners. Moreover, some SSOs, especially in the Internet field, have a policy of flatly refusing to adopt a standard that implicates any proprietary technology, insisting on "open" standards.[73]

C. PATENTED STANDARDS AND SOCIAL EFFICIENCY

Indeed, economics suggests that SSOs have a strong tendency to act in a socially *inefficient* fashion when determining whether to adopt a standard on which a firm has a patent. Royalty payments for the use of a patented technology are a *transfer payment* from the users of the patent to the owner of the patent. Thus, the royalty payments per se[74]

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72. This suggests that the commonly held view that patent infringement inherently involves improperly and knowingly "copying" others' innovations is incorrect. In our experience, a significant amount of patent infringement is "inadvertent" in the sense that the infringer did not learn of the patented technology directly from the patent holder, but developed the technology independently.

73. The best-known example is the World Wide Web Consortium (W3C). Though W3C recently contemplated changing its policies to allow the use of patented technology in its standards, it decided to retain its earlier policy of refusing to adopt any standard that implicated patented technology. *See* Margaret Kane, *W3C Bows to Royalty Free Pressure*, CNET News.com, *available at* http://news.com.com/2100-1001-965863.html (Nov. 22, 2002).

74. The fact that the patent holder is charging for the use of its patent, rather than letting others use the patents for free, leads to some degree of what economists term "dead weight loss," in the sense that there are some consumers who would buy the patented product (and obtain some degree of consumer surplus) if no royalty was charged, but who will elect not to purchase (and thus will forego the consumer surplus) when a royalty is charged. For a discussion of the concept of dead-weight loss and its economic significance, see HAL R. VARIAN, MICROECONOMIC ANALYSIS 229-30 (3d ed. 1992).

This is not unique to the standards-setting situation, however. Some

represent no *net* cost to society: the users have less money, but the patent owner has more. But from a *private* standpoint, SSO members treat the prospect of paying royalties as a *private* cost akin to any other cost. This in turn implies that SSO members have an incentive to adopt societally-*in*efficient production techniques that avoid patented technology.

As an illustration, consider the following numerical example.[75] Suppose that an SSO is trying to set a standard for the widget-making process. Suppose that there are two alternative ways of making (otherwise identical) widgets, one patented and one unpatented.[76] Suppose that the patented way

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degree of "dead weight loss" is an unavoidable consequence of the fact that society has chosen to encourage innovation by granting successful inventors the right to exclude others from using their patented innovations, or to charge a fee for such use.

75. This issue is treated in more analytic detail in the Appendix. *See infra* notes 237-40 and accompanying text.

76. In his commentary on our Article, Professor Mark Patterson correctly points out that our focus is on the choice between a patented standard (call it P) and an unpatented standard (U), and that we do not consider a third situation, namely, one in which no standard is adopted at all (N). Mark R. Patterson, *Antitrust and the Costs of Standard-Setting: A Commentary on Teece & Sherry*, 87 MINN. L. REV. 1995, 1997 (2003). He notes that the actions of the SSO in adopting *a* standard generates value. *Id.* at 1999. We agree. His focus is on the *relative* contributions of the SSO and the patent holder when moving from no standard (N) to the patented standard (P). *Id.* at 2011. We agree that such a focus is a worthwhile topic for investigation, but it is not the one we focus on. Our analysis focuses on the choice between P and U.

We agree with Professor Patterson that both the SSO and its members need to be compensated for their efforts in developing the standard. *Id.* at 2000-01. We acknowledge that non-members may be able to "free ride" on the standardization efforts of the SSO and its members. But we are not convinced that such free riding is a significant practical concern, especially in cases when the majority of interested industry participants are members of the relevant SSO. We note that SSOs collect dues from their members, and that SSOs can and do copyright their standards and charge non-members for copies, which reduces (though may not fully eliminate) the "free rider" problem. (See ANSI's prices for copies of its standards at ANSI Electronic Standards Store, *at* http://webstore.ansi.org/ansidocstore/default.asp (last visited Mar. 24, 2003).) We also believe that SSO manufacturer members benefit from the standard by making and selling the standardized product, and that SSO purchaser members benefit from the standard by being able to purchase compatible parts at a lower cost than would be the case if no standard were adopted.

We further believe that the costs of standardization efforts, while clearly non-trivial, are often very small relative to the benefits that SSO member firms receive from standardization. For example, the semiconductor industry is a $155 billion a year industry. *See* DRAM Market Drives Semiconductor Revenue Growth, *at* http://www.computeruser.com/news/02/12/17/news4.html (Dec. 17, 2002). Even if standardization efforts in the industry cost are, say, $750 million per year (which we believe is unrealistically high), that would

consumes $100 in real resources to make a widget, while the unpatented way consumes $130 in real resources. Suppose that in either case widgets can be sold for $150 and that the patent holder demands a royalty of $35 per widget for the use of its patent. If the SSO chooses the unpatented technology as the standard, consumers pay $150 for widgets, firms incur $130 in real resource costs to make the widgets (and thus make a $20 profit), and the patent holder receives nothing. Conversely, if the SSO chooses the patented technology, consumers again pay $150 for their widgets, firms incur $100 in real resource costs and pay $35 in royalties to the patent holder (thus making a $15 profit), and the patent holder receives $35 in royalties.

From a societal standpoint, society is clearly better off if the SSO adopts the patented technology as a standard. Society saves $30 per widget in real resource cost savings. The $35 royalty payment from manufacturers to the patent holder is a "wash" from a societal standpoint; manufacturers are $35 worse off, but the patent holder is $35 better off. But the SSO members clearly prefer to adopt the unpatented technology as a standard, because they make a $20 profit per widget rather than the $15 profit per widget that they would make if they adopted the patented technology as a standard.

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only amount to less than 0.5% of annual industry revenues.

Moreover, we are aware of examples where the SSO itself developed patented technology in the course of developing its standard, and applied for patents in the name of the SSO. One example is the SynchLink consortium (later known as SLDRAM), which developed an alternative specification for DRAMs. SLDRAM contracted with Mosaid Technologies to develop the technology for SLDRAM chips, and Mosaid assigned its intellectual property rights to the SLDRAM consortium. *See* Press Release, *Mosaid to Design Next Generation Memory Technology*, *available at* http://www.mosaid.com/corporate/press97-04-18.htm (April 18, 1997). Unlike Professor Patterson, we see no need for a sui generis form of intellectual property protection for standards per se.

We disagree with certain aspects of his analysis, and (in particular) with his proposal that the patent holder receives an unwarranted "windfall" when its patented technology is incorporated in the standard, relative to what it would receive under the no-standard (N) case. Patterson, *supra*, at 2009. In our view, there are gains to *both* the users of the (patented) standard and the owner of the patented technology from moving from N to P; we see no reason why *all* of those gains should be attributed to the SSO's actions and should accrue to the users of the standard rather than to the patent holder.

D. POLICY IMPLICATIONS

The above analysis suggests that SSOs are likely to be biased toward a societally inefficient attitude towards IP when setting standards, for three reasons: (1) the rules of the SSOs are likely to favor the users of IP rather than the owners of IP, as the former outnumber the latter; (2) SSO participants tend to be engineers, with an engineer's bias against patents; and (3) royalties are treated as a private cost by manufacturers and end-users, despite the fact that from a *societal* standpoint they are best seen as a *transfer payment* rather than a (social) *cost*.[77]

This in turn suggests that both the antitrust authorities and the legislature should tread warily when making public policy in this area. The complaints of those who believe that they are being compelled to "overpay" for the use of others' IP embedded in the standard are frequently and forcefully stated.[78] The more reasoned and quieter countervailing arguments focused on the social benefits of innovation and the need to compensate inventors for their efforts often are downed out by this din. The tension between static and dynamic views of efficiency is nothing new in the context of IP. But it suggests that policies that further burden IP and IP holders will only exacerbate the problem.

III. CHOOSING STANDARDS

A. THE CHOICE OF STANDARDS: DIVERGENT ROLES AND DIVERGENT BELIEFS

In choosing a standard, there is typically a range of alternative candidates that could be adopted as the standard. Setting a standard may mean choosing one alternative and discarding alternatives, but it need not do so. For example, many health and safety standards are "inclusive" in the sense that quite different products (e.g., wood, aluminum, and fiberglass ladders) can all satisfy the standard. In other contexts, the adoption of one standard effectively amounts to

77. The major caveat here is that firms may expend real resources in what economists term a "rent-seeking" effort to affect the pattern of transfer payments. For a discussion of the economics of rent-seeking, see Gordon Tullock, *Rent Seeking*, *in* PALGRAVE, *supra* note 65, at 147-49.

78. Examples include the other gasoline refiners in the Unocal case (*see* discussion, *supra* Part I.B), and semiconductor manufacturers in the Rambus case (*see* discussion, *infra* Part IV.D.1).

discarding other alternatives that could have been adopted. For example, assigning a particular function to a particular pin in a new computer chip means that chips that assign that function to a different pin will be incompatible with the standard.

In some contexts, the participants in the standard-setting process will have very similar views as to which standard should be chosen, and the task at hand is simply to facilitate the coordination process by agreeing on a standard. In other cases, however, the participants may have genuine disagreements as to which alternative should be adopted as the standard. In many such cases, the disagreements may arise out of the different beliefs, expertise, or roles that the participants bring to the table.

For example, in designing the next-generation microprocessors, certain functions must be performed for the system as a whole to work, but some of those functions can be implemented either in hardware or in software.[79] The SSO must determine what functions (or portions thereof) will be implemented in hardware and what functions will be implemented in software, in order to coordinate the development efforts. Not surprisingly, different parties may possess different degrees of expertise in the two areas. Software firms may believe that it is better to have certain functions implemented in software, while hardware manufacturers may believe the opposite (or vice versa). SSOs routinely address these sorts of disagreements in the give-and-take process of setting the standard.

From an economic perspective, it is worth noting that the positions that firms take, even on "technical" issues, are likely to reflect the competitive positions and comparative advantages that different firms enjoy. A firm with experience in solving a problem in a particular way will, not surprisingly, favor standards that adopt that familiar approach, as that will give that firm a comparative advantage over other firms that have more experience in alternative solutions.

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79. For example, the choice of the instruction set for microprocessors (e.g., between Complex Instruction Set Computer (CISC) and Reduced Instruction Set Computer (RISC) architectures) in turn affects the nature of the software that runs on such computers. For a (moderately technical) discussion which emphasizes the hardware/software trade-off, see RISC v. CISC, *at* http://cse.stanford.edu/class/sophomore-college/projects-00/risc/risccisc/ (last visited Mar. 10, 2003).

Some comparative advantage may rest in a firm's accumulated knowledge and expertise, some of which may have arisen from research and development that may also have led to patented inventions. Thus, firms may have a preference for adopting a standard on which they have a patent, not primarily because of the existence of the patent per se, but because the firm has a comparative advantage (relative to other firms) in the technological approach reflected in the patented technology. It may be a difficult task to determine whether a firm supports selecting choice *A* rather than choice *B* as the standard because of its belief that technology *A* is superior, because of its comparative advantage in using *A* rather than *B*, because of its economic legal (patent) position with respect to *A* versus *B*, or because of some combination of the above.

B. THE CHOICE OF STANDARDS: EX ANTE VERSUS EX POST ASSESSMENT

Choosing a standard generally means that some alternative will be adopted and other alternatives discarded. Ex ante, prior to the adoption of the standard, there typically will be a range of feasible alternatives available. The alternative selected as the standard may be significantly superior to the alternatives, and if so, it is likely that the SSO would have been reluctant to adopt a different standard.

But in other contexts, there exists a range of roughly equivalent alternatives, and in such cases the need is to pick one and standardize on it so as to facilitate coordination and avoid fragmentation. In such situations, the chosen alternative may be only slightly superior ex ante to other feasible alternatives, and the SSO could have just as easily chosen another alternative.

One clear historical example involves which side of the road countries require automobile users to drive on. In most countries, cars drive on the right-hand side of the road. In the United Kingdom and certain other countries (notably Japan and some former Commonwealth countries), cars drive on the left.[80] There is little reason to prefer one over the other, and the other alternative could equally well have been chosen.

Clearly, it is a factual question as to the extent that the

80. *See Which Side of the Road Do They Drive On?*, *at* http://www.travel-library.com/general/driving/drive_which_side.html#changing (last updated Aug., 2002).

chosen standard was superior to available alternatives on an ex ante basis. This issue has to be evaluated on a standard-by-standard basis.[81]

However, ex post, after the adoption of the standard, once firms have committed to the standard and have made the requisite investment in complementary assets to manufacture and sell the standardized product, switching to an alternative may be much less feasible, for three reasons. First, the industry may have made investments in implementing the (patented) standard. Products may have been designed to meet the standard, and factories geared up to produce the patented standardized products. While from an economic standpoint those costs are often "sunk costs"[82] (not recoverable), manufacturers clearly do not want to incur the additional costs associated with switching to another alternative.

Second, the need or desire for compatibility (especially backwards compatibility with the existing installed product base) may make it costly to switch to a different standard. Third, and similarly, there is often a significant coordination problem in getting all interested parties to switch to an alternative. For example, computer manufacturers may already have designed their motherboards and computers to work with existing standardized chips, and switching to a different chip design would require changes, not only to the chips themselves, but also to the motherboards and computers. The difficulties associated with coordinating the necessary changes may make it impracticable to switch away from the patented standard.

Here again, the left-hand-versus-right-hand-drive example provides an illustration. Once a country has adopted one alternative, it is important for everyone to comport with the standard so as to avoid collisions. The public and private sectors make substantial investments in automobile design and in road construction that are consistent with the chosen alternative and inconsistent with the other. Changing over is complex, requiring significant social planning and coordination,

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81. From an economic standpoint, what is important is not the technological feasibility of various alternatives, nor cost considerations (narrowly considered), but rather the overall attractiveness (on a quality/cost-adjusted basis) of the various alternatives.

82. For a discussion of the nature and economic significance of "sunk costs," see F. M. SCHERER, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 414-16 (2d ed. 1980).

as evinced by the Swedish changeover in 1967.[83]

C. STANDARDIZATION, LOCK-IN, AND OPPORTUNISM

The asymmetry between the low ex ante cost of choosing an alternative proposed standard and the higher ex post cost of abandoning an existing standard in favor of a new standard causes concerns about the prospect for "lock-in."[84] In recent years this issue has received particular attention when, after the standard has been adopted and becomes established, someone claims an intellectual property right (whether patent or copyright) over the existing standard.[85]

The argument frequently made is that, had the SSO members known of the IP claim ex ante while they were considering the standard for adoption, the SSO members could have chosen another, non-patented alternative.[86] But once the standard has been chosen and widely adopted, it may be much more difficult to avoid the patent. In other words, the adoption of the standard *may* increase the bargaining position of the IP holder. If so, the patent holder may be able to extract, not only the gains from using its patented technology vis-à-vis other alternatives, but also a portion of the gains from standardization generally.

This prospect for ex post "hold-up" is one of the key rationales for requiring a patent holder to disclose its patents ex ante and to specify ex ante the royalty rates (if any) that it intends to seek for the use of its patents.[87] Armed with such knowledge, the SSO can choose to adopt another alternative if it believes that the patent holder's prospective royalties are too high relative to the benefits of using the patented technology.

Whether the SSO *would* have in fact adopted another alternative had it known of the patent claims raises a complex

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83. For a discussion, see *Which Side of the Road Do They Drive On?*, *at* http://www.travel-library.com/general/driving/drive_which_side.html (last updated Aug., 2002).

84. *See* HOVENKAMP ET AL., *supra* note 1, § 35.5b, at 35-37 to 35-46; SHAPIRO & VARIAN, *supra* note 12, 104-05, 116-30.

85. The *Dell* and *Rambus* cases provide examples. *See* HOVENKAMP ET AL., *supra* note 1, § 35.5b, at 35-37 to 35-46.

86. See, *e.g.*, FTC Unocal Compl., *supra* note 27, ¶ 5; Compl. ¶ 65, *In re* Rambus, Inc. (Fed. Trade Comm'n June 19, 2002) (No. 9302) [hereinafter FTC Rambus Compl.], http://www.ftc.gov/os/2002/06/rambuscmp.htm (last visited February 23, 2003).

