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Has the Academy Led Patent Law Astray?

Jonathan M. Barnett*

*University of Southern California, jbarnett@law.usc.edu

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Abstract

Scholarly commentary widely asserts that technology markets suffer from a triplet of adverse effects arising from the strong patent regime associated with the establishment of the Court of Appeals for the Federal Circuit in 1982: “patent thickets” that burden innovation with transaction and litigation costs; “patent holdup” resulting in excessive payouts to opportunistic patent holders; and “royalty stacking” resulting in exorbitant patent licensing fees. Together these effects purportedly depress innovation and inflate prices for end-users. These repeated assertions are inconsistent with the continuing robust output, declining prices and rapid innovation observed in the most patent-intensive technology markets during the more than three decades that have elapsed since 1982. Recent empirical studies relating to each of these assertions have found little to no supporting evidence over a variety of markets and periods. Nonetheless courts, antitrust agencies and legislators have taken, or have proposed taking, actions consistent with these assertions. Most importantly, policymaking entities have sought to mitigate thickets, holdup and stacking effects by limiting injunctive relief for important segments of the patentee population and placing significant constraints on damages awards. Substituting monetary relief for injunctive relief—what I call the “depropertization” of the patent system—yields three potential efficiency losses. First, depropertization impedes efficient resource allocation by shifting the pricing of technology assets from the relatively informed marketplace to relatively uninformed judges and regulators. Second, depropertization distorts markets’ organizational choices by inducing entities to undertake innovation and commercialization through vertically integrated structures, rather than contractual relationships now clouded by the prospect of judicial re-negotiation. Third, depropertization may facilitate oligopsonistic efforts to depress royalties on patent-protected inputs, resulting in wealth transfers to downstream entities and discouraging innovation by upstream R&D suppliers. This possibility is consistent with the revealed preferences of downstream intermediate users in the smartphone market, who advocate limiting

injunctive relief and damages awards for certain patent holders. These potential welfare losses, combined with the paucity of evidence for thicket, holdup and stacking effects, recommend against policy actions that have weakened patent protections in technology markets.

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* Professor, University of Southern California, Gould School of Law. I am grateful for comments received from Prof. David Teece and other participants at a workshop on antitrust and standard essential patents held at the Haas School of Business, University of California, Berkeley, on October 29, 2016. I thank the library staff of the University of Southern California, Gould School of Law, for invaluable research assistance. Comments are welcome at jbarnett@law.usc.edu.



Commentary by legal scholars and economists on the patent system has often focused on three alleged adverse effects of strong patent protection that purportedly restrain innovation. First, it is asserted that a strong patent system induces “patent thickets” that slow down innovation in a web of dispute-resolution and licensing costs.¹ Second, it is asserted that a strong patent system induces “patent holdup” –a variant of the standard holdup problem in which the holder of a patent on the component of a complex product can extract an “exorbitant” licensing fee from manufacturing and other entities that cannot design around the patent.² Third, it is asserted that a strong patent system induces “royalty stacking” – a variant of the standard double marginalization scenario in which uncoordinated pricing by the holders of patented complementary inputs results in an aggregate licensing burden that “excessively” inflates the price borne by end-users.³ As a policy matter, this triplet of assertions drives toward a single solution: namely, significant limitations on patent holders’ ability to seek injunctive relief and monetary damages against allegedly infringing users. Constraints on the value of a patent in litigation reduce the patent holder’s bargaining power in licensing negotiations, which limits the holder’s incentives to engage in the “opportunistic” behavior that lies behind thickets, holdup, and royalty stacking. So goes what has become a standard narrative.

These alleged adverse effects of a strong patent system have been widely (although certainly not uniformly) asserted in scholarly and policy debates⁴ and are embedded within a broader set of concerns regularly voiced by legal scholars and some economists over “excessively” strong or numerous patents.⁵ These prevailing academic views are either implicitly or explicitly reflected in courts’ rulings in patent-related cases, antitrust agencies’ enforcement actions and policy pronouncements, legislative debates over enacted and proposed amendments to the patent statute, and practitioner commentary. Most notably, these assertions are reflected in a 2006 Supreme Court decision, *eBay Inc. v. MercExchange, LLC*⁶, and a decade of case law interpreting that decision, which has significantly limited the circumstances in which a patent holder can secure injunctive relief.⁷ Erosion of the injunction remedy has been coupled with the adoption of royalty determination standards by some courts, antitrust agencies, and standard-setting organizations (“SSOs”) that may undercompensate the holders of “standard essential patents” (“SEPs”) in information and communications technology (“ICT”)

¹ See *infra* Part A.1.

² See *infra* Part A.2.

³ See *infra* Part A.3.

⁴ As indicated in the parenthetical language, these views are not universally shared by academic writers on intellectual property (for some existing critiques, see *infra* note 12). However, these do appear to be the dominant view among legal scholars and an often-expressed view among economists, which are then cited as persuasive authorities by courts, agencies and other policymakers. For data on Supreme Court amicus briefs as an indicator of IP-skeptical views among academics, see Jonathan M. Barnett, *Three Quasi-Fallacies in the Conventional Understanding of Intellectual Property*, 12 J. L. ECON. & POL’Y 1, 3, 33-34 (2016) (74% of amicus briefs filed by academics in patent-related Supreme Court cases during 2008-2015 favor alleged infringer). For citation data as an indicator of the influence of these views among academics and policymakers, see *infra* notes 29-32, 87 and 114.

⁵ For some of the most influential publications, see MICHELE BOLDRIN & DAVID LEVINE, *AGAINST INTELLECTUAL MONOPOLY* (2008); JAMES BESSEN & MICHAEL J. MEURER, *PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK* (2008); ADAM B. JAFFE & JOSH LERNER, *INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT* (2004).

⁶ 547 U.S. 388 (2006).

⁷ See *infra* Part I.B.1.

industries.⁸ As a result, patentees in those market segments now have little expectation of obtaining an injunction against future use and a reduced expectation of compensatory damages for past or future use. In the aggregate, these legal changes have effectively converted a significant portion of issued patents from a set of legal entitlements protected by property rules, akin to land and other tangible property, in which prices are determined through market transactions, to entitlements protected by liability rules, in which prices are determined subject to a judicially administered rate ceiling.⁹

Even a partial depropertization of the patent system is not something to be taken lightly. It is an elementary principle that market transactions in general price assets more accurately and rapidly than command-and-control regulators. Well-supported economic principles hold with little qualification that reasonably secure property rights, and the associated pricing mechanism, are an institutional precondition for achieving efficient resource allocation, translating into increased investment and growth.¹⁰ Given this analytical presumption, it would be expected that any significant deviation from the market pricing principle in an area of commercially vital activity would rest on strongly persuasive grounds. Yet that is demonstrably not the case with respect to any of the three assertions that have provided the putative grounds for the partial depropertization of the patent system. Based on available evidence, these assertions appear to be primarily theoretical propositions that, until shown otherwise, are inconsistent with observed market performance during the more than three decades that have elapsed since the establishment of the Federal Circuit.

The disconnect between theory and evidence is apparent on both a “macro” and “micro” level. On a macro level, in markets in which conditions are most fertile for thickets, holdup and stacking to occur (most notably, ICT markets characterized by multi-component products and dispersed patent holders), we can observe all the signs of vigorous economic health: constantly increasing output, constantly decreasing prices (adjusted for quality), constant entry, and constant flow of new innovation. On a micro level, recent empirical studies find little to no evidence for these claimed adverse effects in real-world technology markets.¹¹ What that literature *does* find is that market players tend to anticipate those *potential* adverse effects and take preemptive efforts to prevent or mitigate them. Those “micro” findings nicely fit the “macro” picture that innovation markets have thrived during an extended period of historically strong patent protection.

Unlike initial critiques of thicket, holdup and stacking arguments, which principally identified important theoretical limitations to those arguments¹², my critique is primarily empirical and relies on

⁸ See *infra* Part I.B.3-4.

⁹ For the standard source on the distinction between property rules and liability rules, see Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules and Inalienability: Another View of the Cathedral*, 85 HARV. L. REV. 1089 (1972).

¹⁰ See DOUGLASS C. NORTH AND ROBERT PAUL THOMAS, *THE RISE OF THE WESTERN WORLD: A NEW ECONOMIC HISTORY* (1973).

¹¹ See *infra* Part II.B.2.

¹² See Einer Elhauge, *Do Patent Holdup and Royalty Stacking Lead to Systematically Excessive Royalties?*, 4 J. COMP. L. & ECON. 535 (2008); J. Gregory Sidak, *Holdup, Royalty Stacking, and the Presumption of Injunctive Relief for Patent Infringement: A Reply to Lemley and Shapiro*, 92 MINN. L. REV. 714 (2008); Damien Geradin, *Can Standard Setting Lead to Exploitative Abuse? A Dissonant View on Patent Hold-Up, Royalty Stacking and the Meaning of*

more recent examinations of those arguments' descriptive force in contemporary and historical technology markets.¹³ Given the absence of persuasive evidence of thicket, holdup and stacking effects in those studies, two scholarly tasks are in order. First, it is necessary to revisit the assumptions behind the theoretical models that have supported strong expectations of transactional blockage in patent-intensive markets. This exercise shows that these models rely on assumptions that do not track real-world standard-setting environments involving sophisticated players, repeat play, and significant standards turnover, which therefore explains why these models have such weak descriptive force. Second, it is necessary to revisit the policy actions taken (or proposed policy actions to be taken) on the basis of those theories. To do so, I present a qualitative social cost-benefit analysis with respect to ongoing and proposed retractions of the injunction remedy by courts and antitrust agencies. This cost-benefit approach strongly favors reinstating the historical presumption in favor of injunctive relief for patent holders that can defend validity and show infringement. The reasoning is straightforward. Based on our current empirical understanding, the social costs associated with injunctive relief do not seem to be high: in general, markets tend to anticipate and work around patent-related transactional roadblocks in the innovation and commercialization process. However, the social costs associated with substituting liability rules for property rules *are* likely to be high and cannot be easily corrected by the market.

There are three principal types of costs associated with moving from property rule to liability rule protections for technology assets. First, courts and regulators are inherently underinformed compared to market participants and therefore unlikely to price assets appropriately, while imposing significant incremental transaction costs to achieve that lackluster result. Second, a liability rule regime ignores the fact that patents do not only operate to recover returns on innovation but supply legal “envelopes” that enable transactions with parties that can most efficiently implement the commercialization process that is necessary for an innovation to reach market. Withdrawing those legal envelopes may inefficiently drive innovation and commercialization activities within the confines of vertically integrated corporate structures. Third, a diluted patent regime, combined with latitude for standard-setting organizations to pre-specify royalty rates and preclude injunctive relief by contract, may facilitate oligopsonistic coordination by downstream users of R&D inputs. This concern is particularly salient given the fact that industry advocates of holdup and stacking theories tend to be manufacturers that are located at intermediate levels of the ICT supply chain, rather than upstream R&D specialist firms that have often been responsible for the most significant advances in digital communications technology. The result may be distorted pricing that fails to provide upstream R&D suppliers with sufficient rates of return on their investment, resulting in long-term dynamic efficiency losses that outweigh any short-term static efficiency gains.

FRAND, 3 EURO. COMP. J. 101 (2007); Vincenzo Denicolo, Damien Geradin, Anne Layne-Farrar & A. Jorge Padilla, *Revisiting Injunctive Relief: Interpreting eBay in High-Tech Industries with Non-Practicing Patent Holders*, 4 J. COMP. L & ECON. 571 (2008); John Golden, *“Patent Trolls” and Patent Remedies*, 85 TEX. L. REV. 2111 (2007).

¹³ For an earlier contribution that reviewed the then-existing empirical evidence on royalty stacking, see Damien Geradin, Anne Layne-Farrar and A. Jorge Padilla, *The Complements Problem within Standard Setting: Assessing the Evidence on Royalty Stacking*, 48 B.C. L. Rev. 149 (2007) [hereinafter Geradin et al., *The Complements Problem*]. For discussion of then-existing empirical evidence on patent holdup, see Denicolo et al., *supra* note 12, at 596-600. My paper looks at evidence relating to a broader set of related theories and, given the passage of time, covers a broader pool of relevant evidence.

Organization is as follows. In Part I, I describe the concepts of patent thickets, holdup, and royalty stacking, and show how each concept has supported policy actions that have qualified property-rule protections in favor of liability-rule protections for significant portions of the patentee population. In Part II, I assess the theory and evidence behind each concept, showing that the evidence for each assertion is lacking, which in turn reflects limitations in the theory behind each assertion. In Part III, I present a cost-benefit approach that supports reinstating the historical presumption in favor of injunctive relief for valid and infringed patents. The paper briefly concludes.

I. **Thickets, Holdup and Stacking**

In this Part, I describe briefly the patent thicket, holdup and stacking propositions that are widely asserted in the academic literature. I then show how these propositions have had an impact, or are consistent with, policy actions undertaken by courts and agencies.

A. **The Conceptual Triplet**

Legal and economics scholars often attribute three principal welfare losses to strong forms of patent protection. Note that the following discussion is intended to provide an overview, rather than a comprehensive literature review.

1. **Patent Thickets**

The thicket thesis is straightforward. In the patent context, it contends that the issuance of large numbers of patents held by large numbers of holders is likely to depress innovation by burdening innovators with significant transaction costs relating to dispute resolution or licensing activities.¹⁴ The fragmentation of ownership interests increases the transaction costs of reaching agreement among IP-holders with respect to the use of any single bundle of technology assets. If those costs are sufficiently high, then a large part of the value generated by the innovation is dissipated, which, in the extreme case, causes the transaction to terminate because net expected value has fallen to zero. Transaction costs refer generally to the coordination costs required to reach agreement among multiple parties, which could encompass the costs relating to holdout behavior by patent holders. Holdout behavior may arise because, assuming each component is a necessary element in the relevant product (and cannot be designed around at a reasonable cost), each patent holder has an incentive to withhold agreement so it can capture the largest portion of the value embodied in the product. If each patent holder adopts this individually rational waiting strategy, then collective irrationality ensues: the transaction cannot move forward and innovation gets stuck in the patent thicket.

¹⁴ For commonly cited sources, see MICHAEL A. HELLER, *THE GRIDLOCK ECONOMY* (2008); Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 *Sci.* 698 (1998). I note that, in response to empirical studies concerning anticommons effects, Prof. Eisenberg has qualified her initial position. See Rebecca S. Eisenberg, *Noncompliance, Nonenforcement, Nonproblem? Rethinking the Anticommons in Biomedical Research*, 45 *HOUS. L. REV.* 1059 (2008).

2. Royalty Stacking

Royalty stacking is an application of the standard double marginalization problem in industrial organization.¹⁵ Suppose there is a different monopoly supplier for each of the required inputs into a single product. Each supplier rationally sets a price for its input so as to maximize its individual profits. But this may mean that the total price charged to the end-user lies above the collective revenue-maximizing level and inefficiently restricts total output. Absent price coordination, the standard solution is vertical integration: all suppliers merge into a single firm, which can then set the profit-maximizing price for the package delivered to the end-user. In the patent context, commentators have asserted that the same scenario could arise whenever a product consists of multiple components, each of those components are patented, and the patents are held by multiple parties.¹⁶ In that case, each patent holder demands an individually profit-maximizing royalty as the product travels down the supply chain, which inflates the total price borne by end-users, inefficiently restricts output and fails to maximize collective revenues for the patent holders as a group

3. Patent Holdup

The concept of holdup was pioneered by Nobel Prize winner, Oliver Williamson.¹⁷ The simplest holdup scenario consists of three elements: (i) *firm A* makes an investment in the context of a contractual relationship with *firm B*, who does not make any such investment; (ii) the investment is “specific” to the relationship—meaning, it has no or a lower value in any other use; and (iii) the contract is incomplete and *firm B* subsequently exploits that gap by unilaterally altering the terms of the relationship to its advantage. Given that contractual incompleteness precludes *firm A* from pursuing a legal remedy, *firm A* rationally forfeits to *firm B* almost all the value of its investment in the relationship in order to avoid a total loss. In the patent context, “holdup” has been used to describe a circumstance in which (i) a firm has invested in adopting or developing a technology, (ii) the firm is sued for infringement by the holder of a patent that covers (or purports to cover) a component of that technology, and (iii) it is costly to design around the patented component.¹⁸ To preserve consistency with Williamson’s definition of holdup and its continuing use in the institutional economics literature, patent holdup also requires that the investing firm did not anticipate or could not reasonably have anticipated the patent at the time it made the investment.¹⁹ This last assumption is sometimes dropped

¹⁵ The original insight is attributed to Antoine Cournot. For a modern discussion, see JEAN TIROLE, *THE THEORY OF INDUSTRIAL ORGANIZATION* 174-175 (1988).

¹⁶ See Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 *TEX. L. REV.* 1991 (2007); Mark A. Lemley, *Ten Things To Do About Patent Holdup of Standards (And One Not To)*, 48 *BOSTON COLLEGE L. REV.* 149 (2007). For similar arguments made in the same year, see Joseph Farrell, John Hayes, Carl Shapiro and Theresa Sullivan, *Standard Setting, Patents and Hold-Up*, 74 *ANTITRUST L. J.* 603 (2007).

¹⁷ See OLIVER E. WILLIAMSON, *THE ECONOMIC INSTITUTIONS OF CAPITALISM* 47-52, 64-67 (1985).

¹⁸ See Lemley & Shapiro, *supra* note 16.

