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Competition Policy for Industry Standards

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I. Introduction

Standards are all around us. Screws fit into nuts thanks to standards. There are standards for weights and measures, professional certifications, time zones, money, wireless communications, plumbing fixtures, electrical components and green buildings to name just a few of the very many categories of economic activity impacted by standards. Despite the vast number of standards that impact commerce and daily life, standards often impress by their absence. Fire engines responding to the 1991 Oakland firestorm carried hoses that were incompatible with the local fire hydrants (Seek and Evans, 2004). The charger that refreshes my cell phone is unlikely to work on yours, my word processor may not be fully compatible with your word processor (or with an earlier version of my own word processor), and if we travel abroad we should bring adapter plugs – lots of them.

This chapter surveys issues raised by the development of industry standards, whether accomplished through a formal standard setting committee structure or the activities of a single sponsor. The focus is on the tradeoff between the benefits from standards and possible costs that standards and the activity of standard development may impose on consumers. A particular focus is on the consequences of intellectual property rights for standards. The topics are large and this chapter does not attempt a comprehensive survey, but rather complements several other surveys of standards and their economic impacts, examples of which include Farrell and Saloner (1987), David and Greenstein (1990), Katz and Shapiro (1994), Matutes and Regibeau (1996), Shapiro (2001), Lemley (2002), ABA (2005), and Simcoe (2006).

A. Types of Standards

Standards have different functions. Compatibility standards (also called interoperability standards) are specifications that assure that one component will function as intended with another component. For example, the Small Computer Systems Interface (SCSI) specifies how small and medium-size computer processors communicate with external devices such as disk storage devices, printers and scanners.
Interoperability standards have mushroomed with the need for computers and telecommunications devices to function smoothly with complementary components and with advances in communications between devices and over the Internet. Biddle et al. (2010) concluded that a modern laptop computer has components that implement at least 251 different interoperability standards. The sources of these standards varied with 90 developed by formal standard development organizations, 112 developed in less formal consortia, and the remainder sponsored by individual companies.

Quality and safety standards inform consumers about important product characteristics and may limit products that may be sold. The green building certification informs commercial tenants about the building’s energy performance and environment impacts. The classification scheme established by the Gemological Institute of America informs consumers about a diamond’s color, clarity, imperfections and weight. The state of California requires petroleum refiners to produce and sell gasoline that meets the California reformulated gasoline emissions standard.

Many standards help to coordinate economic activity. Interoperability standards have an explicit coordination function by ensuring that components work together. Standardized time and geographic time zones coordinate activity by allowing people to agree about the time of day. Currency standards, such as the $20 bill, help to coordinate economic exchange.

II. The Development of Standards

The International Organization for Standardization defines a standard as a “document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.”\(^1\) A broader definition embraces product or interface specifications developed through coordination or by independent action. Coordination can occur in a standard development organization (SDO) that holds regular meetings and follows defined procedures to specify and promulgate standards. Less formal organizations called standard-setting organizations (SSOs) also develop standards. As the line between SDOs and SSOs is often blurred, I use the term SSO to refer to both formal and less formal organizations that specify and promulgate standards.

SSOs can be agencies of a government, organizations that have some affiliation with a government, or private. Compliance with a standard may be mandatory, meaning that parties engaged in commercial activity covered by the standard must employ the standard. Examples of mandatory standards include analog and digital broadcast standards, fuel emission standards, state and local building codes, and reflectivity standards for highway signs. These are *de jure* standards, although that term is sometimes applied to any standard developed by a formal standard development organization. More commonly, compliance with a standard is voluntary.

Private parties, acting individually, often develop specifications or protocols that are widely adopted and become *de facto* industry standards. Examples include Microsoft’s Office Open XML file format or Hewlett-Packard’s PCL protocol for computer printers. De facto standards sometimes become adopted as formal standards. The Portable Document Format developed by Adobe is an example.

Another dimension of standards and the standard development process is the degree to which the standard or the process is “open” (Krechmer, 2009). Standard development is open if the process is transparent, participation is available to any interested party, and consensus determines the choice of a standard. The standard itself is open if it is freely available and unencumbered by intellectual property rights such as patents, copyrights, and trademarks although, according to some a standard can be open and protected by intellectual property rights if those rights are licensed to any interested party at reasonable non-discriminatory terms.

A. International standard-setting organizations

Three organizations headquartered in Geneva, Switzerland, operate at an inter-governmental level and develop standards intended for international application. ISO (the International Organization for Standardization) is a non-governmental organization that is the world’s largest developer and publisher of International Standards. The International Telecommunications Union (ITU) is an agency of the United Nations responsible for standards development in information and communication technologies. The third Geneva-based agency that develops international standards is the International Electrotechnical Commission (IEC), which provides a forum for companies, industries and governments to develop International Standards for electrical, electronic and related technologies.

B. National and regional standard-setting organizations

Several organizations set standards for adoption at a regional level. In the European Union, the European Telecommunications Standards Institute (ETSI) is responsible for standardization of information and communication technologies within Europe and is the European counterpart to the ITU. Its accomplishments include the GSM technology for mobile communications. Nearly every country has a recognized standards body that acts as the country’s representative to the ISO. In the U.S. that
body is the American National Standards Institute (ANSI). ISO representatives from other countries include the British Standards Institution, Deutsches Institut für Normung, the French Association for Standardization, the Standardization Administration of China, the Japanese Industrial Standards Committee and more than 100 others.

C. ANSI-approved and other U.S. SSOs

The American National Standards Institute (ANSI) coordinates the U.S. voluntary consensus standards system by providing a forum for the development of policies on standards issues. ANSI also accredits organizations that meet its requirements for openness, balance, consensus and due process in the development of voluntary national standards. ANSI’s members include more than 1,000 companies, government agencies, institutions and international organizations. At the end of 2006 about 200 organizations were accredited by ANSI for standards development. The total number of American National Standards at that time exceeded 10,000.

Numerous other organizations engage in standards development but are not formally accredited by ANSI either because they have not sought accreditation or because ANSI has not verified that the organizations conform to its requirements for openness, balance, consensus and due process. Nonetheless, these organizations may develop and publish standards that obtain ANSI certification and may obtain certification by one of the international standardization organizations. These organizations include influential standard-setting consortia such as the Internet Engineering Task Force and the World Wide Web Consortium.

III. Competition Principles for Standard-setting organizations

Standards benefit consumers in many ways. Quality and safety standards provide valuable information about product characteristics and can prevent the sale of potentially hazardous products. Compatibility standards benefit consumers and producers by facilitating product adoption and promoting compatible solutions. Furthermore, coordination to choose a standard can avoid or mitigate a costly “standards war” in which parties promote incompatible solutions. Competition to adopt a standard can be particularly intense and costly in markets characterized by strong network effects that support “winner-takes-all” or “winner-takes-most” market outcomes (Besen and Farrell, 1994, Shapiro and Varian, 1999). Familiar examples include the Betamax and VHS video tape formats, competing DVD formats (Drano e and Gandal, 2003), Blu-ray and HD high definition recording media, and WiMax versus LTE and other 4th generation mobile communications systems. Some standard wars splinter the market to such an extent that no winner emerges. An example is quadraphonic sound (Postrel, 1990).