87. Such disclosure and licensing rules will be discussed in more detail *infra* Parts IV.B and IV.C.

counterfactual question: "What would the SSO have done *if* the world had been different?" The answer is likely to be hotly debated,[88] and depends on the particular facts of the standard at issue. The greater the advantages of the (patented) standard over the alternatives that were considered and rejected at the time the standard was originally set, the less likely it is that an alternative would, in fact, have been chosen.

It is true that some SSOs have an absolute policy against adopting a standard that incorporates a (known) patent.[89] But this must be interpreted carefully. These SSOs retain the option of withdrawing the standard entirely, or of not adopting any standard. There need be no presumption that the SSOs would have adopted different standards than those adopted had they known of the existence of relevant patents.

In the more common case, however, the SSO *is* willing to adopt a standard incorporating patented technology if there are good technical reasons for doing so. In such situations, it seems reasonable to require those who contend that the SSO would have adopted a different standard, *if* it had only known of the existence of the (undisclosed) patent, not only to suggest another non-patented alternative standard and to demonstrate that the alternative was acceptable (on a commercial, not merely a technological, basis), but also to give some basis for believing that the SSO *would* have adopted such an alternative had it known of the existence of the patent.[90]

D. LIMITATIONS OF THE "HOLD-UP" CONCERN

The above analysis suggests that the "hold-up" concern has some natural limitations. First, it is limited to what might be termed "necessary" or "essential" patents—patents that *must* be used in order to practice the standard. Often there are other "desirable" patents that firms wish to use when making and selling products that incorporate the standard. But if those

88. Ex post, once a standard has been adopted and a patent reading on the standard has been asserted, the accused infringers clearly have a strong incentive to claim that the SSO would have adopted some alternative non-patented standard had the SSO only known of the existence of the patent. In our experience, such claims rarely articulate *which* alternative would have been adopted, or demonstrate that the SSO *would* in fact have adopted a different alternative.

89. The best-known example is the World Wide Web Consortium, discussed *supra* note 73.

90. This is likely to require an evaluation of the commercial acceptability of alternative standards on a quality/cost-adjusted basis.

patents involve non-standardized features, or "optional" features that are not required in order to practice the standard, the "hold-up" problem does not arise.

Second, the "hold-up" concern is limited to patents that are "implicated by" the *standard* itself, not necessarily by the *products* made that comport with the standard. As noted above, many standards involve only certain features of the product.[91] For example, an SSO may set a standard for the physical size and pin assignment of a new generation of memory chip.[92] The standard determines those particular characteristics of the chip. But there are many other features of the chip that are not standardized. Some of those features may themselves be patented. Adoption of the standard does not affect such independent patent claims.

For example, a basic patent on the integrated circuit (e.g., Texas Instruments's original Kilby patent) covers *all* integrated circuits, regardless of the physical size and pin assignment of the chip.[93] Where such basic patents exist, the new generation chip infringes on the basic patent regardless of which pin-assignment standard the SSO adopts: The adoption of the standard does not affect the strength of the IP holder's position. In such contexts, the "hold-up" problem again does not arise. Hence, the basic-patent holder should not be precluded from enforcing its patent against those who use the newly standardized pin assignment to make chips merely because the patent holder participated in setting the pin-assignment standard. This in turn implies that the test should be the relationship of the patent to the *standard*, not the relationship of the patent to the *products* made that comport with the standard.[94]

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91. *See supra* text accompanying notes 5-7.

92. *See, e.g.*, JEDEC SOLID STATE TECHNOLOGY ASSOCIATION, DOUBLE DATA RATE (DDR) SDRAM SPECIFICATION 3-7, http://www.jedec.org/download/search/JESD79R2.pdf (May 2002).

93. For a discussion of the Kilby patent and its significance, see Texas Instruments, *About Jack*, *at* http://www.ti.com/corp/docs/kilbyctr/jackbuilt.shtml (last visited Mar. 10, 2003).

94. It is only when the standard is effectively coextensive with the product that these two inquiries yield the same answer.

Moreover, there may be patents on what might be termed "optional" features of the product—features that, though they may be commercially desirable, are not necessary to practice the standard. Here again, the "lock-in" concern is not an issue, because a firm can avoid the patent while still complying with the standard by eliminating the optional feature.

Third, in many industries in which standards play an important role, the fast pace of technological change drives the continual redesign and reengineering of products. For example, the product life cycle in the semiconductor industry is reported to be as low as ten months.[95] Therefore, even if there may be some "lock-in" of earlier designs, once the existence of the patent is disclosed, the SSO has the opportunity to revise the standards, and manufacturers have the opportunity to redesign their products to avoid incorporating the patented features. In other words, the extent of "lock-in" may be limited by the pace of technological change.

E. "MANIPULATION" OF STANDARDS: ACTIVE AND PASSIVE CONDUCT

The "hold-up" concern is particularly present in two paradigm cases of what might be termed "active" manipulation. In the first case, the patent holder participates in the SSO and steers the standard toward the claims of one of its existing patents or pending patent application, in an effort to "capture" the standard within the claims of its IP. In the second case, the patent holder modifies a pending patent application so that the claims of the pending patent read more closely on the proposed standard (or, more precisely, on future products that comport with the standard).

The pejorative use of the term "manipulation," to some extent begs the question. It *assumes* what needs to be *shown*: namely, that the rationale behind the patent holder's conduct constitutes an improper effort to "capture" the standard. The discussion above[96] of the reasons why different firms might prefer different alternative standards—whether because of divergent technical beliefs, differences in comparative advantage, or intellectual property issues—suggests that distinguishing between intentional "manipulation" and less sinister motives may be difficult.

But in many cases, the concern is not with "active" conduct (as above), but with "passive" conduct: the failure to disclose patent rights that may read on the standard being considered. The issue then becomes whether "active" and "passive" conduct should be treated differently. One obvious difference is that

95. *See* Tom Dellecave Jr., *Charged With Change*, Information Week, http://www.informationweek.com/545/500elec.htm (Sept. 18, 1995).

96. *See supra* Part III.A.

"passive" conduct has a much lower prospect for manipulation of the standards-setting process or its outcome.[97]

IV. SSO IP RULES: MAKING THE CASE FOR CLARITY

A. SSOs AND IP RULES: EFFECT ON PARTICIPATION AND ORGANIZATIONAL CONSTRAINTS

Many, if not most, SSOs have policies that address the interplay between the standards they adopt and the IP rights of participants.[98] These policies take several forms. Some policies constrain the SSO itself and the standards that it can adopt (or maintain).[99] Other policies seek to impose duties or obligations on SSO participants.[100]

1. Rules Constraining the SSO Itself

Some (but by no means all) SSOs have policies that prevent the SSO from adopting standards on which some individual or entity has (or claims to have) a patent.[101] Some of these policies are absolute, but most allow exceptions if the patent holder declares that it is willing to license its patent, whether royalty-free or on certain terms, to those making products that comport with the standard.[102] Similarly, some SSOs have policies that call for the SSO to withdraw previously approved standards if it is subsequently discovered that there is a patent that reads on the standard.[103]

These policies—which might be termed "adoption policies"—impose restrictions on the *SSO* itself, *not* on the patent holder. To some extent, this is a consequence of the fact

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97. This is because "active" conduct can steer the SSO to adopting a patented standard, while "passive" conduct can at most "capture" a standard that the SSO was willing to adopt in any case.

98. *See* Lemley, *supra* note 17, at 1903-06, 1973-75.

99. *Id.*

100. *Id.*

101. Professor Lemley, in an overview of SSOs, asks, "Can Standard Include IP?" *Id.* at 1973.

102. "[T]wenty-nine of the thirty-six SSOs with [patent licensing] policies required members to license their patent rights on ['reasonable and non-discriminatory'] terms." *Id.* at 1906.

103. According to Professor Lemley's survey, examples include CEN/CENELEC ("RAND to entire world required or standard is withdrawn"); ECMA ("RAND, or the standard will be cancelled"); J Consortium ("RAND, or the standard will be referred back to Committee for consideration"); and JEDEC ("RAND, or possible withdrawal of the standard"). *Id.* at 1974.

that private SSOs are voluntary entities. A voluntary SSO cannot bind the rights of non-participants. If an SSO adopts a standard and subsequently discovers that a non-participant has a patent that reads on the standard, the SSO cannot compel the non-participant to relinquish its patent rights. All the SSO can do is elect to "de-establish" the standard.

Such rules, however, often only address part of the issue. They state what the SSO must do *if* and when it learns of a relevant patent, but this begs the question of how the SSO comes to *know* of the existence of a relevant patent. We turn to that issue next.

2. Rules Affecting Participants

The more significant rules or policies impose certain obligations on SSO participants. These policies take three main forms: *search* rules, *disclosure* rules, and *licensing* rules. Under a search and/or disclosure rule, the question is "to what extent does a participant in an SSO have an obligation to search for, and/or to disclose, the existence of IP (whether issued or pending, whether its own or belonging to others) that may relate to a (proposed or issued) standard?" Under a licensing rule, the question is "to what extent does a participating IP holder have an obligation to license its IP to those practicing the standard, and on what terms?"

The terms of such policies vary widely across different SSOs, as demonstrated by the results of a recent survey by Professor Mark Lemley.[104] His survey results indicate that a "one size fits all" policy approach is inappropriate.

Search and disclosure rules clearly impose burdens on SSO participants. More significantly, they impose *asymmetric* burdens and benefits. The burdens fall primarily, if not exclusively, on IP holders. The benefits accrue primarily to the users of the standard.

Search and disclosure rules rarely pose problems when the participants in the SSO are roughly symmetrically situated. In such circumstances, firms realize that they will incur the burdens sometimes (when their IP is implicated by a proposed standard) but reap the benefits other times. But in contexts where the participants in the SSO are *not* symmetrically situated—and, in particular, where some participants are pure-play technology companies (suppliers of IP) and others are

104. *Id.* at 1904-06, 1973-75.

primarily users of others' IP—then the problem of conflicting interests can become acute.

3. Participation Constraints

Given the consequences of SSO rules and the nature of voluntary participation, SSOs must tread warily. IP holders must believe that their interests will be protected in the standards-setting process, or they may choose not to participate.[105] Indeed, the proliferation of voluntary special-purpose consortia in many technological areas means that a number of different SSOs, to a greater or lesser extent, "compete" with one another to develop standards.[106] Thus, IP holders that believe that a particular SSO does not adequately protect their interests *may* be in a position to leave that SSO and participate in another SSO that provides better protection for their IP rights.

SSO competition, however, is not a panacea for resolving these concerns. Leaving the SSO often entails foregoing any opportunity to affect the SSO's decision. Especially when the IP holder "wears multiple hats" (as both an IP holder and a participant in the product market, whether as a buyer or seller), the holder often faces a significant conflict between these different roles. As an IP holder, the firm may believe that the SSO's policies provide inadequate protection for its IP. But leaving the SSO to avoid being bound by the SSO's policies may prove difficult if the firm believes that it needs to participate in the standards-setting process in its *other* role(s).

Consequently, the (apparent) "voluntariness" of participation in SSOs may be illusory. Even firms with significant IP portfolios may conclude that they have little practical choice but to participate in certain SSOs; the SSO may be "the only game in town." In particular, the SSO may make standards decisions that significantly affect the firm's participation in the product market.[107] As such, the firm may have a business need to participate in the SSO that outweighs the risks that participation imposes on its IP portfolio.

One concern raised by this pragmatic constraint on firms'

105. This factor differentiates voluntary SSOs from regulatory agencies.

106. In 1998, Sun Microsystems participated in eighty-seven different SSOs, and "there are dozens of different SSOs associated with Internet technical standards alone." Lemley, *supra* note 17, at 1907.

107. For example, a standard for next-generation DRAM chips affects both DRAM manufacturers and DRAM purchasers.

ability to leave an SSO is that other SSO participants who are aware of this factor may take advantage of the firm's predicament by setting onerous rules that adversely affect the IP holders' interests. For instance, the SSO may adopt rules that impose a burden that almost, but not quite, causes the IP holder to elect to quit.

B. SEARCH AND DISCLOSURE RULES: REPRESENTATION AND BURDEN

Firms are represented at SSOs by individuals.[108] The representatives are typically chosen for their technological knowledge of the issue under discussion.[109] A large firm may have hundreds of such representatives attending different SSO meetings.[110] The representatives are not likely to be aware of the scope of their firms' patent portfolios.[111] They are even less likely to be aware of their firms' pending patent applications. Moreover, determining whether a particular patent reads on a proposed standard is often a complex task in claims construction and patent interpretation.[112] It is rare for representatives to have both the requisite knowledge and the relevant expertise to evaluate patent claims.

1. Search

The fact that firms' representatives to the SSO often have limited knowledge of their firms' patent portfolios implies that the *scope* of the obligation (if any) to search for potentially relevant patents is extremely important. As a conceptual matter, there clearly is a continuum of possible search and disclosure rules that might be adopted. At one extreme of the continuum, the representatives may have no search or disclosure obligations whatsoever. Or the representatives might merely have an obligation to disclose patents (and/or patent applications) of which they personally are aware and which they personally believe may implicate the standard. At the other extreme, one might impose on the firm a "disclose it

108. This and the following points are based on our discussions with senior management at major high-tech firms, including Texas Instruments and Hewlett-Packard. *See also* Lemley, *supra* note 17, at 1907.

109. *Id.*

110. *Id.*

111. *Id.*

112. *See* Markman v. Westview Instruments, Inc., 517 U.S. 370, 388-89 (1996).

or lose it" obligation to search for and disclose all potentially relevant patents (or pending applications). Under such a proposal, a firm might be required to certify that it had searched for and disclosed all of its relevant IP. The certification would preclude the firm from subsequently asserting any undisclosed IP.

An obligation to search for "implicated" IP can be extremely onerous. It is a major task to search a patent database and to compare it against the proposed standard. Patent searching is especially problematic when the standard evolves over time. Further, it is often difficult to know whether a patent "reads on" a proposed standard, as that may entail a major effort at claims construction and interpretation.[113]

A search requirement is especially onerous for IP owners who have substantial numbers of patents. Many firms in high-tech industries have thousands of patents, hundreds of which may be potentially relevant to a proposed standard.[114]

Moreover, with the advent of computerized patent databases, there is no particular reason why the patent holder has any comparative advantage over other SSO participants in searching for its potentially relevant patents.[115] As such, one would expect that it would be more cost-effective for the SSO to take on the responsibility of searching for potentially relevant patents, raising the necessary funds to pay for such searches by charging a fee to SSO participants.[116] One key virtue of such

113. *Id.* In the closely-analogous licensing context, determining whether a patent holder's patent portfolio reads on a (prospective) licensee's products can be extremely expensive and time consuming, taking a year of effort and hundreds of engineering man-hours. *See* Grindley & Teece, *supra* note 68, at 19, n.42.

114. For example, IBM received over 22,000 patents during the 1993-2002 period, and has an active portfolio of 21,000 U.S. patents and 38,000 patents worldwide. IBM, *State-of-the-Art Patent Portfolio*, http://www.ibm.com/ibm/licensing/patents/portfolio.shtml (last visited Mar. 10, 2003).

115. The main caveat here is pending patent applications. Under current U.S. law, most (but not all) pending applications are "thrown open" for public inspection eighteen months after filing. *See* 35 U.S.C. § 122(b)(1)(A) (2000). Until that date, the application is confidential, and others are not in a position to know whether such an application has been filed. *See id.* §122(a).

116. The economic cost of performing searches is not eliminated when the obligation to search is imposed on SSO members; it just means that the costs are borne by patent holders rather than being spread across all SSO participants. As such, an SSO-based search coupled with a participation fee to finance the search has the potential for allocating the cost of conducting the search more equitably across the various SSO participants than a policy that requires each SSO participant to search its own patents.

an approach (rather than relying on SSO members to search their own patent portfolios[117]) is that an SSO-conducted search would have a much better chance of finding potentially relevant patents that did *not* belong to SSO participants.

