



Federal Trade Commission

SSOs, FRAND, and Antitrust:

Lessons from the Economics of Incomplete Contracts

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Good afternoon. It is my pleasure to be here today and I would like to thank the Center for the Protection of Intellectual Property, George Mason University School of

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Law, and especially Adam Mossoff, Mark Schultz, and Matthew Barblan, for the invitation to speak with you today.

Today I would like to share some thoughts with you regarding standard setting organizations (“SSOs”), their contracting practices, and the appropriate role of antitrust in regulating SSO contracts. In particular, I am going to focus upon licensing issues involving Standard Essential Patents (“SEPs”) that arise from SSO Intellectual Property Right (“IPR”) policies. Terms of art from the economics of contracting, such as “hold-up,” “reverse hold-up” and “*ex post* opportunism,” are commonly invoked around current debates concerning SEP licensing. Indeed, some of these terms appear to have taken on a life of their own when applied to SSO contracting and IPRs. While I also approach patent licensing in general, and SSO contracting specifically, from an economic perspective, I am concerned that some important economic insights have been misunderstood, misapplied, or ignored altogether.

Economists have long recognized that the very literature upon which the current patent hold-up agenda is based teaches that private ordering and contracting play an important role in governing *ex post* opportunism. Indeed, the economics of hold-up began not as an effort to explain contract failure, but as an effort to explain real world contract terms, performance, and enforcement decisions starting with the fundamental premise that contracts are necessarily incomplete. The incompleteness of contracts did not signal inefficiency; rather, incomplete contracts were a predictable and efficient

result given the costs associated with identifying all contingencies that might arise during the life of the contractual relationship.

Understanding the contracting process, and the role of incompleteness and ambiguity in SSO contracts, is a necessary first step toward understanding what incentives different legal and regulatory regimes will have upon that process. It is impossible, and likely counter-productive, to talk about the relative efficiency of one set of rules or another without first understanding the underlying contracting process. Only with that understanding in hand can one begin to analyze the desirability of different legal frameworks to govern *ex post* opportunism with respect to SEPs in the SSO setting. Much of the current policy debate surrounding SSO contracts involving SEPs is based upon precisely these sorts of questions. For example, is the availability of injunctive relief as opposed to monetary damages for infringement of an SEP desirable in the shadow of a fair or reasonable and non-discriminatory (“F/RAND”) commitment? Or, what will be the effect of imposing antitrust remedies for what amounts to the breach of a F/RAND commitment found in an SSO contract? Many policymakers and academics have developed strong priors that SSO contracts are inherently inefficient due to their incompleteness, and in particular, the ambiguity of the F/RAND commitment and lack of precision concerning when injunctive relief is permitted. Based upon those priors, certain policymakers and academics often argue that the SSO contracting process is broken and requires additional legal machinery to

afford potential licensees and consumers greater protection. I do not believe that conclusion – or many of the policy measures suggested or already adopted – follows from the relevant economic principles or, where economic theory offers conflicting predictions, the available empirical evidence.

I. Standard Setting Organizations and Their Role in Facilitating Innovation, Commercialization, and Competition

SSOs have long played a crucial role in our innovation-driven economy, and this fundamental role has only intensified over the last few decades. SSOs develop, support, and set interoperability and performance standards, among others, which help to facilitate the adoption of new technologies.¹ By the early 2000s, hundreds of collaborative SSOs existed worldwide.² They are comprised of firms, large and small, and anywhere in between, and include members that contribute as well as members who adopt and implement technology. SSOs also span across a variety of industry and technical categories, including aeronautics, life sciences, telecom, and electronics.³

¹ See, e.g., U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, ANTITRUST ENFORCEMENT AND INTELLECTUAL PROPERTY RIGHTS: PROMOTING INNOVATION AND COMPETITION 33 n.1 (2007), *available at* <http://www.ftc.gov/reports/innovation/P040101PromotingInnovationandCompetitionrpt0704.pdf>.

² See *id.* at 33 n.5.

³ See, e.g., *Standard Settings Organizations and Standards List*, CONSORTIUMINFO.ORG, <http://www.consortiuminfo.org/links/> (last visited Sept. 12, 2013) for a list of SSOs and standards in a variety of fields.

Standards can make products more valuable for consumers and less costly for firms to produce.⁴ Interoperability standards, for example, ensure that products manufactured by different companies are compatible with one another and can also reduce companies' costs of production by making it less costly for them to acquire technical information and simplify product design. For consumers, standards facilitate interoperability from a wide adoption of the standards, which in turn can help to protect consumers from stranding and result in greater realization of network effects.⁵ Consumer benefits from product compatibility are particularly large for network industries, where the value of a product or service to an individual consumer increases as the number of consumers that adopt compatible products rise.

It is important to recognize that SSOs are not the same contractual institutions as patent pools, despite confusion among many commentators and even judges. Each institution represents a distinct private-ordering response to a different problem. A patent pool is a response to a failure precipitated by the *law*—high transactions costs in terms of both coordinating extensive numbers of patent owners and hold-up costs resulting from many patent owners having overlapping legal property rights over the

⁴ See, e.g., U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 33; Bruce H. Kobayashi & Joshua D. Wright, *Intellectual Property and Standard Setting* 95, in ABA SECTION OF ANTITRUST LAW, HANDBOOK ON ANTITRUST ASPECTS OF STANDARD SETTING (2d ed. 2011).

⁵ See, e.g., Kobayashi & Wright, *supra* note 4; 1 CARL SHAPIRO, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in INNOVATION POLICY AND THE ECONOMY 119-150 (Adam B. Jaffe, Josh Lerner & Scott Stern eds., 2001).

same commercial product, such as MPEG technology.⁶ An SSO is a response to a failure precipitated by *technology*—high transaction costs that result from lack of standardized platforms for production and use of technological products, such as the need for standardized terminology and equipment in electrical lights and other electrical systems.⁷ Because they arise to solve different problems, it is unsurprising that SSO contractual terms are negotiated in a very different legal and commercial context from that of patent pools.

When developing and setting standards, SSOs typically require their members to disclose the intellectual property rights they own and ask for a commitment to a F/RAND royalty rate for a license to any IPRs the members contribute that become standard essential.⁸ Working groups within SSOs then review and evaluate the various contributed technologies and through many discussions among engineers and technical experts, determine the best technology or sets of technologies for the standard. IPRs deemed essential to a standard by the working groups are known as SEPs.⁹ SSOs'

⁶ See, e.g., <http://www.mpegla.com/main/Pages/AboutHistory.aspx> (discussing history of the MPEG patent pool and the creation of the first contemporary patent pool, MPEGLA).