¹⁹ See, e.g., Gerald F. Masoudi, *Antitrust Enforcement and Standard Setting: The VITA and IEEE Letters and the “IP2” Report*, May 10, 2007. At the time, the author was a Deputy Assistant Attorney General in the Department of Justice, Antitrust Division.

in looser uses of the term, “holdup”, that now appear in patent-related commentary and statements by practitioners²⁰, antitrust agencies²¹, courts²² and scholars.²³

B. Ideas Matter: Policy Actions Based on the Conceptual Triplet

Academic theories concerning the adverse effects of a strong patent system would be of little practical interest were it not for the fact that policymaking entities have taken actions under patent or antitrust law, or issued influential statements, that explicitly or implicitly rely on, or are consistent with, those theories. Starting in the early 2000s, notions of thickets, holdup and stacking appeared in statements issued by the Federal Trade Commission (“FTC”)²⁴, which were then articulated more formally in academic publications, which have in turn been cited as persuasive sources by courts and antitrust agencies. I identified 37 federal court decisions that mentioned “patent holdup” or “royalty stacking”, eight International Trade Commission (“ITC”) proceedings that did so²⁵, and four FTC proceedings that did so. In a 2011 decision that cast doubt on the validity of patents relating to isolated genetic material, the Southern District of New York specifically referenced scholarly views that biomedical markets suffer from patent thickets.²⁶ The FTC and the Department of Justice (“DOJ”), which periodically undertake antitrust enforcement actions that have implications for the patent system, refer to these theories, sometimes noting that these theories reflect an academic consensus.²⁷

To provide a more precise sense of these theories’ potential influence on agency action, the Table below shows the number of times the thicket, holding and stacking concepts have been mentioned in major reports issued in the past 10 years by the FTC, DOJ and the U.S. Patent & Trademark Office (“USPTO”) on antitrust and intellectual property matters, as well as the 2007 report issued by the

²⁰ See, e.g., Suzanne Michel, *Bargaining for RAND Royalties in the Shadow of Patent Remedies Law*, 77 ANTITRUST L. J. 889, 892 n.9 (2011).

²¹ See *infra* note 67.

²² See *infra* note 67 and accompanying text.

²³ Reflecting this looser understanding, Profs. Contreras and Gilbert propose that a “RAND” (reasonable and nondiscriminatory royalty) commitment should be imposed in all patent litigations involving “holdup”, which is defined to include any circumstance in which the infringing party must incur switching costs to move to a non-infringing alternative. To illustrate this proposition, the authors describe a hypothetical in which the infringing party is aware that the dominant technology is covered by a patent. See Jorge L. Contreras & Richard J. Gilbert, *A Unified Framework for RAND and other Reasonable Royalties*, 30 BERK. TECH. L. J. 1451, 1456-1460, 1491-1493 (2015). As I discuss subsequently (see *infra* note 185), this type of argument (which drops the critical element of surprise from the Williamson definition of holdup) invites potential licensees to infringe and wait to be sued, shifting the pricing of IP assets from the market to the courts.

²⁴ See, e.g., FEDERAL TRADE COMMISSION, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY 9-10 (2002); TIMOTHY J. MURIS (CHAIRMAN, FED. TRADE COMM’N), COMPETITION AND INTELLECTUAL PROPERTY POLICY: THE WAY AHEAD (remarks delivered at American Bar Assoc., Antitrust Section, Nov. 15, 2001).

²⁵ The ITC is an administrative tribunal whose jurisdiction includes, among other things, actions brought by patent holders to seek “exclusion orders” blocking importation into the U.S. of allegedly infringing products. See 19 U.S.C. § 1337.

²⁶ *Ass’n for Molecular Pathology v. U.S. Patent and Trademark Office*, 702 F.Supp.2d 181, 208 (S.D.N.Y. 2010).

²⁷ See, e.g., FEDERAL TRADE COMMISSION, THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION 56 (2011).

Antitrust Modernization Committee (“AMC”), an entity formed by congressional action in 2002.²⁸ In the discussion that follows, I describe in some detail how those concepts have had a material effect on, or are consistent with, actions taken by courts, agencies and other policymaking entities that have contributed to the deproertization of the patent system.

Table I: Major Governmental Reports on Antitrust and Intellectual Property (2006-2016)

<u>Year Issued</u>	<u>Agency</u>	<u>References to “Thickets”</u>	<u>References to “Holdup”</u>	<u>References to “Stacking”</u>
2007 ²⁹	FTC, DOJ	23	2	10
2007 ³⁰	AMC	0	7	0
2011 ³¹	FTC	3	9	7
2013 ³²	DOJ, PTO	0	5	0

1. *The Seminal Case: eBay Inc. v. MercExchange LLC (2006)*

The most dramatic intersection between academic discussions and changes in the law may be the Supreme Court’s 2006 decision in *eBay, Inc. v. MercExchange L.L.C.*³³ While the decision slightly predates some of the most prominent academic publications on thickets, holdup and stacking, some of its language appears to be influenced by amicus briefs (including a brief in support of the defendant filed by 50 intellectual property professors³⁴) that referred to “patent holdup” and “patent thickets” and called for imposing limits on injunctive relief.³⁵ The litigation involved a small patent-holding entity that had brought an infringement suit against eBay, the leading e-commerce site. Prior to *eBay*, the Federal Circuit had held that, as a “general rule”, patentees are entitled to a permanent injunction after defending the presumption of validity and showing infringement.³⁶ The Court rejected any such presumption and ruled that courts had discretion to award (or not award) injunctive relief based on a four-factor “equitable” test.³⁷ However, the Court emphasized that judicial determinations under the

²⁸ ANTITRUST MODERNIZATION COMMISSION ACT OF 2002, PUB. L. NO. 107-273, 116 STAT. 1856.

²⁹ FEDERAL TRADE COMMISSION AND DEPARTMENT OF JUSTICE, ANTITRUST ENFORCEMENT AND INTELLECTUAL PROPERTY RIGHTS: PROMOTING INNOVATION AND COMPETITION (2007).

³⁰ ANTITRUST MODERNIZATION COMMISSION, REPORT AND RECOMMENDATIONS TO CONGRESS AND THE PRESIDENT (2007).

³¹ FEDERAL TRADE COMMISSION, THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION (2011).

³² U.S. DEPARTMENT OF JUSTICE AND U.S. PATENT & TRADEMARK OFFICE, POLICY STATEMENT ON REMEDIES FOR STANDARDS-ESSENTIAL PATENTS SUBJECT TO VOLUNTARY F/RAND COMMITMENTS (2013).

³³ 547 U.S. 388 (2006)

³⁴ BRIEF AMICI CURIAE OF 52 INTELLECTUAL PROPERTY PROFESSORS IN SUPPORT OF PETITIONERS, *Ebay, Inc. et al. v. MercExchange, L.L.C.* (2006).

³⁵ See, e.g., BRIEF AMICI CURIAE OF 52 INTELLECTUAL PROPERTY PROFESSORS IN SUPPORT OF PETITIONERS, *Ebay, Inc. et al. v. MercExchange, L.L.C.* 6-8; BRIEF OF TIME WARNER ET AL., *Ebay, Inc. v. MercExchange L.L.C.* 8-12; BUSINESS SOFTWARE ALLIANCE BRIEF, *Ebay, Inc. v. MercExchange L.L.C.* 5-12; COMPUTER & COMMUNICATIONS INDUSTRY ASSOCIATION BRIEF, *Ebay, Inc. v. MercExchange L.L.C.* 2-3, 7-8.

³⁶ *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1247 (Fed. Cir.), cert. denied, 493 U.S. 853 (1989).

³⁷ *eBay, Inc. v. MercExchange, L.L.C.*, 126 S.Ct. 1837, 1841 (2006).

eBay standard should not take into account the type of patent holding entity³⁸ and three concurring justices added that the historical presumption should stand in most cases.³⁹ In an additional concurrence authored by Justice Kennedy, four other justices made specific reference to the holdup problem, observing that “[a]n industry has developed in which firms use patents not as a basis for producing and selling goods but, instead, primarily for obtaining licensing fees.”⁴⁰

In post-*eBay* patent litigation, the Kennedy concurrence has prevailed. The most comprehensive empirical study (through 2015) shows that courts have interpreted *eBay* so as to effectively create a two-tier patent system in which (i) entities that “practice” a patent are typically entitled to injunctive relief; while (ii) non-practicing entities are typically only entitled to a continuing royalty for future infringement.⁴¹ This *de facto* application of *eBay* stands in tension with long-standing precedent rejecting a working requirement for patent holders.⁴² Even more dramatically, some lower court judges have expressed views suggesting that the logic of *eBay* should be extended to embrace even cases of “classic” infringement involving direct competition between two practicing patentees. In the headline patent litigation between Apple and Samsung, the two leading competitors in the smartphone market, the district court judge denied injunctive relief to Apple, even after a showing of validity and infringement, principally on the ground that monetary damages were adequate and the balance of hardships would be onerous (two factors under the *eBay* test) in the case of patents relating to individual components of a multi-component device.⁴³ While the Federal Circuit overturned this decision, it did so in a split decision, with the Chief Judge arguing in favor of upholding the district court’s denial of injunctive relief.⁴⁴ Hence, it is now reasonable to contemplate that a court would deny injunctive relief even to a practicing patent holder that has proved infringement of a valid patent by a direct competitor.⁴⁵ There is perhaps no clearer illustration of the deproportionation phenomenon.

2. “Patent Ambush” Enforcement Actions (1995, 2002, 2008)

In several widely-followed enforcement actions, the FTC has taken actions against firms that allegedly failed to disclose “standard essential patents” (“SEPs”) relating to technology being incorporated into a new standard through an industry SSO. There have been three principal actions in

³⁸ See *id.*, at 1840.

³⁹ See *id.*, at 1841-42 (2006) (Roberts, J.).

⁴⁰ See *id.*, at 1842-43 (2006) (Kennedy, J.).

⁴¹ See Christopher B. Seaman, *Permanent Injunctions in Patent Litigation after eBay: An Empirical Study*, 101 IOWA L. REV. 1949 (2016). In the most striking result, Seaman finds that the average grant rate for petitions for permanent injunctive relief after *eBay* was 72.5% overall but only 16% for non-practicing patent holders. This compares with an overall figure of approximately 95% in the period prior to *eBay*. See *id.*, at 1982, 1986-88.

⁴² *Continental Paper Bag Co. v. Eastern Paper Bag Co.*, 210 U.S. 405 (1908).

⁴³ *Apple, Inc. v. Samsung Electronics Co., Ltd., et al.*, No. 12-CV-00630-LHK (N.D. Cal. 2014).

⁴⁴ *Apple, Inc. v. Samsung Electronics Co., Ltd., et al.* (Fed. Cir. Sept. 17, 2015).

⁴⁵ This course of action has recently been proposed by some scholarly commentators. See *supra* note 12. To be clear, it is still the case that, in general, a patentee engaged in litigation with a direct competitor does retain a high expectation of permanent injunctive relief in the event it can defend validity and prove infringement. See Seaman, *supra* note 41, at 1990 (showing that direct competitors are issued injunctions in patent infringement cases 84% of the time, as compared to 21% of the time in cases involving non-direct competitors). The discussion above is merely intended to show that, in a headline patent litigation involving direct competitors in a multi-component context, permanent injunctive relief is not an assured outcome.

ICT markets, involving: (i) Dell, the prominent original equipment manufacturer (“OEM”) in the personal computer (“PC”) industry, which was filed in 1995 and settled in 1996 through a consent decree prohibiting Dell from enforcing its patent claims⁴⁶; (ii) Rambus, a semiconductor design firm in the memory chip market, which was filed in 2002 and finally adjudicated in 2008 in Rambus’ favor⁴⁷; and (iii) Negotiated Data Solutions (“N-Data”), an entity formed to acquire certain patents relating to network data transmission, which was filed and settled by a consent decree in 2008 prohibiting N-Data from enforcing the patents at issue unless it offered a license based on the commitment made to the SSO by the original owner.⁴⁸ These cases are generally cited as hold-up scenarios in which the patentee strategically failed to disclose its patent position, which then enabled it to pursue opportunistic litigation against “locked in” firms that made investments in adopting the standard.

The most widely-discussed “patent ambush” litigation is the FTC’s action against Rambus, which has become almost a poster child for patent holdup in IP policy discussions. The FTC alleged that Rambus deceptively failed to disclose to the SSO its intention to file or amend patent applications on its memory chip design, thereby enabling Rambus to evade the SSO’s “reasonable and nondiscriminatory” (“RAND”) royalty standard and to demand “exorbitant” royalties after the standard had been set.⁴⁹ Several important facts are typically omitted that complicate, if not undermine, this simple “good guy, bad guy” account of the Rambus litigation. First, this is a case the government *lost*—twice. In the FTC proceedings, the administrative law judge ruled *against* the Commission⁵⁰ as did the D.C. Circuit in the subsequent appellate proceedings.⁵¹ Second, in a concurrent civil litigation brought by a large chip manufacturer, Rambus successfully argued that it had withdrawn from the formal standard-setting process prior to the onset of any disclosure obligation.⁵² Third, in a concurrent antitrust prosecution by the government, the four largest memory chip manufacturers that had been allegedly victimized by Rambus paid criminal fines totaling hundreds of millions of dollars for participation in a price-fixing conspiracy in the worldwide “DRAM” (memory chip) market during 1999-2002.⁵³ In 2010, European Union antitrust authorities reached similar findings, including specifically an attempt by these and other

⁴⁶ FEDERAL TRADE COMMISSION, IN THE MATTER OF DELL COMPUTER CORPORATION, CONSENT ORDER, ETC., IN REGARD TO ALLEGED VIOLATION OF SEC. 5 OF THE FEDERAL TRADE COMMISSION ACT, MAY 20, 1996.

⁴⁷ *Rambus Inc. v. F.T.C.*, 522 F.3d 456 (D.C. Cir. 2008).

⁴⁸ FEDERAL TRADE COMMISSION, DECISION AND ORDER, NEGOTIATED DATA SOLUTIONS LLC (JAN. 23, 2008). Note that I omit from this discussion litigations brought by private parties that involve “patent ambush” theories in the SSO context.

⁴⁹ U.S.A. BEFORE THE FEDERAL TRADE COMMISSION, IN THE MATTER OF RAMBUS INC., DOCKET NO. 9302, JUNE 18, 2002.

⁵⁰ FEDERAL TRADE COMMISSION, OFFICE OF ADMINISTRATIVE LAW JUDGES, INITIAL DECISION, IN THE MATTER OF RAMBUS, INC. (Stephen J. McGuire, J.), FEB. 23, 2004.

⁵¹ *Rambus, Inc. v. Federal Trade Commission*, 522 F.3d 456 (D.C. Cir. 2008).

⁵² *Rambus, Inc. v. Infineon Technologies*, 318 F.3d 1081, 1105 (Fed. Cir. 2003).

⁵³ U.S. DEPT. OF JUSTICE, SAMSUNG AGREES TO PLEAD GUILTY AND TO PAY \$300 MILLION CRIMINAL FINE FOR ROLE IN PRICE FIXING CONSPIRACY, OCT. 13, 2005; Laurie J. Flynn, *Samsung to Pay Large Fine in Price-Fixing Conspiracy*, N.Y. TIMES, Oct. 14, 2005 (noting fines paid by Samsung, Hynix and Infineon in price fixing prosecution and noting that Micron had cooperated with the DOJ in exchange for amnesty). In civil antitrust litigation based on the same facts, Rambus settled with Infineon and Samsung but lost at trial to Hynix and Micron. See Ryan Smith, *Rambus Loses Major Antitrust Case Against Hynix & Micron*, AnandTech, Nov. 16, 2011. In 2013, Rambus settled separately all patent and antitrust claims with Hynix and Micron. See John Ribeiro, *Rambus, Micron settle patent, antitrust disputes*, PCWORLD, Dec. 9, 2013.

chip manufacturers to “coordinate and monitor prices” for “Rambus DRAMs.”⁵⁴ Taking these omitted facts into account, the Rambus case is an especially *weak* illustration of patent holdup. In fact, without further detailed inquiry, the evidence set forth in the Rambus litigation saga appears to support just as strongly the possibility that it was the small patentee who was “held up” by large downstream manufacturers—a possibility to which I will return subsequently.⁵⁵

3. Business Review Letters (2006, 2007, 2015); IEEE Royalty Rate Policy Shift (2015)

Private parties often have the ability, through unilateral or coordinated action, to influence the effective application of the patent system through lobbying efforts and contractual arrangements.⁵⁶ Through a modification-by-contract strategy, holders of large patent portfolios, as well as significant intermediate users of the technologies covered by those portfolios, can use the standard-setting process to influence the terms on which those technologies are made available to the downstream “implementers” market. In the most conventional form, SSOs typically require that all firms whose technology is included in the standard commit to disclose all patents “essential” to that technology and to license those patents to all interested parties on “RAND” terms.⁵⁷ Since the precise meaning of “RAND” is unclear (as evidenced by litigation over these points⁵⁸), even patentees whose technology has been included in a standard still retain significant pricing freedom in licensing transactions. To address this uncertainty, some SSOs have sought guidance from the antitrust agencies as to whether the SSO may require (or, in another variation, may invite) patent holders to commit publicly to what the patent holder identifies as the “most restrictive” royalty and non-royalty licensing terms it would demand. Through the business review letter procedure (a type of non-binding “pre-clearance” mechanism⁵⁹), the DOJ issued letters in 2006, 2007 and 2015 that signaled tolerance for this practice, subject to certain limitations.⁶⁰ In 2015, the Institute for Electrical and Electronics Engineers (the “IEEE”), a major SSO,

⁵⁴ EUROPEAN COMMISSION, CASE COMP/38511 DRAMs, NON-CONFIDENTIAL VERSION OF THE COMMISSION DECISION OF 19 MAY 2010, AT P.10, 25 (avail. at http://ec.europa.eu/competition/antitrust/cases/dec_docs/38511/38511_1813_5.pdf).