Standards can impose costs by reducing the diversity of products on the market and by foreclosing or raising barriers to alternative innovations. Some exclusion is
inevitable because the pro-competitive purpose of standards is to focus industry efforts on one solution at the expense of others or to impose conditions that all suppliers must satisfy. Requiring surgeons to be board certified after years of training reduces the likelihood of being practiced upon by a charlatan, but the process of setting a quality standard can be manipulated to restrict the supply of surgeons in order to increase their compensation. Furthermore, a certification requirement that applies to all surgeons may be too restrictive for some types of medical procedures that can be performed with lesser skill sets.

Standard development can provide a venue for competitors to act jointly to exclude rivals or fix prices. At a more subtle level, a standard can facilitate collusion by making the supply of products more homogeneous, thereby making it easier for firms to monitor their rivals' prices. Product homogeneity from standardization also can soften price competition by discouraging firms from offering competitive alternatives that depart from the standard. A standard that requires refrigerator manufacturers to meet or exceed an efficiency standard can increase costs, raise barriers to entry, make it easier for manufacturers to collude on higher prices, and prevent competition from cheaper units that do not meet the efficiency standard. Of course any adverse effects would have to be balanced against the benefits from lower energy usage.

The timing of standard development also can have social costs if the process moves too slowly and delays pro-competitive solutions or if the process moves too quickly and pre-maturely focuses market activities on an inferior technology, such as occurred in Japan for high definition television (Farrell and Shapiro, 1992).

A. Standard setting as a venue for price fixing and exclusion

Standard setting is likely to encounter antitrust concerns if the practice directly limits price competition. For example, in *National Society of Professional Engineers v. United States*, a professional society's canons of ethics prohibited members from submitting competitive bids for engineering services. The Supreme Court affirmed an injunction prohibiting the association from adopting the rules or similar guidelines.²

The U.S. Federal Trade Commission challenged an agreement by the National Macaroni Manufacturer’s Association concerning the relative proportions of wheat grains used in macaroni products, which the Commission argued was intended to moderate price competition for wheat grains that were in short supply. A court of appeals held that the actions of the Association constituted a combination to

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² Case citations are listed at the end of this chapter. The discussion of antitrust law in this chapter is limited to U.S. case decisions and is intended for illustration and not as a survey of the relevant law.
unlawfully fix prices constituted in violation of Section 5 of the Federal Trade Commission Act.

Several cases have alleged anticompetitive exclusion of rival practices or technologies by members of an SSO. In *Wilk v. American Medical Ass’n*, the plaintiff challenged a resolution adopted by the American Medical Association that labeled chiropractors “an unscientific cult” and implicitly made it unethical for a physician to associate with a chiropractor. The court required the AMA to retract this resolution, finding that the AMA failed to show that it was justified by a concern for patients. In *TruePosition Inc. v. LM Ericsson Telephone Company, et. al*, the plaintiff alleged that defendants conspired to block the adoption of TruePosition’s technology for enabling emergency responders to more accurately locate mobile phone users into new standards being developed for 4th generation wireless networks in favor of their own technologies. The defendants petitioned the court to dismiss the case, but the court refused, allowing the case to move forward.

**B. Standard-setting as a joint venture**

An organization that brings representatives of independent firms together to develop a standard is a joint venture. The participants in the SSO often include competitors and if the standard is successful, it is likely to have an effect on competition and prices. Firms that employ the standard in their products and the consumers that buy them are likely to benefit, while firms and consumers that are stranded with incompatible products may suffer.

With few exceptions, antitrust authorities have accepted the choices determined by standard-setting organizations if standards were developed following an open and transparent process, participation in standard setting is unrestricted and non-discriminatory, and compliance with the standard is voluntary. Yet unlike the outcome of market competition that generally benefits consumers by resulting in lower prices, there is no corresponding “invisible hand” principle that standard setting bodies will coordinate on the best standard, even if the process of standard setting is open and transparent.

To illustrate the problem, suppose there are two alternative standards X and Y and three types of economic agents affected by the standard, labeled A, B, and C. Each type has one vote in a standard-setting organization. Table 1a shows the net benefit to each type of economic agent from standard X and standard Y.
Table 1a. Values that SSO participants place on alternative technology choices

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In Table 1a, technology X is has greater total social benefit. It has a total net benefit of 12 and technology Y has a total net benefit of 11. Agents B and C would vote for technology A, and it will prevail if the SSO follows a majority (or 2/3 majority) voting rule.

Table 1b differs from Table 1a only in that agent A places a value of 10 on technology Y, rather than 6. As a result technology Y is the socially superior choice because it has a total net benefit of 15, compared to 12 for technology X. But technology X will prevail if the SSO follows a majority (or 2/3 majority) voting rule.

Table 1b. Values that SSO participants place on alternative technology choices

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The point of this simple illustration is that due process with open representation does not ensure that standard-setting organization will make choices that maximize total welfare. Arrow (1950) established this result as a theorem that voting rules generally cannot assure outcomes that satisfy reasonable conditions for rational choice. This does not imply that consensus rules cannot be efficient. If the members of a standard-setting organization fairly represent the interests of all the parties that may benefit from the standard, the participants in the SSO may have opportunities to steer votes toward socially desirable outcomes. In the example corresponding to Table 1b, agent A may offer two units of value to agent B (or C) in return for a vote in favor of technology Y. But the opportunities for such trades may be limited.

Standard-setting organizations develop and promulgate thousands of standards that constrain the desired business strategies of some of their members. Although courts have been sensitive to antitrust issues that may arise in the context of collaboratively set standards, they generally have focused on circumstances involving the manipulation of the standard-setting process or the improper use of the resulting standard to gain competitive advantage over rivals rather than on the merits of alternative standards. In this respect the courts’ actions are consistent with monopolization cases in which the focus is typically on practices that may
interfere with competition to become dominant rather than dominance itself. In *U.S. v. Microsoft*, the court did not dwell on whether a different platform would be superior to the Windows platform. Rather, the focus was whether the Microsoft interfered with the competitive process that determined the dominant platform.

C. Corruption of the standard-setting process

Courts have intervened when there is evidence that the standard-setting process has been manipulated to favor particular interests (Anton and Yao, 1995). ANSI accreditation requires that standards developers adhere to principles of consensus, due process and openness. According to ANSI, any organization, company, government agency, or individual with a direct and material interest in the activities of the standards body should have a right to participate in the development and selection of the standard. Consensus does not mean unanimity, but rather an absence of sustained opposition to substantial issues (Farrell and Simcoe, 2012).

1. Vote-stacking

A potential abuse of the standard-setting process involves “vote-stacking” in which members of a standards body recruit participants to vote affirmatively for their interests. *Allied Tube & Conduit Corp. v. Indian Head* concerned approval by the National Fire Prevention Association (NFPA) of a standard for the use of plastic conduit for electrical wiring. The NFPA publishes the National Electrical Code, which establishes requirements for the design and installation of electrical wiring systems. Indian Head, a manufacturer of plastic conduit, submitted a proposal to extend the Code to approve the use of plastic as well as the conventional steel conduit. The proposal was approved by one of the NFPA’s professional panels, and under the Association rules could be adopted into the Code by a simple majority of the members attending the Association’s annual meeting.