⁷ See, e.g., http://www.ieee.org/about/ieee_history.html (discussing history of IEEE reaching back to 1884 and subsequent efforts “linking its members through publications, *standards* and conferences”) (emphasis added).

⁸ See, e.g., James Ratliff & Daniel L. Rubinfeld, *The Use and Threat of Injunctions in the RAND Context*, 1 J. COMPETITION L. & ECON. 1, 4, 10 (2013).

⁹ E.g., Joseph Scott Miller, *Standard Setting, Patents, and Access Lock-In: RAND Licensing and the Theory of the Firm*, 40 IND. L. REV. 351, 364 (2007) (“The working group is the basic unit that meets collaboratively to draft a written specification embodying a standard. The working group is peopled with volunteers from

member firms compete vigorously for inclusion into the standard during the evaluation process, in part because owners of SEPs are guaranteed a steady revenue stream from licensing their IPRs to firms that manufacture products that incorporate the standard.

That said, SSOs are not the only way by which standards are set. Standards also may be set through competition in the marketplace whereby firms compete vigorously in a “standards war,” and the market eventually tips toward a single product that then becomes the *de facto* standard for an industry.¹⁰ One classic example is the competition between VHS and Beta before the market tipped toward VHS in the 1980s. Either way, firms compete against one another for their technologies to become the standard. The difference is not whether competition takes place but rather where that competition takes place – through an SSO’s standard setting process or in the marketplace. Of course, the standards that would emerge through one versus another mechanism may be different, and thus can have different consequences for efficiency and consumer welfare.

Most recognize that an initial industry-wide standard can have significant benefits, including a higher success rate of launching a new network and introducing

the interested firms (and sometimes from government agencies and academic departments) who are technical, not legal or business, experts.”).

¹⁰ See, e.g., U.S. DEP’T OF JUSTICE & FED. TRADE COMM’N, *supra* note 1, at 34; Shapiro, *supra* note 5, at 137-8; Michael L. Katz & Carl Shapiro, *Systems Competition and Network Effects*, J. ECON. PERSP., Spring 1994, at 93, 107-08; Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CALIF. L. REV. 1889, 1899 (2002). It is also possible the market does not tip toward a single product, and multiple, incompatible products prevail in the marketplace.

important technologies to the marketplace, greater realization of network effects, increasing protection afforded buyers from being stranded, and enabling competition within an open standard.¹¹ An SSO-set standard also avoids a standards war, where firms may have to incur significant costs in order to establish an installed base of users. Consumers may also delay purchasing until the *de facto* standard is established to avoid the costs of choosing a losing standard.¹² Nevertheless, some have asserted that standards achieved “collaboratively” through an SSO can impose costs upon consumers by reducing *ex ante* competition and consumer choice, and by promoting proprietary control over a closed standard.¹³

In particular, many have emphasized the potential for patent hold-up involving SEPs as a cost of the SSO process, leading to higher royalties to licensees that are in turn passed on in the form of higher consumer prices. It is well understood that the F/RAND commitment can help to minimize the risk of patent hold-up. What is less clear, however, is the exact meaning of a F/RAND commitment or, for that matter, how one should go about ascertaining that meaning. Also unanswered is the question of what role antitrust can and should play in regulating SSO contracts. Many competition

¹¹ See, e.g., Shapiro, *supra* note 5, at 138; Marc Rysman & Timothy Simcoe, *Patents and the Performance of Voluntary Standard-Setting Organizations*, 54 MGMT. SCI. 1920 (2008).

¹² See, e.g., Jeffrey Church & Roger Ware, *Network Industries, Intellectual Property Rights and Competition Policy*, in COMPETITION POLICY AND INTELLECTUAL PROPERTY RIGHTS IN THE KNOWLEDGE-BASED ECONOMY 230-39 (Robert D. Anderson & Nancy T. Gallini eds., 1998).

¹³ See, e.g., Shapiro, *supra* note 5, at 138.

enforcement agency officials around the world have asserted that SSOs' policies are either not strong enough or not clear enough and, in either case, raise the possibility that a regulatory response may be warranted to cure the inefficiencies resulting from the contracting process.¹⁴ Some have offered free advice in the form of proposing specific improvements to current SSO IPR policies. Others point to the role of antitrust law in deterring patent hold-up and facilitating efficient SSO contracting to solve the SEP licensing problem.¹⁵

II. Are Incomplete SSO Contracts Inefficient?

The threat of hold-up is a generally well-understood economic phenomenon. In the SSO setting, after a standard is adopted, and switching to an alternative standard would require significant additional investment, the holder of the IPR that is part of the

¹⁴ See, e.g., Kai-Uwe Kuhn, Fiona Scott Morton & Howard Shelanski, *Standard Setting Organizations Can Help Solve the Standard Essential Patents Licensing Problem*, CPI ANTITRUST CHRONICLE, Mar. 2013, at 4-5; Renata Hesse, Deputy Assistant Att'y Gen., Antitrust Division, U.S. Dep't of Justice, Six "Small" Proposals for SSOs Before Lunch, Remarks as Prepared for the ITU-T Patent Roundtable, at 9-10 (Oct. 10, 2012); Renata B. Hesse, Deputy Assistant Att'y Gen., Antitrust Division, U.S. Dep't of Justice, The Antitrust Division and SSOs: Continuing the Dialogue, Presentation at ANSI Intellectual Property Rights Policy Committee Meeting, at 3 (Nov. 8, 2012).

¹⁵ See, e.g., George S. Cary et al., *The Case for Antitrust Law to Police the Patent Holdup Problem in Standard Setting*, 77 ANTITRUST L.J. 913 (2011) (arguing that "[w]hile other areas of law may prove capable of addressing certain abuses of standard-setting processes, they are an incomplete solution, as only antitrust law can ensure that private parties and government enforcement authorities can seek redress where the underlying abuse harms competition"); George S. Cary et al., *Antitrust Implications of Abuse of Standard-Setting*, 15 GEO. MASON L. REV. 1241, 1262 (2008) (arguing that "[a]ntitrust law has an important role to play in governing both collusive and unilateral conduct in the standard-setting process"); Thomas F. Cotter, *Patent Holdup, Patent Remedies, and Antitrust Responses*, 34 J. CORP. L. 1151, 1205 (2009) (suggesting that SSO agreements aimed at controlling the price paid for patented technology should be subjected to the same antitrust scrutiny as any other horizontal agreement among competitors).

standard can exploit its position to extract higher royalties when F/RAND terms are vague.