⁵⁵ See *infra* Part III.B.3.

⁵⁶ See Jonathan M. Barnett, *Property as Process: How Innovation Markets Select Innovation Regimes*, 119 YALE L. J. 384, 388-89 (2009).

⁵⁷ For an example, see INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC., IEEE-SA STANDARDS BOARD BYLAWS § 6.

⁵⁸ See *infra* Part I.4.

⁵⁹ 28 C.F.R. § 50.6. For further explanation, see U.S. DEPT. OF JUSTICE, 28 CFR SECTION 50.6 – ANTITRUST DIVISION BUSINESS REVIEW PROCEDURE, at <https://www.justice.gov/atr/28-cfr-section-506-antitrust-division-business-review-procedure>.

⁶⁰ See Letter from Thomas O. Barnett, Asst. Attorney General, Antitrust Div., Dept. of Justice, to Robert A. Skitol, Esq., Drinker, Biddle & Reath, LLP, Oct. 30, 2006 (responding to request from VITA with respect to standard setting process); Letter from Thomas O. Barnett, Asst. Attorney General, Antitrust Div., Dept. of Justice, to Michael A. Lindsay, Esq., Dorsey & Whitney LLP, Apr. 30, 2007 (responding to request from Institute of Electrical and Electronics Engineers, Inc. with respect to standard setting process); Letter from Renata B. Hesse, Acting Asst. Attorney General, Antitrust Div., Dept. of Justice, to Michael A. Lindsay, Esq., Dorsey & Whitney LLP, Feb. 2, 2015 (responding to request from Institute of Electrical and Electronics Engineers, Inc. with respect to certain amendments to the standard setting process).

relied on a business review letter to make rule changes that provide the basis for regulating the royalties assessed by the holders of patents relating to technology included in the 802.11 Wi-Fi standard.⁶¹

The SSOs argued, and the DOJ accepted, that this type of collective rate-setting may address holdup concerns that arise following market adoption of the relevant standard. However, this same practice may have oligopsonistic effects that discourage investment by R&D-specialist firms in the upstream technology input segment.⁶² This may be in part why the Standards Development Organizations Advancement Act of 2004, which otherwise limits antitrust liability for certain cooperative standard development efforts, explicitly does not cover any agreement to “set or restrain prices of any good or service”.⁶³ In particular, collective pre-specification of royalty rates raises concerns (as the DOJ has acknowledged⁶⁴) that large intermediate users of technology inputs could strategically employ the SSO infrastructure to collectively depress the price paid to upstream producers of R&D inputs. The same concern arises with respect to leading patent pools in the ICT market, which are dominated by vertically integrated companies that do not appear to be salient innovation centers in the technology supply chain, as indicated by comparatively low R&D intensities.⁶⁵ As I discuss subsequently, additional factors suggest that these oligopsony risks are most salient in the smartphone market with respect to which patent holdup and stacking concerns are most commonly expressed.⁶⁶

4. *Judicial Erosion of Injunctions: RAND Royalty Litigations (2013-14)*

The inherent imprecision of the “RAND” commitment has given rise to litigation as to whether a patent holder’s royalty demands conform to the RAND standard to which the patent holder had previously committed. In several recent decisions⁶⁷, U.S. courts have for the first time adopted methodologies for determining RAND-based royalty rates. In two of those decisions, courts expressed the view that royalty demands above a certain threshold constitute “holdup” that exploits users that have adopted the relevant standard.⁶⁸ This loose definition of holdup appears to refer to any royalty

⁶¹ PRESS RELEASE, IEEE, IEEE STATEMENT REGARDING UPDATING OF ITS STANDARDS RELATED PATENT POLICY (Feb. 8, 2015), http://www.ieee.org/about/news/2015/8_february_2_015.html?WT.mc_id=std_8feb.

⁶² On this point, see J. Gregory Sidak, *The Antitrust Division’s Devaluation of Standard-Essential Patents*, 104 GEORGETOWN L. J. ONLINE 48 (2015) [hereinafter Sidak, *Devaluation*].

⁶³ PUB. L. NO. 108-237, 118 STAT. 661 (codified at 15 U.S.C. §§ 4301 et seq. and accompanying notes).

⁶⁴ See Letter from Renata B. Hesse, Acting Asst. Attorney General, Antitrust Div., Dept. of Justice, to Michael A. Lindsay, Esq., Dorsey & Whitney LLP, Feb. 2, 2015; Letter from Charles A. James, Asst. Att’y Gen., Antitrust Div., Dept. of Justice, to Ky P. Ewing, Nov. 12, 2002.

⁶⁵ See Jonathan M. Barnett, *From Patent Thickets to Patent Networks: The Legal Infrastructure of the Digital Economy*, 55 JURIMETRICS J. 1, 28-29, 34-35 (2014) [hereinafter Barnett, *From Patent Thickets to Patent Networks*].

⁶⁶ See *infra* Part III.B.3.c.

⁶⁷ *Ericsson, Inc. et al. v. D-Link Systems, Inc. et al.*, Fed. Cir. (Dec. 14, 2014), *affirming in part, vacating in part, remanding in part, Ericsson, Inc. v. D-Link Corp.*, No. 6:10-cv-473, 2013 WL 4046255 (E.D. Tex. Aug. 6, 2013); *Realtek Semiconductor Corp. v. LSI Corp.*, No. C-12-3451, 2014 WL 2738216 (N.D. Cal. June 16, 2014); *In re Innovatio IP Ventures, LLC Patent Litigation*, No. 11 C9308, 2013 WL 5593609 (N.D. Ill., Oct. 3, 2013); *Microsoft Corp. v. Motorola, Inc.*, 795 F.3d 1024, 1031 (9th Cir. 2015), *affirming* *Microsoft Corp. v. Motorola, Inc. et al.*, No. C10-1823, 2013 WL 2111217 (W.D. Wash. Apr. 25, 2013).

⁶⁸ *Microsoft Corp. v. Motorola, Inc.*, 795 F.3d 1024, 1031 (9th Cir. 2015) (“The tactic of withholding a license unless and until a manufacturer agrees to pay an unduly high royalty rate for a SEP is referred to as ‘hold-up’”), *citing* *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1209 (Fed. Cir. 2014). In a 2015 business review letter, the Department of Justice has described these decisions in terms of a similarly broad definition of holdup: “[L]itigated

rate demanded by a “SEP” holder that a court deems “excessive” by reference to the ambiguous RAND standard. This is perhaps the clearest case in which courts, referring specifically to the holdup and stacking issues discussed in the academic literature, have explicitly engaged in what amounts to *ad hoc* price regulation of a patented asset. Opinions issued in two of these litigations take a notable additional step in “depropertizing” the patent grant by holding that a RAND commitment at least sometimes includes a commitment not to seek an injunction against an infringing party⁶⁹ (or at least, an infringing party who is willing to pay the RAND rate⁷⁰—which is to say, whatever rate it is expected that a court would determine to be a “reasonable” rate). Consistent with this view, one court awarded attorney’s fees to the *defendant-infringer* on the grounds that even *seeking* injunctive relief against a licensee willing to pay a royalty within the “RAND range” was contrary to the RAND commitment.⁷¹ Given the inherent uncertainty over a court’s ultimate definition of the RAND royalty range (which then casts doubt over which licensees can be safely deemed as “willing”), this fee-shifting prospect discourages a SEP-holder from ever seeking injunctive relief. This aggressive ruling is hardly an outlier in the current policy climate. The notion that the holder of a “RAND-encumbered” patent who seeks injunctive relief against a “willing licensee” violates the antitrust laws is reflected in two FTC consent decrees in 2012 and 2013⁷², an amicus brief filed by the FTC in a 2012 Federal Circuit litigation⁷³, and a joint statement in 2013 by the Antitrust Division and the USPTO.⁷⁴ In 2013, the National Research Council, in a report commissioned by the USPTO, similarly took the view (subject to a minority dissent) that SSOs should adopt policies that limit severely the circumstances under which SEP holders can seek injunctive relief.⁷⁵

cases demonstrate the potential for hold up when owners of RAND-encumbered standards-essential patents make royalty demands significantly above the adjudicated RAND rate”. See Renata B. Hesse, Acting Asst. Attorney General, Antitrust Div., Dept. of Justice, to Michael A. Lindsay, Esq., Dorsey & Whitney LLP, Feb. 2, 2015, at 7 n.28.

⁶⁹ *Microsoft Corp. v. Motorola, Inc.*, 2013 WL 5373179 (W.D. Wash. 2013), at *8-9 (holding that jury may find breach of implied duty of good faith and fair dealing in a breach of contract action by virtue of fact that holder of RAND-encumbered patent sought injunctive relief). See also *In re Innovatio IP Ventures, LLC Patent Litig.*, No. 11 C9308, 2013 WL 5593609 (N.D. Ill., Oct. 3, 2013), at *11-12 (noting that it is unclear whether RAND-encumbered patents are entitled to injunctive relief); *In re Innovatio IP Ventures, LLC Patent Litig.*, 921 F.Supp.2d 903, 915-16 (N.D. Ill. 2013) (same); *Microsoft Corp. v. Motorola, Inc.*, 696 F.3d 872, 877 (9th Cir. 2012) (citing and apparently endorsing views of academic commentators that RAND-encumbered patents are not entitled to injunctive relief).

⁷⁰ *Microsoft Corp. v. Motorola, Inc.*, 795 F.3d 1024 (9th Cir. 2015), at 1048 n.19. For this proposition, the Ninth Circuit’s opinion cites to *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1331-32 (Fed. Cir. 2014); however, it is not clear that the Federal Circuit adopts any such “rule” barring injunctive relief to holders of RAND-encumbered patents. A more definitive and perhaps the most widely-discussed judicial statement of this view is found in the lower court’s opinion in the same litigation (authored by Judge Posner): *Apple Inc. v. Motorola, Inc.*, 869 F.Supp.2d 901, 913-914 (N.D. Ill. 2012).

⁷¹ *Microsoft Corp. v. Motorola, Inc.*, 2013 WL 5373179 (W.D. Wash. 2013), at *12-14. The attorney’s fees award was upheld on appeal. See *Microsoft Corp. v. Motorola, Inc.*, 795 F.3d 1024, 1049-1052 (9th Cir. 2015).

⁷² U.S.A. BEFORE THE FEDERAL TRADE COMMISSION, IN THE MATTER OF ROBERT BOSCH GMBH, DECISION AND ORDER, Nov. 6, 2012, at 14; U.S.A. BEFORE THE FEDERAL TRADE COMMISSION, IN THE MATTER OF MOTOROLA MOBILITY LLC AND GOOGLE INC., DECISION AND ORDER, July 24, 2013, at 7-8.

⁷³ FEDERAL TRADE COMMISSION, BRIEF OF AMICUS CURIAE SUPPORTING NEITHER PARTY, APPLE INC. ET AL. V. MOTOROLA INC. ET AL., FED. CIR., FILED DEC. 14, 2012.

⁷⁴ U.S. DEPT. OF JUSTICE AND U.S. PATENT & TRADEMARK OFFICE, POLICY STATEMENT ON REMEDIES FOR STANDARD-ESSENTIAL PATENTS SUBJECT TO VOLUNTARY F/RAND COMMITMENTS (Jan. 8, 2013).

⁷⁵ NATIONAL RESEARCH COUNCIL, PATENT CHALLENGES FOR STANDARD-SETTING IN THE GLOBAL ECONOMY: LESSONS FROM INFORMATION AND COMMUNICATIONS TECHNOLOGY (2013).

5. **Administrative Erosion of Injunctions: Motorola Mobility/Google Consent Decree (2013)**

There remains an important venue in which the “eBay effect”—that is, limitations on courts’ latitude to issue injunctive relief in favor of patent holders—has met an important roadblock. This is the International Trade Commission, which, as an administrative entity, is not bound by the *eBay* precedent.⁷⁶ The ITC offers patent holders the powerful remedy of a “Section 337” exclusion order, which instructs the U.S. Customs Service to block the importation of products that are deemed to infringe upon a patent that has been held to be valid and infringed.⁷⁷ This remedy is especially powerful because it can cover a general class of products, rather than being confined to the specific product made by a particular infringing defendant. Several constituencies have responded by advocating action to plug this hole in *eBay*’s suppression of the injunction remedy: in 2012, FTC Commissioner Edith Ramirez testified before Congress that the ITC should adopt an approach that “reconciles” the application of injunctive relief with the case law under *eBay* in the case of SEPs⁷⁸; in 2012, a group of law and economics professors, filed the equivalent of an *amicus* brief with the ITC, making a similar argument⁷⁹; in 2013, the DOJ and USPTO issued a joint statement to the same effect.⁸⁰

In 2013, these calls translated into action. First, the U.S. Trade Representative, acting on behalf of the President, exercised its statutory authority to block implementation of an ITC exclusion order against infringing devices being imported by Apple (in connection with patent litigation involving Samsung).⁸¹ Second, the FTC acted. In the consent decree relating to the FTC’s investigation of Google’s acquisition of Motorola Mobility (and Motorola’s portfolio of thousands of SEPs subject to RAND commitments)⁸², Google, as the acquiror firm, was prohibited from seeking injunctive relief against alleged infringers of its newly-acquired patent portfolio outside of limited circumstances in which the potential licensee refuses to accept a license consistent with the RAND standard or on any other terms (including terms set by a court or arbitrator acting pursuant to the RAND standard).⁸³ Given these limitations, clearly no licensee would take any such aggressive position and thereby allow the patent holder to qualify for the narrow window in which injunctive relief would still be theoretically possible.

II. **Revisiting the Conceptual Triplet: Weak Evidence, Weak Theory**

Academic claims concerning the adverse effects of a strong patent system have not stayed within the academy. Rather, as described above, courts and agencies have translated those theories into practical action that have significantly limited the availability of injunctive relief for certain groups of

⁷⁶ *Spanson, Inc. v. Int’l Trade Cmm’n*, 629 F.3d 1331, 1359 (Fed. Cir. 2010).

⁷⁷ 19 U.S.C. § 1337.

⁷⁸ FEDERAL TRADE COMMISSION, FTC TESTIMONY EXPRESSES CONCERN THAT OWNERS OF “STANDARD-ESSENTIAL” PATENTS MAY OBTAIN INJUNCTIONS ENABLING THEM TO HOLD UP OTHER FIRMS, July 11, 2012.

⁷⁹ RAND PATENTS AND EXCLUSION ORDERS: SUBMISSION OF 19 ECONOMICS AND LAW PROFESSORS TO THE INTERNATIONAL TRADE COMMISSION (2012).

⁸⁰ U.S. DEPARTMENT OF JUSTICE AND U.S. PATENT & TRADEMARK OFFICE, POLICY STATEMENT ON REMEDIES FOR STANDARDS-ESSENTIAL PATENTS SUBJECT TO VOLUNTARY F/RAND COMMITMENTS (2013).

⁸¹ LETTER FROM EXECUTIVE OFFICE OF THE PRESIDENT, U.S. TRADE REPRESENTATIVE, TO THE HONORABLE IRVING A. WILLIAMSON, CHAIRMAN, INTERNATIONAL TRADE COMMISSION, AUG. 3, 2013.

⁸² U.S.A. BEFORE THE FEDERAL TRADE COMMISSION, IN THE MATTER OF MOTOROLA MOBILITY LLC AND GOOGLE INC., July 24, 2013, at 8.

⁸³ *See id.*

patent holders as well as substantially limiting the monetary remedies that certain patent holders can seek in litigation. Given these important implications, it is appropriate to take a close look at whether these propositions, which have typically been presented in the context of stylized theoretical settings, have ever matured into descriptively reliable statements about real-world markets. Remarkably, all available empirical evidence fails to confirm these widely endorsed theories. This mismatch between theory and evidence demands that we revisit the explicit and implicit assumptions behind those theories; upon closer review, it is clear that those assumptions are unlikely to be typically realized in real-world technology markets.

A. Patent Thickets Revisited

The patent thicket thesis is most commonly attributed to an article by Profs. Rebecca Eisenberg and Michael Heller published in *Science* in 1998⁸⁴, which Heller has expanded upon in a book-length treatment published in 2008⁸⁵ and which Eisenberg has significantly qualified in a subsequent paper.⁸⁶ The original article is undoubtedly influential: it has been cited widely in the academic literature⁸⁷, two federal court opinions⁸⁸, and congressional deliberations on patent reform.⁸⁹ At this stage, we are in a good position to assess the paper's descriptive force, since it has been subjected to empirical scrutiny using various methodologies and in different markets and periods. It is beyond the scope of this contribution to provide a detailed and comprehensive review (which I and other authors have done elsewhere to varying extents⁹⁰). However I will describe the key findings.

1. *Biomedical Research*

Multiple studies have used survey and other methods to identify patent thicket or “anticommons” effects in the biomedical research community. This research segment is important

⁸⁴ See Heller and Eisenberg, *supra* note 14.

⁸⁵ See HELLER, *supra* note 14.

⁸⁶ See Eisenberg, *supra* note 14.

⁸⁷ As of January 9, 2017, Google Scholar reports that the Heller and Eisenberg article has been cited in 2,754 academic publications and working papers.