In addition, the scope of any duty to search is difficult to specify in advance. Is a "good faith" effort to discover potentially relevant patents sufficient? How does one determine whether a particular search was adequate? At what stage during the standards-setting process must a search be made? On the one hand, earlier disclosure is (other things equal) preferable.[118] On the other hand, the proposed standard itself is likely to evolve over time, meaning the target of the search—patents within the proposed standard's scope—will also change over time and trying to conduct a patent search against such a "moving target" is difficult.[119]

Professor Lemley's survey of SSO rules demonstrates that, of the twenty-one SSOs that he studied that addressed the question whether there was a duty to search, seventeen imposed *no* duty to search, and one had what Professor Lemley called a "*de facto*" duty (in the sense that the patent holder agreed not to sue users of the standard for any patents not disclosed to the SSO).[120] The European Telecommunications Standards Institute follows the European Community policy which (as Professor Lemley puts it) "requires that the patent owner conduct a search unless the standard-setting body commits to do the search itself."[121] The Frame Relay Forum required a "reasonable" search.[122]

According to Professor Lemley, only *one* U.S.-based SSO, the National Institute of Standards and Technology (NIST),

117. Another alternative is to impose on each SSO participant the obligation to search, not only its own patent portfolio, but also the publicly available information (such as patent databases), for potentially relevant patents belonging to others. The key advantage of such a proposal is that multiple searches, conducted by different individuals or firms, are more likely to discover a greater number of potentially relevant patents, especially since the issue of whether a particular patent is or is not relevant to the proposed standard is likely to be one on which parties can differ. The obvious disadvantage is the likely resulting duplication of effort.

118. Early disclosure allows the SSO to explore the relative merits of patented and non-patented alternatives in a timely fashion.

119. This last issue is especially significant with respect to pending patent applications, which themselves are "moving targets."

120. Lemley, *supra* note 17, at 1905, 1973-75, 1978 n.387.

121. *Id.* at 1977 n.373.

122. *Id.* at 1905.

formerly the National Bureau of Standards, imposes a more extensive duty to search.[123] And NIST appears to be the exception that proves the rule, since NIST appears to have virtually *no* role in actually *setting* the sorts of standards that are at issue here.[124]

2. Disclosure

Like search rules, the scope of any disclosure obligation is also difficult to pin down in advance.[125] There are two difficulties with the scope of a disclosure obligation. First, *over*disclosure can be as problematic as *under*disclosure. To take an extreme example, a firm could simply list *all* of its issued patents and tell the SSO that it is up to the *SSO* to determine whether any of those patents are potentially relevant to the proposed standard. Such a "core dump" type of disclosure is not very helpful. (Nevertheless, if the SSO has a stringent disclosure policy and there are significant sanctions for failure to disclose, the only safe course for a firm with valuable IP may be to make such an overdisclosure.)

Second, the question whether a particular patent does or does not read on a proposed standard is often unclear, involving claim construction and interpretation.[126] Is disclosure of the

123. *Id.*

124. The NIST website indicates that "[o]ur laboratories have the job of developing ever more accurate ways to measure length, time, mass, temperature, and the other physical quantities that are fundamental to all types of technology." *See* NIST, *Standards*, *at* http://www.nist.gov/public_affairs/standards.htm#Documentary (last updated Mar. 18, 2002). The NIST website also indicates, "In the United States, responsibility for setting product and process standards rests almost exclusively with the private sector. . . . Because of its measurement expertise and its impartiality, NIST is called upon to provide technical support that contributes to the development of high-quality domestic and international standards." *Id.*

According to the 2000 "Memorandum of Understanding" between NIST and ANSI, "NIST's role . . . is to coordinate Federal activities in voluntary standards and to ensure adequate representation of U.S. interests in all relevant international standards organizations." *See* NIST/ANSI Memorandum of Understanding, http://ts.nist.gov/ts/htdocs/210/ansimou.htm (last visited Mar. 10, 2003). Also, "NIST facilitates information exchange between Federal agencies and the private sector on voluntary standards activities . . . . It works with ANSI, Federal agencies, and the private sector to ensure that U.S. interests can participate appropriately in international standards activities to enhance U.S. international competitiveness." *Id.*

125. See discussion *infra* Part IV.E for why it is important that the scope of any disclosure obligation be clearly specified.

126. *See* Markman v. Westview Instruments, Inc., 517 U.S. 370, 388-89 (1996).

existence of the patent enough, or does the patent holder have an obligation to explain why (or how) it believes that the patent reads on the standard?

Many SSOs explicitly disclaim any effort to interpret the patent or to determine whether or not a patent reads on a proposed standard.[127] This unwillingness is not surprising, given that SSOs themselves are generally not comprised of patent lawyers and rendering opinions would increase the SSO's potential liability exposure should the SSO get it wrong.[128]

But once a patent has been disclosed, the SSO must determine whether or not to adopt the standard. If the SSO really is concerned about the prospect that a patent reads on a standard, there would appear to be little choice but to try to interpret the patent. The SSO *itself* (as an entity) may choose not to do so, instead leaving it up to the members of the SSO committee considering the standard to determine whether or not to adopt the proposed standard despite the knowledge of the potentially relevant patent.

A "disclose it or lose it" policy is likely (at a minimum) to delay the adoption of a proposed standard. Rational corporate and/or patent counsel would likely require that participation and subsequent disclosures would have to be "vetted" by patent counsel, because the risk of inadvertently losing the ability to enforce an important patent would otherwise be significant. Economics suggests that firms will rationally err on the side of *over*disclosure,[129] which will force the SSO to examine large

127. *See, e.g.*, IEEE STANDARDS ASS'N, COMMENTS REGARDING COMPETITION AND INTELLECTUAL PROPERTY, *at* http://www.ftc.gov/os/comments/intelpropertycomments/ieee.pdf (Apr. 17, 2002) (noting that "the [Institute of Electrical and Electronics Engineers (IEEE)] working group [developing the proposed standard] does not attempt to determine whether" the patent applies "to the proposed standard"). The IEEE provides the following "public notice" in connection with its standards: "The IEEE shall not be responsible for identifying patents for which a license may be required by an IEEE standard or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention." *See* IEEE, *IEEE-SA Standards Board Operations Manual*, § 6.3.1, *at* http://standards.ieee.org/guides/opman/sect6.html (last modified Jan. 18, 2002).

128. The concern is that, if the SSO undertakes such an investigation and concludes that the patent does not read on the standard, users of the standard who are accused of infringing a patent could sue the SSO for negligence should the SSO's evaluation later prove incorrect. Defending against such negligence claims can be costly, even if the SSO were to ultimately prevail on the merits.

129. The economic logic here is that, while both under- and over-disclosure impose costs on the firm, the private costs of underdisclosure (in the form of

numbers of marginally relevant patents in order to determine the patent's significance.

More significantly, a "disclose it or lose it" policy is likely to deter firms with significant IP portfolios from participating in an SSO that has such a policy. In many cases, the risk of losing the ability to enforce patents is likely to outweigh the gains the firm receives from participating in the standards-setting process. This is especially true since firms can get most of the benefits from standardization by adhering to the standard once set, even if they do not participate in setting the standard. However, such firms (which presumably have large IP portfolios because they have successfully engaged in significant R&D may be precisely the firms whose participation in the standards-setting process is the most significant and whose absence would most likely be detrimental.[130]

Again, the results of the Lemley survey are enlightening. Of the thirty-six SSOs surveyed that currently have some policy regarding IP, only twenty-four "imposed either an express or implied obligation that members disclose IP rights of which they are aware," though others "generally imposed other conditions that obviated the need for disclosure."[131] Of those

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the prospect that the firm will be found to have waived its right to assert its patents) are likely to outweigh the private costs of overdisclosure.

130. Professor Janice Mueller argues, "An expansive disclosure requirement is not likely to chill industry participation in standards-setting, because 'participation in standards-setting is motivated by commercial self-interest and is not a form of community service.'" Mueller, *supra* note 27, at 933 (internal citation omitted). This is an unsubstantiated *empirical* claim, for which Professor Mueller provides no basis. Moreover, it is precisely *because* participation *is* "motivated by commercial self interest" that the SSO has to be concerned that onerous search and disclosure rules can tip the balance of the participate-versus-do-not-participate cost-benefit calculation and will thereby cause some participants to elect not to participate.

Yet Professor Mueller's argument contains a grain of truth. It may well be, as discussed above, that some firms believe that they have little choice but to participate in certain "voluntary" SSOs, despite the risk to their valuable IP, because the SSO is "the only game in town." However, we draw a very different conclusion than Professor Mueller does. Her conclusion is that SSOs can and should impose stringent search and disclosure rules, and stringent sanctions for non-disclosure, in order to ensure that the users of the standard can rest assured that their use of the standard will not infringe other participants' patents. *Id.* at 945-46. By contrast, we are concerned that such rules will inappropriately favor the users of IP and harm the owners of IP, who may have little realistic choice but to participate. As discussed in more detail in the Appendix *infra*, we believe that a bias in favor of the users of a standard can be societally inefficient.

131. Lemley, *supra* note 17, at 1904.

that imposed a duty, six explicitly addressed the question whether the duty to disclose also included pending patent applications.[132] The rules of those six were mixed, with four requiring disclosure of all pending applications, one requiring disclosure only of already-published applications, and one requiring disclosure only from the proponent of the standard.[133]

The combination of search and disclosure obligations in Professor Lemley's survey is particularly striking. While most SSOs imposed a duty to disclose known relevant patents, only *four* required a search.[134] In other words, in the vast majority of cases the participant has a duty to disclose patents of which it *is* aware, but has *no* affirmative duty to search its firm's patent portfolio for potentially relevant patents.

It can be argued that imposing disclosure duties without requiring a patent search may do little or nothing to protect other SSO participants, or users of the standard, from future patent infringement claims. Similarly, such a policy may also encourage "willful ignorance" on behalf of patent holders. If a firm's representative to the SSO is aware of relevant patents (and/or patent applications), the representative must disclose them, so the obvious course of action is either to choose not to look for potentially relevant patents and thus remain ignorant of possible patent claims, or to send a representative who has not been informed of such patents to the SSO meetings.

These arguments, while in some sense clearly correct, ignore three considerations. First, imposing a duty to disclose *known* patents is relatively costless, while imposing a duty to *search* for potentially relevant patents can be quite costly to firms with significant patent portfolios. Second, as noted above,[135] the individual representatives to an SSO are typically chosen for their engineering expertise, not for their knowledge of their firms' patent portfolios. Third, if the firm's representative is not aware of its firm's patents that potentially read on the proposed standard, then the representative logically *cannot* be in a position to try to "actively" manipulate the standards-setting process in ways that benefit its firm.[136]

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132. *Id.* at 1905.

133. *Id.*

134. *Id.* at 1905, 1961 n.298 ("[O]nly four out of twenty-four SSOs that require disclosure impose a search obligation.").

135. *See supra* note 77 and accompanying text.

136. As such, this situation is in many ways akin to the situation in which a *non*-participant has a potentially relevant patent. It is widely acknowledged

It is worth noting that, based on the results of Professor Lemley's survey, it appears that the search and disclosure rules of the two SSOs involved in two controversies that have received a significant amount of attention—the Video Electronics Standards Association (VESA) in *In Re Dell*[137] and the Joint Electron Device Engineering Council (JEDEC) in the Rambus matter[138]—are significantly more stringent (in the sense of purportedly imposing strong duties on patent holders) than appears to be the norm.[139] VESA rules required the

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that SSO rules *cannot* bind non-participants. *See, e.g.*, Lemley, *supra* note 17, at 1945 ("Because SSO rules necessarily bind only members of the SSO, exit is always an option.").

137. *See In re* Dell Computer Corp., 121 F.T.C. 616 (1996).

138. *See* FTC Rambus Compl., *supra* note 86.

139. We are aware that the question as to what the scope of the search and disclosure rules of VESA and JEDEC actually were, both on paper and as applied in practice, is a hotly disputed topic. For example, Infineon and the FTC argued that JEDEC rules required disclosure of all pending patent applications that "might be involved in" a proposed standard. See *id.* ¶ 21.

Rambus argued (1) that prior to 1993 the JEDEC rules did not require disclosure of pending patent applications (but only sought disclosure of issued patents), (2) that the October 1993 "Manual of Practice and Procedure" that indicated that disclosure of pending patent applications was required was an internal manual for the use of JEDEC personnel and committee chairmen and was not disseminated to rank-and-file members such as Rambus, (3) that the 1995 Member's Manual, which (unlike the 1993 Manual) was disseminated to JEDEC members, required the disclosure of patent applications by "first presenters" of technology for standardization, thus supporting the conclusion that other JEDEC members not making such a presentation had no similar obligation, (4) that Rambus was never informed that the policy had been changed to require that all members disclose pending patent applications, (5) that the chairman of the JEDEC committee in which Rambus participated consistently displayed the older policy (which sought disclosure only of issued patents, *not* of pending patent applications) at all of the meetings that Rambus attended, so that Rambus had a good-faith belief that the policy only sought disclosure of issued patents, and (6) that, throughout the relevant period, JEDEC rules only sought disclosure of patents or pending patent applications the use of which was "required" in order to practice the standard. *See* Answer of Respondent Rambus, Inc., *In re* Rambus, Inc., No. 9302 (July 29, 2002), *at* http://www.ftc.gov/os/adjpro/d9302/020729arri.pdf (last visited Mar. 26, 2003).

We note that the Federal Circuit has recently ruled, in connection with Infineon's claim that Rambus committed fraud on JEDEC by failing to disclose its patent applications, that Rambus did *not* commit fraud, because the technology claimed in its patent applications while it was a member of JEDEC was not required in order to practice the JEDEC SDRAM and DDR SDRAM standards. *See* Rambus, Inc. v. Infineon Technologies AG, 2003 U.S. App. LEXIS 1421, at *39-*66 (Fed. Cir. 2003).

Resolving this disputed factual issue would take us too far afield. But the example illustrates that one key factor is the clarity of the search and

representative to certify that its firm did not have any relevant patents;[140] the 1993 JEDEC Manual of Procedure required disclosure of pending patents.[141]

C. LICENSING POLICIES

In addition to search and disclosure policies, many SSOs have what might be termed "licensing policies." Such policies most commonly require participating IP holders whose patents have been identified as being relevant to the proposed standard to agree to license whichever patents are "necessary" to make products that comply with the standard to anyone seeking a license.[142] The IP holder must typically also agree to license its patents either royalty-free or on "reasonable and non-discriminatory terms." If the patent holder is not willing to agree to abide by these terms, the SSO will often refuse to adopt the proposed standard or will withdraw the standard if it has already been promulgated.[143]

1. The "One Patent, One Standard" Problem

The implicit paradigm seems to be that a firm has a single patent that reads on the proposed standard, and that the task is to determine the appropriate terms for licensing that *particular* patent. The obvious complication is that, in many high-tech industries, much licensing does not fit this "one patent, one product" paradigm. Instead, it is common to see broad portfolio-wide cross-licenses, often with "balancing payments" reflecting the difference in value between the firms' patent portfolios.[144] As discussed in more detail below, such a practice makes it difficult to determine whether proposed terms

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disclosure rules adopted by the SSO, and the extent to which those rules are clearly conveyed to all participants. We discuss this issue in more detail in Part IV.E *infra*.

140. *See* HOVENKAMP ET AL., *supra* note 1, § 35.5, at 35-37 to 35-38 (Supp. 2003).

141. *Id.* at 35-38.

142. For example, the IEEE patent policy refers to patents "whose use would be *required* to implement the proposed IEEE standard." IEEE, *IEEE-JA Standards Board Bylaws*, *at* http://standards.ieee.org/guides/bylaws/sect6-7.html (last visited Mar. 10, 2003) (emphasis added). There may be other patents—for example, patents on product features that are seen as desirable, but which are not strictly necessary to practice the standard—which relate to standardized products, but which do not fall within the scope of the licensing requirement.

143. *See* examples cited *supra* note 103.

144. *See* Grindley & Teece, *supra* note 68, at 9, 33.

are "reasonable and non-discriminatory."

2. "Royalty-Free" and "Reasonable Terms"

In some contexts, the patent holder may be willing to license its patents royalty-free to all interested parties. From an economic standpoint, this is most likely to occur under one of two conditions: (1) when the patented technology represents only a minor improvement over the next-best non-patented alternative (so that the value of the patent is small), or (2) when the patent holder will benefit from others' adoption of its patented technology as a standard because the patent holder has other complementary capabilities that will enable it to profit from its innovation in a manner other than collecting royalties.

The latter is most common when the patent holder is also a seller in the product market and wants the SSO to adopt the firm's patented technology as a standard to encourage market acceptance of its technology and thus of the products that it sells.

Setting royalty payments at "zero" provides two obvious economic advantages. First, it has what economists and game theorists term a "focal point" clarity[145] that other royalty rates do not have. Once one moves away from zero, no other royalty rate has any particular reason to commend it in all cases. There is nothing special about 1%, 3%, or 7%. Instead, choosing a particular *non*-zero rate must consider the particular advantages of the patented technology relative to non-patented alternatives, which is inherently a fact-specific investigation.