Generally speaking, the alleged imperfections observed in SSO contracts involve contractual incompleteness in the technical economic sense. That is, the contracts omit terms governing some contingent states that may arise over the future life of the contractual arrangement. Other alleged imperfections involve contractual ambiguity, such as the adoption of flexible terms subject to *ex post* interpretation.¹⁶

Consider the intentionally vague F/RAND commitment common in many SSOs' IPR policies. The level of precision of the F/RAND term is a selection made by sophisticated parties informed by a number of tradeoffs. Most importantly, there is considerable uncertainty concerning the ultimate value of the technology, if adopted, especially in dynamic and ever-changing markets. Contractual flexibility *ex post* can be an important source of economic value. There are additional reasons parties favor less precision. For example, fear of antitrust liability imposes some costs of additional

¹⁶ A classic example of this is the “best efforts” clause in contracts. See, e.g., Charles J. Goetz & Robert E. Scott, *Principles of Relational Contracts*, 67 VA L. REV. 1089, 1114–17 (1981). On the efficiency of *ex post* contractual flexibility generally, see Keith J. Crocker & Scott E. Masten, *Pretia ex Machina? Prices and Process in Long-Term Contracts*, 34 J. L. & ECON. 69 (1991); Victor P. Goldberg, *Price Adjustment in Long-Term Contracts*, 1985 WIS. L. REV. 527; Benjamin Klein, *Contract Costs and Administered Prices: An Economic Theory of Rigid Wages*, 74 AM. ECON. REV. 332 (1984); Ian R. Macneil, *Contracts: Adjustment of Long-Term Economic Relations under Classical, Neoclassical, and Relational Contract Law*, 72 NW. U. L. REV. 854 (1978); Scott E. Masten & Keith J. Crocker, *Efficient Adaptation in Long Term Contracts: Take or Pay Provisions for Natural Gas*, 75 AM. ECON. REV. 1083 (1985); Scott E. Masten, *Long-Term Contracts and Short-Term Commitment: Price Determination for Heterogeneous Freight Transactions*, 11 AM. L. ECON. REV. 79 (2009).

precision as such specificity with respect to prices, marketing, and distribution terms may be construed as unlawful price-fixing.¹⁷ Additional precision in the form of well-defined licensing commitments could also raise the costs of SSO participation.¹⁸

It is important to recognize that contractual incompleteness alone is not a reason to conclude that individual contracts are inefficient, much less indicative of market failure in the SSO process. Neither is the mere empirical observation of contracts that trade additional contractual precision – and the rigidity that necessarily arises from more precise language – for greater *ex post* flexibility, a particularly unique economic phenomenon in modern contracting. The modern economic approach to analyzing contracts in fact typically begins with the observation that all contracts are incomplete – because of the costs of identifying, specifying, and negotiating all possible future contingencies – and only then proceeds to analyze the incentives of contracting parties in light of different legal regimes and their implications for economic efficiency relative to the status quo. Unfortunately, much of the policy discussion involving SSO contracting appears to approach SSOs differently, presuming contractual incompleteness in SSO contracts is sufficient to demonstrate inefficiency that requires legal regime change or other solutions. This logic might require one naively to assume

¹⁷ See, e.g., U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 49; Shapiro, *supra* note 5, at 128, 140.

¹⁸ U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 49.

the relevant benchmark against which SSO contracts should be evaluated is a contract that is perfectly complete in the economic sense; a problematic presumption because perfectly complete or comprehensive contracts are observed only on blackboards in graduate economics departments and the occasional textbook.¹⁹

The fact that a patent holder or licensee may *ex post* be able to take advantage of contractual incompleteness or ambiguity to “hold-up” its transacting partner does not imply that the contract is inefficient *ex ante* or that it emerged from a defective contracting process. F/RAND terms as written may well reduce the probability of future hold-up without excluding the possibility altogether – that is, driving the probability to zero. Conclusions about the efficiency of such a choice require an analysis of the costs and benefits of further specificity relative to the status quo and other feasible alternative arrangements. Some commenters firmly believe that requiring IPR holders to commit to more specific licensing terms before a technology is selected to

¹⁹ Even graduate economics textbooks recognize that, in practice, contracts are fairly incomplete. See, e.g., JEAN TIROLE, *THE THEORY OF INDUSTRIAL ORGANIZATION* 29, N.48 (1997) (“A ‘complete contract’ is a contract that has the relevant decisions (transfer, trade, etc.) depend on all verifiable variables, including possibly announcements by the parties” and “[i]n practice, however, contracts are fairly incomplete, owing to ‘transaction costs’...[m]ost existing contracts do not specify many relevant contingencies”); OLIVER HART, *FIRMS, CONTRACTS AND FINANCIAL STRUCTURE* 21-23 (1995) (defining a comprehensive contract as one where it “will specify all parties’ obligations in all future states of the world, to the fullest extent possible. As a result, there will never be a need for the parties to revise or renegotiate the contract as the future unfolds.” In addition, that “[i]n reality, contracts are not comprehensive and are revised and renegotiated all the time... [a]s a result of ...contracting costs, the parties will write a contract that is incomplete.”).

become part of a standard would further minimize the risk of hold-up.²⁰ To be clear, although neither the FTC nor the DOJ have to date advocated requiring that SSOs adopt any specific disclosure or licensing policies,²¹ former and current officials from each agency have suggested reforms to SSOs' IPR policies including stronger and more precise F/RAND commitments that specify both the base to which a royalty should apply and the processes parties must adhere to in resolving F/RAND rate disputes.²² The proposed reforms also include the recommendation that SSOs specify which licensing and cross-licensing arrangements involving SEPs are permissible and which will be prohibited.²³

This approach of "solving" contractual incompleteness by recommending or perhaps even requiring certain contract terms would make sense if there was some reliable indication the incompleteness is inefficient. As I've already observed, however, neither economic theory nor available empirical evidence supports a general presumption that SSO contractual incompleteness is inefficient compared to feasible alternative contractual arrangements. To the contrary, the potential efficiency of

²⁰ See, e.g., U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 36, 46-47 (citing Nov. 2002 hearing transcript of Vishny, Peterson, Shapiro, and others); Lemley, *supra* note 10, at 1906, 1954.