Before the meeting was held, Allied, the largest producer of steel conduit in the U.S., members of the steel industry, other steel conduit manufacturers and independent sales agents collectively agreed to recruit new Association members whose only function was to vote against the proposal to approve the use of plastic conduit. Their recruiting efforts were successful and the proposal was defeated. In response Indian Head sued alleging that Allied and others had unreasonably restrained trade in the electrical conduit market in violation of § 1 of the Sherman Act. A jury delivered a verdict that the conduct violated the antitrust laws.

The case subsequently endured reversals and appeals, largely focusing on whether the conduct was permissible activity to influence legislation because the National Electrical Code was routinely adopted into law by a substantial number of state and 

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local governments. The Supreme Court ultimately sustained the jury verdict and agreed that the proper standard was whether the anticompetitive effects of Allied’s actions outweighed any procompetitive benefits of standard setting. The Court stated that “What [Allied] may not do (without exposing itself to possible antitrust liability for direct injuries) is bias the process by, as in this case, stacking the private standard-setting body with decisionmakers sharing their economic interest in restraining competition.” The Court, however, did not define “stacking” nor did it explain why vote stacking should not survive a rule of reason analysis.

While the recruiting of participants in a standard-setting organization with instructions to support or oppose proposed standards appears improper on its face, participation in standard setting meetings is driven by economic interests and firms with more at stake in the standards process tend to supply more participants to relevant standard-setting organizations (Simcoe, 2012). Vote stacking could be defined as recruiting participants who are not employees of interested firms, but that distinction has little substance for large firms that can tap a large labor pool as potential representatives.

Furthermore, it is not clear without further analysis that vote stacking results in inferior economic outcomes compared to more limited representation in a standard-setting organization. If vote stacking is defined by recruiting more participants than are necessary to evaluate the merits of proposed standards, this activity clearly incurs social costs that include the recruiting efforts and the opportunity costs of the recruited participants. It is likely that firms will incur recruiting costs in proportion to the private benefits they expect from their preferred standard. A firm that expects to benefit from a particular standard has an incentive to incur costs to achieve that standard, even if the social value of the standard is small compared to an alternative. Private values, and not social values, motivate standardization efforts regardless of whether participants are allowed to pack standard setting committees with friendly voters.

Despite its costs, vote stacking could have plausible benefits compared to a majority or super-majority voting rule, which does not necessarily select the best standard. Vote stacking is similar to what is called an “all pay auction”. In an all pay auction the bidders pay the amounts they bid regardless of whether their bids are successful. Examples of conduct with characteristics of an all pay auction include election campaigns, political lobbying, and research and development competition for a patent or for a technology with strong network effects. In the vote stacking analogy the “bid” is the cost of recruiting participants in the standard-setting organization with instructions to vote for or against a proposal on behalf of a party with interests in the outcome.

Suppose two firms participate in the standard setting process and choose to support either of two technology standards. Let $X_1$ be the value of standard 1 to firm 1 and
\( X_2 \) the value of standard 1 to firm 2. Standard 2 has value \( Y_1 \) to firm 1 and \( Y_2 \) to firm 2. Firm 1 prefers standard 1 if \( X_1 > Y_1 \) and firm 2 prefers standard 2 if \( Y_2 > X_2 \). Let \( V_1 = X_1 - Y_1 \) and \( V_2 = Y_2 - X_2 \) and suppose both \( V_1 \) and \( V_2 \) are positive, so that firm 1 strictly prefers the first standard and firm 2 strictly prefers the second standard. Furthermore, assume that \( V_1 > V_2 \), which implies that standard 1 has a higher total value to both firms than does standard 2 (that is, \( X_1 + X_2 > Y_1 + Y_2 \)).

Firm 1 is willing to pay up to \( V_1 \) to get its preferred standard and firm 2 is willing to pay up to \( V_2 \) for its preferred standard. These are the private values of standards to each participant and not their social values. Nonetheless, vote stacking might result in desirable outcomes if the private values of alternative standards are proportional to their social values.\(^4\) Further analysis, however, shows that even with this favorable assumption, vote stacking does not necessarily result in the certain selection of the best standard.

To see this, suppose that a simple majority vote is sufficient to adopt a standard, a firm's costs increase with the number of recruited voters, both firms incur costs to recruit voters, and firm 1 recruits more voters than firm 2. This cannot be a profit-maximizing outcome for firm 2. Firm 2 will not prevail in the contest for the desired standard, so it may as well cut its losses by not recruiting any voters. But if firm 2 does not recruit voters, then firm 1 can save by recruiting fewer voters. If firm 1 recruits fewer voters, firm 2 might then increase its recruiting efforts to prevail in the standard selection. This circular argument shows that there is no “pure strategy equilibrium” of this competition in which each firm knows how many voters will participate in the standard setting process. A profit-maximizing equilibrium exists, however, if the firms play a “mixed strategy” in which the firms recruit a random number of voters.

An implication of random recruiting is that each firm has some positive probability of obtaining its desired standard for otherwise it would not incur the cost of recruiting voters. Hillman and Riley (1989) analyze an all pay auction that is similar to this example and show that if \( V_1 > V_2 \), the probability that technology 1 wins the auction and is adopted as a standard is equal to \( 1 - \frac{1}{2} \frac{V_2}{V_1} \). Thus, if \( V_2 \) is only half as large as \( V_1 \), the probability that vote stacking will result in a win for technology standard 1 is only 75 percent; there is a 25 percent technology that the inferior technology will emerge as the standard.

This analysis shows that vote stacking incurs social costs and does not necessarily result in the selection of a standard with the greatest social benefits relative to alternatives. The analysis is only an example. Modifying the voting rule for adopting

\(^4\) That would be the case if the ratio of producer to consumer surplus is the same for the alternative standards.
a standard from a simple majority to a supermajority introduces complications because it is possible that no technology wins a sufficient plurality to gain adoption as a standard. The incentive to recruit randomly could disappear if technology values and the correspondence between votes and recruiting effort are uncertain, however this does not assure that socially desirable standards will emerge from a process that allows parties to recruit participants in standards committees to vote on their behalf.

Despite the fact that the example in this section is highly simplified, it provides cause to doubt whether allowing parties to a SSO to recruit members on their behalf may lead to better technology adoption decisions than would occur with restrictions on vote stacking. Furthermore, packing standard setting committees with disinterested participants can frustrate negotiations that could lead to adoption of a socially desirable standard. These are reasons why the recruitment of voters in standard setting committees should potentially fail a rule of reason test, as in Allied Tube v. Indian Head. Of course standard selection committees do not necessarily converge on the standard with the greatest social benefit even if interested parties do not pack committees with friendly voters. Furthermore, it is difficult to know how to draw the line between vote stacking and the supply to a standard selection committee of numerous participants that represent a party’s private interests.

2. **Disparagement of alternative proposals**

Another example of alleged subversion of the standard-setting process is in American Society of Mechanical Engineers v. Hydrolevel Corp. The plaintiff Hydrolevel was a manufacturer of low-water cut-off valves for boilers. Hydrolevel alleged that a member of the American Society of Mechanical Engineers (ASME) subcommittee employed by a competitor improperly induced the subcommittee chairman to issue a letter indicating that Hydrolevel’s product did not meet the ASME’s safety standards. The jury found that “ASME has conspired with others to restrain trade unreasonably ... by disparaging Hydrolevel’s cut-off through a misrepresentation of the Boiler and Pressure Vessel Code.” The Supreme Court affirmed the verdict, noting in its opinion the potential for competitors to abuse the process of standard setting in order to gain improper advantage in the marketplace.