Second, a royalty-free license is administratively simple (though determining the *scope* of the license may not be). By contrast, a royalty-bearing license requires mechanisms to monitor sales volume, to pay and collect royalties, and (if necessary) to audit royalty payments to make sure that the patent holder has been properly compensated. For both of these reasons, it is not surprising that a number of SSOs select "zero" (royalty-free) as the *only* pre-specified numerical royalty rate (as opposed to the *un*specified "reasonable" alternative, which does not select a particular number) when setting their

145. For a discussion of "focal points" and their economic significance, see THOMAS C. SCHELLING, THE STRATEGY OF CONFLICT 111-14 (1960).

licensing policies.[146]

Nevertheless, the obvious *dis*advantage of a "zero" (royalty-free) license is that it fails to compensate the patent holder for others' use of its patented technology. From an economic standpoint, there is *no* necessary reason why the appropriate "price" (royalty rate) for use of the patented technology should be *zero*, as it is in a royalty-free license, merely because that technology was incorporated into a standard. Presumably, the SSO adopted the patented technology as a standard, rather than some other alternative, because it believed that using the patented technology was superior to the alternatives. As such, the general economic presumption is that the appropriate price would be *greater* than zero. Thus, though SSOs list royalty-free licenses as one option (indeed, the only numerically pre-specified option), there is and should be *no* presumption that "zero" (royalty-free) is the appropriate price for patented technology that reads on a standard.

3. "Reasonable Terms": When Announced?

One key issue concerning patents is whether the patent holder must announce the terms for a patent license in advance. If so, there are potential antitrust concerns. Typically, the other participants in the SSO are the most likely potential licensees for the patent.[147] This raises the potential for collusive, oligopolistic "price fixing" in the technology market. The SSO members would, in effect, say to the patent holder, "We will collectively reject a standard that incorporates your patented technology unless you agree to license it to us at pre-specified rates that we collectively find acceptable." In other contexts, this clearly would amount to a group boycott.[148]

146. Professor Lemley's survey of SSO licensing practices is misleading in this regard. For example, he lists W3C as having a "[r]oyalty-free license requested but not required; RAND as alternative" licensing policy. Lemley, *supra* note 17, at 1973. But he lists JEDEC as an SSO with a "RAND" policy. *See id.* at 1974. The current JEDEC policy in fact specifies that the patent holder must agree to license either royalty-free *or* on RAND terms. *See* JEDEC, *JEDEC Manual of Organization and Procedure*, at 20, Annex A.1, *at* http://www.jedec.org/Home/manuals/JM21L.pdf (July 2002). Our review of the licensing policies of other SSOs confirms that many other SSOs have similar policies.

147. The prospective licensees are the firms that intend to manufacture and sell the standardized products. As noted above, such firms are likely to participate in the standards-setting process.

148. *See* HOVENKAMP ET AL., *supra* note 1, § 35.6, at 35-46 to 35-54.3 (Supp. 2003).

If advance notice of the patent license's terms is not given, the requirement that the licensing terms be "reasonable" may have little "teeth." What the patent holder believes is "reasonable" may strike potential licensees as excessive.[149] One difficulty is that circumstances (and thus whether a particular rate is "reasonable") vary, not only across different patents and different technology but over time. No single rate is "reasonable."

The more significant difficulty is that the adoption of a standard can affect the bargaining position of the parties. Ex

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149. Professor Lemley discusses the fact that most SSO's "RAND" policies provide little guidance as to "what those obligations mean in practice." Lemley, *supra* note 17, at 1906. He proposes that SSOs should "give content to the reasonable and nondiscriminatory licensing requirement." *Id.* at 1964, 1964-67.

We sympathize with Professor Lemley's concern that having a "RAND" policy without more may do little to provide guidance as to the *rates* that the patent holder can charge. However, a RAND commitment *does* constrain the patent holder in other significant ways.

If a standard is adopted (and especially if that standard becomes the industry norm), manufacturers want the ability to make products that comport with that norm/standard. As such, they would be concerned if patent holders could "pick and choose" by licensing some firms and refusing to license others. (This concern is especially significant if the patent holder itself competes in the product market; in that event, the patent holder could assert its patent to exclude others from competing, thereby reserving the market to itself.) And firms are concerned, not merely about obtaining a license, but about obtaining a license on terms that enable them to compete on a "level playing field."

A patent holder's commitment to license any interested party on (unspecified) RAND terms ensures (a) that all potential licensees can obtain a license (*if* they are willing to pay the royalty rates sought), and (b) that all will be offered the same terms and will be assured the opportunity to obtain a license without being put at a comparative disadvantage. Such a commitment to license on RAND terms limits the patent holder's ability to play potential licensees against one another.

But once such a "level playing field" is attained, then much of the concern that the prospective licensees have about their potential competitive position disappears. To be sure, firms would prefer not have to pay royalties, just as they would prefer not to have to pay their rent or their income taxes. But so long as every firm must pay, then the cost of the royalties can be built into the price of the product being sold, just as the cost of the raw materials and labor needed to make and sell the product is likewise built into the price. That is, prospective licensees may rationally be far more concerned about the "non-discriminatory" aspect of the RAND requirement than they are about the "reasonable" aspect.

This, in turn, implies that from an economic and organizational behavior perspective, it is quite rational for SSOs to pay much more attention to the requirement that licenses be available on (unspecified) RAND terms than they pay to the question of what the "reasonable" royalty rates should be.

ante, before an SSO adopts a standard, the patented technology may be only slightly better than the alternatives. Suppose, for instance, that there are two alternatives: an unpatented public-domain technology, and a patented technology that, if adopted, would result in a 5% cost savings. If the parties were to negotiate ex ante over royalty rates, one would expect that the negotiated rate would be no more than 5%, and likely less.

Once the patented technology is adopted as a standard, however, firms may commit to the standard and invest in complementary assets needed to make and produce the newly standardized products. Ex post, the cost of switching to the unpatented alternative may now be much greater, as the industry is "locked in" to the patented standard. Suppose, for example, that firms in the industry would find it worthwhile to switch only if the patent holder demanded greater than a 20% royalty. Then the patent holder may be able to extract (say) a 15% royalty ex post, despite the fact that the ex ante value of the patented technology is no more than 5%.

The above discussion implies that a royalty rate may be reasonable ex post (in the sense that it could be agreed to in an arm's length negotiation between a willing licensor and a willing, albeit reluctant, licensee) but *not* reasonable ex ante.

4. "Reasonable" Terms: How Determined?

In any case, many if not most SSOs do not get involved in determining whether proposed license terms *are* "reasonable."[150] Indeed, most SSOs do not require the patent holder to announce its proposed license terms in advance of

150. To our knowledge, most SSOs do *not* try to determine whether proposed terms *are* "reasonable," whether ex ante or ex post. For example, the IEEE *Public Notice* explicitly says, "The IEEE makes no representation as to the reasonableness of rates and/or terms and conditions of the license agreements offered by patent holders." IEEE, *IEEE-SA Standards Board Operations Manual cl. 6.3.1, at* http://standards.ieee.org/guides/opman/sect6.html (last visited Mar. 10, 2003).

ANSI does not require that terms be specified in advance, but the ANSI Board of Standards Review will review claims that the royalties being sought are not "reasonable." *See* AM. NAT'L STANDARDS INST., GUIDELINES FOR IMPLEMENTATION OF THE ANSI PATENT POLICY, http://public.ansi.org/ansionline/Documents/Standards%20Activities/American%20National%20Standards/Procedures,%20Guides,%20and%20Forms/ (last updated Mar., 2003); *see also* Lemley, *supra* note 17, at 1906 ("While 'reasonable and nondiscriminatory licensing' thus appears to be the majority rule among SSOs with a patent policy, relatively few SSOs gave much explanation of what those terms mean or how licensing disputes would be resolved.").

adopting the standard, but merely require a statement that the patent holder is willing to license on "reasonable and non-discriminatory" terms.[151] Instead, royalty rates are left to the parties for negotiation.

There are four likely reasons that SSOs avoid addressing the reasonableness of licensing terms. First, determining whether a particular rate is "reasonable" often goes beyond the competence and/or expertise of the SSO or its participants. The "reasonableness" of royalty rates is an economic or business issue, not a technical one. The SSO representatives, generally chosen for their technical knowledge of the technology being standardized, frequently have little or no experience or expertise in negotiating royalty rates or determining what an appropriate rate should be.[152]

Second, trying to determine an appropriate royalty rate is often difficult when technology is changing rapidly, as is often the case in the context of standards for the next-generation of products. From an economic standpoint, patent holders are naturally reluctant to quote a royalty rate for their patents in advance.[153] This is especially true because of the asymmetric (one-way) nature of the commitment. Asking the patent holder to commit to a royalty rate prior to the standard's adoption would, presumably, be binding on the patent holder, in the sense that the patent holder could not *increase* the rate, though it could always agree to accept a *lower* royalty. But the rate, would *not* be binding on the prospective licensees. They would have made no commitment to *take* a license, to agree to *pay* royalties. Not surprisingly, patent holders are reluctant to constrain their future negotiating position in such an asymmetric fashion.

Third, there are potential antitrust issues that might arise if the SSO (or its members, as potential licensees of the patent) were to try to determine whether a proposed rate was "reasonable."[154] Antitrust issues clearly would arise if the SSO

151. For a survey of licensing policies, see Lemley, *supra* note 17, at 1906, 1973-75.

152. We obtained this information in conversations with senior management at several major semiconductor companies.

153. In large part, this is because they cannot be aware of the scope of the ultimately issued patents, and thus of what it is that they will be licensing.

154. The concern is that the SSO manufacturer members are often the most likely licensees of the patented technology, and collective action by manufacturers could amount to collusive buyer-side price fixing in the technology market.

explicitly conditioned its acceptance (or rejection) of a proposed standard implicating a patent on the asked-for royalty rates. Indeed, even asking the patent holder to announce its proposed rates in advance, and then having the SSO determine whether or not to adopt the standard in light of the announced rates, may be problematic from an antitrust standpoint.

Fourth, SSOs are aware that the issue of royalty rates pits the interests of some participants (the patent holders) against those of other participants (the prospective licensees), and the SSOs do not want to "take sides" in such matters.

Unfortunately, the reluctance of SSOs to get involved in determining (ex ante or ex post) whether proposed licensing terms are "reasonable" can lead to an ex post situation in which: (1) a standard has been adopted; (2) a participant has a patent that reads on the standard; (3) the patent holder contends that it is willing to license its patent on "reasonable" terms (albeit at rates that were not announced in advance); and (4) the users of the standard, as prospective licensees, protest that the royalty rates are unacceptably high and are thus anything *but* "reasonable."

5. Antitrust Remedies

In our view, the antitrust authorities have shown what we believe to be an unfortunate tendency to propose royalty-free as a remedy in cases where the antitrust authorities have contended that the patent holder violated the antitrust laws by failing to disclose its patents (or pending patent applications). For example, the *In Re Dell* consent decree called for Dell to allow others to use its VESA patent on a royalty-free basis.[155] The recent Federal Trade Commission (FTC) complaint against Rambus effectively seeks to compel Rambus not to enforce its patents against users of the JEDEC synchronous dynamic random access memory (SDRAM) and double data rate (DDR) SDRAM standards; if successful, the action amounts to forcing

155. *See In re* Dell Computer Corp., 121 F.T.C. 616, 619-23 (1996). Our understanding (based on discussions the authors had with parties familiar with the case) is that one likely explanation for Dell's willingness to agree to this remedy is that, by the time of the consent decree, the VESA bus standard at issue was obsolescent and rapidly becoming obsolete. We also understand (on the same basis) that others had challenged the validity of Dell's patents. Thus, Dell may not have been giving up much in the way of potential revenue by agreeing to license its patents on a royalty-free basis in order to settle the matter.

a royalty-free license on Rambus.[156]

Such a remedy typically goes far beyond the SSO's requirements, which *allow* a patent holder to agree to license its patent royalty-free, but *also* generally allow a patent holder to agree to license on "reasonable and non-discriminatory" royalty-bearing terms.[157] The above analysis suggests that a more appropriate remedy would be to require a patent holder to license its patent to others on terms that are "reasonable" in the ex ante sense.

To be sure, it can be difficult to determine ex post what the ex ante "reasonable" terms would be. It is far easier administratively to propose a royalty-free license as a remedy. The courts are routinely asked, however, to determine ex ante reasonable royalty rates in the context of patent infringement damages.[158] We know of no reason why the analysis that courts use in patent damages cases, such as the well-known *Georgia Pacific* factors,[159] could not be applied equally well in antitrust cases alleging wrongful non-disclosure. The harsh nature of the proposed royalty-free license as a remedy for (allegedly) wrongful non-disclosure strikes us as out of line with the nature of the offense. In particular, the royalty-free license remedy does not set damages equal to the difference between the actual world and the but-for world.

6. "Non-Discriminatory" Terms

The common requirement that the patent holder agree to license its patent on "non-discriminatory" terms is not likely to be controversial in the context of cash-only single-patent licenses. That is, if the patent holder seeks, for example, a 1% royalty for the one patent that is implicated by the standard, its terms are "non-discriminatory" if every licensee is asked to pay the same 1% royalty.

But even here there may be problems. Suppose, for example, that both the patent and the standard read on a

156. *See* FTC Rambus Compl., *supra* note 86.

157. In essence, it amounts to a confiscation of the patent holder's rights, in favor of the users of the standard.

158. Indeed, the patent statute requires that damages be set at a level "adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer." 35 U.S.C. § 284 (2001).

159. *See* Georgia-Pacific Corp. v. United States Plywood Corp., 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970).

variety of different products (e.g., multiple generations of computer chips). The patent holder may elect to seek different royalties for different products: For example, it may seek a 1% royalty on older-generation chips and a 2% royalty on newer-generation chips. If it offers these same terms to all firms, knowing that they will apply differently to different firms depending on their product mix, this may be discriminatory.

On the one hand, firms that predominantly sell newer-generation chips will complain that they are being discriminated against, because they must pay 2% while firms selling older-generation chips only pay 1%. The terms change the competitive position of the newer chips vis-à-vis older chips, making newer chips relatively more expensive than older chips and shifting demand away from newer chips toward older chips. On the other hand, the patent holder can truthfully point out (1) that its patent is more valuable to makers of newer-generation chips, so that the royalty terms should reflect that difference in value, and (2) by offering the *same terms* to all potential licensees, it did not "discriminate" in favor of or against any particular firm.

More significantly, the "non-discriminatory" requirement is likely to be controversial in the context of the practice of *portfolio* licensing, whereby the firm does not license its patents individually, but instead grants a license for its entire portfolio of patents.[160] It is also likely to be controversial where some users of the standard already *have* portfolio licenses from the patent holder.

Suppose, for example, that a firm like IBM, which has tens of thousands of patents,[161] has a patent that is implicated by a newly-adopted standard. IBM already has many preexisting licenses with many firms.[162] Many of those licenses are portfolio licenses and thus already include a license to use the patent at issue. Those licensees would naturally contend that they do not need to take *another* license for the same patent, merely because the patent has now been implicated by a standard.

But other firms that do not yet have licenses may argue that they are being asked to pay a disproportionately high price

160. *See* Grindley & Teece, *supra* note 68, at 9, 33.

161. *See supra* note 114.

162. We know this because of our discussions with IBM licensing executives.

(relative to the price paid by IBM's other licensees) for access to the patent. For example, suppose that IBM offers a portfolio-wide license to its thousands of patents for a 5% royalty, but asks a 1% royalty for a single-patent license.[163] Users of the standard, who need the single patent implicating the standard but who do not need access to IBM's thousands of other patents, will, not surprisingly, argue that they are being charged a price that is out of proportion to the price paid by others—and thus that they are being discriminated against.

This issue has already arisen in connection with various patent pools.[164] For example, patent pools may seek to license the pooled patents on a "bundled" basis, with a single royalty rate for the use of all of the patents in the pool. For a number of legitimate reasons, the patent pools administrator may prefer not to offer the pooled patents on an a la carte basis, that is, setting separate royalty rates for each patent and allowing licensees to take licenses only for those patents that they elect to license.[165] But firms that (because of their existing cross-

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163. IBM's current policy reads,

> The following practice applies *to the extent* IBM has committed to provide patent licenses as required by a Standards Organization: Upon written request, IBM is willing to grant nonexclusive licenses under its patents (*to the extent required* for the practice or implementation of standards), on reasonable and nondiscriminatory terms and conditions, *to those who respect IBM's intellectual property rights*.