²¹ U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 48.

²² See, e.g., Kuhn, Scott Morton & Shelanski, *supra* note 14, at 4-5; Hesse (Oct. 2012), *supra* note 14, at 9-10.

²³ See, e.g., Hesse (Nov. 2012), *supra* note 14, at 3.

incomplete contracts is well understood in the economics literature.²⁴ To perfectly prevent opportunism, much costly effort would be required to anticipate all contingencies and to negotiate and draft responsive terms. Indeed, in some cases, drafting enforceable terms perfectly covering all aspects of contractual performance is likely impossible. Transactors' reputational capital can also efficiently reduce the need for court-enforced, written terms. The efficiency rationale for incomplete contracts identifies an intuitive tradeoff between more complete contractual specification which may generate benefits in the form of reducing the expected value of hold-up costs and the additional costs of precision both in terms of additional negotiation and rigidity of court enforcement as compared to self-enforcement.²⁵ These costs are likely to be substantial in the SSO context. For example, additional negotiations could also slow down the standard setting process, further causing inefficiencies and delay in terms of bringing the technology to market, the commercialization of IPRs, and rewarding the inventors to continue to stimulate innovation.²⁶

²⁴ See, e.g., Benjamin Klein, *Why Hold-Ups Occur: The Self-Enforcing Range of Contractual Relationships*, 34 *ECON. INQUIRY* 444, 447 (1996); Benjamin Klein, Robert G. Crawford & Armen A. Alchian, *Vertical Integration, Appropriable Rents, and Competitive Contracting Process*, 21 *J. L. & ECON.* 297 (1978).

²⁵ The additional negotiation costs to attempt to cover all contingencies are wasteful and inefficient because they involve only wealth transfers between the parties and because most future events can be accommodated at lower cost after the relevant information is revealed. Klein, *Why Hold-Ups Occur*, *supra* note 24. See also Benjamin Klein & Keith B. Leffler, *The Role of Market Forces in Assuring Contractual Performance*, 89 *J. POL. ECON.* 615, 616 (1981) (noting that "economists . . . have long considered 'reputations' and brand names to be private devices which provide incentives that assure contract performance in the absence of any third-party enforcer").

²⁶ U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 49.

Of course, the inherent uncertainty in anticipating future contingencies – most important among them being changes in technology and its commercialization over time – renders contracts necessarily imperfect and incomplete. One implication of this observation is that attempts to increase specificity may not bear fruit: the probability of hold-up will not be reduced to zero. This point highlights why focusing upon incompleteness and individual terms rather than the contracting process itself is a troublesome approach. The relevant question is not whether one can point to contractual incompleteness but whether there is reason to believe – based upon economic theory and evidence – alternative contracts would improve efficiency as compared to those observed in the real world. Another useful way to ask this question, to which I will now turn, is whether there is reason to believe that IPR holders and SSOs systematically err in making the tradeoffs already discussed between greater precision at greater cost on the one hand, versus increased contractual flexibility on the other.

III. Does *Ex Post* Opportunism in SEP Licensing Represent a Market Failure in SSO Contracting?

As I've already pointed out, the key question is whether SSO contract terms are inefficient compared to plausible alternatives, and, again, it is vitally important not to confuse SSOs with patent pools, as the commercial functions of these distinct organizations differ. The relevant comparison is between alternative institutional arrangements in defining and commercializing standardized technology and not in

addressing the possibility of market distortions caused by overlapping claims of different patent owners to the same technological innovation. To identify whether SSO's incomplete contracts represent a market failure in need of fixing, however, it should be clear that we need an understanding of the competitive contracting process and the incentive effects created by different contract terms or legal regimes.

A starting point for such an analysis is the SSO contracts themselves. SSO contracts exhibit rich variation, which could suggest the terms respond to the competitive forces at work and the specific needs of each SSO to design, incorporate, and attract the IPRs that yield the best standard for the organization. Although some SSOs have no policies at all, others have well-developed IPR policies.²⁷ For the SSOs with IPR policies, the requirements imposed by those policies vary significantly. There is also rich variation in SSO rules governing the scope of disclosure, licensing arrangements, and whether members' ownership of IPRs within a standard is prohibited. Some SSOs require royalty-free licensing before incorporating the IP into a standard, while others require "reasonable and nondiscriminatory licensing."²⁸ Some SSOs specifically compel members to license worldwide to everyone using the standard, not just to other members of the SSO. Certain SSOs provide guidance on the

²⁷ See, e.g., Benjamin Chiao, Josh Lerner & Jean Tirole, *The Rules of Standard-Setting Organizations: an Empirical Analysis*, 38 RAND J. ECON. 905, 916-18 (2007); Lemley, *supra* note 10, at 1904-6, 1973-1980; U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 47.

²⁸ See, e.g., U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 47; Chiao, Lerner & Tirole, *supra* note 27; Lemley, *supra* note 10, at 1904-06, 1973-80.

meaning of “reasonable” and specify a mechanism for dispute resolution, while others do not. The F/RAND commitment can also take a variety of forms -- it may be implicit from the patentees’ participation in a standard-setting process (per the SSOs’ bylaws), or by a written acknowledgement of such obligations to the SSOs.²⁹ SSOs may require uniform F/RAND assurances they specify, or allow the IPR holder the freedom to express its willingness to license on its own terms. For example, IEEE considers the letters of assurance from four different owners of SEPs for the wi-fi standard. One patent holder promises that the technology “will be made available at nominal costs to all who seek to use it for compliance with an incorporated standard,” while another agrees to “non-discriminatory basis and on reasonable terms including its then current royalty rates.”³⁰ A third patent holder provides no benchmark at all to roughly estimate the royalty rates it would charge. In short, SSO contract terms exhibit remarkable heterogeneity quite consistent with the variation in market forces faced by their remarkably varied members and associated technologies.

Indeed, the significant variation we observe in SSOs’ IPR policies is what one expects to see in competitive contracting process in a diverse ecosystem of technologies

²⁹ See Ratliff & Rubinfeld, *supra* note 8, at 10-11.