**IV. Competition principles for unilaterally-determined standards**

Standards that are sponsored by a single entity sometimes achieve broad market acceptance without the imprimatur of a standard-setting organization. Examples include the Intel x86 microprocessor architecture, Microsoft’s Windows application programming interfaces, Apple Quicktime, and Adobe Flash. These standards are typically proprietary, meaning that the firm that sponsors the standard (and possibly others) own intellectual property rights that cover use of the standard. Proprietary standards may be licensed separately or bundled with a product.
Firms often have strong incentives to promote the use of a standard, particularly in markets with network effects that reinforce demand. Sponsors of alternative standards may compete to become the dominant standard by subsidizing sales in the short run or by engaging in activities such as bundling a product employing the standard for free with other products that increase the opportunity to gain market acceptance for the standard. Sometimes firms are successful in promoting a standard and enjoying the benefits of network effects while maintaining ownership of the standard. Other times firms choose to relax control of a proprietary standard, trading off competition with broad market acceptance for dominance of a smaller market. Adobe licensed its Portable Document Format standard without charge before it was released as an open standard published by the ISO. Cisco licenses its Telepresence Interoperability Protocol for videoconferencing on a royalty-free basis.

Several cases have alleged unlawful unilateral conduct among sponsors of alternative standards in the competition to become a dominant standard, although assessing when such competition represents competition on the merits and when it crosses the line to become exclusionary is often difficult. In *U.S. v. Microsoft*, the complaint initially included allegations that Microsoft distributed its Internet Explorer browser for free, but the Department of Justice did not pursue a predatory pricing theory at trial and the district court opinion noted that Microsoft’s free distribution of Internet Explorer benefited consumers. Neither did the Department challenge premature announcements of new products in an attempt to capitalize on network effects by attracting a base of customers through a bandwagon effect or by maintaining an installed base of customers by encouraging customers to forestall purchases of competing products (Farrell and Saloner, 1986).

In the contest to promote a desired standard a firm may take actions that disadvantage a competing standard. Conduct by a firm with monopoly power that excludes rivals by foreclosing access to efficient distribution channels or inputs can raise antitrust concerns if there are no offsetting benefits. The complaint in *U.S. v. Microsoft* is an example of such an allegation, focusing on conduct by Microsoft to deny distribution opportunities to Netscape’s Navigator web browser. The Netscape browser did not compete with the Microsoft Windows operating system, and indeed was a complement to the operating system and increased its value. However, the complaint alleged an “applications barrier to entry” to competitors of the Windows platform that could be surmounted by providing Netscape Navigator as an alternative platform for applications. By foreclosing Netscape’s browser, Microsoft sought to maintain the applications barrier to entry to the development of competing platforms.

When a firm controls a compatibility standard, the firm may promote or discourage the supply of interoperable products and services by other parties. Interoperability embraces a wide range of activities including physical compatibility, software
interfaces, digital rights management (such as Apple’s Fairplay technology for iTunes) and communications protocols, and is a matter of degree. A firm that controls a component of a system can benefit from competition that lowers the prices and increases the diversity of complementary components, which makes the system more attractive to consumers and increases their willingness-to-pay for the component. However, the owner of a component that is necessary to achieve interoperability may choose to limit intra-platform or inter-platform compatibility to pursue a strategy of price discrimination or to raise barriers to new competition (Farrell, 2007). A firm can use control over a complementary component such as replacement printer cartridges to meter demand and charge higher prices to more intensive users. The Microsoft case illustrated the control of compatibility to raise barriers to entry. Sponsors of compatibility standards can control interoperability through trade secrets, access to copyrights and patents, contractual restrictions, and frequent design changes (Samuelson, 2009).

While antitrust policy frowns on conduct by a firm with monopoly power that excludes rivals with no offsetting benefits, a firm generally has no obligation to promote its rivals’ products or a rival standard (Garza, et al, 2007). The economic welfare effects of interoperability are complex and depend on particular market circumstances. Interoperability often promotes consumer welfare by increasing the diversity of complementary products and by encouraging competition among suppliers of those products. This can promote a virtual cycle that results in lower costs and greater consumer benefits if there are scale economies or positive network effects. However, compatibility also can incur costs by limiting technological alternatives and can impede competition in some circumstances.

Sellers of incompatible systems can have greater incentives to innovate than sellers of compatible components. Selling a system offers greater sales to amortize research and development expenditures compared to selling an individual component (Farrell and Weiser, 2004). Network effects reinforce the expectation of a high reward because a single product or standard is likely to dominate a market when network effects are large. The expectation of a high reward motivates firms to compete aggressively to become dominant. While consumers may pay a price for market dominance, they also benefit from the intense competition that occurs in the battle for dominance (Shapiro and Varian, 1999, Farrell and Klemperer, 2007).

When markets can support different incompatible systems, competition among those systems can benefit consumers relative to a market with compatible components. When a firm sells a system whose components are incompatible with the components of other systems, the sale of another unit earns a margin on all of the firm’s system components. This margin is an inducement to cut prices to win the sale. In contrast, when a firm sells a compatible component, some of the benefit of a price cut is lost to other sellers of compatible components by increasing the demand for those products (Matutes and Regibeau, 1988). When firms sell
incompatible systems, the increased incentive for price competition benefits consumers, although compatibility also benefits consumers by increasing the diversity of available products and by facilitating competition among independent suppliers of complementary components. Thus there is no simple conclusion that “compatibility” is always superior to “incompatibility.”

V. Intellectual property

The focus of this section is on patents that are essential to comply with a standard, although much of the discussion also applies to other intellectual property rights such as copyrights and trademarks. Standard-setting organizations differ in their policies with respect to developing standards that require access to proprietary intellectual property rights. The American National Standards Institute patent policy states “There is no objection in principle to drafting an American National Standard (ANS) in terms that include the use of an essential patent claim (one whose use would be required for compliance with that standard) if it is considered that technical reasons justify this approach” (ANSI, 2008). Other standard-setting organizations, such as the World Wide Web Consortium, are less receptive to proprietary technologies. With some exceptions, the World Wide Web Consortium’s patent policy requires that licenses for essential patents be made available on a royalty-free basis.

When firms own intellectual property that is necessary to employ a standard, there is a potential tension between what Simcoe (2006) calls value creation and value capture. The cost of proprietary intellectual property rights limits the adoption and use of a standard and interferes with the potential value that the standard can create. Owners of intellectual property rights may accept this limitation if those rights enable the owners to appropriate a greater share of the value created by the standard. This tradeoff, however, omits an additional tension, which is that intellectual property rights provide incentives for innovation and for innovators to participate in the development of standards.

A. The potential for patent holdup

Firms and consumers often make investments that are specific to the use of a particular standard, such as applications for the Windows operating system, interface designs for computer memories, or a library of DVDs. Switching to a different technology, such as an Apple computer or different optical recording medium, may require new investments. Firms and consumers are “locked in” to a standard if it is not economically feasible to incur the costs of switching to a new standard. Even if irreversible investment costs are not large the difficulty of coordinating substitution to an alternative technology can pose a barrier to switching, particularly when technologies exhibit networks effects, as is often the case for interoperability standards.
When firms and consumers are locked in to the standard, owners of proprietary rights that are essential to comply with the standard can have the economic power to charge high royalties and impose burdensome licensing terms. The term “patent holdup” is sometimes used to characterize attempts to charge such high royalties or impose burdensome terms “ex post”, after firms and consumers have made investments that are specific to a standard.