⁸⁸ *Association for Molecular Pathology v. U.S. Patent and Trademark Office*, 702 F.Supp.2d 181, 208 (S.D.N.Y. 2010); *Board of Trustees of Leland Stanford Junior University v. Roche Molecular Systems, Inc.*, 131 S.Ct. 2188, 2200 (2011). A dissenting Federal Circuit judge took note of the theory but observed that it has not been supported empirically. See *Momenta Pharmaceuticals, Inc. v. Amphastar Pharmaceuticals, Inc.*, 686 F.3d 1348, 1374-75 (2012) (Rader, J., dissenting).

⁸⁹ See, e.g., PROVIDING FOR CONSIDERATION OF H.R. 1908, PATENT REFORM ACT OF 2007 (HOUSE OF REPRESENTATIVES – SEPT. 7, 2007), CONGRESSIONAL RECORD ONLINE, PAGE H0250 (Rep. Berman stating that “the much more insidious and troubling kinds of poor quality patents are the ones that are granted which impede commerce or further invention because they create a patent thicket so wide and so dense that an entire industry or segment of our economy becomes subservient to a single patent from a single innovator”). Avail. at <https://www.congress.gov/congressional-record/2007/9/7/house-section/article/H10249-1>

⁹⁰ For a broad review of evidence relating to the thicket thesis, both in contemporary and historical markets, see Jonathan M. Barnett, *The Anti-Commons Revisited*, 29 HARVARD J. L. & TECH. 127 (2015) [hereinafter Barnett, *Anti-Commons*]. For a comprehensive review of empirical studies of “thicket effects” in the biomedical environment, see Charles R. McManis & Brian Yagi, *The Bayh-Dole Act and the Anticommons Hypothesis: Round Three*, 21 GEO. MASON. L. REV. 1049 (2014).

because it is the field with respect to which the “anticommons thesis” was originally asserted, at the time reflecting concerns that increased patenting in the biomedical research field would generate transactional thickets that would impede research. The survey studies are remarkably consistent in finding little to no evidence that these concerns have ever materialized.⁹¹ Interviewees widely reported the use of workarounds to potential patent thickets, including nonenforcement by the patentholder⁹², nominal fees being assessed by the patent holder⁹³, design arounds⁹⁴, licenses or informal industry understandings.⁹⁵ This literature can be summarized by the conclusion of a leading study: “[L]egal excludability due to patents does not appear in practice to impose an important impediment to academic research in biomedicine . . .”⁹⁶

2. Evidence for Market Self-Correction: Collective Rights Organizations and Patent Pools

A related line of scholarly inquiry has considered whether markets have capacities to anticipate patent roadblocks and take steps to prevent it. This has important implications for the thicket thesis: if markets have robust self-correction capacities, then it would be unlikely that thickets would ever arise or persist in practice. In an early contribution that predates the “anticommons” literature, Prof. Robert Merges had argued that firms use contractual arrangements to preempt or resolve IP roadblocks through pooling and cross-licensing mechanisms.⁹⁷ As a principal example, Merges showed how the market for performance rights in musical compositions had avoided transactional blockage by developing collective rights societies for efficiently administering copyrights held by large numbers of dispersed holders.⁹⁸ Building on this line of inquiry in subsequent research, I identified over 100 documented IP (mostly patent) pooling arrangements from 1900 through 2014, finding that content and

⁹¹ See John P. Walsh, Ashish Arora & Wesley M. Cohen, *Effects of Research Tool Patents and Licensing on Biomedical Innovation*, in PATENTS IN THE KNOWLEDGE-BASED ECONOMY 285-340 (eds. Wesley M. Cohen & Stephen A. Merrill 2003) (based on survey of limited sample of industry and academic researchers, finding little evidence that access restrictions attributable to patents delayed or halted research projects or significantly limited knowledge transfer among researchers); John P. Walsh, Charlene Cho & Wesley M. Cohen, *View from the Bench: Patents and Material Transfers*, 308 Sci. 2002 (2005) (based on interviews of 414 academic biomedical researchers, finding that only one percent of interviewees reported delays in research, and none reported having halted research, due to access constraints attributable to patents); Wesley M. Cohen & John P. Walsh, *Real Impediments to Academic Biomedical Research*, in ADAM B. JAFFE, JOSH LERNER AND SCOTT STERN (EDS.), 8 INNOVATION POLICY AND THE ECONOMY 1, 12 (MIT 2008) (based on review of surveys of biomedical researchers in industry and academia, finding that patents are only one of multiple, and are rarely a determinative, means available to researchers to block access to research results, data, materials or processes, and finding little evidence of anticommons effects); Zhen Lei et al., *Patents Versus Patenting: Implications of Intellectual Property Protection for Biological Research*, 27 NATURE BIOTECH. 36 (2009) (reporting survey findings that scientists “do not [generally] encounter an anti-commons or a patent thicket”, but do experience frictions due to technology transfer agreements, which are perceived to be associated with an environment in which patenting is promoted).

⁹² See Cohen & Walsh, *supra* note 91, at 12; Walsh, Cho & Cohen, *supra* note 91, at 2002; Lei et al., *supra* note 91, at 37, 39.

⁹³ See Walsh, Cho & Cohen, *supra* note 91, at 2002.

⁹⁴ See Cohen & Walsh, *supra* note 91, at 12; Walsh, Arora & Cohen, *supra* note 91, at 323.

⁹⁵ See Walsh, Arora & Cohen, *supra* note 91, at 325-27; Cohen & Walsh, *supra* note 91, at 3.

⁹⁶ See Cohen & Walsh, *supra* note 91, at 11.

⁹⁷ See Robert P. Merges, *Contracting Into Liability Rules: Intellectual Property Rules and Collective Rights Organizations*, 84 CAL. L. REV. 1293 (1996).

⁹⁸ See *id.*

technology markets have regularly formed IP pools, except during a roughly three-decade period following World War II during which antitrust policy effectively prohibited them.⁹⁹ In other work, I documented intricate contractual and organizational solutions to potential patent thickets that have been devised by external pooling entities, as well as industry consortia, in the ICT markets starting in the late 1990s.¹⁰⁰ These transactional innovations support the deployment of data compression, data transmission and other technologies that lie behind everyday fixtures of the digital economy, including Blu-Ray players, Firewire and Bluetooth systems, MP3 players, LAN systems, cable television set-top boxes, and online streaming of audio and visual content.¹⁰¹ Contrary to the thicket thesis, widely dispersed ownership of large numbers of patents relating to critical technologies has not impeded rapid dissemination of these technologies to the end-user market, which is consistent with observed experience in these markets.

3. *Historical Research: Revisiting the “Clear Cases” of Patent Thickets*

Ron Katznelson, John Howells, and I have revisited classic patent litigations⁹⁹ that are widely cited to illustrate how strong patents can pose transactional obstacles that slow down technological progress. Some of these classic litigations include the litigation over the Wright patent in the early aircraft industry¹⁰², litigation over the “De Forest” and other patents in the early radio communications industry¹⁰³, and litigation over the “Selden” patent in the early automotive industry.¹⁰⁴ The Howells and Katznelson studies find that intensive patent litigation in the early aircraft and radio communications industries had little effect on entry opportunities or market growth, in large part because the principal stakeholders took steps to reach a mutually agreeable settlement through cross-licensing and other arrangements.¹⁰⁵ I confirmed those findings through a review of the authors’ primary sources (as well

⁹⁹ See Barnett, *Anti-Commons*, *supra* note 90, at 147-151.

¹⁰⁰ See Barnett, *From Patent Thickets to Patent Networks*, *supra* note 65.

¹⁰¹ See *id.*

¹⁰² For examples of scholars and agencies asserting that the Wright patent litigation impeded innovation and growth in the aircraft industry, see JOEL I. KLEIN, ACTING ASST. ATTORNEY GENERAL, ANTITRUST DIV., DEPT. OF JUSTICE, CROSS-LICENSING AND ANTITRUST LAW (Address before the American Intellectual Property Law Association, May 2, 1997), avail. at <http://www.justice.gov/atr/public/speeches/1118.htm>; HELLER, *supra* note 14, at 30-31; Michele Boldrin & David K. Levine, *The Case Against Patents*, FED. RES. BANK OF ST. LOUIS, WORKING PAPER 2012-035A, at 3.

¹⁰³ For examples of scholars and agencies asserting that litigation over radio communications patents impeded industry growth, see NATIONAL ACADEMY OF SCIENCES, STEPHEN A. MERRILL, RICHARD C. LEVIN AND MARK B. MYERS (EDS.), *A PATENT SYSTEM FOR THE 21ST CENTURY* 26 (2004); Mark Lemley, *The Myth of the Sole Inventor*, 110 MICH. L. REV. 709, 727-28 (2012); Roberto Mazzoleni & Richard R. Nelson, *The benefits and costs of strong patent protection: a contribution to the current debate*, 27 RESEARCH POLICY 273, 280 (1998); Robert P. Merges, *Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents*, 62 TENN. L. REV. 75 (1994).

¹⁰⁴ For examples of agencies or scholars asserting that the Selden patent litigation blocked innovation in the automotive industry, see FEDERAL TRADE COMMISSION, *TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY* 3 (2003); Tim Wu, *Intellectual Property, Innovation and Decentralized Decisions*, 92 VA. L. REV. 123, 136-37 (2006).

¹⁰⁵ See Ron D. Katznelson & John Howells, *The myth of the early aviation patent hold-up—how a U.S. government monopsony commandeered pioneer airplane patents*, IND. CORP. CHANGE (2014); John Howells & Ron D. Katznelson, *The Coordination of Independently-Owned Vacuum Tube Patents in the Early Radio Alleged Patent “Thicket”* (Working Paper 2014, available at www.ssrn.com). In the case of the aircraft and radio communications industries, the government promoted the formation of patent pools (in the radio industry, through the formation

as additional sources) and, consistent with the market self-correction thesis, described how the early petroleum refining and automotive industries had similarly addressed potential thickets through pooling and cross-licensing arrangements. Contrary to widespread assumptions, the extended patent infringement litigation between Ford Motor Co. and the holder of the Selden patent, which claimed the internal combustion engine, had no apparent effect on the expansion of the U.S. motor vehicle market or the economic performance of Ford, which thrived throughout this period and regularly released new innovations into the market.¹⁰⁶ In the petroleum refining industry, intensive patent litigation involved even more entities and extended over a substantially longer period. Again contrary to the thicket thesis, this economically critical industry showed the signs of a healthy innovation market throughout this period: accelerating R&D expenditures, robust competition for market share, and declining royalty rates.¹⁰⁷ These historical studies all converge toward a common interpretation: markets are adept at anticipating transactional blockage, and taking steps to preempt it, so that intensive patent acquisition and enforcement have little persistent adverse effect (if any) on innovation, even without taking into account positive effects on innovation incentives and transactional opportunities.

4. Re-Evaluation: Why Evidence for Patent Thickets is So Weak

In hindsight, it is perhaps unsurprising to learn that markets are so adept at identifying and preempting potential patent thickets. This result derives from pure self-interest: a thicket prevents patent holders from earning a return on their R&D investment, giving them a powerful incentive to avoid litigation and, following Coasean logic¹⁰⁸, reach a mutually agreeable allocation of property rights and split of the surplus value that is unlocked as a result. So long as antitrust or other regulatory interventions do not impede contract enforcement, stakeholders tend to exhibit robust capacities to resolve potentially conflicting patent claims for mutual advantage. Relatedly, given the rapid product life cycle of technology-intensive markets and actual or potential competition from alternative technologies, patent holders incur a large opportunity cost by failing to reach an agreement that enables the market to deploy and commercialize the relevant technology. Of course, markets' self-correction capacities in any particular case are sensitive to transaction costs. Hence, it would be expected that Coasean bargaining would perform well, and thickets would be unlikely to persist, in low transaction-cost settings involving small numbers of repeat-play patent holders with approximately homogenous IP portfolios, who can more easily enter into patent cross-licensing arrangements, or industry understandings, that avoid the complexities of formal enforcement, side payments, and ongoing royalty payments. Contrary to expectations, however, the thicket thesis does not even seem to hold true in high transaction-cost settings involving large numbers of holders with heterogeneous IP portfolios. Even in those settings, profit-motivated transactional entrepreneurs enter to devise pooling and licensing

of the Radio Corporation of America). However, in both cases, historical evidence shows that the stakeholders had already reached, or were actively negotiating, an alternative licensing or other transactional solution to the patent dispute. See Barnett, *Anti-Commons*, *supra* note 90, at 170-72, 179-82 (aircraft, radio); Howells & Katznelson, *supra* note 105, at 20-21 (radio).

¹⁰⁶ See Barnett, *Anti-Commons*, *supra* note 90, at 27-29.

¹⁰⁷ See *id.*

¹⁰⁸ See Ronald Coase, *The Problem of Social Cost*, 3 J. L. & ECON. 1 (1960).

solutions that can suppress actual or potential thickets among multiple patent holders.¹⁰⁹ Since the effective lifting of the *de facto* prohibition on patent pools following release of the 1995 revised antitrust guidelines on IP licensing¹¹⁰ and a business review letter issued by the DOJ in 1997 (in connection with a proposed patent pool)¹¹¹, this externally administered structure has become the most prevalent pooling structure in ICT markets.¹¹² This type of transactional engineering may explain why contemporary ICT markets have enjoyed rapid and expansive deployment of new technologies concurrent with the intensive acquisition and enforcement of patents.

B. Patent Holdup and Stacking Revisited

The patent holdup scenario describes a *possible* state of affairs in which the holder of a patent on one component of a multi-component technology package is able to secure payment in excess of the economic contribution of that component toward the larger product package. The royalty stacking scenario similarly describes a *possible* state of affairs that represents a straightforward application of the double marginalization problem. In both cases, however, the practically relevant question is the frequency with which these scenarios actually arise and persist in real-world markets. I address that question in two steps: (i) I examine the evidence presented in the original and most widely-cited article on holdup and stacking by Profs. Mark Lemley and Carl Shapiro (“L&S”)¹¹³; and (ii) I examine the more systematic evidence that has subsequently been presented by other researchers, especially in the smartphone market in which stacking effects have been asserted most frequently. Both steps support a single conclusion: available empirical evidence does not support the view that holdup and stacking effects are significant and persistent in contemporary technology markets.

1. Evidence in the “2007 Paper”

The paper published by L&S in 2007 is undoubtedly influential: it has been cited widely by not only academics¹¹⁴ but policymaking entities, including two federal court opinions¹¹⁵, an FTC amicus

¹⁰⁹ See Barnett, *Anti-Commons*, *supra* note 90, at 140, 160-63.

¹¹⁰ FEDERAL TRADE COMMISSION & DEPT. OF JUSTICE, ANTITRUST GUIDELINES FOR THE LICENSING OF INTELLECTUAL PROPERTY (1995).

¹¹¹ See Letter from Joel I. Klein, Asst. Att’y Gen., Antitrust Div., Dep’t. of Just., to Gerrard R. Beene, Esq., Sullivan & Cromwell 1, 16 (June 26, 1997) (indicating no intention to initiate antitrust enforcement against proposed patent licensing arrangement).

¹¹² See Barnett, *Anti-Commons*, *supra* note 90, at 186, Tbl. 3.

¹¹³ See Lemley & Shapiro, *supra* note 16. Two other contemporaneously published articles, one authored separately by Lemley and another co-authored by Shapiro, set forth similar claims. See Lemley, *supra* note 16; Farrell et al., *supra* note 16. Related patent holdup concerns had been addressed in a 2005 publication, see Daniel G. Swanson and William J. Baumol, *Reasonable and Nondiscriminatory (RAND) Royalties, Standards Selection, and Control of Market Power*, 73 ANTITRUST L. J. 1, 5, 10-11 (2005). The phrase, “patent holdup”, seems to derive from an earlier phrase, “patent ambush”, which had originated in a 1998 publication, and referred specifically to a case in which a patent holder participates in a standard-setting process and deceptively fails to disclose its patent position to other participants. See William J. Baer & David A. Balto, *Antitrust Enforcement and High-Technology Markets*, 5 MICH. TELECOMM. & TECH. L. REV. 73, 82 (1998).

¹¹⁴ As of January 9, 2017, it had been cited in 963 publications or working papers, according to Google Scholar.

brief¹¹⁶, two agency business review letters¹¹⁷, and various legislative deliberations on patent reform, including a 2007 Senate committee report.¹¹⁸ While other commentators have made related claims before and since¹¹⁹, it is clearly the key reference point in current discussion on these issues. The article consists of two parts: (i) a theoretical model of holdup and stacking effects (which other commentators have analyzed extensively¹²⁰), and (ii) empirical evidence presented in support of the model. L&S conclude that the “evidence suggests that there are indeed very real problems associated with royalty stacking”.¹²¹

A closer look supports at best a far more ambiguous conclusion. Three types of evidence are presented. First, holdup is illustrated by anecdotal examples, which, while dramatic (most notably, the \$613 million payout by RIM to a patent holding entity suing with respect to a component of the then-dominant Blackberry device), cannot be used as a compelling basis for concluding that this is a common scenario or that any specific reported settlement is exorbitant, absent reference to a reliable market benchmark. Second, stacking is supported by evidence from a sample of reasonable royalty awards in 47 infringement litigations during 1982-2005, showing that the average rate was approximately 10% for components, 13.1% for all inventions, and 14.7% for integrated product claims.¹²² This evidence suffers from small sample size and selection effects, which are likely to bias upwards the royalty rate given

¹¹⁵ *Hynix Semiconductor Inc. v. Rambus Inc.*, 609 F.Supp.2d 951, 966 (N.D. Cal. 2009); *Microsoft Corp. v. Motorola, Inc.*, 795 F.3d 1024, 1031 (9th Cir. 2015).