³⁰ *Id.* (citing University of California, Davis, Notice of Patent Applicability (rev. July 1, 1994), available at <http://goo.gl/F0djs>; Letter from Walter Willigan, Program Director, Licensing, IBM, to Vic Hayes, Chairman, IEEE P802.11 (Oct. 10, 1995), available at <http://goo.gl/ioCp4>).

and SSOs.³¹ The diversity in contract terms also reflects the many different ways SSOs seek to attract valuable technology contributors as well as adopters to their standards. Although some technology companies join more than one SSO, complying with differing disclosure rules and other policies in different SSOs can be very costly to companies with IPRs, especially for those with large patent portfolios.³² Economists Josh Lerner and Jean Tirole have examined competition among SSOs to better understand how IPR contract terms are used to attract technology contributors, and demonstrated that forum shopping technology contributors respond to “sponsor friendly,” less rigid, IPR policies, resulting in higher quality standards.³³

Competition to attract contributors does not imply SSOs would always craft IPR policies that favor contributing members, possibly leading to higher probability of hold-up. SSOs are also constrained to have policies that are attractive to adopter members and, as all else equal, an SSO is more attractive to technology contributors with a larger base of adopters. SSOs thus have the features of a two-sided market, where they serve as platforms to join together contributors and adopters. As a platform, a successful SSO needs to attract members on both sides of the platform, by striking a balance for the two

³¹ See e.g., Michael J. Schallop, *The IPR Paradox: Leveraging Intellectual Property Rights to Encourage Interoperability in the Network Computing Age*, 28 AIPLA Q.J. 195, 234 (2000) (suggesting that the variance in IP policies creates a sort of competition, with the most efficient IP rule likely to prevail).

³² U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 43; Lemley, *supra* note 10, at 1907.

³³ See, e.g., Josh Lerner & Jean Tirole, *A Model of Forum Shopping*, 96 AM. ECON. REV. 1091 (2006). See also, Kobayashi & Wright, *supra* note 4, at 13.

sides with respect to their rules and policies. Again, the relevant question is not whether SSOs, contributors, and adopters face tradeoffs in terms of balancing IPR policy completeness and precision – they certainly do – but whether there is reason to believe the sophisticated parties get the balance systematically wrong as the result of some market failure.

SSO members elected to enter into incomplete contracts, presumably because they believed that the contracts, though imperfect, struck the optimal balance between the cost of more precise terms and the probability and cost of hold-up. Economists have long recognized that hold-ups occur when unanticipated events place the contractual relationship outside the self-enforcing range, where transacting parties optimally combine court-enforced written terms with privately enforced unwritten terms.³⁴ This probabilistic framework, where transacting parties enter contractual relationships despite knowing that a hold-up may occur, has important implications for understanding the structure of the contracts adopted by SSOs and their members. By entering into the contractual relationship with incomplete terms, the transacting parties reveal their belief that the expected gains from trade outweigh the expected costs associated with the possibility of hold-up. This suggests that contractual incompleteness and ambiguity in SSOs' IPR policies is an intended and key design

³⁴ See, e.g., Klein, *Why Hold-Ups Occur*, *supra* note 24, at 444, 447.

feature of SSOs. Indeed, despite the changes SSOs have made to some of their IPR policies, the key ambiguities involving F/RAND and other terms have persisted over time. The persistence of these terms in competitive markets over time suggests, strongly in my view, that this imprecision is a feature and not a bug of the SSO contracting process.

Thus far, as a simplifying assumption, I've largely ignored the role of reputational capital and self-enforcement in evaluating the efficiency of SSO contracts. Despite the amount of attention patent hold-up has drawn from policymakers and academics, there have been relatively few instances of litigated patent hold-up among the thousands of standards adopted.³⁵ This begs the question of why – if incomplete SSO contracts are inherently and systematically imperfect as suggested by some – the empirical evidence of patent hold-up is so unremarkable. Reputational costs offer one possible answer – that is, the decision to engage in hold-up results in short-term gains than can easily be overwhelmed in a “repeated game” setting.³⁶ Indeed, most firms and IPR holders are repeat players that hope both to license SEPs and to have their technology incorporated in subsequent standards. A reputation for engaging in patent

³⁵ See, e.g., Kobayashi & Wright, *supra* note 4.

³⁶ See, e.g., Kobayashi & Wright, *supra* note 4; Damien Geradin, Anne Layne-Farrar & A. Jorge Padilla, *The Complements Problem Within Standard Setting: Assessing the Evidence on Royalty Stacking*, 14 B.U. J. SCI. & TECH. L. 144, 163-68 (2008). The few instances of documented patent hold-up involve firms that have no long-term stakes or prospects in the industry. See Bronwyn H. Hall & Rosemarie Ham Ziedonis, *An Empirical Analysis of Patent Litigation in the Semiconductor Industry* (2007 American Economic Association Annual Meeting, Chicago, IL, 4-7 January, Working Paper, 2007), available at <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.69.5271&rep=rep1&type=pdf>.

hold-up would make it more difficult to convince SSOs and their members to adopt a firm's technology in the future, which would reduce the firm's ability to earn licensing revenue in the future. In addition, for firms that contribute patents to SSOs and implement standards in products, a reputation for hold-up as a licensor could affect the firm's position when operating on the other side of the bargaining table as a licensee.

So ultimately, is there a market failure in the SSO contracting process that requires regulatory as opposed to private ordering solutions? The evidence-based approach to answering this question relies upon economic theory and empirical evidence.

Economic theory tells us that one possible reason for market failure is the existence of externalities. In markets where externalities are present, economic agents do not sufficiently internalize the costs that their actions or particular rules that they impose onto others. Does the SSO contracting process result in such externalities? It appears unlikely, as most if not all SSOs include both contributing and adopter members (licensees), and as I mentioned earlier, SSOs have incentives to strike a balance between the interests of both member groups in order to attract both groups and increase the value of the organization as a platform.

Some have suggested that licensees do not necessarily care about increased royalty rates, for example, because the increased rates are simply passed on to end-user

customers.³⁷ This is not likely to be the case. Bargaining over royalty rates and litigation involving licensee claims against SSOs to enforce contract terms suggest licensees do care. Further, licensees are not likely to pass on the full increased cost of a royalty rate increase. This makes complete economic sense. Very few end-use products, and in particular those that incorporate standardized technology, face a completely inelastic demand curve where manufacturers are able to completely pass on higher royalty rates to consumers. Additionally, I am not aware of any reliable evidence that indicates royalty rates and final end-use prices are higher for standardized technologies.