If participants in a standard-setting organization are aware of the existence of proprietary rights that cover a proposed standard and the likely royalties that may be charged for those rights “ex ante”, before firms and consumers make investments that are specific to a proposed standard, they can make informed decisions that account for the risk of holdup. A minimum requirement for informed decision-making is disclosure of patents that are essential to make or use products that comply with a standard. The term “patent ambush” is sometimes used to describe the activity of charging allegedly high royalties following a failure by a participant in a standard-setting organization to disclose to the SSO’s members the existence of the patent or patent application when the standards are first established.

Standard-setting organizations differ in their disclosure policies (Lemley, 2002, Bekkers and Updegrove, 2012) and competition authorities have been reluctant to impose rigid disclosure rules. Mandatory disclosure is complex and expensive, particularly for technologies in a crowded patent space. MPEG LA lists more than 900 essential patents and 150 essential patent families for the MPEG-2 standard. Participants in the ETSI standard-setting organization declared more than 750 U.S. patents as essential to W-CDMA, a third generation mobile telecommunications standard (Bekkers et al., 2011), and more than 500 unique patent families as essential to the fourth generation LTE cellular standard (Blind et al., 2011). Note that a declaration of an essential patent is not a confirmation that the patent is actually essential to a standard.

Furthermore, a disclosure requirement for planned patent applications may force firms to expose valuable trade secrets, potentially jeopardizing future patent protection by contributing inventions to the common pool of knowledge, and may discourage firms from participating in the standard setting process. An alternative to mandatory disclosure is a blanket commitment in which SSO participants agree to license any essential claims at reasonable terms without disclosing patents in advance. While a default commitment to license any standard-essential patent at RAND terms may address the problem of patent ambush, it leaves uncertain whether particular patent claims cover a particular proposal. Understand the extent of essential patent claims is material to the evaluation of alternative proposals when the nature of the licensing commitment is uncertain. For this reason blanket...

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5 MPEG LA, MPEG-2 Patent Portfolio License Briefing, August 4, 2010, at 4. A patent family is a set of patents filed in different countries for a particular invention.
disclosures are more common when SSOs, such as the World Wide Web Consortium, require royalty-free licensing commitments.

B. Reasonable and non-discriminatory licensing commitments

If a patented technology is essential to comply with a standard, most standard-setting organizations, and all ANSI accredited SDOs, require the patent owner to make a license available for the purpose of implementing the standard either royalty free or under reasonable terms that are free of any unfair discrimination. The latter condition is called a RAND (reasonable and non-discriminatory) or FRAND (fair, reasonable and non-discriminatory) licensing obligation, and the former is called RF (for royalty free) or F/RAND-z, for zero royalty. SDO policies may differ or be silent on important issues including the obligations of patent owners to disclose patents and patent applications (or other intellectual property) that they represent to be essential to a proposed standard, the specifics and contractual form of RAND licensing obligations, whether standard-essential patents (SEPs) are limited to patents with claims that are technically necessary to comply with a standard or may include patents that are commercially necessary, whether licensing obligations remain in force if a member withdraws from the SSO, whether licensing obligations travel with the patent if they are sold or assigned to another entity, and the consequences for failing to abide by the SDO’s policies.

1. RAND royalties

Competition authorities and a number of scholars have endorsed the principle that a “fair and reasonable” royalty should reflect its incremental value relative to the next-best alternative assessed before firms and consumers make investments that are specific to the technology. The Federal Trade Commission (2011) concludes that “Courts should cap the royalty at the incremental value of the patented technology over alternatives available at the time the standard was chosen.” Swanson and Baumol (2005) suggest that standard-setting organizations should conduct an auction in which sponsors of patented technologies submit bids that describe their intended licensing terms.

While the incremental value principle has theoretical appeal (see, e.g., Farrell et al., 2007), it does not have general acceptance as the interpretation of fair and reasonable licensing terms (Patterson, 2002). Some commentators have argued that a licensing agreement is fair and reasonable if it is the outcome of arms-length bargaining, even if that bargaining occurs after firms and consumers have made investments that are specific to a standard (see, e.g., Geradin and Rato, 2007). Furthermore, no SSO has yet offered a workable definition of RAND licensing terms.

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6 I make no distinction between “RAND” and “FRAND”. Note that royalty free license is not the same as an agreement not to assert a patent right, because a license may be royalty free but impose other terms and conditions.
and, despite numerous opportunities, no U.S. court has yet endorsed a particular methodology to assess when royalty terms fail to be fair or reasonable.

The determination of a fair and reasonable royalty for a patent is particularly difficult when the patent is one of many that are essential to practice a standard, as is often the case for compatibility standards. Every essential patent has a potential claim to the entire value of the product for which they are essential, because by definition the product cannot be made, sold or used without access to each essential technology. However, this yields a contradiction when there is more than one essential patent. Approaches such as assigning equal values to essential patents are arbitrary, as patents may differ in quality and in the extent to which they are essential for different products that comply with a standard.7

Furthermore, patent owners often have different business models that affect their assessments of a reasonable royalty. Firms that sell products that embody patented technologies are technology implementers. These firms may be content to earn revenues primarily from the sale of products rather than from patent licenses. Other firms, including those that specialize in technology innovation, have business models that depend on earning revenues from patent licensing. A technology implementer may be unaccustomed to charging or paying significant royalties, while a technology innovator may deem a royalty to be unreasonable if it does not provide an adequate return on investment.

If some patent owners are content to charge low royalties, this increases the net value available to other patent owners. Suppose there is a technology for implementing secure wireless communications that is worth $2 more than the next best alternative for every handset that employs the technology. Furthermore, suppose that ten patents are essential to make, sell, or use that technology. An equal allocation of the $2 value would allocate $0.20 to each patent, ignoring any other inputs that may be necessary to achieve the technology’s value. But suppose that five of the patent owners would be content to license their patents at a zero royalty. That leaves the full $2 value for allocation to the remaining five patents. With an equal allocation rule they could each charge a “reasonable” royalty of $0.40.

When multiple patents are essential to use a standard and some technology implementers are content to charge zero or low royalties, this leaves more “headroom” for other patentees to charge relatively higher royalties. It is open question whether these higher royalties would be considered fair and reasonable. For a patent owner that is accustomed to licensing technology without charge or for less than its apportioned value of $0.20, allowing other owners of essential patents to charge more than $0.20 may appear unreasonable.

7 For illustrations of royalty allocations for complementary technologies under different assumptions, see Layne-Farrar et al. (2007) and Salant (2007).
2. **RAND and cross-licenses**

Firms often enter into cross-licensing arrangements of large patent portfolios (Grindley and Teece, 1997). These arrangements give the parties the ability to operate free of patent disputes in a broad area of economic activity. Parties may enter into cross-licensing arrangements that involve patents with RAND commitments. However, insistence on a cross-license as a condition for a license to a patent with a RAND commitment complicates the determination of the royalty in the transaction because the royalty depends on the values of the patents that are cross-licensed.