IBM, *IBM Standards, Practices*, *available at* http://www.ibm.com/ibm/licensing/standards/practices.shtml (last visited Mar. 10, 2003) (emphases added). It further states, "The royalty rates are 1% of the selling price for each patent used, up to a maximum of 5% of the selling price, for each licensed product." *See id.*

164. For an extensive discussion of patent pools and the antitrust issues they raise, see HOVENKAMP ET AL., *supra* note 1, § 34, at 34-1 to 34-34 (Supp. 2003).

165. From an economic and organizational behavior perspective, one concern is that, if the managers of the patent pool were to grant such licenses, they would have to monitor the subsequent conduct of the licensee to make sure that the licensee was not using the unlicensed patents as well as the licensed ones. Such monitoring can be costly, because it may involve a detailed patent infringement-style evaluation of the licensee's product.

One of the reasons that the patent pool is willing to license is to avoid incurring the ongoing costs of such investigations.

Another concern is that it may be more difficult for the various owners of the pooled patents to agree on the appropriate royalty rates for such a la carte licenses than it is to agree on both (a) an overall rate for the pooled patents, and (b) a division of the royalty income among the patent holders.

Moreover, if all of the patents in the pool are "blocking," that is, it is necessary to have a license to each of the patents in the pool in order to make

licenses) already have a license to some, but not all, of the patents in the pool contend that they should not have to pay the same royalties as others who do not have such cross-licenses.[166] This raises the difficult question of how much "credit" against the "pooled" rate should be allowed for the existing in-licenses.

The "non-discriminatory" issue is also likely to be controversial in the context of *cross*-licenses, in which one firm out-licenses its patents to another firm in exchange for in-licenses to the other firm's patents.[167] As one of us has discussed extensively elsewhere, cross-licenses can be royalty-free, or they can involve some "balancing payment" that reflects the difference in the value of the firms' patent portfolios.[168] Firms that are being asked to pay a higher *cash* royalty than other firms (especially when the other firms have a royalty-free license) may well disagree as to whether their out-licensed patent portfolio is being valued in a "non-discriminatory" fashion vis-à-vis other firms' portfolios.

Both the portfolio license and the cross-license issue discussed above reflect the complications that arise when one moves away from the simple "one patent, one standard, one license" paradigm, into the more realistic world in which firms have numerous patents and licenses cover more than one patent.

Another concern involves the question of how one determines whether or not license terms are "non-discriminatory." License terms are often extremely confidential business information (for both the licensor and the licensee). Establishing whether license terms are "non-discriminatory" inherently involves comparing the rates charged to one licensee to the rates charged to other licensees. This leads to an

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and sell a commercially viable product, then a la carte licensing makes no economic sense, since a firm that took a license to some but not all of the patents in the pool would be unable to make a commercially viable product without licenses to the other blocking patents. (There are two main caveats here. First, some firms may already have a license to some, but not all, of the necessary patents. Second, firms may disagree about whether particular patents in the pool are or are not "blocking.")

166. *See, e.g., Hewlett-Packard Company for FTC/DOJ Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy*, 4-6, *at* http://www.ftc.gov/opp/intellect/020417jeffretfromm.pdf (last visited Mar. 10, 2003) (statement of Jeffrey Fromm).

167. For a general discussion of cross-licensing in high-tech industries, see Grindley & Teece, *supra* note 68.

168. *Id.* at 9, 18-19, 33.

inherent conflict between maintaining confidentiality and demonstrating that the terms are "non-discriminatory." This conflict is even more pronounced when the other license terms (e.g., the scope of the license or the royalty base) are different across different licensees.

D. PENDING PATENT APPLICATIONS

Pending patent applications present a number of complications not present in the context of issued patents. First, as noted above, until recently the PTO kept pending patent applications confidential.[169] The public policy rationales for that confidentiality are well recognized.[170] Research projects are often multi-faceted, and the results of that research are developed over time. Some inventions may be fully developed and ready to patent before other inventions that flow from the same research. Other things being equal, a firm with an invention wants to apply for a patent as quickly as possible in order to preserve its priority date.[171] But if its application is immediately made public, others can see the disclosure and rush in to file patent applications that "flank" the initial application. This sort of "patent flooding" can deprive the initial inventor of the fruits of its invention. Allowing the patent applicant a "grace period" of confidentiality before the patent application is thrown open gives the inventor the opportunity to finish any remaining research and prepare applications in an orderly fashion.

Moreover, the quid pro quo of patent law is that the government grants the inventor the right to exclude others from using the patented invention for a period of years in exchange for the inventor's public *disclosure* of the invention.[172]

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169. This was changed by 35 U.S.C. § 122(b)(1) (2000).

170. For an economic analysis of the pros and cons of confidentiality and disclosure, see REIKO AOKI & YOSSI SPIEGEL, PRE-GRANT PATENT PUBLICATION, R&D, AND WELFARE, (May 16, 2001) (unpublished manuscript, *at* http://www.tau.ac.il/~spiegel/papers/reiko.pdf); DANIEL K.N. JOHNSON & DAVID POPP, FORCED OUT OF THE CLOSET: THE IMPACT OF THE AMERICAN INVENTORS PROTECTION ACT ON THE TIMING OF PATENT DISCLOSURE, (July 2001) (Nat'l Bureau of Econ. Research, Working Paper No. 8374, 2001, *at* http://papers.nber.org/papers/w8374.pdf).

171. Even under a first-to-invent system, the priority date for evaluating prior art is the filing date. As such, the innovating firm has an incentive to file as early as possible, so as to prevent later publications from being considered as "prior art."

172. *See* 35 U.S.C. § 122(b)(1) (2000).

If the PTO chooses not to grant the patent, the inventor does not get the right to exclude others, but retains the opportunity to try to keep its invention a trade secret. Mandatory disclosure to the SSO precludes this opportunity.

Though the confidentiality issue is now less significant than it used to be (because the change in the law now means that many, but not all, pending applications are "thrown open" for public inspection eighteen months after filing), the issue is still significant (1) for those applications which are not thrown open and (2) during the eighteen-month period for those applications that are thrown open.

Second, any interested party (or the SSO itself) can search for issued patents that are potentially relevant to a proposed standard.[173] But only the applicant and the PTO are aware of not-yet-disclosed, thus confidential, pending patent applications. Therefore, to the extent that the SSO believes that early disclosure (during the eighteen month confidentiality period) is needed, it inherently has to rely on the patent applicant to disclose the existence of the application.

Third, and most significantly, while the application is pending, the applicant cannot know (1) *whether* any patent will ultimately issue from a given application or (2) what the *scope* of any (ultimately) granted patent may be.[174] It is widely recognized that the scope of patent claims is often narrowed (sometimes drastically) during the patent prosecution process. As such, it is often very difficult to reach a conclusion about whether a patent application will ultimately mature into a patent that reads on the proposed standard. And it is virtually impossible to set "reasonable" ex ante licensing terms for the patent *if and when* it issues.

As with issued patents, there is a continuum of possible disclosure rules, ranging from no disclosure obligation, to an obligation to disclose the *existence* (but *not* the content) of the application,[175] to an obligation to disclose the contents of the

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173. The advent of computerized patent databases, such as the official United States Patent and Trademark Office (PTO) database, *at* http://www.uspto.gov/patft/ (last visited Mar. 10, 2003) and the Thompson/Delphion database, *at* http://www.delphion.com (last visited Mar. 10, 2003), among many others, has made it significantly easier to conduct such searches.

174. By definition, these issues have already been resolved for issued patents.

175. At least one major SSO, the IEEE, seems to propose such a policy: "Given the confidentiality of the information [in pending applications], it is

initial application, to a continuing obligation to inform the SSO of any change in the status of the pending application. As noted above, of the SSOs surveyed by Professor Lemley, only four required disclosure of all pending patent applications, while one required disclosure of published applications, and one required disclosure only from the proponent of the standard.[176] Again, given the variety of policies that have been adopted by different SSOs, there is no reason why a "one size fits all" policy is appropriate.

1. Non-Disclosure Does Not Equal Lack of Knowledge

Even if the patent holder (or applicant) does not disclose the existence of its patent (or application) to the SSO, some or all of the other SSO participants may be aware of the existence of the patent (or application), whether as a result of their own investigations or as a consequence of disclosures in other contexts. If so, the patent holder's "failure" to disclose would appear to be relatively innocuous.

For example, if the other SSO members are aware that a firm has a patent that it has not disclosed to the SSO, and the SSO elects to adopt the standard anyway, that action implies that they are not concerned about the patent issue. The SSO may adopt the standard because they believe that the patent either does not read on the standard or that the patent will not be enforced (possibly because of validity concerns). Similarly, if aware that a firm has a pending patent application, but the SSO elects to adopt the standard anyway, this again implies that they are not concerned about the patent issue, possibly because they believe that no patent will ultimately issue (or that the scope of any issued patent will not read on the standard).

For example, in the Unocal case discussed in Part I.B above, by disclosing the results of its research to Auto/Oil, Unocal presumably put other firms on notice that Unocal had conducted its own research, and those firms should have reasonably inferred that Unocal would have applied for a

recognized that only a very limited amount of information can be expected to be disclosed: i.e., that a patent application has been filed in a subject area." Public Comments filed by the IEEE Standards Association in connection with the FTC/DOJ Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy, *at* http://www.ftc.gov/os/comments/intelpropertycomments/index.htm (last visited Apr. 22, 2003).

176. *See* Lemley, *supra* note 17, at 1905.

patent on its innovation. Indeed, several other oil companies filed for patents for their own formulations of reformulated gasoline and diesel fuel that complied with the CARB regulations and did not disclose those patent applications to others.[177] If the existence of a patent application had been an issue, the obvious solution would have been for CARB to ask Unocal whether it had any potentially relevant patents or pending patent applications. CARB did not do so.[178]

The Rambus case provides another example.[179] Rambus did not disclose to the standards-setting organization, a JEDEC committee, that it had pending U.S. patent applications.[180] But Rambus had filed European counterparts to its U.S. applications, and under European patent law the European applications had been thrown open eighteen months after filing. One European-based JEDEC member explicitly informed other JEDEC members of the existence of Rambus's European application, which contained a cross-reference to the existence of the counterpart (and confidential) U.S. application.[181] Since the European application was open for public inspection, one presumes that, had the other JEDEC members been concerned about the issue, they could have obtained and examined the European counterpart.

Moreover, Rambus had entered into limited-field-of-use licenses with many of the JEDEC members for its proprietary

177. *See* Unocal, *Unocal Patent Issues Timeline*, *at* http://www.unocal.com/rfgpatent/rfgtime.htm (last visited Apr. 22, 2003).

178. Deposition testimony in Unocal case (on file with authors).

179. David Teece testified as Rambus's damages expert in the patent infringement case brought by Rambus against Infineon. Rambus, Inc. v. Infineon Technologies AG, 155 F. Supp. 2d 668 (E.D. Va. 2001), *rev'd and remanded*, 318 F.3d 1081 (Fed. Cir. 2003).

The discussion in this Article is based on publicly available information (including the transcript of that trial), and does not reflect any confidential or proprietary information. Some of the relevant factual background can be found in the FTC's administrative complaint against Rambus. FTC Rambus Compl., *supra* note 86. The views expressed in this Article are those of the authors, and do not necessarily reflect Rambus's position.

180. We do not address here the question whether Rambus had any *duty* to disclose its pending applications to the JEDEC committee, or the related question whether the (acknowledged) "failure" to disclose was wrongful. That is a hotly-contested topic, and to address the issue fully would take more space than is appropriate here. We note, however, that the Federal Circuit has ruled that Rambus did *not* commit fraud on JEDEC by not disclosing its pending patent applications. Rambus, Inc. v. Infineon Technologies AG, 318 F.3d 1081, 1106 (Fed. Cir. 2003).

181. *See* FTC Rambus Compl., *supra* note 86, ¶ 77.

technology, and thus the Rambus licensees were aware of the likelihood that Rambus had pending patent applications.[182] These facts suggest that at least some other JEDEC members were aware of the existence of Rambus's U.S. patent applications and of the possibility that Rambus's patent applications might read on the proposed standard.[183] Furthermore, JEDEC meeting minutes indicate that at least some other firms apparently believed at the time that Rambus's patent applications were "stuck" in the PTO and would not ultimately issue (or would be limited by prior art).[184] The fact that the JEDEC committee adopted the standard despite this knowledge suggests that the other JEDEC members were not concerned about Rambus's pending patent applications either because they believed that the patents would not issue, because they felt that the Rambus technology was sufficiently superior to the available alternatives, or because they believed that they would be able to obtain licenses from Rambus.

Obviously, there are intermediate cases, in which *some* but

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182. We are aware, from discussions with Rambus executives, that, in at least one Rambus license signed in 1995, the licensee (Hynix) agreed to pay Rambus royalties on a relatively broad range of DRAM types, not merely Rambus's proprietary RDRAMs.

183. In its Complaint, the FTC alleged that it was only after attending JEDEC meetings that Rambus submitted additional patent claims to the PTO that (allegedly) expanded the scope of the patent to cover the proposed standard. FTC Rambus Compl., *supra* note 86, ¶¶ 48, 54, 61, 64, 68.

Under U.S. patent law, a patent applicant is allowed to amend the patent claims and to add additional claims while still retaining the priority date of the original patent application, so long as the new claims do not introduce any "new matter" into the application. 35 U.S.C. § 132(a) (2000); Kingsdown Med. Consultants, Ltd. v. Hollister, Inc., 863 F.2d 867, 874 (Fed. Cir. 1988).

Rambus contended, and the PTO examiner (by issuing the patent) apparently agreed, that the ultimately-issued patent claims involved nothing more than the invention that was disclosed in its initial patent filing, which Rambus submitted over a year before it joined JEDEC and several years before the meetings at issue. *See* FTC Rambus Compl., *supra* note 86, ¶¶ 34, 37.g, 37.i, 38.

Even if Rambus *had* disclosed the existence of its U.S. application, it is by no means clear that the other JEDEC members would have believed that the U.S. application read on the proposed standards. Other JEDEC members were aware of the European counterpart application, and presumably examined it. *Id.* ¶ 77. If they believed that the Rambus application would *not* apply to the products being standardized by JEDEC, then presumably they would not have acted differently than they in fact did.

184. *See* Committee Meeting Minutes of JEDEC Solid State Technology Association (Dec. 6, 1995) (on file with author).

not all SSO participants are aware of the existence of a potentially relevant patent or patent application. Our main point here is that it is a mistake to confuse the lack of disclosure with the proposition that other SSO participants were unaware of the existence of the patent or patent application. What should matter is what is known by the SSO, not how the knowledge was acquired.

2. Public Policy Regarding Disclosure of Pending Patent Applications

It might be argued that Congress's recent revision of the patent statute, that throws open most pending patent applications eighteen months after initial filing (which we will refer to below as "early disclosure"), is likely to render the disclosure issue largely moot in the context of standards-setting. Estimates suggest that 75-85% of applications will be thrown open, putting participants in the SSO in a position to search pending applications and ending reliance on the applicant's disclosure.[185] Alternatively, it might be argued that Congress's decision represents a preference for openness, so that there should be a presumption that SSO rules should require disclosure. A closer examination casts doubt on both suggestions.

Addressing the second suggestion first, it appears that Congress amended the statute to bring U.S. patent law into closer conformity with the patent laws of other countries, notably European countries and Japan, which have long had a policy of early disclosure.[186] In the debates leading up to the adoption of the new statute, a number of scholars investigated whether the change was desirable from a public policy perspective. The general conclusion was that early disclosure, by reducing the competitive advantage that innovators could gain from their innovations, ran substantial risks of reducing the returns to innovation, reducing the incentive to innovate and thereby reducing the rate of innovation and the resulting economic growth. In other words, as a stand-alone policy, mandatory early disclosure does not appear to be desirable from an overall social welfare standpoint.

We believe that Congress's enactment of early disclosure legislation, in light of the contemporary evidence of the

185. *See* Johnson & Popp, *supra* note 170, at 33.