Others have argued that SSOs are best conceived of as collaboration among *competitors* who have entered into a *de facto quid pro quo* with antitrust authorities by which the authorities allow collusive interaction in the form of standardization in exchange for tougher antitrust scrutiny.³⁸ This argument strikes me as a rhetorical device that does not shed much light on the relevant economics of SSOs and their role in the modern economy. It is neither a serious claim that such a *quid pro quo* actually exists, nor is it an attempt to accurately describe the economic function of SSOs. And

³⁷ See, e.g., U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 40 (citing 31. Nov. 6 Tr. at 26-27 (Farrell) ("I think it's also relevant to observe that to the extent that the people paying royalties are competing against each other and are all — or believe that they're all paying roughly the same royalty, there's a lot of pass-through, so it's the final consumer rather than these competitors who end up paying.")).

³⁸ See, e.g., Cotter, *supra* note 15.

how could it be? There is no empirical evidence that supports the proposition that breach of an SSO contract – even one resulting in higher royalty rates – is somehow analogous to the collusive interaction between rivals conventionally condemned by the antitrust laws or generates similar economic effects. Further, courts have uniformly rejected this view when interpreting and applying the Sherman Act. In particular, to date there does not appear to be a single case that finds breach of an SSO agreement without proof that deception resulted in acquisition of market power a violation of the Sherman Act.³⁹

Antitrust law allows productive cooperation. As I discussed earlier, an initial industry wide standard achieved through standard setting in an SSO has potential efficiency benefits to the alternative – where standards are determined through a standards war in the marketplace. Moreover, although some may view SSOs' processes as collaborations among competitors, standardization at SSOs are subject to a rigorous evaluation process where contributing members compete to have their technology incorporated into the standard. The collaborations and the SSOs are, in fact, a playground for *competition* among competitors.

³⁹ See *Rambus Inc. v. FTC*, 522 F.3d 456, 466–67 (D.C. Cir. 2008), cert. denied, 129 S. Ct. 1318 (2009); *Broadcom Corp. v. Qualcomm Inc.*, 501 F.3d 297, 311 (3d Cir. 2007). In each case, a showing of deception that led to the acquisition of market power is required to state a claim under the Sherman Act. In *N-Data*, the Commission alleged that deviation from a contractual commitment to an SSO amount violates Section 5 of the FTC Act without proof that deceptive conduct caused the defendant to have its technology adopted by the standard. Statement of the Federal Trade Commission, *Negotiated Data Solutions LLC*, FTC File No. 051-0094 (Jan. 23, 2008), available at <http://www.ftc.gov/os/caselist/0510094/080122statement.pdf>.

This does not mean that antitrust cannot or should not play a role in the SSO process. Where antitrust laws can and should come into play is when participants abuse and manipulate the standard setting process to exclude competitors from the market, such as in *Allied Tube & Conduit Corp. v. Indian Head, Inc.*⁴⁰ and *American Society of Mechanical Engineers, Inc. v. Hydrolevel Corp.*⁴¹ The existing antitrust laws already deal with these types of collusive manipulations of the standard setting process. There is no evidence that suggests SSOs' contracting processes are consistent with anticompetitive collusion specifically or with market failure in general. Instead, what we observe is a heterogeneous set of market participants in SSOs, apparently rigorous competition among the participants and their technologies during the standard setting process and among SSOs to attract sponsors, and a diverse set of contract terms that is reflexive and responsive to changes in market conditions.

IV. Would the Proposed SSO IPR Policy Reforms Help or Hinder the Hold-Up Problem?

Developing an understanding of the likely effects of changes in SSO contract terms – including more precise and therefore more rigid ones recently proposed – depends upon a robust understanding of the SSO contracting process itself. For example, how did the SSOs end up with the terms they have today? Was it an

⁴⁰ 486 U.S. 492 (1988).

⁴¹ 456 U.S. 556 (1982).

oversight? A case of historical accident coupled with path dependence? Or were there particular reasons that necessitated the adoption of those terms? It is also necessary to understand the costs of the various proposals – intended and otherwise. Some of the proposed reforms are likely to have little effect on hold-up but may introduce new inefficiencies.⁴² For example, industry participants have noted that they support policies that permit voluntary and unilateral *ex ante* disclosure of specific licensing terms by a patent holder, but suggest that proposals for the federal government to promote a mandatory *ex ante* IPR policy are likely to be costly and cumbersome with little benefit. Similarly, as discussed, an overly narrow focus on hold-up alone is likely to overestimate its social costs. For example, economists have found that a legal regime allowing for damages for excessive licensing fees might solve the patent hold-up problem at the cost of retarding innovation and SSO participation.⁴³

Much of the call for SSO contract reform – whether under the guise of possible antitrust enforcement or friendly advice on contract drafting – is based upon the notion

⁴² See Letter from Microsoft to the Fed. Trade Comm’n, Comment for Patent Standards Workshop, Project No. P11-1204, 3-5 (June 14, 2011), *available at* <http://www.ftc.gov/os/comments/patentstandardsworkshop/00009-60523.pdf> (noting that “Most SSOs have an IPR (or patent) policy that seeks to balance the rights and interests of their stakeholders by seeking commitments from participating patent holders that they will offer patent licenses for their essential patent claims on reasonable and non-discriminatory (RAND) terms and conditions” and that “[s]tandards will not fulfill their salutary purposes if standards policies deter innovators from contributing patented technologies or investing in further innovation related to standardized technology.”).

⁴³ Bernhard Ganglmair, Luke M. Froeb & Gregory J. Werden, *Patent Hold-Up and Antitrust: How a Well-Intentioned Rule Could Retard Innovation*, 60 J. INDUS. ECON. 249 (2012).

that SSOs bear a special responsibility for constraining the market power of SEP holders. Indeed, the possibility of SSOs constraining the exercise of SEP holders' market power is purported to be the primary benefit of filling gaps in SSO contracts. However, it is unlikely SSO contract reform can bear the burden its proponents place upon it. SSO members are a heterogeneous group including contributing members as well as non-contributing, adopting members, with widely varying incentives. It is important to recognize that SSOs are not necessarily in a position to constrain license terms for SEPs at will. SSOs compete to attract key players to join and contribute their technology to the standard and can be at the mercy of certain members with essential technologies. However, even assuming *arguendo* SSO contract terms can constrain market power newly created by adoption of the standard, that situation is clearly not always the case. For some SEPs, the relevant market power will be inherent in the underlying technology and the patents themselves, rather than conferred upon the SEP holder by the SSO as the result of the standard-setting process.⁴⁴ Imposing more restrictive terms can undermine key players' incentives to join SSOs and/or contribute technology, which could have welfare-reducing consequences.