For illustration, putting aside the ambiguities of RAND, suppose there is agreement that the RAND royalty for a standard-essential patent is $0.50 per unit. Suppose the owner of the patent refuses to license the patent if the licensee does not offer a royalty-free cross-license to its own patents. If the licensee's patents are also worth $0.50 per unit, this is equivalent to a transaction in which the standard-essential patent is licensed at its RAND value of $0.50 per unit. But if the licensee's patents are worth $1 per unit, the implicit royalty for the standard-essential patent is $1, which exceeds its RAND value.

Allegations of cross-licensing demands that violate RAND commitments play at center stage in the smartphone patent wars. Motorola and other suppliers of smartphones own patents that have been declared essential for communications employing cellular and wireless network standards such as the 3rd generation UMTS standard and 802.11 Wi-Fi and are subject to RAND licensing commitments. Apple owns patents on desirable smartphone features such as pinch-to-zoom and text recognition. These technologies have not been declared essential to a standard and are not subject to RAND licensing commitments, and until recently Apple owned no standard-essential patents. \(^8\) Motorola accused Apple of violating its RAND-encumbered SEPs (see, e.g., Apple v. Motorola) and offered to license these patents to Apple, but at a royalty that Apple considered to be excessive. \(^9\) Alternatively, Apple represented that Motorola offered to cross-license its SEPs if Apple would enter into a cross-license to its smartphone patent portfolio. \(^10\) This offer would be a

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\(^8\) Apple acquired rights to numerous standard-essential patents through its participation in the acquisitions of patent portfolios previously owned by Novell and Nortel.

\(^9\) In Apple v. Samsung, the court concluded that Motorola did not establish that its royalty demand based on a portfolio value equal to 2.25% of Apple’s product revenues was consistent with the requirements of a RAND royalty. In a separate case involving different products, an Administrative Law Judge concluded that Motorola’s offer to Microsoft of a 2.25% royalty “could not possibly have been accepted by Microsoft” (In the Matter of Certain Gaming and Entertainment Consoles).

\(^10\) The European Commission reported that “[A]ccording to Apple, Motorola Mobility has insisted that Apple cross-license its full non-SEP portfolio in exchange for Mototola
Hobson’s choice if the cross-license effectively values the RAND encumbered patents at a royalty similar to or larger than Motorola’s initial royalty offer for its SEPs.

3. **RAND and injunctions**

A patent gives its owner the right to exclude others from making, using or selling the article protected by the patent, but that right is not unconditional, as the Supreme Court noted in its *eBay v. MercExchange* decision. The right to exclude is a powerful tool for a patent owner even if it is not exercised because the patent owner can use the threat of exclusion to negotiate more favorable licensing terms (Farrell and Shapiro, 2008). The exclusion threat is particularly powerful when firms and consumers make investments that are specific to the standard. The opportunities for a technology user to avoid infringement by designing around a patent are severely limited when the patented technology is essential to comply with a standard. If the patent covers a feature in the 802.11n Wi-Fi standard, eliminating that feature could make a product inoperable for wireless connectivity. The power of the exclusion threat is compounded when the patent covers one of many technologies that are essential to make or use a product (Gilbert, 2010). Returning to the example of ten patents that are essential for a technology that has a value of $2, a single patent owner can demand the full $2 if it can exclude others from its patent even if nine other patents are also essential to the technology.\(^\text{11}\)

If a RAND commitment requires a patentee to forego the threat of an injunction, this has profound implications on licensing negotiations because it puts courts in the position of determining a reasonable royalty instead of possibly granting an injunction if parties cannot agree to licensing terms. Arguably, the commitment to license is the RAND promise’s core function and meaning (Miller, 2007). It is not, however, settled that a RAND commitment foregoes the opportunity for a patentee to seek injunctive relief. Some argue that the RAND commitment is by definition an obligation to grant a license and therefore is plainly inconsistent with a demand for injunctive relief,\(^\text{12}\) while others maintain that an injunction is warranted if the patent owner makes a reasonable licensing offer that is refused. A middle ground limits injunctions to circumstances in which the owner of a patent with a RAND commitment has made a licensing offer that a court has validated as being

\(\text{\textsuperscript{11}}\) In *Apple v. Motorola*, a witness for Motorola claimed that a single essential patent can command 40-50% of the value of the entire portfolio, even if the portfolio includes 100 essential patents. The court, however, rejected this claim.

reasonable, the offer was refused, and continued infringement of the patent would create injury that could not be compensated.

Patent owners are testing the limits of injunctive relief for patents subject to RAND commitments by bringing infringement suits to the International Trade Commission. The ITC provides a venue to adjudicate infringement of intellectual property through the importation and/or sale of imported goods under 19 U.S.C. §1337 (commonly referred to as "Section 337"). The ITC has the power to prohibit imports from entering U.S. borders (an exclusion order) or to prohibit parties from distributing or selling infringing articles from existing U.S. inventories (a cease and desist order) (Yeh, 2012). The Commission has some flexibility to tailor the scope of the order and to delay its onset, but unlike the courts, the ITC lacks the authority to award monetary damages for patent infringement. Since many products are manufactured abroad, the ITC is often available as a venue for patent holders to challenge alleged infringers. In 2011 every major smartphone manufacturer was a party to a patent infringement action at the ITC (Chien and Lemley, forthcoming).

As a form of injunctive relief, the threat of an exclusion order at the ITC can allow owners of standard essential patents with RAND commitments to negotiate royalties that are inconsistent with those RAND commitments. In deciding whether to issue an exclusion or cease and desist order for patent infringement the Commission has scope to consider the public interest, which includes findings on the public health and welfare, competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, and United States consumers. The ability to hold up an industry by refusing to license standard-essential patents with RAND commitments at reasonable terms has important consequences for competitive conditions in the U.S. economy and for U.S. consumers. In past cases the Commission has only very rarely invoked these considerations to permit infringing imports. The Commission has notified requests for statements about public interest impacts in its proceedings relating to patents with RAND licensing obligations, however the extent to which the Commission will consider these effects has yet to be determined.

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14 19 USC § 1337 - Unfair practices in import trade.
4. **Sales and assignments of RAND-encumbered patents**

Another factor that is relevant to the RAND commitment is whether it binds the patent or only its owner. If it is the latter, the RAND commitment may be lost if the patent is sold or assigned to a party that has not made a commitment to license its patents on RAND terms. Patents are easily sold or assigned. Reneging on a RAND commitment does not fit neatly into traditional antitrust paradigms that focus on collusion or the acquisition or maintenance of monopoly power. Nonetheless, it is clear that a RAND commitment is toothless if the commitment does not remain with a patent that is sold or assigned to a different party.

The U.S. Federal Trade Commission alleged that Negotiated Data Solutions (N-data) reneged on a RAND commitment for a patent that was declared essential to the IEEE’s Ethernet local area networking standard. The Commission challenged N-data’s conduct as an unfair method of competition and unfair acts or practices under Section 5 of the FTC Act.

C. **Antitrust concerns from failure to disclose standard-essential patents**

The failure of a patent owner involved in standard setting to disclose the existence of a patent or patent application that covers a proposed standard may give rise to a monopolization claim under the antitrust laws if there is a specific intent to monopolize a market, anticompetitive conduct, and the acquisition of a monopoly or a dangerous probability of successful monopolization. Patent ambush monopolization claims have been brought by private parties and by government antitrust enforcement agencies. In *Dell Computer Corp.*, the FTC complained that Dell falsely certified to the Video Electronics Standards Association (VESA) standard-setting organization that it did not own patents that covered a standard for communicating information between a computer’s central processor and peripheral devices (a computer “bus”). Dell sought to enforce its patent rights after adoption of the VESA-approved bus. Dell and the FTC entered into a consent decree prohibiting Dell from enforcing its patent rights on the VESA bus design.