186. *See* the articles cited in note 170 *supra*, and sources cited therein.

detrimental effects of early disclosure, can best be interpreted as Congress's recognition of the U.S.'s obligation (under international treaties) to modify U.S. patent law to harmonize it with the patent law of other countries, and of the overall benefits of such harmonization, rather than as an endorsement of early disclosure per se. In fact, the form of the statute reflects Congress's skepticism of early disclosure. Early disclosure does not apply to certain types of patent applications; in particular, the application will *not* be disclosed if the applicant commits not to file foreign patent applications for the invention.[187] This exception suggests that Congress made the minimum disclosure change necessary to harmonize U.S. patent law with foreign patent law. Where the issue of harmonization did not arise—as it does not with applications filed only in the United States—Congress chose *not* to adopt early disclosure, but to retain the earlier no-disclosure policy instead.[188] This clearly casts doubt on any suggestion that Congress favors early disclosure as a general policy matter. On the contrary, the "carve-outs" in the statute suggest that Congress preferred a no-disclosure regime, but felt constrained by the United States' treaty obligations.

The fact that some applicants can opt out of early disclosure (albeit at some economic cost, such as foregoing the opportunity to file for foreign patent protection) in turn suggests that non-disclosure of at least some pending applications is likely to persist into the foreseeable future. Hence, SSOs will still have to come to terms with the issue of disclosure rules for pending patent applications. We believe, however, that Congress's reluctance to adopt a widespread early disclosure regime suggests that the public policy rationales favoring secrecy of pending applications are still significant.

E. THE NEED FOR CLARITY

Regardless of what search, disclosure, and licensing rules the SSO adopts, from a public policy standpoint it is important that the rules be (1) clearly stated, (2) clearly communicated to participants, and (3) clearly enforced in an even-handed manner. It is also important (4) that the consequences of a participant's failure to comply with the rules be explicitly laid

187. *See* 35 U.S.C. § 122(b)(2)(B)(i) (2000).
188. *Id.*

out.

Some SSOs have no explicit policies, believing (falsely) that "everyone knows" the appropriate policies.[189] The wide divergence in actual policies noted in Professor Lemley's survey undercuts the credibility of this claim.[190]

Other SSOs have ambiguous policies. For example, they may not make it clear whether the disclosure policy applies to pending patent applications as well as issued patents.[191] More commonly, policies can fail to indicate whether a duty to search for potentially relevant patents exists; or, if such a duty exists, the extent of the duty's scope. For example, is a "good faith" investigation enough, or is something more required? Such policies also fail to provide whether a search and/or disclosure obligation applies to the firm's representative to the SSO or instead reaches to the entire firm.

Moreover, regardless of what the rules say on paper, there is a significant question whether the SSO applies those rules in practice in an even-handed manner that is consistent with the written rules. For example, suppose that on paper the SSO has a strong policy requiring participants to search for and disclose all potentially relevant patents and patent applications. Given the sheer number of existing patents and new patent applications in many technological fields, if such a policy were interpreted literally, one would expect that the SSO would be deluged with hundreds or thousands of disclosures.

The limited amount of available evidence suggests that, in practice, disclosure is in fact much more limited. SSO representatives are apparently disclosing only a tiny fraction of their firms' potentially relevant patents.[192] To be sure, the representatives may be doing so on technological grounds, disclosing only the patents that they believe are clearly

189. Professor Lemley reports that, of the forty-three SSOs he studied, "four had no policy at all" and "two had statements on their website about IP rights but no official policy." Lemley, *supra* note 17, at 1904.

190. Professor Lemley notes that "[t]he fact that different SSOs have different rules governing IP rights (or no rules at all) means that it is very difficult for IP owners to know ex ante what rules will govern their rights." Lemley, *supra* note 17, at 1906-07.

191. *See* Lemley, *supra* note 17, at 1904 ("There was rarely discussion of the problem of pending patent applications.").

192. *See* Committee Meeting Minutes of JEDEC Solid State Technology Association, RAM Devices Subcommittee (May 24, 1995) (on file with author). We have also had several discussions with various SSO representatives to obtain this information.

relevant to the standard under consideration. But this limited disclosure, provides no assurance that the patent holder will not subsequently assert an undisclosed patent against those practicing the standard. A more realistic interpretation is that the representatives simply are not aware of the full scope of their firms' patent portfolios.

Similarly, even when the SSO's written policies require that patent holders publicly announce the royalty rates that they will seek on their patents that are implicated by proposed standards before the standard's adoption, such policies appear to be frequently ignored.[193] If a written rule is "honored in the breach" by many, if not most, SSO participants, then it is clearly objectionable to argue that the rule should nonetheless be interpreted at face value when subsequent legal disputes arise.

Lack of clarity in the rules—both as written and as applied—clearly is something that SSOs can and should address. As the Federal Circuit noted in the *Rambus* case, "Just as lack of compliance with a well-defined patent policy would chill participation in open standard-setting bodies, after-the-fact morphing of a vague, loosely defined policy to capture actions not within the actual scope of that policy likewise would chill participation in open standard-setting bodies."[194] But again there should be no presumption that, because the rules are cloudy, the appropriate solution is to err on the side of requiring disclosure and penalizing non-disclosure. On the contrary, the fact that many, if not most, SSOs impose *no* duty to search, and merely expect the individual representative to disclose any potentially relevant patents of which she

193. For example, Professor Mueller cites a policy of the Internet Engineering Task Force (IETF) to the effect that the IETF requires patent holders to agree to license their implicated patents on "openly-specified . . . terms." Mueller, *supra* note 27, at 906 n.55. Yet an examination of the letters from various patent holders who have agreed to license their necessary implicated patents indicates that the claimed obligation that the terms be "openly specified" is almost entirely ignored in practice. See the letters posted at the IETF Page of Intellectual Property Rights Notices, *at* http://www.ietf.org/ipr.html (last visited Mar. 10, 2003). Virtually all of the letters merely indicate that the patent holder agrees to license on "reasonable, non-discriminatory terms," *without* specifying what the royalty rate will be. The "exception that proves the rule" is when the patent holder is willing to license on a royalty-free basis. Mueller, *supra* note 27, at 906 n.55; *see also id.* (listing examples of patent letters).

194. Rambus, Inc. v. Infineon Technologies AG, 318 F.3d 1081, 1102 n.10 (Fed. Cir. 2003).

individually is aware, suggests that the "default" rule should err in the other direction.

F. SANCTIONS FOR NON-COMPLIANCE

A significant question that appears to have received almost no attention is: what remedies and/or sanctions (if any) does the SSO have when its members fail to comply with the SSO's search, disclosure, and licensing rules?

Voluntary SSOs have to be concerned that, if they impose onerous rules, firms may elect not to participate.[195] This "participation constraint" limits the sanctions that SSOs can impose on firms for failure to comply with the SSO's rules. The typical remedy for non-disclosure imposed by the SSO is quite limited: the SSO will elect not to issue the proposed standard, and will "decertify" or withdraw the standard if it is subsequently discovered that there is a patent that reads on the standard, *and* the patent holder is *not* willing to agree to license its patent on "reasonable and non-discriminatory" terms.[196]

Taking the latter point first, this raises the obvious question: does a willingness to license on "reasonable and non-discriminatory" terms to all interested parties effectively "purge" any failure to disclose earlier? On the face of it, the answer would appear to be "yes." If the patent holder is willing to license on reasonable terms, there is no reason to believe that the SSO will withdraw the standard, and no reason to believe that the SSO would have acted any differently had it known of the existence of the patent before the standard's adoption. The major caveat here involves the distinction drawn above between ex post and ex ante "reasonableness."[197]

The power of the "threat" to withdraw the standard as a sanction for non-disclosure varies across different standards, depending on how easy it is for industry participants to switch to a different standard. In other words, the threat's power depends on the degree of "lock-in" involved. In some cases, once firms in the industry gear up to make and sell a standardized product, it may be extremely difficult to change to

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195. *See supra* discussion Part IV.A.3.

196. As noted, a relatively small number of SSOs have policies preventing the adoption, or maintenance, of any standard on which there is a patent unless the patent holder is willing to license its patent royalty-free. *See supra* Parts IV.A and IV.C.

197. *See supra* Part IV.C.3.

another, unpatented alternative.[198] Merely "withdrawing" a standard *as* a formal standard may have little effect on industry behavior or the ability of the patent holder to induce others to pay royalties. Moreover, withdrawing a standard on a going-forward basis will not undo the fact that industry participants previously used the standard, thereby infringing the patent and exposing themselves to liability for damages for past infringement.

On a more conceptual level, withdrawing the standard imposes costs on other firms, not just on the firm that failed to comply with the SSO's rules. Ideally, one would want to find a sanction for non-compliance that penalized only the offending firm, not others.

On the face of it, the fact that SSOs may have relatively weak sanctions for non-compliance might be thought to justify the antitrust authorities in imposing stronger sanctions under the antitrust laws. Such a policy is seriously questionable, for several reasons.

First, if sanctions for non-compliance are relatively weak, the participants in the SSO, and other non-participants who make and use the standardized products, presumably are, or should be, *aware* of that fact. They presumably are thus aware that their protection against non-compliance is weak, and they can make their plans accordingly. Second, as noted above,[199] imposing strict sanctions for non-compliance would run the risk that firms would choose not to participate in the SSO in the first place.

In other words, firms "know what they are getting into" when the sanctions for non-compliance are clearly specified in advance. In such situations, intervention by the antitrust authorities to impose *additional* sanctions for non-compliance, beyond the ones imposed by the SSO itself, essentially amounts to changing the "ground rules" ex post. We see *no* reason why, if an SSO chooses to impose weak sanctions for non-compliance, and if those sanctions are clearly laid out in advance, the antitrust authorities should "fix" the situation by imposing additional sanctions beyond those imposed by the SSO.

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198. The FTC has argued that the *Rambus* case, involving semiconductor manufacturers and JEDEC SDRAM standards, involves such a "lock-in" to the standard. *See* FTC Rambus Compl., *supra* note 86, ¶¶ 105-09. The extent to which any such "lock-in" exists, or how significant it is in a dynamic industry such as DRAMs, is a disputed factual question.

199. *See supra* Part IV.A.3.

V. CAPTURING THE BENEFITS OF STANDARDIZATION THROUGH SSO-RULE CLARITY

A. THE BENEFITS OF STANDARDIZATION AND THE NEED FOR SPEED

It is widely recognized that standardization can yield significant social benefits.[200] It is often less widely recognized that factors that delay the standards-setting process can impose significant adverse social costs. To generate the greatest social benefits, the standards-setting process must be both timely and efficient. This is especially true in fast-moving, high-tech industries. It does little good to take twenty-four months to set a standard when product life-cycles are eighteen months. A delay in setting a standard often means that new products get delayed, or markets do not develop.[201]

1. The Social Costs of Delay

Public policies that slow the adoption of standards can have very detrimental economic effects. By way of illustration, suppose that the product life-cycle in the industry is three years, and that some factor delays the adoption of a standard for the next-generation product by six months. This delay causes the loss of *one-sixth* (the three-year product life-cycle, divided by the one-half-year delay) of the overall social gains realized by moving to the next generation product. It is not uncommon in many high-tech industries for new generation products to represent a 50-100% improvement or more (in terms of net consumer satisfaction) over the earlier product, as anyone who recalls the early days of cellular telephones or personal computers can appreciate.[202] If so, a six-month delay

200. *See, e.g.*, Lemley, *supra* note 17, at 1896-98.

201. Examples include digital audio tape (DAT), high-definition television, and cellular telephone technology. For an extended discussion of these and other examples, see GRINDLEY, *supra* note 5, at 99-130, 195-234, 235-72.

202. In the semiconductor industry, "Moore's Law" asserts that the number of transistors per square inch of silicon in integrated circuits doubles every twelve to eighteen months. For an extended discussion, see Ilkka Tuomi, *The Lives and Death of Moore's Law*, *at* http://www.firstmonday.dk issues/issue7_11/tuomi/ (last visited Apr. 23, 2003). A recent study suggests that, on a quality-adjusted basis, prices of desktop personal computers fell at a compound annual rate of 27% over the 1976-99 period. Ernest R. Berndt et al., *Price and Quality of Desktop and Mobile Personal Computers: A Quarter Century of History*, 2, *at* http://www.nber.org/~confer/2000/si2000/berndt.pdf (July 17, 2000).

can result in losing 8-16% of the overall social value of the product line as a whole.

2. Consortia, Organizational Structure, and Efficiency

Special-purpose SSOs, sometimes called consortia, are often faster, and can be more focused and nimble, than more "formal" SSOs in setting standards.[203] Participation in special-purpose SSOs is often limited to key players whose agreement is crucial to developing the standard.[204] With fewer participants, it is often faster and easier to reach consensus. Moreover, consortia are often less constrained by "due process" considerations than formal SSO counterparts that have formalized agendas and procedures. This in turn has led to a major shift away from the use of "formal" SSOs, and the proliferation of informal/voluntary SSOs and special-purpose consortia.

The difference is especially apparent in the distinction (discussed above[205]) between voluntary standards and regulations. Regulatory bodies are often constrained by due-process considerations in ways that voluntary SSOs are not.[206] As such, the regulatory process can often be much more time-consuming than private standards-setting.

The shift from more-formal SSOs to less-formal consortia can potentially have an adverse effect on the openness and transparency of decision making if consortia lack the types of due process procedural safeguards that more-formal SSOs have. In our view, however, the absence of complex procedural rules should be seen as an advantage, not a disadvantage. So long as the SSO's rules are clearly specified in advance, firms can "know what they are getting into" and can decide whether to participate and whether to rely on (or adopt) the SSO's standard accordingly.

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203. The authors have discussed this with participants at the FTC/DOJ panel on standards setting and antitrust, and, in particular, with Carl Cargill, Director of Corporate Standards, Sun Microsystems, Inc. (Apr. 18, 2002).

204. For a discussion of the pros and cons of limited-membership SSOs, see HOVENKAMP ET AL., *supra* note 1, § 35.3, at 35-21.

205. *See supra* Part I.A.2.

206. *See supra* note 24 and accompanying text.

B. EFFORTS TO BLOCK OR DELAY THE ADOPTION OF A STANDARD

This Article's premise so far has been that the patent holder wants the SSO to adopt a standard that incorporates its patent. But in some cases, a patent holder may want to *prevent*—or if that is not possible, delay—the adoption of a standard. For example, an incumbent firm may be concerned that an SSO is developing a standard that will enable other firms to compete more effectively with the incumbent.[207] If the incumbent can prevent or delay the adoption of such a competing standard, it may be able to protect its current market position.

Further, if the incumbent firm holds a potentially relevant patent, it may be able to manipulate the SSO's rules to prevent or delay the adoption of a competing standard. Suppose, for example, that the SSO rules prevent the SSO from adopting a standard once a patent has been identified that potentially reads on the standard, unless the patent holder is willing to agree to license its patent on reasonable and non-discriminatory (RAND) terms. The incumbent firm need only assert that it has a potentially relevant patent and refuse to agree to license on RAND terms to block the standard's adoption. By blocking the SSO standard, the incumbent protects its market position.

Note that this tactic requires only that the incumbent *assert* that it has a potentially relevant patent. It does *not* require that the patent *actually* read on the proposed standard, at least if the SSO is not willing to take a position on that issue. Many SSOs are unwilling to do so, instead taking at face value the assertions of the patent holder.

C. RESTRICTIONS ON PARTICIPATION

Above we discussed one sort of "participation constraint": the concern that onerous rules will discourage participation in the SSO by patent holders. But there is another, unrelated "participation" concern: should any interested party be allowed

207. For example, Microsoft has been accused of trying to prevent or delay the development of operating systems or middleware such as Java that would undercut its market position. *See* United States v. Microsoft Corp., 84 F. Supp. 2d 9, 22-24, 32-37 (D.D.C. 1999); Franklin M. Fisher & Daniel L. Rubinfeld, U.S. v. Microsoft—*An Economic Analysis*, 46 ANTITRUST BULL. 1, 19-23 (2001).

to participate in the SSO, or are "closed" SSOs acceptable?[208]

In this regard, it is important to draw a distinction between *participating* in *setting* a standard and *practicing* that standard. Unless the standard implicates a patent, *anyone* can practice the standard, even those who did not participate in setting it. Indeed, one concern that many SSOs have is that non-participants can "free-ride" on the standardization efforts of others. Operating an SSO involves costs; those costs have to be recouped somehow,[209] and the SSO is often concerned about how to do so. One way is to charge a significant fee, much larger than the cost of reproduction, for copies of the standards adopted by the SSO.[210]

Concerns about firms' ability to participate in setting the standard are fundamentally different from concerns that firms need to produce products that comport with the standard in order to participate in the product market, i.e., in that the ability to practice the standard is (in antitrust terms) an "essential facility." As a general matter, unless the standard involves patented technology that the SSO-member patent holder is not willing to license to non-members on RAND terms,[211] non-participants in the standards-setting process can still *practice* the standard.