⁴⁴ See, e.g., U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, *supra* note 1, at 39; Mark R. Patterson, *Inventions, Industry Standards, and Intellectual Property*, 17 BERKELEY TECH. L.J. 1043, 1044 (2002). For an elaboration of the antitrust implications of pre-existing market power in the standard setting process, see Joshua D. Wright, *Why the Supreme Court Was Correct to Deny Certiorari in FTC v. Rambus*, ANTITRUST CHRONICLE (March 26, 2009), available at SSRN: <http://ssrn.com/abstract=1349969>.

Requiring stricter SSO terms might make it less attractive for IPR holders to join the SSO process. The social costs associated with deterring participation in SSOs can outweigh any potential benefits associated with decreasing the probability of hold-up. This would lead to, in the short-term, SSOs more frequently selecting an inferior technology; it could also lead to a dichotomy between competing technologies, which would defeat the purpose of SSOs and deprive consumers of the well-understood benefits of standardization. Over the long-run, these reforms could undermine the very desirable purpose of SSOs, which among other things, facilitate compatibility and interoperability, reduce consumer costs, and advance innovation.

To return to a theme of my remarks today, yet another benefit of less precise contract terms is the flexibility they allow in quickly changing markets. For example, and as many recognize, SSOs typically specify very little as to the meaning of “fair” or “reasonable,” at least in part because there is significant heterogeneity among the firms, technologies, and products within a given SSO.⁴⁵ Other terms in IPR policies also must vary depending upon technologies (*ex ante* value, number of closely competing technologies) and the characteristics of the members in a given SSO.

One contract term of interest to many commentators lately involves whether injunctive relief will be available for F/RAND-encumbered SEPs. In some SSOs, the

⁴⁵ See, e.g., Kuhn, Scott Morton & Shelanski, *supra* note 14.

availability of injunctive relief against infringers is very likely part of the understanding among the SSO and its members. As such, the right to pursue an injunction in some circumstances was likely accounted for and incorporated into the patent owner's decision to join the SSO and contribute its technologies under F/RAND.⁴⁶

Some commentators and some courts reason that – as a matter of *contract* – the F/RAND commitment is an agreement that damages are adequate compensation for infringement and therefore an injunction should not be granted under the Supreme Court's standard in *eBay Inc. et al. v. MercExchange, L.L.C.*⁴⁷ No maxim of contract interpretation requires this result. Indeed, it is difficult to imagine why such an interpretation would hold in general in light of the fact that no SSO appears to uniformly disallow injunctions. To the contrary, some appear to expressly consider and

⁴⁶ It is not clear that any SSO disallows injunctions. In fact, industry players have argued that, as an example, “European Telecommunications Standards Institute (ETSI) policies do not contain any provision precluding members from seeking injunctive relief when an infringer and potential licensee has rejected a FRAND licensing offer from the patent holder.” See Ratliff & Rubinfeld, *supra* note 8, at 7. In addition, “[m]ost of the SSOs and their stakeholders that have considered these proposals over the years have determined that there are only a limited number of situations where —patent hold-up takes place in the context of standards-setting. The industry has determined that those situations generally are best addressed through bi-lateral negotiation (and, in rare cases, litigation) as opposed to modifying the SSO's IPR policy and arguably unnecessarily burdening the standardization process for the many ICT standards that are being widely implemented in the marketplace with no apparent IPR-related challenges.” Microsoft, *supra* note 42, at 13-17.

⁴⁷ 547 U.S. 388 (2006). In *Apple, Inc.*, Judge Posner held that holder of a F/RAND-encumbered SEP could not establish the inadequacy of monetary relief required under *eBay v. MercExchange LLC*. *Apple, Inc. v. Motorola, Inc.*, 869 F. Supp. 2d 901, 914 (N.D. Ill. 2012) (“By committing to license its patents on FRAND terms, [the patent holder] committed to license the [patent-in-suit] to anyone willing to pay a FRAND royalty and thus implicitly acknowledged that a royalty is adequate compensation for a license to use that patent.”).

reject such rules.⁴⁸ *Ex post* interpretation of F/RAND commitments to preclude injunctive relief can deprive the parties the benefit of their bargain, undercompensate patent holders relative to *ex ante* expectations, and reduce incentives to innovate and the commercialization of innovation.⁴⁹

Further, it is well understood that weakening the availability of injunctive relief for infringement – including infringement of F/RAND encumbered SEPs – may increase the probability of “reverse hold-up” and weaken any incentives implementers have to engage in good faith negotiations with the patent holder.⁵⁰ Some argue the primary purpose of injunctive relief is to allow patent holders to threaten to exclude a product from the market, and thus enable extraction of royalties above the F/RAND rate and other significant licensing conditions from willing licensees.⁵¹ Such reasoning assumes the rate negotiated with the threat of an injunction has to be above the F/RAND rate. But that assumption is dubious. Although the rate negotiated with the injunction threat is likely greater than the rate negotiated without the threat of injunction, it does not

⁴⁸ See, e.g., Microsoft, *supra* note 42, at 13-17 (“Most of the SSOs and their stakeholders that have considered these proposals over the years have determined that there are only a limited number of situations where patent hold-up takes place in the context of standards-setting. The industry has determined that those situations generally are best addressed through bi-lateral negotiation (and, in rare cases, litigation) as opposed to modifying the SSO’s IPR policy [by precluding injunctions or mandating a particular negotiation process]”).

⁴⁹ F. Scott Kieff, *Coordination, Property, And Intellectual Property: An Unconventional Approach to Anticompetitive Effects And Downstream Access*, 56 EMORY L.J. 327 (2006).

⁵⁰ Microsoft, *supra* note 42.