Patents also were at stake in a complaint brought by the FTC against the Union Oil Company of California (Unocal), alleging failure by Unocal to disclose that it owned patent rights covering a proposed standard for reformulated gasoline that was subsequently adopted by the California Air Resources Board. Unocal agreed not to enforce its relevant patents as part of a consent order for its acquisition by Chevron.\(^\text{15}\)

In a case with a long history involving government and private plaintiffs, the Federal Trade Commission charged Rambus with failing to disclose patent applications covering standards for dynamic random access memory devices (DRAMs) developed by the Joint Electron Device Engineering Council (JEDEC). Rambus participated in the JEDEC committee for DRAM standards for a period of time during which it did not disclose that it had patent applications that covered standards being developed for DRAMs. The FTC alleged that Rambus's silence and subsequent enforcement of its patents was a patent ambush in violation of Section 5 of the Federal Trade Commission Act.

An FTC administrative law judge dismissed the Rambus complaint, concluding that JEDEC policies did not obligate Rambus to disclose its patent applications and that its conduct was not anticompetitive. The Commission, however, reversed the ALJ's decision. Rambus appealed the Commission verdict and the Court of Appeals ultimately decided in its favor. The court noted that Rambus had no patent applications on file when it left JEDEC and that JEDEC policies did not clearly require disclosure of unfiled but planned applications for patents that may be necessary to make or use standard-compliant products. Furthermore, the court concluded that the Commission did not prove that JEDEC's members would not have chosen the Rambus technologies even if they were aware of its patent applications. The lack of disclosure would have had no competitive effect if JEDEC's members would have included the Rambus technologies in its DRAM specification without insisting on a RAND commitment. The fact that JEDEC's members might have imposed a RAND licensing condition if they had been aware of the Rambus patent applications did not sway the court. The court reasoned that even a monopolist has latitude to determine its prices without triggering antitrust liability.

The court drew a distinction between the unlawful acquisition of a monopoly and conduct that allows an otherwise legitimate monopolist to increase its price. The court reasoned that to the extent that Rambus had a monopoly it was a consequence of its lawful patents, and given that monopoly it was not an antitrust violation for Rambus to set a high price. Indeed, the court noted that a higher price encourages more competition from alternative technologies and therefore does not harm the competitive process.

The court did not consider the probability that JEDEC either would have excluded the Rambus technologies from the DRAM standards or would have imposed a RAND condition if its members had been aware of Rambus's intended patent applications. If JEDEC would have excluded the Rambus technologies, it is possible that the failure to disclose its plans enabled Rambus to acquire a monopoly. If JEDEC would have included the Rambus technologies in the standard but imposed a RAND obligation, then it is possible that the failure to disclose allowed Rambus to achieve more monopoly power (i.e., a higher price) than it otherwise would have been able to exercise.
The distinction between achieving a monopoly and achieving more monopoly power has little economic significance. A monopoly does not confer the ability to set any price. Even a monopolist faces competition if its price is high enough – if only for a share of consumers’ wallets – and a profit-maximizing monopolist sets a price high enough to make its demand at least partially elastic, since otherwise it would have an incentive to increase its price. Hence the difference between acquiring a monopoly and acquiring more monopoly power is a matter of degree and not a fundamental distinction. Of course a monopolization allegation cannot succeed if the standard does not achieve market dominance or if the patent that is allegedly concealed is not essential to comply with the standard.

Rights holders have not fared as well in all standards-related cases. In *Broadcom v. Qualcomm* a court denied a motion to dismiss antitrust allegations that Qualcomm violated a commitment to license wideband CDMA technology at FRAND terms. The court held that a patent holder’s intentionally false promise to license essential proprietary technology on FRAND terms, coupled with an SDO’s reliance on that promise when including the technology in a standard, and the patent holder’s subsequent breach of that promise, is actionable anticompetitive conduct. In a separate case the Court of Appeals for the Federal Circuit sanctioned Qualcomm for failing to disclose patents to a standard-setting organization related to the H.264 video standard. The court applied the legal principles of waiver, equitable estoppel, and patent misuse, leading some scholars to conclude that these doctrines are more likely to capture conduct before standard-setting organizations that may harm consumers (Hovenkamp, 2007, Merges and Kuhn, 2009, Contreras, 2011). However, if the conduct actually harms consumers, this leaves unanswered why the appropriate doctrine to evaluate such conduct should not be antitrust law.

In the Rambus and Qualcomm cases it was the patentee’s conduct that was the focus of potential antitrust liability. It is conceivable that a standard-setting organization as well as its members could be found liable for violating the antitrust laws if the SSO permits standards to be developed with no limitations, the standard succeeds in establishing market power, and its members abuse this latitude to develop standards that promote their joint interests at the expense of consumers (Skitol, 2005). However, any evaluation of such conduct would have to recognize that standard setting is critical for a well-functioning economy and therefore must give considerable deference to the activities of SSOs (Carrier, 2003).\(^{16}\)

\(^{16}\) Moreover, Teece and Sherry (2003) argue that total welfare is maximized if SSO members make technology choices based solely on performance and real resource costs without regard to licensing costs. However, high royalties can create deadweight losses from underutilization of a technology that can offset performance benefits or resource savings. Furthermore, royalties and other licensing terms are relevant because they affect incentives for innovation and rent-seeking (Patterson, 2003).
A clear RAND requirement for standard-essential patents and patent applications may appear to be the solution to the risk of ex post holdup, but that over-simplifies the tradeoffs involved in developing standards that invoke proprietary intellectual property rights. Participation in a standard-setting organization is voluntary. If SSOs impose licensing obligations that deny patent owners an opportunity to earn a reasonable return on their inventions, they will choose not to participate in standard setting activities at these organizations. Patent owners that do not participate in the standard development process generally are not subject to RAND licensing obligations and therefore would have greater latitude to charge high royalties after firms and consumers make investments that are specific to the standard.

The competitive dynamics within and among standard-setting organizations are complex. Technology sponsors compete to have their technologies adopted in a standard. Standard-setting organizations compete with other SSOs and with de facto efforts of firms to develop standards. A consequence of this competition is that sponsors of technologies that have few competitive alternatives are unlikely to accept restrictive licensing terms and SSOs may adopt measures such as vague RAND commitments that are relatively favorable to these rights holders in order to encourage their participation (Lerner and Tirole, 2006, Chiao et al. 2007). Sponsors of weaker technologies are willing to participate in SSOs and accept stronger licensing commitments in order to obtain greater influence in the development of a standard. The RAND obligation is a quid pro quo for this influence, but the value of influence is diminished if participation in standard-setting activities triggers RAND obligations that leave little opportunity to monetize inventions.