Instead, the inquiry turns to whether those excluded from participating are disadvantaged either (1) in terms of setting the standard or (2) in terms of access to the patented technology incorporated in the standard. With respect to the former issue, the non-participants' concern is that they may disagree with the standard ultimately chosen. But in a world where firms disagree about the best standard, that is likely to be the case for some participants as well. The relevant issue is whether the standards-setting process is systematically biased

208. For an extensive discussion of this issue, see HOVENKAMP ET AL., *supra* note 1, § 35.3.

209. *See* Patterson, *supra* note 76, at 2003-04.

210. Some SSOs charge significant fees (especially to non-members) for copies of their standards. For example, ANSI promotes membership by indicating that members "achieve up to three-times financial payback on member dues via site licensing of electronic standards collections." American National Standards Institute, *The Benefits of ANSI Membership*, *at* http://public.ansi.org/ansionline/Documents/Membership/why_buy_ansi.pdf (last visited Mar. 10, 2003).

211. Issues arise if licenses are only available to SSO members, or if non-members are charged higher royalties than members are charged. *See* HOVENKAMP ET AL., *supra* note 1, § 5.7, at 35-54.2. Even here, there is a countervailing "free rider" issue.

by excluding non-participants.

With respect to the latter (access to patented technology) issue, if the patent holder agrees to license all interested parties (whether SSO members or non-members) on RAND terms, then non-members can obtain access to the standardized technology on non-discriminatory terms, and the issue does not arise. If, however, the SSO members agree only to license their IP to each other (and not to non-members), or agree to charge higher royalty rates to non-members, then the issue of discrimination *may* become significant.[212]

The example in the previous section suggests that SSOs may legitimately want to limit participation in the standards-setting process by those whose interests would be served by preventing or delaying the adoption of such a standard. Unfortunately, it may be very difficult to determine whether this is in fact the case. Ascertaining true motives can be difficult, especially since large incumbent firms are likely to be affected by proposed changes and, thus, presumably have a strong interest in having their views considered. And accusations of misconduct are easy to make but difficult to resolve. What one firm may see as "delay" or "obstructionist behavior" on the part of another firm can often be defended as "deliberate consideration of relevant factors."

Moreover, considerations of organizational efficiency suggest that the standards-setting process is likely to work more efficiently and more quickly with fewer participants, especially if those participants have interests that are reasonably well aligned with one another. One suspects that this is the reason for the proliferation of special-purpose standards consortia; they can limit participation to a small number of key players, and are not constrained by the "due process" and other procedural considerations that more formal

212. We stress "may" here because, to the extent that the SSO depends on member contributions (e.g., membership dues) to fund its operations, it is perfectly reasonable for the SSO to charge non-members (who do not pay dues) a higher royalty rate for the SSO's IP than it charges to non-members.

Similarly, to the extent that SSO members have contractually agreed to a mutual licensing policy (so that each member agrees, as part of the quid pro quo membership agreement, that it will agree to out-license its patents to other members in exchange for their agreement to do the same), there is no reason why *non*-members (who have *not* agreed to be bound by such a commitment) should get the benefit of the lower (member) royalty rates.

As such, it can often be a difficult factual issue to determine whether any differential treatment of members and non-members is legitimate.

SSOs must follow.

Efficiency considerations also suggest that there is no necessary reason for a "one firm, one vote" rule in setting standards. Some firms are much more likely to be affected by which standard is selected than other firms are. Absent some procedural safeguards (such as a supermajority voting requirement), some firms may well elect not to participate. Nonetheless, the choice of a standard clearly can affect non-participants. Affected individuals or firms naturally want to "have a voice" in decisions that affect them.

Different SSOs can and do "compete" with one another via the participation rules and procedures they adopt. These include such factors as membership qualifications, voting rules (e.g., one-firm-one-vote, one-attendee-one-vote, votes proportional to market share, and supermajority rules), procedures (e.g., agenda setting, the role of committees, and opportunities for comments), and the overall cost and speed of the standard setting process. Our point here is that, again, there is no reason why a "one size fits all" approach is appropriate.

However, we believe that one comment is in order. There is a fundamental asymmetry between participants and non-participants. Non-participants cannot be bound by the rules of a voluntary SSO. In particular, a non-participant can assert its patents against those practicing the standard, without being subject to search, disclosure, or licensing obligations.

If participants are bound by the SSO's rules, and (in particular) to extend the benefits of such rules (in particular, rules requiring licensing on RAND terms) to non-members, then non-participants can remain free to assert their own patents against participants as they see fit, while retaining the ability to compel participants to grant licenses for *their* patents on "reasonable and non-discriminatory" terms. Such an asymmetric situation provides an incentive for firms *not* to participate in the standards-setting process.[213] This in turn implies that it may well be rational for the SSO to implement asymmetric rules aimed at counteracting this incentive.

One possible resolution to this asymmetry would involve having a "two-tiered" membership in the SSO. "Full" members would be able to fully participate in the standards-setting

213. This is especially likely if non-participants can argue that they should be able to claim the benefits, under the legal theories of equitable estoppel or third-party beneficiary, of disclosure policies for SSOs for which they are not members.

process, including proposing new standards, proposing changes, and voting on proposed standards. "Observer" members would be able to observe, and be informed of, the standard being set, but would not otherwise be able to participate. The quid pro quo would be that "full" members would have broader disclosure and/or licensing obligations than "observer" members would. The key idea here is that "observer" members would have little or no ability to actively "manipulate" the standards-setting process in their favor.

D. ADOPTION OF IMPLICATED STANDARDS

The analysis thus far has been based on the premise that the SSO wants to *avoid* adopting a standard if there are patents that read on the standard. It is worth considering the *converse* situation, in which the SSO adopts a standard when it knows (or has good reason to know) that there are potentially relevant patent claims that may read on the products that comply with the standard.

Such conduct need not be entirely intentional. An SSO may be aware of the patent claims (or the existence of the pending patent application), but may conclude that the patent does not read on the proposed standard, or that the patent is invalid, or that the patent application will not issue. The SSO may, thus, adopt the standard despite its knowledge of the patent or pending application. The patent holder (applicant) clearly may disagree with the SSO's assessment of the prospect that a patent will ultimately issue; such a discrepancy on the merits is unsurprising.

Many SSOs have policies that, at least on paper, prevent the SSO from adopting a standard when there is any doubt as to whether a known patent reads on the proposed standard, unless the patent holder has agreed to license its patent to all potential users of the standard, whether royalty-free or on a "reasonable and non-discriminatory" basis. However, the extent to which such policies are honored in practice is an open question.

The concern here is that ex post, once (1) the standard is adopted, (2) firms are making products comporting with the standard, and (3) the patent holder seeks payment for the use of its patent, the accused infringers may argue that it is inappropriate under the antitrust laws for a participating patent holder to assert its patents against the infringing standardized products. If this argument is accepted, the users

of the standard can use the leverage of the antitrust law to compel the patent holder to allow them to use the patent. If the antitrust remedy is a compulsory license (whether royalty-free or a license at a court-determined rate), then the other SSO members have in effect been able to obtain a compulsory license at a court-ordered rate (or for free), rather than having to negotiate and pay for a license.

As noted above, we believe that SSOs tend to be biased in favor of the users of standards and against the interests of patent holders.[214] The prospect that SSOs may be able to use the antitrust laws to compel compulsory licenses (especially if such licenses are royalty-free) is likely to exacerbate this bias. In particular, we believe that it makes no sense on public policy grounds to allow SSO members effectively to "expropriate" others' patented technology merely by adopting a standard when they know (or have reason to know) of potential patent issues.

The Rambus case provides a possible example.[215] Rambus withdrew from JEDEC in June 1996, some three years prior to JEDEC's adoption of standards for the next-generation of dynamic random access memory (DRAM) (known as DDR SDRAMs) in August 1999.[216] In its withdrawal letter, Rambus explicitly stated that it had both issued patents and pending patent applications, and informed JEDEC that it intended to enforce its patent rights against other firms.[217] To the extent that other JEDEC members were aware of Rambus's patent specification and/or claims (whether in its issued patents or its pending patent applications), but chose to adopt a DDR SDRAM standard (or later standards) incorporating Rambus's technology despite that awareness, this clearly raises concerns.

E. ANTITRUST INTERVENTION AND CLARITY

As noted above,[218] we believe that clarity of the SSO's rules is a key *desideratum*. Unfortunately, in our opinion, ex post antitrust enforcement efforts are often likely to *reduce* clarity and predictability, rather than enhance it.

Up to this point, this Article has tacitly assumed that

214. *See supra* Part II.B.
215. *See* discussion *supra* Part IV.D.1.
216. FTC Rambus Compl., *supra* note 86, ¶¶ 27, 82-83.
217. *Id.* ¶¶ 48, 56, 63-64, 67, 72, 82-85.
218. *See supra* Part IV.E.

standards-setting activities can potentially raise antitrust concerns. But in our experience the nature of those concerns, and the legal basis for intervention, has rarely been articulated clearly.[219]

We believe that the typical context[220] involves the claim that, by manipulating the standards-setting process (whether "actively" in an effort to "capture" a standard, or "passively" by improperly failing to disclose a relevant patent), the patent holder has gained improper market power in the technology market. Absent the need to comport with the standard (i.e., absent the "lock-in"), firms might (if feasible) find a way to avoid infringing the patent, by adopting an alternative technology.[221] But given that firms have a strong economic incentive to comport with the standard, the patent holder may be able ex post to extract a much higher price for the use of its patented technology than it would have been able to do absent the standard.

The antitrust concern here is *not* the proposition that the standard enhances the patent holder's market power per se. This is most readily seen in connection with patents held by *non*-participants in the standards-setting process. Adoption of a standard can confer a substantial windfall gain on non-participant patent holders, who (just like participant patent holders) may be able to extract higher royalties for the use of their patents than they would have been able to do absent the standard. But we know of no one who suggests that such conduct is an antitrust violation. Consequently, the "evil" that the antitrust law seeks to address in these contexts is the

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219. Is the concern one of a conspiratorial agreement under section 1 of the Sherman Act, or monopolization or attempted monopolization under section 2 of the Sherman Act? If so, presumably the challenger must establish the other elements of any such claims.

The distinction between an enforcement action by the FTC or DOJ and a private antitrust action can be significant here. In particular, section 5 of the Federal Trade Commission Act gives the FTC the authority to intervene in the context of "unfair methods of competition," but does not create a private right of action. *See* 15 U.S.C. § 45 (1994); 1 AM. BAR ASS'N, SECTION OF ANTITRUST LAW, ANTITRUST LAW DEVELOPMENTS (FOURTH) 759-60 n.22 (1997). Despite this, private litigants (such as Infineon in *Rambus v. Infineon*) have argued that the FTC's *In re Dell* consent decree reflects a more general antitrust policy regarding standards-setting activities.

220. Obviously, there are other antitrust claim contexts, such as the "stuffing the ballot box" conduct in *Allied Tube & Conduit Corp. v. Indian Head, Inc.*, 486 U.S. 492, 496-97 (1988).

221. *Cf.* HOVENKAMP ET AL., *supra* note 1, § 35.5b, at 35-41.

manipulation that led to the enhanced value of the patent, not the fact that a patent reads on a standard or the enhanced value per se.

It is one thing for the antitrust authorities to adopt clearly specified rules on an ex ante basis governing standards-setting organizations and practices. For example, if the antitrust authorities believe that the public interest will be best served by requiring fully open participation, then they could announce an ex ante rule (or ask Congress to pass a statute) requiring all SSOs to be fully open to all interested parties. If the antitrust authorities believe that the public interest would be best served if all standards were "open," in the sense that they did not implicate patent rights, then the antitrust authorities could announce an ex ante rule (or ask Congress to pass a statute) requiring that standards be "open" in that sense.[222]

But it is something quite different for the antitrust authorities to use enforcement actions applying general antitrust principles to penalize conduct on an ex post basis in contexts where the rules are not clear, or, indeed, where the rules are explicitly to the contrary. For example, many of the public comments on the *In Re Dell* consent decree expressed concern that the scope of that ruling was unclear.[223] Was it intended to apply solely to cases (such as the situation described by the FTC majority in *Dell*[224]) where the SSO's policies required the firm's representative to certify in writing that his or her firm had no patents that read on the proposed standard? Or did the prohibition extend to other cases? For example, what is the appropriate antitrust rule (or policy)

222. We stress that we do not believe that either of these rules is desirable as a general policy.

223. The *Dell* matter involved a consent decree, and, in theory, consent decrees have no precedential effect. *See* 2 AREEDA & HOVENKAMP, *supra* note 24, ¶ 327c. This does not mean, however, that interested parties were not concerned about the general policy that underlay the FTC's reasoning in *Dell*, as the number of public comments demonstrates. *See In re* Dell Computer Corp., 121 F.T.C. 616, 623 (1996).

224. *See In re* Dell Computer Corp., 121 F.T.C. 616, 623 (1996). It is our understanding, based on conversations with knowledgeable individuals, that Dell contended that the scope of the VESA certification obligation was limited to the representatives' personal knowledge. However, Dell was willing to enter into the consent decree rather than litigate this disputed issue. Then-Commissioner Azcuenaga's dissent in *In Re Dell* took the Commission majority to task (in our opinion, correctly) for going beyond what the parties had stipulated to in the consent decree when writing the majority opinion (in particular, whether Dell's conduct was "intentional"). *Id.* at 639 (Azcuenaga, Comm'r., dissenting).

toward disclosure when the SSO's policies make it clear that it imposes *no* obligation to search for potentially relevant patents and that any disclosure obligation is limited to the personal knowledge of the individual representative?

F. PROBLEMS WITH "ONE SIZE FITS ALL" POLICIES

It is common for commentators to suggest that the rules "should" or "must" be one way or another. For example, Mueller recently proposed that "[a]ny firm that participates in creating an industry standard and thereafter obtains patent rights in some aspect of the standard *must*, at a minimum, disclose the existence of any patents or pending patent applications that may be relevant to the standard."[225]

Such a proposal can be understood in one of two ways. The first is as a *mandatory* rule, specifying what the rules should be—whether as a general matter of public policy or as a consequence of application of antitrust principles—allowing for no deviation. The second is what is often termed a *default* rule, to be thought of as the general proposition to be applied in the absence of evidence to the contrary, but one that can be changed by the SSO if it chooses to do so.[226]

These two interpretations have fundamentally different bases and policy implications. In our opinion, it is simply unnecessary to adopt mandatory rules in this area. SSOs are perfectly capable of adopting their own search, disclosure, and licensing rules, and of adapting those rules to the needs of the SSO participants. The results of Professor Lemley's survey indicate that SSOs have a variety of different rules.[227] There is no reason why a "one size fits all" mandatory-type approach is appropriate.[228]

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225. Mueller, *supra* note 27, at 929 (emphasis added) (internal citations omitted).

226. For a discussion of the law and economics of default rules, see generally, Ian Ayres, *Default Rules for Incomplete Contracts*, *in* 1 PALGRAVE, *supra* note 65, at 585-90.

227. *See* Lemley, *supra* note 17, at 1904-07.

228. Professor Lemley has expressed concern that the variety across SSO rules does not appear to be indicative of any intentionally adopted policies. He sees no indication that the SSOs explicitly considered the range of alternative policies and intentionally chose the particular alternative that it did based on any kind of cost-benefit analysis. As such, he suggests that the antitrust authorities need not give deference to SSO policies in this area. *See* Lemley, *supra* note 17, at 1954-57.

We agree that the existing policies often appear to be a matter of

We find it is extremely telling that, at the recent FTC and Department of Justice (DOJ) hearings on the intersection between antitrust and intellectual property, *both* of the comments from SSOs expressed the belief that the current system worked reasonably well, and expressed concern that the antitrust authorities might adopt a "one size fits all" interventionist approach to standards issues.[229] We believe that those comments, coupled with the results of Professor Lemley's survey showing the wide diversity of policies across SSOs,[230] strongly suggest that the antitrust authorities should proceed cautiously in this area.