¹¹⁶ BRIEF OF AMICUS CURIAE, FEDERAL TRADE COMMISSION SUPPORTING NEITHER PARTY, APPLE INC. ET AL. V. MOTOROLA INC., Dec. 4, 2012, at 7, 13.

¹¹⁷ See Letter from William J. Baer, Asst. Att’y Gen., Antitrust Div., U.S. Dept. of Justice, to Gerard A. Beeney, Sullivan & Cromwell LLP, Mar. 26, 2013 (with respect to Intellectual Property Exchange International, Inc.); Letter from Renata B. Hesse, Acting Asst. Attorney General, Antitrust Div., Dept. of Justice, to Michael A. Lindsay, Esq., Dorsey & Whitney LLP, Feb. 2, 2015 (with respect to Institute of Electrical and Electronics Engineers).

¹¹⁸ REPORT, TOGETHER WITH ADDITIONAL AND MINORITY VIEWS, TO ACCOMPANY S.1145, THE PATENT REFORM ACT OF 2007 (Jan. 4, 2008), at 7 n.24. Avail. at <https://www.congress.gov/110/crpt/srpt259/CRPT-110srpt259.pdf>

¹¹⁹ A search in the Westlaw JLR database for articles that mention “patent holdup” or “royalty stacking” in the title, abstract or introduction identified 142 articles (as of December 2016). For other contributors that made similar claims previously or contemporaneously to the L&S article, see *supra* note 113. For representative examples of contributors who have made similar claims subsequently, see Contreras & Gilbert, *supra* note 23; Colleen V. Chien & Mark A. Lemley, *Patent Holdup, the ITC, and the Public Interest*, 98 CORNELL L. REV. 1 (2012); Timothy Simcoe, *Private and public approaches to patent hold-up in industry standard setting*, 57 ANTITRUST BULLETIN 59 (2012); Daryl Lim, *Misconduct in Standard Setting: The Case for Patent Misuse*, 51 IDEA 559 (2011); Robert A. Skitol & Kenneth M. Vorrasi, *Patent Holdup in Standards Development: Life after Rambus v. FTC*, 23 ANTITRUST 26 (2009); Mark A. Lemley & Philip J. Weiser, *Should Property or Liability Rules Govern Information?*, 85 TEXAS L. REV. 1991 (2007). For more qualified views, see Colleen V. Chien, *Holding Up and Holding Out*, 21 MICH. TELECOMM. & TECH. L. REV. 1 (2014) (acknowledging holdup by patentees and holdout by infringers); Thomas F. Cotter, *Patent Holdup, Patent Remedies and Antitrust Responses*, 34 J. CORP. L. 1151 (2008) (recommending error-cost approach for addressing potential patent holdup).

¹²⁰ See *supra* note 12.

¹²¹ See Lemley & Shapiro, *supra* note 16, at 2027, at 1994. Writing separately and concurrently, Prof. Lemley asserted: “Time and time again, we have seen this sort of royalty stacking problem arise”. See Mark A. Lemley, *Ten Things To Do About Patent Holdup of Standards (And One Not To)*, 48 B.C. L. REV. 149, 152 (2007).

¹²² See Lemley & Shapiro, *supra* note 16, at 2034.

other research showing that litigated patents tend to represent the most valuable patents¹²³ (as would be expected based on standard litigation models). Again, even apparently high royalty rates may not be exorbitant in any individual case without making reference to a reliable market benchmark.¹²⁴ Third, the authors provide case studies of alleged royalty stacking in various IT markets, in particular communications markets that operate under the 3GPP and 3GPP2 (also known as WCDMA and CDMA2000) standards and markets that operate under the WiFi 802.11 standard.¹²⁵ The authors present the most detailed evidence with respect to the “3G” wireless communications market so I will examine that evidence closely, especially since it involves the smartphone market in which stacking concerns have been most widely discussed.

This case study evidence consists of a three-part argument that (i) observes large numbers of patents relating to a particular wireless standard (in this case, “3G”), held by multiple entities; (ii) refers to individual cases of double-digit royalty rates or third-party reports “suggesting” that royalty rates are unusually high in this market segment; and (iii) implicitly multiplies the number of patents in (i) by reported rates in (ii) to conclude that collective royalty rates are likely “exorbitant”. This logic is unpersuasive for several reasons. First, the cited royalty rates typically consist of individual reports that may not be indicative of the relevant market as a whole, given different values of individual patents or different bargaining positions of individual licensors and licensees. Second, reported or announced rates may not reflect ultimately agreed-upon rates, which may be reduced through negotiation (as noted by L&S¹²⁶), especially by licensees that have significant IP portfolios to use as a bargaining chip.¹²⁷ The combination of these two factors raises the possibility that some licensees may even pay nominal or zero royalties to some SEP holders. Third, as mentioned above, there is no economically meaningful sense in which a specific royalty rate is “exorbitant” without reference to a reliable market benchmark.

To be sure, L&S acknowledge these complexities, observing that “[i]t is not clear what the total price of these stacked royalties is”.¹²⁸ Nonetheless the 2007 paper, and, in particular, its assertion that stacking is an empirically significant problem, does rely to a substantial extent on specific reports of royalty rates of 20% for internet functionality features in a smartphone (after cross-licensing offsets)¹²⁹, and over 30% for a dual-band smartphone (then sold widely in the European market), including 22.5% for W-CDMA technology (a type of “3G” wireless communications technology, also known as the

¹²³ See Jean O. Lanjouw & Mark A. Schankerman, *Characteristics of Patent Litigation: A Window of Competition*, 32 RAND J. Econ. 129 (2000).

¹²⁴ See Geradin et al., *supra* note 13.

¹²⁵ “CDMA” stands for code-division multiple access. It is a type of wireless communications technology, which was developed (mostly by Qualcomm) as an alternative to time-division multiple access (TDMA) and frequency-division multiple access (FDMA) wireless technologies. For discussion, see HSIAO-HWA CHEN, *THE NEXT GENERATION CDMA TECHNOLOGIES 1-2*, 181-82 (2007).

¹²⁶ See Lemley & Shapiro, *supra* note 16, at 2026.

¹²⁷ See Damien Geradin, *What’s Wrong with Royalties in High-Technology Industries?*, in *COMPETITION POLICY AND PATENT LAW UNDER UNCERTAINTY* (eds. Geoffrey A. Manne & Joshua D. Wright 2011).

¹²⁸ See Lemley & Shapiro, *supra* note 16, at 2026.

¹²⁹ See *id.*, at 2027, citing Rudi Bekkers & Joel West, *The Effect of Strategic Patenting on Cumulative Innovation in UMTS Standardization* 10, 22 (Dynamics of Insts. & Mkts. in Eur., Working Paper No. 9, Mar. 2006) [hereinafter Bekkers & West 2006], available at <http://ipr.dime-eu.org/node/144>.

“UMTS” standard) and 15-20% for GSM technology (a type of “2G” wireless communications technology).¹³⁰ The implication appears to be that handset manufacturers may likely operate under an aggregate royalty burden of 30% or even higher. While L&S did note in part that cross-licensing offsets may adjust these rates downward¹³¹, that detail appears to have often been ignored in subsequent scholarly and popular discussions, which have focused on the authors’ global conclusion that stacking is an empirically significant phenomenon.¹³²

Closer scrutiny shows that taking into account cross-licensing makes a critical difference. Given cross-licensing opportunities, there is substantial doubt that major handset manufacturers incurred double-digit royalty rates during the relevant period. The 2006 working paper that is cited by L&S for the 20% figure mentioned above, authored by Profs. Rudi Bekkers and Joel West (“B&W”), does report estimated total royalties of 20% for UMTS/WCDMA technology¹³³ (most likely the “internet functionality” to which L&S referred), based on an unpublished research paper by a private consulting group.¹³⁴ However, B&W note that those rates may be adjusted downward after cross-licensing offsets.¹³⁵ Moreover, in the 2009 published version of the same paper, B&W note that the 20% royalty for UMTS-related patents are the rates paid by “*non-IPR* holders” (my emphasis) and that “an undetermined number of firms reduce or avoid royalties through cross-licenses.”¹³⁶ In another publication in 2006, Prof. West had written separately that (i) in the GSM cellular market, major European handset manufacturers “were believed *exempt* [(my emphasis)] from patent royalties through cross-licensing” (also noted in the 2006 B&W working paper¹³⁷) and (ii) in the UMTS/WCDMA market, Qualcomm, which was the nearly exclusive supplier of CDMA chipsets, assessed royalties of 4.5% against handset manufacturers.¹³⁸ Hence, the best reading of this evidence seems to be that the then-largest European handset manufacturers, such as Ericsson and Nokia, which held significant IP portfolios that

¹³⁰ See Lemley & Shapiro, *supra* note 16, at 207 (citing Michael W. Thelander, *The IPR Shell Game*, Signals Ahead, June 6, 2005, at 1, 7). I have been unable to locate the Thelander source, but the figures are identical to the figures cited in the Bekkers & West paper noted above.

¹³¹ See Lemley & Shapiro, *supra* note 16, at 206.

¹³² Popular commentary in particular has sometimes focused on double-digit royalty rate estimates in the smartphone market, see, e.g., *Patent insanity: Royalty fees could reach \$120 on a \$400 smartphone*, ZDNet.com, May 31, 2014. The article refers to a 2014 working paper published by other authors, who, similarly to some of the evidence in the L&S paper, rely on announced, rather than finally negotiated, royalty rates. That paper “finds” an approximately 30% estimated aggregate royalty rate in the smartphone market and then notes but does not adjust for the possibility of negotiation and cross-licensing by individual licensees. See Ann Armstrong, Joseph J. Mueller and Timothy D. Syrett, *The Smartphone Royalty Stack: Surveying Royalty Demands for the Components Within Modern Smartphones*, Working Paper (2014), avail. at https://www.wilmerhale.com/uploadedFiles/Shared_Content/Editorial/Publications/Documents/The-Smartphone-Royalty-Stack-Armstrong-Mueller-Syrett.pdf.

¹³³ See Bekkers & West 2006, *supra* note 129, at 22.

¹³⁴ See *id.* I do not have access to this unpublished source.

¹³⁵ See *id.*, at 7.

¹³⁶ See Rudi Bekkers & Joel West, *The Limits to IPR Standardization Policies as Evidenced by Strategic Patenting in UMTS*, 33 TELECOMMUNICATIONS POLICY 80, 92 (2009) [hereinafter Bekkers and West 2009].

¹³⁷ See Bekkers & West 2006, *supra* note 129, at 22.

¹³⁸ See Joel West, *Does Appropriability Enable or Retard Open Innovation?*, in Henry Chesbrough, Wim Vanhaverbeke and Joel West eds., *OPEN INNOVATION: RESEARCHING A NEW PARADIGM* 126-27 (2006).

could be used to secure cross-licensing offsets¹³⁹, paid (i) 0% for “2G” GSM technology and (ii) approximately 4-5% for “3G” UMTS/WCDMA technology. Clearly that total “royalty stack” does not approach the double-digit rates that the 2007 L&S paper had suggested were being incurred in the case of dual-band mobile telephones.

2. Recent Evidence

L&S arguably describe a theoretically plausible set of circumstances in which patent holdup and royalty stacking may arise.¹⁴⁰ However, they did not provide persuasive empirical evidence that this is a frequently or even occasionally realized scenario as of the publication of the 2007 paper. It may of course be the case that subsequent evidence has validated their argument. Based on available evidence, however, that possibility has not yet been realized, even though the number of SEPs and SEP holders has increased dramatically during the rollout of “3F” and “4G” wireless communications technologies during the past decade.¹⁴¹ While no study described below definitively resolves the ongoing empirical debate, it is striking that *every* study, as well as several industry reports described below, fails to find persuasive evidence of holdup and stacking effects in the patent-intensive IT, and especially smartphone, markets in which those effects should, as a theoretical matter, be most salient.

a. Industry Reports: Royalty Rates in the “3G” Smartphone Market

Multiple industry reports provide reason to believe (although, given their anecdotal nature, they cannot be interpreted to definitively show) that the total royalty burden in the 3G smartphone market (the market discussed in the L&S 2007 paper) does not typically venture into the double-digit range. First, that range is consistent with public statements by two leading handset makers at the time of the initial rollout of “3G” cellular devices: (i) in 2007, Ericsson’s chief technology officer stated that the total royalty rate burden for WCDMA technology is typically 4-5%¹⁴²; and (ii) in 2007, Nokia reported a total royalty rate burden for UMTS/WCDMA handsets of 3%.¹⁴³ Second, reports in the business press noted in 2006, 2009 and 2015 that Qualcomm, the industry’s principal licensor of CDMA-based chipsets to handset manufacturers, typically licenses its CDMA patents at approximately 5% of the handset’s wholesale price.¹⁴⁴ At a 2009 conference, Qualcomm’s Chief Operating Officer reportedly stated that

¹³⁹ See West, *supra* note 138, at 23 (noting that, during the UMTS standardization process, Nokia and Ericsson, two large handset manufacturers, held the largest number of patents with respect to the standard).

¹⁴⁰ Scholars who have focused on L&S’s theoretical models have reached varying conclusions about the plausibility of these circumstances, often finding that they are restricted to a relatively narrow set of cases. See *supra* note 12. I am largely abstracting away from these critiques so as to focus on the empirical evidence for the holding and stacking assertions.

¹⁴¹ See Alexander Galetovic and Kirti Gupta, *Royalty Stacking and Standard Essential Patents: Theory and Evidence from the World Mobile Wireless Industry*, Working Paper (2016), at 3, 8.

¹⁴² See Geradin et al., *supra* note 13, at 154 (citing statement by president of Ericsson that the IPR rate for WCDMA and HSPA technologies is higher than 4-5% “on only a few occasions”).

¹⁴³ NOKIA PRESS RELEASE (April 17, 2007). Available at <http://www.nokia.com/press/press-releases/showpressrelease?newsid=1118142>.

¹⁴⁴ See Mark Halper, *Nokia battles Qualcomm over royalties*, Fortune, Dec. 19, 2006; Tammy Parker, *Qualcomm focused on bilateral deals for LTE IPR*, telecoms.com, Feb. 9, 2009, at <http://www.telecoms.com/4844/qualcomm-focused-on-bilateral-deals-for-lte-ipr/>; Don Clark, *Qualcomm’s Main Profit Driver is Under Pressure*, Wall St. J., Apr. 13, 2015.

Qualcomm assessed a royalty rate of 4-5% on its 3G CDMA licenses.¹⁴⁵ While the credibility of these statements should be discounted to some extent given potential strategic considerations, a 5% figure (applied to a truncated royalty base, which reduces even further the effective royalty rate) was also reported in connection with Qualcomm's settlement of a Chinese government "anti-monopoly" investigation in 2015¹⁴⁶ and rates of 5.25-5.75% have been reported in connection with Qualcomm licenses to Korean firms.¹⁴⁷ While the Qualcomm figure cannot fully reflect the aggregate royalty burden in the "3G" market given required patented inputs held by other suppliers, there is reason to believe that royalties payable to those other suppliers may not be significant given Qualcomm's nearly exclusive position as the supplier of CDMA chipsets used in "3G" smartphones.¹⁴⁸ As discussed further below¹⁴⁹, these anecdotal reports of royalty rates in the smartphone market turn out to be largely consistent with recent empirical studies.

b. *Price Data in SEP-Reliant Industries*

Profs. Galetovic, Haber and Levine examine "SEP-reliant" industries for evidence that these industries suffer from slower declines in quality-adjusted prices compared to "non-SEP-reliant" industries.¹⁵⁰ If the holdup and stacking hypotheses are correct, then the "excessive" royalties imposed by SEP-patent holders would raise prices for intermediate and end-users, slowing adoption and impeding entry. Yet the evidence is negative. In this comparison, which mostly covers 1997-2013, SEP-reliant industries (for example, smartphone, computing and certain other electronics industries) have more rapid quality-adjusted price declines as compared to non-SEP-reliant industries (for example, the automotive industry). To address the possibility that those differentials might reflect underlying industry-specific differences in innovative capacity, the authors compare quality-adjusted price declines in SEP-reliant and non-SEP-reliant industries that are subject to Moore's Law (used as a proxy for innovative intensity).¹⁵¹ The same result holds: SEP-reliant industries still experience faster quality-adjusted price declines than non-SEP-reliant industries.¹⁵² While not definitive, this evidence is inconsistent with the holdup and stacking hypotheses, which anticipate that intensive and fragmented patenting would result in higher quality-adjusted prices. In SEP-intensive markets, the opposite has occurred.

¹⁴⁵ See Scott Moritz, *Tech Rumor of the Day: Qualcomm*, The Street, June 24, 2009. Avail. at <https://www.thestreet.com/story/10526160/1/tech-rumor-of-the-day-qualcomm.html>

¹⁴⁶ See QUALCOMM, FORM 10-K (2015), at 10-11 (noting that Qualcomm had agreed with Chinese authorities to assess a royalty rate of 5% for 3G CDMA or WCDMA devices and 3.5% for 4G devices that do not use CDMA or WCDMA, but applied to a royalty base of 65% of the net sale price).

¹⁴⁷ See DAVE MOCK, THE QUALCOMM EQUATION 177 (2005).

¹⁴⁸ See DAVID S. EVANS, ANDREI HAGIU AND RICHARD SCHMALANSEE, INVISIBLE ENGINES: HOW SOFTWARE PLATFORMS DRIVE INNOVATION AND TRANSFORM INDUSTRIES 191 n.13 (2006) (noting that Qualcomm owns "virtually all patents for CDMA", all patents for CDMA2000, the "3G" standard promoted by Qualcomm, and 20% of the patents for WCDMA, an alternative "3G" standard promoted by European firms such as Ericsson and Nokia).