⁵¹ Kuhn, Scott Morton & Shelanski, *supra* note 14.

follow that the former is above F/RAND. Moreover, a key role of property rights is to allow the property owner to exclude, which enables clear assignment of property rights and facilitates economic exchange.⁵²

Thus, it is quite possible the reforms' net effect is to exacerbate the possibility of reverse hold-up. That is, by stripping the SEP holder's right to injunctive relief, a potential licensee can delay good faith negotiation of a F/RAND license and the patent holder can be forced to accept less than fair market value for the use of the patent.⁵³ The threat of injunction can be a very important part of the bargaining process and is likely part of the benefit of the bargain conceived of by a contributing member of the SSO at the time it decided to participate in the standard. The existence of the threat does not necessarily lead to hold-up, as some feared, but rather can encourage an

⁵² Armen A. Alchian & Harold Demsetz, *Property Rights Paradigm*, 33 J. ECON. HISTORY 16, 22 (1973) (observing that with clearly defined property rights, including the right to exclude, "it will be easy for those who can put resources to their most valuable uses to contact and negotiate with those persons presently owning the rights to these resources."); ROBERT COOTER & THOMAS ULEN, *LAW AND ECONOMICS* 72 (2ND ED.1997).

⁵³ See, e.g., Prepared Statement of The Federal Trade Commission, Concerning "Standard Essential Patent Disputes and Antitrust Law," Before the United States Senate Comm. on the Judiciary Subcomm. on Antitrust, Competition Policy and Consumer Rights, July 30, 2013, at n. 16, available at <http://www.ftc.gov/os/testimony/113hearings/130730standardeessentialpatents.pdf>; Reply Submission of the Office of Unfair Import Investigations on Remedy and the Public Interest, *In re Certain Wireless Communications Devices, Portable Music and Data Processing Devices, Computers and Components Thereof*, Inv. No. 337-TA-745, at 12 n.3 (Int'l Trade Comm'n July 18, 2012) (addressing "the possibility of a reverse hold-up, whereby the patent-holder is forced to license the patents at less than fair market value").

infringing implementer to come to the negotiation table.⁵⁴ Reforms that suggest undermining this bargaining outcome or antitrust rules that would do so as a matter of law create a significant risk of doing more harm than good.

We can all agree that it's important to encourage SSO IPR policies that benefit competition and innovation, and that anticompetitive hold-up can retard competition and innovation. However, neither economic theory nor available empirical evidence supports the proposition that filling contractual gaps by suggesting specific terms or with the threat of antitrust enforcement actions is likely to achieve those goals. Indeed, there is at least as much support for the proposition that reforms and enforcement aimed at "perfecting" SSO contracts will do more harm than good for competition and consumers. This risk is underscored by the fact that mandatory or government "suggested" contractual changes are not likely necessary given IPR policies themselves appear to adapt to changes in market conditions and events in a dynamic environment.

⁵⁴ See, e.g., Ratliff & Rubinfeld, *supra* note 8, at 9 ("[T]he existence of that threat does not lead to holdup as feared by those who propose that a RAND pledge implies (or should embody) a waiver of seeking injunctive relief. If RAND terms are reached by negotiation, the negotiation is not conducted in the shadow of an injunctive threat but rather in the shadow of knowledge that the court will impose a set of terms if the parties do not reach agreement themselves."). Ratliff and Rubinfeld explain the economic logic undermining the typical claim that availability of injunctive relief only serves to exacerbate the threat of hold-up. ("The crucial element of this model that substantially diminishes the likelihood that the injunctive threat will have real bite against an implementer willing to license on RAND terms is the assumption that an SEP owner maintains its obligation to offer a RAND license even if its initial offer is challenged by the implementer and, further, even if the court agrees with the SEP owner that its initial offer was indeed RAND. Thus any implementer that is willing to license on court-certified RAND terms can avoid an injunction by accepting those RAND terms without eschewing any of its challenges to the RAND-ness of the SEP owner's earlier offers.").

V. Does Antitrust have a Role in Regulating SSO Contracting Processes?

In my view, the antitrust laws are not well suited to govern contract disputes between private parties in light of remedies available under contract or patent law. The same concerns extend to attempts by antitrust agencies to influence SSOs' IPR policies. Caution should be exercised in both situations. Indeed, economists have long viewed the hold-up problem and *ex post* opportunism more generally as a problem sounding in contract law with its default substantive rules and remedies rather than in antitrust law.⁵⁵ The risk of imposing antitrust remedies in pure contract disputes can have harmful effects in terms of dampening incentives to participate in standard setting bodies and to commercialize innovation. These would be unfortunate consequences of policy reforms and enforcement efforts designed to improve the competitive process. They are also avoidable consequences. The sanctions available to address patent hold-up and related concerns under other legal regimes are more than adequate to provide

⁵⁵ See, e.g., Benjamin Klein, *Market Power in Antitrust: Economic Analysis After Kodak*, 3 S. CT. ECON. REV. 43, 62-63 (1993) ("Antitrust law should not be used to prevent transactors from voluntarily making specific investments and writing contracts by which they knowingly put themselves in a position where they may face a 'hold-up' in the future [C]ontract law inherently recognizes the pervasiveness of transactor-specific investments and generally deals with 'hold-up' problems in a subtle way, not by attempting to eliminate every perceived 'hold-up' that may arise."); OLIVER E. WILLIAMSON, *MARKETS AND HIERARCHIES: ANALYSIS AND ANTITRUST IMPLICATIONS* 26-30 (1975) (...to prevent opportunism, "an effort must be made to anticipate contingencies and spell out terms much more fully than would otherwise be necessary. . . . [In addition,] the agreement needs to be monitored."); see also Timothy J. Muris, *Opportunistic Behavior and the Law of Contracts*, 65 MINN. L. REV. 521 (1981).

optimal deterrence against patent hold-up.⁵⁶ Antitrust enforcement remains available in cases of true anticompetitive price-fixing or deceptively manipulating standards. In the absence of robust empirical evidence to suggest that SSOs' adaptation of their IPR policies over time have been inadequate in minimizing the probability of hold-up, there is little reason to bring to bear the blunt weaponry of antitrust rules and remedies to micromanage the competitive process in the name of improving SSO contracts.

Thank you for your time.

⁵⁶ Bruce H. Kobayashi & Joshua D. Wright, *The Limits of Antitrust and Patent Holdup: A Reply to Cary et al.*, 78 ANTITRUST L.J. 505, 510-11 (2012) ("Because multiple damages are not required to generate optimal deterrence, remedies for breach of contract, or preventing the enforcement of the patent through estoppel, waiver, or other equitable doctrines, can serve to optimally deter undesirable patent holdup if they impose approximately single damages.").