In particular, we are concerned that antitrust intervention may reduce the clarity of the rules, thereby making participation in SSOs more risky and reducing the willingness of firms with valuable IP (and which therefore presumably have much to contribute to selecting the appropriate standard) to participate. If the SSO's rules are unclear, the obvious public policy solution is to encourage SSOs to adopt clearer rules on a going-forward basis.

Most significantly, we believe that intervention runs a significant risk of slowing down the standards-setting process, thus delaying the adoption of new standards and new products made in accordance with those standards, to the detriment of consumers and of society generally.

This is not, of course, to suggest that there will never be an appropriate role for antitrust scrutiny of the standards-setting actions of SSOs or their participants. There is no question but that the activities of SSOs can affect non-participants, and one

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historical accident and are not likely to reflect a well-thought-out or "optimal" degree of diversity. But in our opinion this is all the more reason for the antitrust authorities to tread warily in this area. This implies either that the SSOs *themselves* did not believe that the issue was important enough to carefully consider the range of alternative policies and to select the "best" policy, or that the choice of search, disclosure, and licensing rules reflects a degree of political compromise within the SSO. In either case, it is not likely that the antitrust authorities are in a better position than the SSO itself to strike a better balance of the competing interests of the various SSO participants.

229. *See* IEEE Standards Association, *Comments Regarding Competition and Intellectual Property*, *available at* http://www.ftc.gov/os/comments/intelpropertycomments/ieee.pdf (Apr. 17, 2002); Amy A. Marasco, *Standards-Setting Practices: Competition, Innovation and Consumer Welfare*, *available at* http://www.ftc.gov/opp/intellect/020418marasco.pdf (Apr. 18, 2002) (testimony by Amy A. Marasco, Vice President and General Counsel, American National Standards Institute).

230. *See* Lemley, *supra* note 17, at 1904-07.

rationale for antitrust intervention is to protect the interests of such non-participants from being adversely affected by decisions in which they did not participate or could not exert influence. And there are obvious examples of manipulation of SSO rules/policies, such as the "stuffing the ballot box" example of *Allied Tube*,[231] in which antitrust intervention may be the only solution.

But we believe that the antitrust authorities are likely to give too little weight to the fact that SSOs, as voluntary organizations, must often walk a fine line between competing interests. In our view, ex post intervention runs the serious risk of failing to recognize the ex ante balancing of competing interests.

CONCLUSION

Standards have come to play an increasingly significant economic role in fostering the development and adoption of new technology. Of particular importance in many fields are formal standards adopted by voluntary SSOs. Since the source of new technology is new innovation, and since Western societies have chosen to use the patent system (along with trade secrecy and copyright) as a major social incentive mechanism to encourage innovation, SSOs must ipso facto come to grips with the issue of how to deal with standards that involve patented innovations. A recent survey by Professor Mark Lemley indicates that SSOs have a variety of types of rules—notably search, disclosure, and licensing rules—to address these issues, and that SSOs vary widely in the stringency of the rules that they adopt.[232]

Private standards-setting by SSOs represents a classic example of what organizational theorists term a "private ordering." Such private orderings can be both a possible substitute for, and a strong complement to, "public" orderings such as those reflected in the antitrust laws and other statutes. As such, private SSOs have the flexibility to experiment with alternative procedures and rules, and to adapt those rules and procedures to particular circumstances in a way that a "one size fits all" approach can never achieve.

Consequently, we believe that though there clearly is a legitimate role for antitrust policy in connection with standards

231. Allied Tube & Conduit Corp. v. Indian Head, Inc., 486 U.S. 492 (1988).
232. *See* Lemley, *supra* note 17, at 1904-07.

setting, the antitrust authorities should tread warily in intervening in this area. Intervention runs the risk of reducing the clarity and predictability of rules, thereby increasing uncertainty and making participation in SSOs by firms with valuable intellectual property more risky and, therefore, less likely. As such, intervention runs the risk of delaying the adoption of standards, thereby reducing the economic gains from standardization and reducing social welfare generally.

APPENDIX

ON THE PRIVATE AND SOCIAL EFFICIENCY OF STANDARDS INVOLVING PATENTS

For simplicity and analytic convenience, we consider the case in which the characteristics of the *product* are fixed, and the issue is whether a standards-setting organization (SSO) should adopt (as a standard) either a patented *process* (denoted P) of making the product or an alternative unpatented process (denoted U).

We assume throughout that the SSO must select either P or U as a standard, and that the adoption of a standard makes it much more expensive for firms to subsequently switch to the alternative.

Obviously, if the patented alternative P costs *more* than the unpatented alternative U, it would make no sense for the SSO to adopt P as the standard.[233] As such, we restrict our

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233. In practice, the SSO might not know whether P is (or will turn out to be) lower cost than U at the time that the SSO must adopt the standard. For example, U might be the existing technology, while P might be a new, unproven but promising technology that has the prospect (but not the certainty) of lowering costs.

Analytically, if the SSO must make a once-and-for-all irrevocable decision to adopt either P or U, the appropriate approach is straightforward: the SSO should calculate the ex ante expected costs of using P and U (given the best available information at the time the decision is made), and choose the alternative with the lower expected cost. However, if the SSO can delay adoption of the standard until more information about cost is known, or if adopting a standard does not rule out future use of the rejected alternative, the analytic framework is more complicated, involving a "real options" approach. For a discussion of the concept of "real options" and its economic significance, see TOM COPELAND & VLADIMIR ANTIKAROV, REAL OPTIONS: A PRACTITIONER'S GUIDE (2001).

Another, related but conceptually distinct issue involves the appropriate choice of standards in contexts where technology is changing over time. The concern is that, by adopting a particular technology or feature as the standard, it may be more difficult to switch to another technology/feature that subsequently becomes feasible, less costly or more desirable. This "lock-in" feature of standards is well recognized.

It might be argued that that standardization is undesirable, on the grounds that adopting any given technology as a standard makes it more costly and/or difficult for the industry to adapt to new technologies as they develop. In our opinion, such a conclusion is unwarranted. While it is clearly true that premature standardization can impose significant social costs (as the history of efforts to develop a high-definition television standard demonstrate), the difficulty is knowing in advance when standardization is "premature."

attention to the case where P is a lower cost alternative than U, ignoring for now the issue of royalties. By "lower cost" we mean that fewer real economic resources (e.g., labor, materials, capital, etc.) are used in producing the good using P than using U. Thus, choosing P rather than U "frees up" those resources for use elsewhere in the economy.

We denote by C_P the cost (per unit) of making the product using the patented alternative P, and by C_U the cost (per unit) of making the product using the unpatented alternative U. (For simplicity, we ignore fixed costs, or assume that the fixed costs are the same regardless of which alternative is chosen.) Then the per-unit cost savings from adopting the patented alternative P are $S = C_U - C_P$. In light of the above discussion, we assume $S > 0$.

Assume for now that, prior to the adoption of the standard, the patent holder commits itself to demanding per-unit royalties[234] of R_P for the use of its patented technology.

Suppose further that, once the standard is adopted, competition among users of the standard (i.e., manufacturers of the product) will drive the price of the product down to the marginal cost of production.[235] Thus if the unpatented alternative is adopted, the price will equal C_U, while if the patented alternative is adopted, the price will equal the sum of the manufacturing cost-per-unit C_P and the per-unit royalty R_P.

With a downward-sloping demand curve D with $Q = D(P)$, the market-clearing price if the unpatented alternative is adopted will be $Q_U = D(C_U)$, while the market clearing price if the patented alternative is adopted will be $Q_P = D(C_P + R_P)$.

Using 20/20 hindsight provides little useful policy guidance. And the alternative is often to forego the benefits of standardization altogether, a "cure" that is likely to be worse than the "disease."

234. The case where the patent holder asks for running royalties expressed as a percentage of the selling price (rather than on a flat per-unit basis) is similar. If the patent holder seeks a fully-paid-up-lump-sum (FPULS) license rather than running royalties, the economic analysis is significantly different. Fundamentally, with running royalties, the royalty payments impose a marginal cost on the licensee and thus affect the licensee's profit-maximizing output choice, while under a FPULS license the marginal royalty cost is zero.

235. If there are positive recurring "fixed" costs, in a free entry/exit equilibrium, economic theory implies that price will be driven down to average total cost. We ignore this complication in the text, as it does not fundamentally alter the analysis.

If entry/exit is otherwise difficult, so that the market is oligopolistic, the basic insight of the text is unchanged, but the mathematical derivation is more complex.

There are three cases, which we consider in turn:

(1) the royalties demanded may equal the cost savings ($R_P = S$);

(2) the royalties demanded may be less than the cost savings ($R_P < S$); or

(3) the royalties demanded may exceed the cost savings ($R_P > S$).

In the first case, with $S = C_U - C_P$ and $R_P = S$, the market clearing price if the patented alternative is adopted, $(C_P + R_P)$, will just *equal* the market-clearing price C_U if the unpatented alternative is adopted, and so the market-clearing quantities in the two cases will be the same. Consumers will be indifferent between the two alternatives. Manufacturing firms will likewise be indifferent between the two alternatives; in either case, their total cost per unit is $C_U = C_P + S = C_P + R_P$.

From a *societal* perspective, however, the patented alternative is clearly *superior* to the unpatented alternative. If the unpatented alternative is adopted, society consumes more real resources (costing C_U) to make the product. If the patented alternative is adopted, the cost of production is only C_P, with a per-unit real-resource savings of S. This cost savings all accrues to the patent holder in the form of a royalty payment R_P. In other words, consumers and manufacturing firms are indifferent between the two alternatives, but the patent holder is strictly better off, and thus, society is strictly better off, if the patented alternative is adopted.

Turning to the second case, where the royalties demanded are *less* than the cost savings ($R_P < S$), if the patented alternative is adopted as the standard, competition among manufacturing firms drives prices down to $(C_P + R_P)$ which is *less* than C_U. Quantity $Q_P = D(C_P + R_P)$ will be greater under the patented alternative than under the unpatented alternative $Q_U = D(C_U)$.

Consumers benefit from adopting the patented alternative as a standard both because they pay lower prices [$(C_P + R_P)$ is less than C_U] and because, at the lower prices, more consumers are willing and able to purchase the good ($Q_P > Q_U$), thereby receiving additional consumer surplus. Manufacturing firms are indifferent, as they still earn zero profits in equilibrium. And society is better off because it avoids the higher real resource costs associated with using the unpatented alternative. In essence, some of those cost savings accrue to the patent holder in the form of royalties, and some of them

accrue to consumers in the form of lower prices.

This leaves only the third case, in which the royalties demanded exceed the cost savings ($R_P > S$). This case is illustrated in Figure 1. Let us compare what would happen if the SSO adopted the patented alternative with what would happen if the SSO adopted the unpatented alternative.

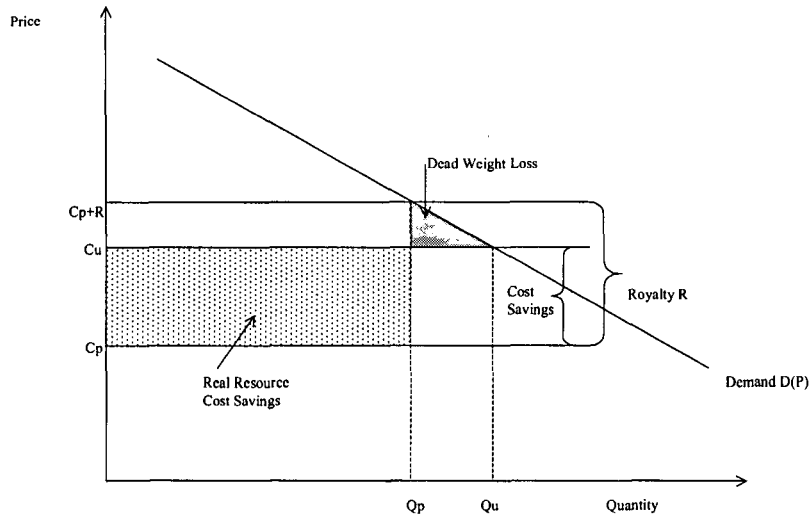

Figure 1

Because the market-clearing price (of $C_P + R_P$) is higher with the patented standard than with the non-patented alternative (at C_U), the quantity demanded is lower if the patented standard is adopted [at $Q_P = D(C_P + R_P)$] than if the non-patented standard is adopted [at $Q_U = D(C_U)$]. This in turn implies that there is what economists term a "dead weight loss" associated with adopting the patented standard, in the form of the shaded triangle shown in Figure 1. This represents the lost consumer surplus from consumers who would have purchased at a price above C_U but below $(C_P + R_P)$ but who choose not to purchase given that the price is $(C_P + R_P)$.

Set against this dead weight loss, however, is the fact that, if the *unpatented* standard is adopted, society uses *more real resources* to produce the goods that are produced. The

manufacturing firms incur the real resource cost C_U rather than the lower real resource cost C_P on each of the $Q_U = D(C_U)$ units produced. This is shown by the shaded rectangle in Figure 1. In essence, when the SSO adopts the unpatented standard, society foregoes the savings $S = C_U - C_P$ on each unit produced.

Note that, from a *private* standpoint, the SSO-member manufacturing firms would rather incur the higher cost C_U (and forego the cost savings S) rather than incur the lower costs C_P associated with the patented standard, because by doing so they can avoid paying royalties R_P which are larger than the savings S. That is, from a bargaining theory standpoint, if the patent holder announces its royalty terms R_P ex ante (i.e., *prior* to the adoption of the standard), the SSO-member manufacturing firms will choose to adopt the *un*patented alternative as the standard because, from a private-cost standpoint, they strictly prefer the unpatented alternative (with its cost of C_U) to the patented alternative (with its higher private cost of $C_P + R_P$).

But from a *societal* perspective, the net result is that the reduction in dead weight loss (the shaded triangle) can be outweighed by the extra real resources (the shaded rectangle). It is an *empirical* question which of these two offsetting factors is larger, and, thus, it is an empirical question whether society as a whole is better off adopting the patented alternative as the standard. But the key point here is that, in making that determination, the amount of the royalty payments is almost entirely *irrelevant*. From a *societal* standpoint, the royalty payments are a "wash."[236]

The above discussion of case (1) assumed that the patent holder was able to charge a royalty R_P that exceeded the cost savings S. In practice, however, faced with such a royalty demand, the SSO members would likely tell the patent holder that they would choose the non-patented standard instead, so that the patent holder would receive no royalties. Faced with a choice between maintaining its high royalty demand (and receiving no royalties) or dropping its royalty demand to a

236. This needs to be interpreted with some care, because of the phenomenon known as "rent-seeking." *See supra* note 77. Firms can and do expend real resources in an effort to appropriate larger fractions of the overall economic "rents" (surplus) for themselves. The real resources consumed in such rent-seeking behavior themselves are a social cost that must be considered.

lower level (so that the SSO would adopt the patented standard and the patent holder would receive royalty revenues), and given that a rational patent holder prefers revenues to no revenues, one would expect that, at least when the royalty rates are negotiated ex ante (prior to the adoption of the standard), the patent holder would moderate its royalty demands so that the situation fell within case (1) or case (2) above rather than case (3).

This in turn implies that adopting the patented alternative is a win-win-win situation. Society is better off because fewer real resources are used in producing the product. Manufacturers are better off (or at least no worse off) because the cost of the royalties is no more than the cost savings from using the patented technology. And, the patent holder is better off because it receives income from its invention.

However, when the royalty rates are negotiated ex post (*after* the adoption of the standard), things are somewhat more complex. It is still the case that society is better off using the (lower-cost) patented standard than the (higher-cost) unpatented alternative. And, the patent holder is better off. But when royalties are negotiated ex post, the patent holder may be able to extract royalties that exceed the cost savings. In such situations, the patent holder may be able to extract royalties that exceed the cost savings. Hence, manufacturers will be worse off having adopted the patented technology than using the unpatented (but higher cost) alternative.

Analytically, much the same economic issues arise in the more realistic case where the standard in question involves some feature of the product, and the issue is whether to adopt a patented version of the feature or a non-equivalent but unpatented version as a standard. The advantage of the current approach is that, because the features of the product are fixed, we can assume that the demand curve for the product is the same regardless of which standard is adopted.

In the more realistic case, it is necessary to control for the fact that consumers will have different willingness-to-pay for products with different features. It can be shown analytically that, when consumers uniformly value the patented product more than the unpatented alternative, and the extent of that preference is the same across all consumers, the same analysis developed above for cost-saving innovations applies to such quality-enhancing innovations, and the same conclusions apply.