¹⁴⁹ See *infra* Part II.B.2.d.

¹⁵⁰ See Alexander Galetovic, Stephen Haber, and Ross Levine, *An Empirical Examination of Patent Holdup*, 11 J. COMP. L. & ECON. 549 (2015).

¹⁵¹ Moore's Law states that the number of transistors in an integrated circuit doubles approximately every two years.

¹⁵² See Galetovic et al., *supra* note 150.

c. *Indirect Indicators of Holdup and Stacking*

In a 2015 paper and a 2016 paper (co-authored with Prof. Galetovic), Dr. Kirti Gupta assessed indirect indicators of potential holdup and stacking effects in the “3G” and “4G” mobile wireless communications markets.¹⁵³ Both papers are motivated by a simple question. If there *were* significant holdup and stacking effects, then we would expect to observe one or more of the following effects: (i) end-users experience increasing quality-adjusted prices (as a result of stacked royalties being passed on by handset manufacturers); (ii) handset manufacturers experience reduced profit margins (as a result of stacked royalties that cannot be passed on to consumers); or (iii) participants in standard-setting reduce R&D or reduce participation in SSOs. None of these effects are observed. During 2004-2013, firms in the mobile wireless industry (and, in particular, manufacturers of standard-compliant products) exhibit increasing R&D investment¹⁵⁴, increasing participation in standard-setting efforts¹⁵⁵, and little change in gross profit margins.¹⁵⁶ If we look for adverse effects at the consumer market level, there too the readings are negative: during 2000-2013, the flow of new wireless products increased (as measured by releases of new consumer devices in the 3G and 4G smartphone markets)¹⁵⁷, the number of unique manufacturers of mobile wireless devices increased¹⁵⁸, and there was frequent turnover in market shares among leading manufacturers.¹⁵⁹ In a 2016 paper, Keith Mallinson similarly observed a continuous flow of new models and continuous entry of new manufacturers in the smartphone market, as well as a decline in smartphone prices coupled with an increase in functionality.¹⁶⁰ These indicators are simply not symptomatic of an industry in which patent holdup and stacking are endemic and royalty burdens are “exorbitant”, which should raise prices, slow down innovation, and discourage entry.

d. *Estimating the “Royalty Stack”*

In two papers published in 2016, Keith Maillinson and J. Gregory Sidak have sought to estimate the aggregate “royalty stack” associated with a smartphone device.¹⁶¹ In a 2016 working paper, Alexander Galetovic, Stephen Haber and Lew Zaretski have undertaken a similar task.¹⁶² This empirical test goes to the heart of the stacking thesis, which holds that the royalty stack inflates the price of the

¹⁵³ See Kirti Gupta, *Technology Standards and Competition in the Mobile Wireless Industry*, 22 GEO. MASON L. REV. 865 (2015).

¹⁵⁴ See *id.*, at 889-90.

¹⁵⁵ See *id.*, at 888-89.

¹⁵⁶ See *id.*, at 891-92; Galetovic and Gupta, *supra* note 141, at 24-25.

¹⁵⁷ See Gupta, *supra* note 153, at 892-93.

¹⁵⁸ See *id.*, at 893-94.

¹⁵⁹ See *id.*, at 893-94.

¹⁶⁰ See Keith Mallinson, *Don't Fix What Isn't Broken: The Extraordinary Record of Innovation and Success in the Cellular Industry under Existing Licensing Practices*, 23 GEO. MASON L. REV. 967, 894-990, 993-94 (2016) [hereinafter Mallinson, *Don't Fix What Isn't Broken*].

¹⁶¹ See J. Gregory Sidak, *What Aggregate Royalty Do Manufacturers of Mobile Phones Pay to License Standard-Essential Patents?*, 1 CRITERION J. INNOVATION 701 (2016) [hereinafter Sidak, *Aggregate Royalty*]; Mallinson, *Don't Fix What Isn't Broken*, *supra* note 160; Keith Mallinson, *Cumulative Mobile SEP Royalty Payments No More Than Around 5% of Mobile Handset Revenues*, WISE HARBOR (2015).

¹⁶² See Alexander Galetovic, Stephen H. Haber and Lew Zaretski, *A New Dataset on Mobile Phone License Royalties*, HOOVER INSTITUTION WORKING GROUP ON INTELLECTUAL PROPERTY, INNOVATION AND PROSPERITY, WORKING PAPER SERIES NO. 16011 (2016) [hereinafter Galetovic et al., *New Dataset*].

end-user product, thereby endangering the economic viability of the relevant market or pricing it out of the reach of many consumers. All three analyses reach results that are inconsistent with this thesis. The papers use publicly available data on, or make estimates of, the revenues of major SEP owners, patent pools, large implementers of SEPs, and patent-assertion entities. Based on certain conservative assumptions and slightly different methodologies, all three studies then reach the conclusion that royalties paid to SEP owners in 2013 and 2014 for 3G and 4G handsets fell within a range of 3-5.5% of global handset revenues. While there cannot be complete confidence in these estimated royalty ranges due to the confidentiality of specific licensing agreements and the varying quality of different data sources, these studies provide the best currently available estimate of the actual royalty stack borne by manufacturers and consumers in smartphone markets.

3. Re-Evaluation: Why Evidence for Holdup and Stacking is So Weak

If evidence for the stacking and holdup theories is so weak, it is sensible to revisit those theories and in particular the assumptions on which those theories implicitly rely. That analysis shows that the welfare-depleting outcomes anticipated by the stacking and holdup theories rely on at least four assumptions that are typically not satisfied in real-world technology markets.

a. *Faulty Assumption I: One-Shot Play*

Firms invest heavily in the R&D required to launch a new technology standard, a high-risk process that can take up to a decade and is not assured to result in market adoption.¹⁶³ And they anticipate doing that process all over again: in the mobile phone and smartphone market, “2G” is followed by “3G”, “4G” and now “5G” is in development.¹⁶⁴ Hence, patent holders have incentives to demand modest royalty rates in order to seed the market, elicit widespread adoption of the new standard, and establish a credible commitment to “reasonable” rates in order to promote adoption of upgrades and new standards in the future. Put differently: even powerful patent holders select *long-term* profit maximizing, not *short-term* profit maximizing, strategies. Repeat players would be foolish to forfeit a long-lived stream of gains, achieved by maintaining “good-faith” pricing policies with intermediate users and end-users, in order to maximize short-term royalty streams. This is especially true in the SSO context in which firms seek to contribute not just to the initial release of a single standard, but to subsequent releases of that standard, and other standards in the future.¹⁶⁵

b. *Faulty Assumption II: Licensees Have No Foresight*

Stacking and holdup theories implicitly assume that licensees have little foresight and do not calculate total future licensing costs in connection with adoption of a particular technology. A review of the practitioner literature shows that this is flatly untrue: the IP licensing trade literature discusses how

¹⁶³ On this point, see Gupta, *supra* note 153, at 869-874.

¹⁶⁴ On the evolution in smartphone technology from 2G through 5G, see Rana Pratap & Rahul Vijh, *5G Mobile Networks: The Next Big Battleground*, IPWATCHDOG, Mar. 31, 2016.

¹⁶⁵ See Joshua D. Wright, *SSOs, FRAND, and Antitrust: Lessons from the Economics of Contracts*, 21 GEO. MASON L. REV. 791, 879 (2014); Gupta, *supra* note 153, at 869-74.

to protect against stacking by using clauses that set a cap on the total royalty burden.¹⁶⁶ Given licensee foresight into potential holdup and stacking behavior, licensors must set royalty rates in order to commit against that behavior and elicit adoption of their technology. This explains why leading handset makers and chipset providers in telecommunications markets reportedly strive to maintain a constant royalty rate over time¹⁶⁷ and some patent pools offer “post-netting” policies that reduce a licensee’s royalty rate to reflect royalty obligations to other technology holders.¹⁶⁸ Perceived “excessive” royalty rates for any particular release trigger market punishment by promoting infringement and discouraging adoption, thereby endangering the significant R&D investment required to launch and then build upon a new technology standard.

c. *Faulty Assumption III: Licensors Have No Competition*

The stacking and holdup models not only must assume that sophisticated licensees lack foresight, but further assume that patent holders uniformly hold a unique technology to which there is no reasonable alternative in the near to mid-term. This is often, and perhaps even typically, not the case.

First, new technology standards often face competition from other existing standards (for example, the “war” between Blu-Ray and HD-DVD in the optical disc market), in which case patent holders have incentives to set especially low royalty rates in order to elicit adoption. This can be observed in the smartphone market, in which multiple overlapping standards have competed for adoption upon the release of “3G” and “4G” wireless technologies, which in turn must compete to attract handset manufacturers, telecom carriers, and end-users, who are already invested in the existing older technology and incur switching costs in abandoning it.¹⁶⁹ Standards competition at the intermediate user and end-user levels necessarily limits the pricing freedom of an upstream firm that cannot recoup and earn a return on its R&D investment without significant end-user adoption of its new technology.

Second, even well-established technology standards typically face some competition or can reasonably anticipate being confronted with competitive entry in the near to mid-term.¹⁷⁰ Consider Qualcomm, which holds what is widely recognized as an indispensable portfolio of patents underlying the CDMA technology used in “3G” smartphones. Stacking theory would contemplate that Qualcomm would set its royalty rate with complete disregard for other licensors’ pricing policies. That is not the

¹⁶⁶ See, e.g., Erik Verbraeken, *Drafting of Royalty Clauses: 30 Ways to Head for Windfall or Pitfall*, LES NOUVELLES (Sept. 2011), at 169-70; Sharon Finch, *Royalty Rates: Current Issues and Trends*, 7 J. COMMERCIAL BIOTECH. 229 (2001).

¹⁶⁷ Qualcomm, the leading chipmaker in the handset market, claims to have maintained its royalty at a constant 5% of the handset’s wholesale price, see Tammy Parker, *Qualcomm focused on bilateral deals for LTE IPR*, telecoms.com, Feb. 9, 2009, at <http://www.telecoms.com/4844/qualcomm-focused-on-bilateral-deals-for-lte-ipr/>.

¹⁶⁸ I am referring to the practice of some patent pool administrators (for example, the One-Blue pool, which encompasses technology relating to Blu-Ray players), who commit to “post-netting” policies that reduce the royalty rate owed by any individual licensee if that licensee is already subject to royalty obligations with a pool member pursuant to an independent bilateral licensing agreement. See Ruud Peters, *One-Blue: a blueprint for patent pools in high-tech*, INTELLECTUAL ASSET MANAGEMENT, Sept./Oct. 2011, at p.40.

¹⁶⁹ See Mallison, *Don’t Fix What Isn’t Broken*, *supra* note 160, at 991-92.

¹⁷⁰ See Barnett, *From Patent Thickets to Patent Networks*, *supra* note 65, at 41-43. On inter-standard competition in technology markets, see Gupta, *supra* note 153, at 871-72.

case. First, even in the case of 3G CDMA technologies, in which Qualcomm holds a dominant patent position, it is reported that some telecom operators had initially adopted an alternative technology with similar functionality and in which Qualcomm did not have a patent position.¹⁷¹ Second, Qualcomm's pricing decisions are necessarily influenced by the fact that, concurrently with the release of "3G" devices, industry players were already developing "4G LTE" technology, a future market in which Qualcomm did not expect to have a comparably dominant patent position. Hence, in 2008, Qualcomm announced that, in the 4G LTE market, it would reduce its royalty rate to approximately 3.25% to reflect its less dominant patent position as compared to the 3G CDMA market.¹⁷² While that statement must be discounted to reflect potential strategic considerations, it is consistent with the notion that even powerful patent holders must take into account users' concerns over future opportunism.

d. *Faulty Assumption IV: Licensors Cannot Signal*

Stacking models assume that licensors cannot signal pricing intentions to each other in order to avoid or mitigate double marginalization inefficiencies. Based on this expected market failure, the conventional stacking literature proposes either that (i) antitrust regulators permit SSOs to set pre-specified royalty caps; or (ii) judicial regulators "correct" market pricing through royalty caps in the form of reasonable royalty determinations. But this ignores a far less costly and more subtle market mechanism that addresses and mitigates stacking outcomes through signaling behavior. Leading patent holders in the wireless market periodically issue press releases indicating expected royalty rates. The rollout of the 4G LTE wireless standard illustrates this type of behavior. As shown in the Table below, major upstream technology providers issued statements indicating expected royalties in connection with the release of 3G and 4G LTE devices.¹⁷³

¹⁷¹ See MOCK, *supra* note 147, at 231.

¹⁷² QUALCOMM LTE/WIMAX PATENT LICENSING STATEMENT (DECEMBER 2008). As of 2015, industry commentary confirms that Qualcomm has adhered to this commitment, indicating that Qualcomm typically assesses a royalty of 3.5% on 4G devices. See Yoshida, *supra* note 146.

¹⁷³ The statements below were initially sourced through Eric Stasik, *Royalty Rates and Licensing Strategies for Essential Patents on LTE (4G) Telecommunications Standards*, LES NOUVELLES, Sept. 2010.

Table II: Statements Relating to 3G and 4G Wireless Technology Royalties

<u>Firm</u>	<u>Date</u>	<u>Statement</u>
Nokia	2002	Advocates industry-wide commitment to 5% cumulative royalty for W-CDMA technology. ¹⁷⁴
Alcatel-Lucent	2008	Commits to single-digit maximum aggregate royalties for LTE essential IPR in handsets. ¹⁷⁵
Ericsson	2008	Same as above. ¹⁷⁶
Qualcomm	2008	Commits to not increase royalties on 4G LTE above existing royalties on 3G CDMA devices. ¹⁷⁷
Nokia	2010	“To avoid unfavorable effects of royalty stacking”, Nokia pledges not to charge royalties greater than 2%. ¹⁷⁸

While this signaling practice among upstream providers in the wireless markets deserves further empirical study (in particular, it is undetermined whether these signals are credible indicators of future licensing practice), it appears at least to be a plausible strategy by which firms with significant patent positions in a common standard can signal their pricing intentions, which in turn mitigates any double marginalization inefficiencies that could arise from uncoordinated pricing by multiple monopoly suppliers. This possibility is made more likely by the fact that a small group of five firms holds a majority percentage of all SEPs used in 3G and 4G technologies (Qualcomm, Ericsson, Nokia, Alcatel-Lucent, and InterDigital)¹⁷⁹, four of which issued statements as shown above. Consistent with standard signaling models used in the context of tacit collusion to maintain pricing discipline among cartel members, small-numbers, repeat-play environments provide the most hospitable conditions in which signaling can plausibly influence third-party pricing behavior to mitigate double marginalization outcomes.

III. Re-Appreciating the Importance of Injunctive Remedies

So far three propositions have been established. First, courts and agencies rely to some significant extent on thickets, holdup and stacking theories. Second, that reliance has translated into policy actions that have significantly limited the availability of injunctive relief, and significantly limited patent remedies, for important portions of the patentee population—including, it should be noted, some firms that undertake the upstream R&D that drives technology markets. Third, available data do not

¹⁷⁴ NOKIA ADVOCATES INDUSTRY-WIDE COMMITMENT TO 5% CUMULATIVE IPR ROYALTY FOR WCDMA, May 8, 2002. Avail. at <http://www.pijip.org/non-sdo-patent-commitments/>.

¹⁷⁵ WIRELESS INDUSTRY LEADERS COMMIT TO FRAMEWORK FOR LTE TECHNOLOGY IPR LICENSING, Apr. 14, 2008. Avail. at <http://www.pijip.org/non-sdo-patent-commitments/>.

¹⁷⁶ *see id.*

¹⁷⁷ QUALCOMM, LTE/WIMAX PATENT LICENSING STATEMENT, DEC. 2008. Avail. at <http://www.pijip.org/non-sdo-patent-commitments/>.

¹⁷⁸ *See Stasik, supra* note 173, *citing* NOKIA LICENSING POLICY ON LONG TERM EVOLUTION AND SERVICE ARCHITECTURE EVOLUTION ESSENTIAL PATENTS (2010).

¹⁷⁹ *See Sidak, Aggregate Royalty, supra* note 161.

support the view that thicket, holdup and stacking theories correspond to empirically salient phenomena. Given these propositions, it logically follows that we should revisit the policy actions that have been undertaken (and actions that are being discussed) on the basis of these theories. In particular, we should revisit the wisdom of any significant curtailment in patentees' ability to rely on injunctive relief against unconsented third-party use.

A. Background and Approach

Some observers date the historically strong regime of patent protection not to the establishment of the Federal Circuit in 1982 but rather, to the closure in 1990 of Kodak's instant camera business as a result of its loss in a patent infringement litigation brought by Polaroid.¹⁸⁰ Contemporary reports noted that the ruling "sent a message" that infringement resulted not just in a monetary penalty but a potential business shutdown.¹⁸¹ For commentators concerned with thicket, holdup and stacking effects, the Kodak decision in 1990 planted the seeds for the "exorbitant" Blackberry settlement in 2006, which was addressed in part by the *eBay* decision later that same year. As discussed above, the lower courts' application of *eBay*, coupled with actions undertaken by the antitrust enforcement agencies and court decisions relating to the determination of "RAND" royalties, have imposed significant limitations on patent holders' ability to seek injunctive relief. This is a potentially dramatic step since injunctive relief supplies the legal bedrock on which patent licensing negotiations take place. If a patentee's only credible legal recourse against an infringing party is a costly, lengthy and uncertain litigation that, if successful, results in judicially calculated royalties (and does not typically shift legal fees to the infringer), then licensing demands are discounted in general and may often be ignored, especially if the infringing party has a resource advantage in funding projected litigation costs. Hence, policy actions that circumscribe the injunctive right and truncate the damages spectrum, which then impacts and potentially distorts patent licensing and other transactions, merit a careful balancing of the social costs and benefits associated with those actions.