D. Overly broad declarations of essential patents, overly broad standard specifications, and package licensing of standard essential patents

Failure to disclose essential patents raises concerns about potential holdup, but concerns also can arise if firms disclose too many patents. Excessive disclosure can occur if firms incorrectly claim patents to be essential to comply with the standard. A study of patents declared essential to third generation cellular standards concluded that only about 21 percent of the patents were technically essential to make, sell or use products that comply with the standards (Goodman and Myers, 2005), although a larger number may be commercially essential because they cover the best implementation of the standard. Excessive disclosure also can occur because a standard includes patented technologies that do not facilitate the pro-competitive objectives of the standard. In addition, patent owners can increase the number of patents they declare as essential to a standard by arbitrarily subdividing patent claims into multiple patent applications.

Patents that are declared to be essential to standard are sometimes involved in cross-licensing arrangements or licensed as a package by their owner or by a group
of owners acting through a licensing agent, as in a formal patent pool. Overstating the number of essential patents can benefit a party to a cross-licensing arrangement by making it appear that the party has a stronger patent portfolio. Including non-essential patents in a package license can raise issues related to licensing costs and the allocation of licensing revenues if the patents are licensed jointly. A per-patent royalty would reward all patents, even if they were not essential to comply with the standard. Patent pools sometimes address this concern by allocating licensing revenues in proportion to an assessment of patent values (Lerner et al, 2007). In addition, the inclusion of non-essential patents in a package license can shelter competition in royalty rates if the patents are substitutes for each other, as the Federal Trade Commission alleged in its complaint against Summit Technology and VISX.

The Court of Appeals for the Federal Circuit addressed alleged exclusionary effects from package licenses that included non-essential as well as standard-essential patents in *Princo v. International Trade Comm’n*. The case concerned patents related to a standard for recordable and rewritable compact discs. Philips and Sony developed two different methods to encode information on a disc so that a CD writer could maintain proper alignment while writing data to the disc. Both methods were patented. The parties adopted the Philips method in the compact disc standard. Sony and Philips licensed their patents for the CD standard as a package, which included the Sony and well as the Philips patents for the two different methods for encoding information on the disc.

Princo challenged the package license as a tied sale that obligated the licensee to purchase rights to patents that it did not require, viz. the patents on the Sony method, and required licensees to pay for the Philips encoding technology even if it did not intend to use that technology. The Federal Circuit opined that a package license was not a tied sale because it did not obligate licensees to use a particular technology but merely gave its licensee the option of using the patents in the package. The court’s opinion endorsed the efficiencies from package licensing and recognized that for a particular application there is a single profit-maximizing royalty for a package that includes at least one patent that is essential for that application, even if the patent includes other patents that are not essential (Gilbert, 2010). The court also found that Princo failed to show that competition would have been viable using the Sony technology.

A separate potential concern from overly broad claims of essential patents is the manipulation of standards to impose RAND licensing obligations on patented

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17 Note that allowing patents to be licensed separately as well as in a package would address both the concern that the package license may exclude competition and any concern that the package would raise royalty payments by combining substitute patents (Lerner and Tirole, 2004).
technologies when those technologies are not required to achieve benefits from standardization such as interoperability. Whether those obligations would promote economic welfare depends on many factors, including whether affected technologies are genuinely essential for commercial feasibility and the effects of involuntary RAND obligations on incentives for innovation. This concern may be entirely theoretical because the patent owner could avoid RAND licensing obligations by refusing to participate in the standard development process, but the owner could have other interests that mandate participation.

E. Ex ante bargaining as an alternative to RAND commitments

Some standard-setting organizations have considered measures to obtain greater certainty about potential royalty terms for patents that are essential to proposed standards. In the past, SSOs have shunned discussions of royalty terms out of concern for potential antitrust exposure. A 2007 policy statement by the IEEE addressed whether prices could be discussed in meetings of IEEE standards associations. The unequivocal answer was “no” (IEEE Standards Association, 2010). More recently, some SSOs have reconsidered this position and have received encouraging guidance from the U.S. Department of Justice about proposals that would require patent owners to disclose maximum royalties and the most restrictive terms under which rights holders would license their technologies, prior to the development of a standard.18

Ex ante disclosure risks the exercise of monopsony power by members of standard-setting organizations. Members who have a common interest in obtaining low royalties may act in concert to impose low royalties on owners of patents that are essential to make or use products that comply with the standard. Both the Department of Justice and the Federal Trade Commission have acknowledged this risk, but also recognized that ex ante disclosure of maximum royalties and most restrictive licensing terms can provide valuable information to avoid exposure to potential holdup. The agencies have indicated that they would apply a rule of reason framework to evaluate the relative benefits and risks of joint negotiation of licensing terms.

The tolerance for coordinated conduct by members of an SSO that may exercise buyer market power should depend on the likelihood and magnitude of ex post holdup. If ex post holdup is unlikely, coordinated conduct to establish licensing

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terms ex ante has little benefit and may distort incentives for innovation by shifting the terms of patent licenses to favor technology adopters.

If standard-related holdup is likely and substantial, joint negotiation of licensing terms by the members of an SSO before a standard issues can help fill the void left by vague RAND commitments to limit possible opportunist conduct. However, a less restrictive alternative is to rely on independent bilateral negotiations between potential licensees and rights holders along with a clear non-discrimination requirement (Gilbert, 2012). Preventing undue discrimination between similarly situated licensees assures that firms will gain the benefits of licensing terms negotiated by early adopters before these early adopters and consumers make investments that are specific to a standard. This alternative policy requires SSOs or the courts to convey the meaning and requirements of non-discrimination in a technology licensing context, but it does not require a precise determination of fair and reasonable royalties.

VI. Summary remarks

The development of industry standards is a cooperative activity among representatives of firms that often compete to supply products covered by the standards. Cooperative activity by rivals often raises antitrust concerns. The decision to endorse a particular standard can have significant implications for the cost and performance of the products they sell and for competition from products that do not comply with the standard. The potential for participants in a standard-setting venue to harm competition by favoring one standard over another or by imposing conditions that affect prices of products covered by the standard cannot be ignored.

Nonetheless, courts and antitrust agencies generally defer to the choices made in standard-setting organizations when those decisions are made in a consensus process that is transparent and open to interested parties. The justification for the deferential treatment of standard setting is not based on a general principle akin to the “invisible hand” that guides market outcomes. There is no guarantee that the members of a standard-setting organization will choose the “best” standard. Instead, courts acknowledge the likely benefits from standards and implicitly admit that litigation is unlikely to result in better standards. Antitrust challenges to standard setting generally have focused on coordinated conduct that distorts the process to fix prices or to favor entrenched interests by excluding or imposing costs on rivals.

Technologies that are candidates for standards often require access to proprietary intellectual property rights, particularly in the information and communications technology industries for which hundreds of patents can be essential to comply with a standard. Most setting-setting organizations do not prohibit the development of standards that invoke patented technologies, but require assurance that licenses to
these patents be available either royalty-free or on “reasonable and non-discriminatory” (RAND) terms. Standard-setting organizations have not clearly delineated the extent of disclosure obligations, the meaning of reasonable or non-discriminatory, or the conditions under which the owner of a patent with a RAND commitment may seek an injunction to prevent the use of a technology covered by the patent. Courts also have been slow to define these obligations, and recent developments at the International Trade Commission will test whether RAND commitments prevent patentees from pursuing exclusion orders at that venue. The resolution of the dimension and extent of RAND commitments, or the failure to resolve these characteristics, will have important consequences for the benefits from industry standards.
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