B. Cost-Benefit Analysis

The literature on thicket, holdup and stacking effects identifies the potential benefits from retracting injunctive relief and limiting patent damages—namely, a reduction in the opportunistic use of patents, and patent litigation in particular, to extract settlements that do not reflect the intrinsic value of the patented technology. If that were the *only* effect, then limiting injunctive relief would reduce intermediate users' exposure to holdup, potentially resulting in dynamic efficiency gains in the form of more innovation, and to royalty stacking, potentially resulting in static efficiency gains in the form of reduced prices. Based on currently available evidence, however, these gains would appear to be limited since neither holdup nor stacking appears to be a regular and persistent occurrence in patent-intensive markets. The countervailing effect of limiting injunctive relief and patent damages is a dynamic efficiency *loss* in the form of reduced innovation given a patent holder's reduced ability to extract a return on its R&D investment, which now must be negotiated under a restrained threat of

¹⁸⁰ *Polaroid Corp. v. Eastman Kodak*, 228 U.S.P.Q. 305 (D.Mass.).

¹⁸¹ See Nancy J. Perry, *The Surprising New Power of Patents*, FORTUNE, June 23, 1986.

infringement litigation. More specifically, eroding the property-rights infrastructure in intangible goods markets is likely to give rise to efficiency losses in the form of three types of resource misallocation. To contextualize the discussion, I illustrate the arguments below by reference to the mobile wireless market in which holdup and stacking concerns have been most commonly expressed.

1. *Legal Mispricing*

It is often stated (including in the “Kennedy” concurrence to the *eBay* opinion) that a monetary remedy, in the form of a reasonable royalty, is sufficient to make whole an infringed-upon patentee, so long as the patentee is engaged in R&D solely or primarily for licensing purposes.¹⁸² The rationale is simple: the licensor receives the income it would have received in a voluntarily negotiated transaction, thereby preserving its return on innovation, and the licensee can still enjoy access to the underlying technology, thereby reducing the deadweight losses inherent to any property rights protection for nonrivalrous goods. From an efficiency perspective, that would appear to be a “win-win” scenario. There are at least four reasons why this logic is faulty in any real-world litigation environment, in which case monetary remedies are likely to chronically yield distorted valuations relative to market negotiations.

a. *Informational Disadvantage*

It is unlikely that a court will calculate the hypothetical royalty accurately, given that it operates at an informational disadvantage relative to market participants, who engage in licensing activities on a day-to-day basis.¹⁸³ As F.A. Hayek famously observed, the key efficiency advantage of market-based transactions, as compared to any command-and-control mechanism, is that transacting parties harness information concerning the trade in question, thereby enabling that information to be embedded in the market price.¹⁸⁴ The retraction of injunctive relief drives the pricing of some significant portion of intellectual assets from the market to the state, either due to infringement litigation brought by the patent holder or a strategic refusal to license on the part of an infringing user, who prefers to negotiate pricing through the costly and lengthy litigation process.¹⁸⁵ Absent credible evidence of willful infringement, the alleged infringer is immune from the threat of treble damages and may rationally choose to compel the patentee to enforce its patent through litigation. Given courts’ inherent informational disadvantage, compounded by the high costs of the litigation process, this shift from market pricing (“MP”) to legal pricing (“LP”) most likely imposes a social cost in the form of some deviation away from the most feasibly efficient pricing of those assets. It may be objected that, in holdup and stacking cases, LP improves upon MP by precluding licensees from paying an “excessive” premium to the patent holder. Even granting that possibility, however, the strength of this objection

¹⁸² *eBay, Inc. v. MercExchange, L.L.C.*, 126 S.Ct. 1837, 1842-43 (2006) (Kennedy, J.).

¹⁸³ For similar views, see THOMAS F. COTTER, *COMPARATIVE PATENT REMEDIES: A LEGAL AND ECONOMIC ANALYSIS* 54-55 (2013).

¹⁸⁴ See F.A. Hayek, *The Use of Knowledge in Society*, 4 *AMER. ECON. REV.* 519 (1945).

¹⁸⁵ On the strategic use of patent litigation to set licensing terms, see F. Scott Kieff & Anne Layne-Farrar, *Incentive Effects from Different Approaches to Holdup Mitigation Surrounding Patent Remedies and Standard-Setting Organizations*, 9 *J. COMP. L. & ECON.* 1091, 1099-1100 (2013); Richard A. Epstein, F. Scott Kieff & Daniel F. Spulber, *The FTC, IP and SSOs: Government Hold-Up Replacing Private Coordination*, 8 *J. COMP. L. & ECON.* 1, 26-27 (2012).

depends on two factors: (i) the relative incidence of “legitimate” holdup and stacking scenarios, in which case LP outperforms MP by the assumption just made above, and (ii) the relative incidence of “illegitimate” claims of holdup and stacking (an inherent by-product of expanding access to LP), in which case LP almost certainly underperforms MP. Taking these factors into account, this objection is not especially compelling given available evidence suggesting that the incidence of holdup and stacking behavior is low, in which case the predominant effect of removing injunctive relief may be strategic recourse to LP by well-resourced intermediate users, resulting in a mispricing effect relative to a more secure property-rights environment.

b. *Transaction Costs*

Even if the royalty could be calculated correctly by courts, licensors must incur legal costs both to litigate and then collect on the royalty award from the noncooperative licensee. Hence, LP must outperform MP by a significant amount in order to overcome the inherently lower costs of market negotiation over the legal process. Litigation costs would almost certainly dwarf the costs that would be incurred in the licensing negotiations that take place on a day-to-day basis in technology markets. Since courts in patent cases (like U.S. courts in civil litigation generally) do not generally shift attorneys’ fees except if willful infringement can be shown¹⁸⁶, the royalty award is unlikely to make the patentee whole, resulting in chronic undercompensation. Additionally, given that the increased availability of LP will induce strategic refusals to license by well-resourced intermediate users (who will be advised to avoid making statements or taking actions that could be construed as willful infringement, which would raise the possibility of treble damages), total litigation costs are compounded as those intermediate users elect LP over MP to negotiate the terms of access to required R&D inputs held by upstream entities.

c. *Non-Price Terms*

Even if the royalty could be calculated correctly *and* legal costs were shifted to prevailing patent holders, the royalty award would still not reflect the myriad of non-price terms, or tailored lump-sum, variable, and hybrid pricing regimes, that may be included in a negotiated license. Any judicially awarded royalty typically assumes that all licensors always offer a simple per-unit royalty license, with a non-exclusivity clause, without field of use, territorial or other restrictions, and without valuable technical and other support, which is clearly not the case. While it is conceivable that courts could craft damages awards that would take into account the mix of price and non-price terms to mimic these fine details of market negotiations, that seems well beyond the realm of feasibility in real-world litigations.

d. *Negative Feedback Effects*

Even recognizing the inherent limitations of judicial pricing, it might nonetheless be argued that courts over time would improve in their ability to determine the “reasonable” royalty and thereby mimic efficient market transactions. The opposite is likely to be the case. Let’s assume that courts rely on market rates in determining the royalty that would have been determined in a hypothetical negotiation



between patentee and infringer, following one factor in the governing “Georgia-Pacific” standard.¹⁸⁷ That might give comfort that LP would mimic MP, while surgically addressing periodic opportunistic uses of patents for holdup purposes. However, if (i) the availability of injunctive relief is limited and the patentee’s shutdown threat is therefore diluted, (ii) courts make errors in distinguishing between legitimate and opportunistic holdup and stacking claims, and (iii) litigation costs are significant and courts do not generally award treble damages, then, even in scenarios not involving holdup or stacking behavior, well-resourced infringing parties will strategically shift pricing away from the markets and to the courts. The result would not only be an increase in the transaction costs associated with administering the patent system but a progressive contraction in the pool of pricing data from which courts can draw in making reasonable royalty determinations. Moreover, even the remaining pool of market transactions would yield distorted pricing data given the absence of a credible threat of injunctive relief, which would result in an across-the-board discount on all patents.

2. ***Organizational Distortion***

Any firm engaged in innovation must execute a sequence of tasks to deliver its innovations to the target consumption market and earn a return on its R&D investment. With respect to each task, the firm faces the “make/buy” decision that is familiar from the institutional economics literature in the tradition of Ronald Coase and Oliver Williamson.¹⁸⁸ From an efficiency perspective, we are indifferent to the firm’s particular make/buy decision at any specific point on the supply chain—namely, whether it executes a particular downstream commercialization function internally or delegates it to more efficient outside providers. However, we are *not* indifferent as to whether the firm makes *efficient* make/buy decisions—that is, whether it makes decisions that minimize the total costs of commercializing its new technology and bringing it to market, thereby maximizing the net social gain generated by its R&D investment. In informational asset markets, firms face a challenge in achieving this goal. As noted initially by Kenneth Arrow, that is because transactions involving informational assets expose the holder to expropriation risk in the course of negotiating or executing those transactions with a potentially adverse counterparty.¹⁸⁹ Absent strong reputational constraints that are only likely to apply in small-numbers, repeat-play settings, there is an inherent risk that the counterparty will use any disclosed information for its competitive advantage.

Broadly speaking (and again, excluding strong reputational constraints), there are two means by which to significantly mitigate this transactional conundrum: (i) vertical integration; and (ii) secure IP

¹⁸⁷ For the “Georgia-Pacific” standard (and, in particular, factor 2, which refers to “rates paid by the licensee for the use of other patents comparable to the patent in suit”), see *Georgia-Pacific Corp. v. United States Plywood Corp.*, 318 F.Supp. 1116, 1120 (S.D.N.Y. 1970), *mod. and aff’d*, 446 F.2d 295 (2d Cir. 1971), *cert. denied*, 404 U.S. 870 (1971).

¹⁸⁸ For the seminal sources, see Ronald Coase, *The Nature of the Firm*, 4 *ECONOMICA* 386 (1937); OLIVER E. WILLIAMSON, *THE ECONOMIC INSTITUTIONS OF CAPITALISM* (1985).

¹⁸⁹ This is commonly known as Arrow’s “information paradox”. See Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY* (NAT’L BUREAU OF ECON. RES. 1962).

rights.¹⁹⁰ The latter solution has a distinct advantage over the former: namely, vertical integration precludes contracting with outside parties, thereby foreclosing “buy” choices, while secure IP rights enable the innovator firm to select freely across the full spectrum of transactional options at any given point on the supply chain. If that is the case, then any deviation from secure patent coverage—for example, limiting the availability of injunctive relief—may give rise to organizational distortions that skew innovators’ choices toward vertically integrated commercialization structures as a solution to holdup. If complete vertical integration is not the cost-minimizing structure, then weakening or eliminating patent protection would have precisely the result typically attributed to *strengthening* patents – that is, it would inflate entry costs by compelling firms to undertake commercialization through integrated structures, which may *increase* the prices demanded from intermediate and end-users in the relevant market. Conversely (and paradoxically), strengthening patent protection would then have the opposite effect.

This risk of organizational distortion, and attendant increases in access costs, is particularly salient in the SEP-intensive technology markets in which thicket, holdup and stacking concerns have been most commonly expressed. That is because some firms that are responsible for much of the innovation in these industries have adopted R&D-only or R&D-mostly vertically disintegrated structures that rely on contractual interactions with downstream partners to achieve commercialization and extract value from their R&D investments. The “fabless” segment of the semiconductor industry exemplifies this tie between patents, organizational choice, and innovation.¹⁹¹ This market segment describes firms that primarily have capacities in semiconductor chip design and contract with stand-alone “foundries” for manufacturing functions. The fabless structure lowers entry costs by relieving the upstream chip design firm from incurring, or having to raise sufficient capital to fund, the billions of dollars required to construct and maintain a new chip fabrication facility.¹⁹² However, it exposes the design firm to expropriation risk by the foundry and therefore relies on some combination of patents and know-how to sufficiently reduce expropriation risk and allow the transaction to move forward.

Two of the primary targets of FTC and private antitrust and patent-related litigation alleging holdup and “excessive” royalty demands are fabless firms: Qualcomm, the leading supplier of CDMA chipsets to the smartphone market, and Rambus, a smaller firm that has specialized in the design of memory chips that are licensed to chip manufacturers. These firms have mostly adopted vertically disintegrated models in which the firm concentrates principally on R&D activities while licensing IP into the downstream market or outsourcing the manufacturing and other tasks that must be executed to complete the pathway to market.¹⁹³ As of 2015, Rambus earned 92% of its revenues from technology

¹⁹⁰ There is a third option, consisting of various graduated disclosure mechanisms, in which the disclosing party gradually releases information about its innovation to a potential transacting partner. This cannot apply in circumstances involving “lumpy” technologies in which the underlying innovation is not amenable to step-by-step disclosure. I abstract away from this possibility because it is only likely to apply in specialized circumstances.

¹⁹¹ For a more extended analysis, see Jonathan M. Barnett, *Intellectual Property as a Law of Organization*, 84 S. CAL. L. REV. 785, 838-852 (2011).

¹⁹² See *id.*

¹⁹³ See QUALCOMM, FORM 10-K (2015), at 9 (noting that the company relies on “independent third-party suppliers to perform the manufacturing and assembly, and most of the testing, of our integrated circuits based on

and patent licenses, the majority of which covers technology developed internally.¹⁹⁴ Qualcomm's history illustrates a progressive movement up the technology supply chain in a process of vertical disintegration. Specifically, in 1999, Qualcomm sold its wireless infrastructure business¹⁹⁵ and handset manufacturing business¹⁹⁶, after which it has focused on the upstream R&D required to design and supply chipsets to handset manufacturers. Hence, Qualcomm is uniquely dependent on licensing revenues from its patent portfolio to fund and capture a return on its R&D investment. As shown in the Figure below, this upstream-heavy structure is reflected by the fact that both Qualcomm and Rambus maintain high R&D intensities that significantly exceed the R&D intensities of almost all other leading firms in the semiconductor and computing markets, especially firms that are principally active in mid-stream and downstream portions of the technology supply chain.

Table III: R&D Intensities for Selected Leading IT Firms¹⁹⁷

<u>Firm</u>	<u>R&D Intensity</u>	<u>Primarily Upstream Activities?</u>
Rambus	38%	Y
Marvell	31.4%	Y
Nvidia	29.5%	Y
Intel	21.9%	N
Qualcomm	20.8%	Y
Dolby	20.72%	Y
Broadcom	15.37%	Y
Google	14.9%	N
Oracle	14.45%	N
Microsoft	12.87%	N
Cisco	12.85	N
Samsung	7.43%	N
IBM	6.42%	N
Panasonic	5.93%	N
Sony	5.65%	N
Toshiba	5.18%	N
LG	4.21%	N
HP	3.1%	N

our proprietary designs"); RAMBUS, FORM 10-K (2015), at 5 (noting that a majority of the company's revenues are derived from patent licenses).

¹⁹⁴ RAMBUS, FORM 10-K (2015), at 5.

¹⁹⁵ See Mark LaPedus, *Qualcomm, Ericsson settle CDMA squabble as part of larger agreement*, EETimes, Mar. 25, 1999.

¹⁹⁶ See Loring Wirbel, *Qualcomm sells CDMA phone division to Kyocera*, EETimes, Dec. 22, 1999.

¹⁹⁷ Figures calculated by author, based on disclosures in each firm's most recent annual Form 10-K or 20-F filing with the SEC in 2015 or 2014 (using the most recent available annual filing). R&D intensity is based on the standard definition of R&D expenditures as a share of total revenues. A firm was deemed to be primarily engaged in upstream activities if its revenue model relied principally on licensing IP assets to third parties, rather than using IP assets in conjunction with internal manufacturing and distribution operations. This determination reflects the author's judgment, informed by the firm's most recent annual Form 10-K or 20-F reports. A broader understanding of "upstream activities" would capture firms such as Microsoft, Google, Cisco and Oracle, which exhibit mid-range R&D intensities as shown above, and Intel, an integrated chip manufacturer that exhibits high R&D intensity reflecting its extensive design capacities.

The upstream, R&D-mostly structure of entities such as Qualcomm and Rambus contrasts with the vertically integrated structures maintained by semiconductor incumbents such as Intel, the world's largest semiconductor manufacturer, which have been challenged by the entry of "fabless" chip design firms that no longer need to match incumbents' integrated manufacturing infrastructure. These entrants' disintegrated structures logically rely on a secure patent portfolio backed up by a credible litigation threat. This assertion does not seem to be merely theoretical. In 2015, Rambus announced that, given the change in the enforcement climate for patents in the United States, it had shifted strategy and would undertake to develop chips that it would sell directly into the market under its own brand, rather than solely or primarily licensing designs to firms located downstream in the semiconductor ecosystem.¹⁹⁸ Other leading chip designers, such as Qualcomm and Broadcom, have recently entered into acquisition transactions involving firms with chip manufacturing capacities.¹⁹⁹ While other factors may account for these transactions, at least one stated factor in Rambus' forward integration strategy is a decline in the ability to enforce its patent portfolio, which may have induced the firm to acquire complementary non-IP assets by which to extract returns from its R&D investment.

3. Oligopsony Risk and Rent Diversion

It is commonly asserted that standard-setting arrangements raise the risk of collusion, enabling participants to use royalty streams to coordinate on the pricing of standardized inputs. Both SSOs, and a close organizational relative, patent pools, adopt structural features that are designed to limit collusion risk.²⁰⁰ In the case of SSOs, participants are specifically directed to refrain from engaging in discussions over the specific royalties that participant firms will charge for the use of technology incorporated in the standard.²⁰¹ This effort to reduce collusion risk accounts in part for the vagueness of the RAND commitment undertaken by SSO members. In the case of patent pools, which explicitly set a common blanket royalty rate, the most widely used structures incorporate a variety of mechanisms designed to address this higher level of collusion risk. Most notably, contemporary patent pools are typically administered by independent third parties that have no business stake in the downstream market but *do* have a long-term stake in maintaining a reputation for "fair play", which can then support the creation of new pools and the associated stream of transaction fees.²⁰² Additionally, at least in the case of the leading pool administrator, MPEG LA, the pool operates under a nondiscrimination commitment, which means that any increase in the royalty rate is borne by all licensor-contributors to the pool, who therefore do not have a uniform interest in raising rates (and, if they are a net recipient of licensed technology from the pool, would have *no* interest in doing so).²⁰³

¹⁹⁸ See Don Clark, *Rambus Expands With Its Own Chip Brand*, Wall St. J., Aug. 17, 2015.

¹⁹⁹ In October 2016, Qualcomm announced its acquisition of NXP Semiconductor, which has chip manufacturing capacities. See Don Clark and Dana Cimilluca, *Qualcomm to Buy NXP Semiconductors for \$39 Billion*, Wall St. J., Oct. 27, 2016. In 2015, Avago Technologies, which has chip manufacturing locations, announced its acquisition of Broadcom, a leading fabless chip design firm. See Jeffrey McCracken, Alex Sherman and Ian King, *Avago to Buy Broadcom for \$37 Billion in Biggest Tech Deal Ever*, Bloomberg, May 27, 2015.

²⁰⁰ See Barnett, *From Patent Thickets to Patent Networks*, *supra* note 65, at 16.

²⁰¹ See, e.g., IEEE STANDARDS ASSOCIATION, PROMOTION COMPETITION AND INNOVATION: WHAT YOU NEED TO KNOW ABOUT THE IEEE STANDARDS ASSOCIATION'S ANTITRUST AND COMPETITION POLICY, Aug. 24, 2010.

²⁰² See Barnett, *From Patent Thickets to Patent Networks*, *supra* note 65, at 21, 41-43.

²⁰³ See *id.*, at 37-38.

This risk of sell-side collusion through pooling arrangements certainly deserves serious consideration. However, SSOs and pooling arrangements also carry the risk of buy-side collusion.²⁰⁴ That is: there is a risk that these cooperative arrangements may set the price of technology inputs *too low*, rather than being set too high as is commonly alleged by commentators who raise holdup and stacking concerns. Three pieces of evidence support paying attention to this risk.

a. *Pool Composition*

In a previous study of pooling arrangements in the ICT market, I observed that, whether measured by the number of contributed patents or governance rights, the leading pools (specifically, the pools administered by the MPEG LA organization) are dominated by vertically integrated firms that have relatively low R&D intensities (all of those firms are among the laggards in Table II above).²⁰⁵ That suggests that these firms are net technology users, in which case pools could be an attractive mechanism by which these firms can depress royalty rates, thereby reducing their technology input costs and enabling them to earn greater margins through the downstream manufacturing and distribution functions in which they excel. Corroborating evidence derives from the absence of Qualcomm (again, a regular target of litigation and commentary that targets “excessive” patent royalty rates) in patent pooling arrangements.²⁰⁶ Given that Qualcomm holds critical technologies for CDMA technologies used in “3G” and “4G” wireless standards, it has little to gain from participating in patent pools that typically assign royalties based on simple numerical proportions, rather than a value-based standard.²⁰⁷ But the decision of the highest-value patent holders not to participate in pooling arrangements may indicate that these pools threaten to operate as a collective buying mechanism by which to depress royalty rates below the level at which upstream R&D firms can earn a commensurate return. If that is the case, then there is no inherent reason to be alarmed over apparently high royalty demands being made by the highest-value patent holders, which may simply reflect an attempt by those holders to counteract the buying power of large net technology users and earn a return that reflects the value contributed by their R&D investment to the relevant technology package.

b. *Lobbying Behavior*

The oligopsony scenario is further supported by the revealed preferences of technology firms in SEP-related litigations concerning the determination of reasonable royalties for damages purposes. Those preferences can be imperfectly identified through the positions expressed in amicus briefs filed in those litigations. For purposes of the Table below, a firm is deemed to favor the patentee if it expresses support for injunctive relief or a royalty determination methodology that would tend to advantage patentees; conversely, a firm is deemed to disfavor the patentee if it advocates limiting injunctive relief or expresses support for a royalty determination methodology that would tend to disadvantage patentees. In general, firms’ revealed preferences in favor of or against injunctive relief, or royalty determination methodologies that favor the patentee or the alleged infringer, track the predominant

²⁰⁴ For the only dedicated exploration of this possibility, see J. Gregory Sidak, *Patent Holdup and Oligopsonistic Collusion in Standard-Setting Organizations*, 5 J. COMP. L. & ECON. 123 (2009).

²⁰⁵ See Barnett, *From Patent Thickets to Patent Networks*, *supra* note 65, at 28-29, 34.

²⁰⁶ See *id.*, at 34-35, 46-47.

²⁰⁷ See *id.*, at 42-43.

location of a firm on the supply chain. More specifically, firms primarily active at upstream portions of the supply chain (e.g., Qualcomm, Dolby) tend to take a position that would result in a higher royalty determination and/or preserve the availability of injunctive relief; firms that are primarily active at midstream or downstream portions (e.g., Dell, T-Mobile, HP) or are fully integrated (Intel) tend to take a position that would result in a lower royalty determination and/or limit the availability of injunctive relief. There are some exceptions (some upstream chip design firms disfavor the patentee in certain litigations²⁰⁸) but there is at least a suggestive correlation between IP preferences and organizational form. That suggests that calls to limit injunctive relief or reduce royalty rates, based on holdup and stacking concerns, may merely promote the private interests of downstream entities in reducing technology input costs, rather than any overriding interest in protecting consumers by constraining “exorbitant” payments to patent holders.

Table III: Amicus Briefs (or Equivalent) Filed by Large Firms in “Patent Ambush” and “RAND” Royalty Litigations²⁰⁹

Filer	<u>Rambus (2008): Favors Patentee?</u>	<u>N-Data (2008): Favors Patentee?</u>	<u>Ericsson (2013): Favors Patentee?</u>	<u>Microsoft (2014): Favors Patentee?</u>	<u>Principal Activity on Supply Chain²¹⁰</u>
Qualcomm			Y	Y	Chip Design
Dolby			Y		IP Licensor (Audio)
Nokia			Y	Y	IP Licensor (Networks)
Nvidia	N				Chip Design
Broadcom	N		N		Chip Design
Marvell			N		Chip Design
MediaTek			N		Chip Design
Xilinx				N	Chip Design
Freescale	N				Chip Design, Mfr
Intel				N	Chip Design, Mfr

²⁰⁸ The firms are: Broadcom, Freescale, Micron, Samsung, Hynix and Nvidia. Note that all these firms have been engaged in patent, breach of contract and antitrust disputes with Rambus, in some cases concurrently with the FTC litigation against Rambus. See Tom Krazit, *Rambus, Infineon end DRAM dispute, sign licensing deal*, InfoWorld, Mar. 21, 2005 (avail. at <http://www.infoworld.com/article/2672061/computer-hardware/rambus--infineon-end-dram-dispute--sign-licensing-deal.amp.html>). Hence, those firms had obvious strategic incentives to take actions to promote an adverse outcome for Rambus in its litigation with the FTC (in which they filed the equivalent of amicus briefs favoring limitations on injunctive relief and/or patent damages).

²⁰⁹ Companies are arranged from upstream to downstream positions. All briefs (or equivalent) filed as part of *Microsoft Corp. v. Motorola et al.*, No. 14-35393 (W.D. Wash. 2014); *Ericsson, Inc. et al. v. D-Link Systems, Inc. et al.*, Fed. Cir. (Dec. 14, 2014), *affirming in part, vacating in part, remanding in part*, *Ericsson, Inc. v. D-Link Corp.*, No. 6:10-cv-473, 2013 WL 4046255 (E.D. Tex. Aug. 6, 2013); or *Rambus, Inc. v. Federal Trade Commission*, 522 F.3d 456 (D.C. Cir. 2008); FEDERAL TRADE COMMISSION, DECISION AND ORDER, NEGOTIATED DATA SOLUTIONS LLC, FTC DOCKET NO. C-4234 (JAN. 23, 2008). In the case of FTC enforcement actions, the patentees’ public comments were described in “Letters to Commenters” available on the FTC website.

²¹⁰ Information in this column reflects the author’s judgment, informed by the firm’s most recent annual reports.

<u>Filer</u>	<u>Rambus (2008): Favors Patentee?</u>	<u>N-Data (2008): Favors Patentee?</u>	<u>Ericsson (2013): Favors Patentee?</u>	<u>Microsoft (2014): Favors Patentee?</u>	<u>Principal Activity on Supply Chain</u> ²¹¹
Micron	N				Chip Mfr
SK Hynix	N				Chip Mfr
Samsung	N				Hardware, Chip Mfr
Apple				N	Hardware, Software
Microsoft			N		Software
IBM		N			Hardware, Software, Chip Design, Mfr ²¹²
Oracle		N			Software, Hardware
Sun ²¹³		N			Software, Hardware
Cisco		N	N		Hardware
Ericsson			N		Hardware
Vizio				N	OEM (TV)
Dell				N	OEM (PC)
HP			N	N	OEM (PC)
T-Mobile				N	Telecom carrier

c. *The Economic History of the Smartphone*

The connection between private interests in reducing technology input costs, on the one hand, and publicly-interested statements in favor of protecting the market against holdup and stacking effects, on the other hand, is illustrated by the historical evolution of the mobile wireless market.

(1) *The Positive Royalty Shock*

Prior to the advent of the wireless market, telecom operators in the U.S. and Western Europe were typically national monopolies, which performed R&D internally and purchased equipment from outside manufacturers.²¹⁴ Patents were not emphasized by operators and manufacturers due to the inability to capture rents in a market dominated by what were effectively government-sanctioned procurement monopolies.²¹⁵ In the European wireless telecom market, the “GSM” standard initially dominated (starting in the early 1990s), at which time large European handset manufacturers (specifically, Ericsson, Nokia, Siemens, Alcatel) and, one American firm, Motorola²¹⁶, operated under a

²¹¹ Information in this column reflects the author’s judgment, informed by the firm’s most recent annual reports.

²¹² IBM exited the semiconductor manufacturing business in 2014, which precedes the filing of the amicus brief indicated above. See IBM, GLOBALFOUNDRIES TO ACQUIRE IBM’S MICROELECTRONICS BUSINESS, Oct. 20, 2014.

²¹³ Acquired by Oracle in 2010, which precedes the filing of its amicus brief indicated above.

²¹⁴ See Rudi Bekkers, Geert Duysters, Bart Verspagen, *Intellectual property rights, strategic technology agreements and market structure: The case of GSM*, 31 RESEARCH POL’Y 1141, 1144 (2002).

²¹⁵ See *id.*, at 1144.

²¹⁶ See *id.*, at 1147.

cross-licensing scheme that resulted in a zero net royalty burden for the participating firms.²¹⁷ At the same time, some of those manufacturers had formed a joint venture to develop an operating system for mobile phones, called Symbian, available to all joint venture members.²¹⁸ Both cooperative actions appear to have had a common objective: namely, to commodify key upstream components of the mobile phone “stack” (the chipset and the OS), which would then enable the manufacturers to capture the bulk of available rents in the market.²¹⁹ While this cross-licensing scheme operated to the advantage of these five participants (who then constituted approximately 85% of the European GSM market²²⁰), it effectively operated as an entry barrier into the European GSM market for all other firms, who could not access the required technology or could only do so at significantly higher royalty rates.²²¹

Once the “3G” (also known in Europe as the “UMTS”) wireless standard was developed in the early 2000s, GSM was substantially displaced by the technically superior CDMA technology (pioneered by Qualcomm).²²² Unlike the club of European handset makers that dominated the GSM market, Qualcomm has licensed its CDMA technology widely.²²³ This is no accident: an upstream R&D holder has a natural incentive to license to all interested parties in order to maximize the size of its royalty base; by contrast, a vertically integrated firm may have no incentive to license a valuable IP asset to strategic competitors. As a result of Qualcomm’s licensing activities, formerly dominant manufacturers like Ericsson and Nokia now faced a positive royalty burden, as well as competition from other manufacturers that had entered the market (most notably, Samsung) by licensing Qualcomm’s technology. Perhaps not coincidentally, it is precisely at this moment that Ericsson, Nokia and other major device manufacturers lobbied European Union antitrust authorities to pursue “abuse of dominance” claims against Qualcomm for “exorbitant” licensing policies.²²⁴

(2) *Lessons for Patent Policy Analysis*

The history of the smartphone market, and the shift in industry rents associated with the emergence of Qualcomm’s CDMA as the prevailing “3G” technology, illustrates an important baseline insight for policy discussions of stacking and holdup effects. Any sophisticated analysis must at a minimum recognize that lobbying efforts by manufacturers and other downstream entities, and associated publicly-interested arguments, to characterize patent royalty rates as a case of “holdup”

²¹⁷ See Joel West, *Does Appropriability Enable or Retard Open Innovation?*, in Henry Chesbrough, Wim Vanhaverbeke and Joel West eds., *OPEN INNOVATION: RESEARCHING A NEW PARADIGM* 126-27 (2006).

²¹⁸ See EVANS ET AL., *supra* note 148, at 194-95.

²¹⁹ On this interpretation of the Symbian OS joint venture, see EVANS ET AL., *supra* note 148, at 270.

²²⁰ See Bekkers et al., *supra* note 214, at 1159.

²²¹ See *id.*, at 1158.

²²² See *id.*

²²³ See MOCK, *supra* note 147, at 159 (noting that Qualcomm has licensed its CDMA-related patents to hundreds of companies); QUALCOMM, FORM 10-K (2015), at 19 (stating that Qualcomm has licensed its CDMA technology to more than 285 licensees).

²²⁴ EUROPEAN COMMISSION, ANTITRUST: COMMISSION INITIATES FORMAL PROCEEDINGS AGAINST QUALCOMM, Oct. 1, 2007. The release notes that the Commission had initiated formal antitrust proceedings against Qualcomm based on “abuse of a dominant position” as the holder of IP rights in the CDMA and WCDMA technologies that “form part of the 3G . . . standard”. The investigation was subsequently withdrawn. See Adam Cohen, *European Commission Closes Antitrust Investigation*, WALL ST. J., Nov. 25, 2009.

simply represent an effort to reallocate industry rents to the advantage of downstream implementer entities and the disadvantage of upstream R&D suppliers. This is almost transparently the case, for example, with respect to Chinese “anti-monopoly” investigations of Qualcomm for its licensing practices, resolved by a 2015 settlement in which Qualcomm reduced its royalty rates for Chinese handset and other device manufacturers²²⁵, and regulatory actions in 2009 and 2016 against Qualcomm by Korean antitrust regulators relating to allegedly “unfair” licensing terms for Korean handset makers.²²⁶ There is obviously no inherent reason to believe that downstream manufacturers’ interest in private value-maximization necessarily coincides with the public interest in social value-maximization. Restraining injunctive relief and reducing royalty rates for patent holders clearly has distributive implications for the division of wealth between upstream and downstream firms, favoring the latter over the former. This “mere” reallocation of industry rents along the supply chain—which would otherwise be a matter of indifference from an efficiency perspective—may generate medium to long-term efficiency losses to the extent that shifting value toward downstream firms results in royalty streams that fail to sufficiently compensate upstream R&D suppliers (or compels those suppliers to adopt second-best integrated structures in response to an insecure property rights environment). If that is the case, then end-users would enjoy a short-term static gain in the form of reduced prices (depending on competitive conditions at the intermediate user level) at the price of long-term losses in the form of reduced innovation. That would seem to be a short-sighted choice.

C. Weighing the Risks

There are countervailing effects that result from maintaining secure expectations of injunctive relief as compared to a legal regime in which those expectations are insecure. On the one hand, it may be the case that strong forms of patent protection give rise to some combination of thicket, holdup and stacking effects that discourage innovation and inflate intermediate and end-user costs. On the other hand, weak forms of patent protection may result in some combination of asset mispricing, organizational distortion and oligopsony risk. Given these offsetting considerations, *a priori* it is impossible to anticipate the precise policy implications of maintaining, or diluting, the injunction remedy in patent litigation. However, based on our current knowledge base, it *is* possible to state with relative confidence the likely policy implications of doing so. That knowledge base indicates that we have little reason to believe that thicket, holdup and stacking effects are regularly and persistently occurring phenomena that impose significant social costs, especially in the SEP-intensive technology markets in which those concerns have been most commonly expressed. That knowledge base also indicates that we *do* have reason to believe that eroding the availability of injunctive relief is likely to give rise to several socially harmful effects, including legal mispricing, organizational distortions and rent-diversion effects that would perversely undercompensate upstream entities that have often been the most fertile sources of innovation in IT markets.

²²⁵ See Don Clark, *Qualcomm to Pay \$975 Million Antitrust Fine to China*, WALL ST. J., Feb. 10, 2015. For further details on the agreed-upon royalty rate, see QUALCOMM, FORM 10-K (2015), at 10-11.

²²⁶ See Eun-Young Jeong, *Qualcomm Faces \$853 Million Fine From South Korea Over Alleged Antitrust Violations*, WALL ST. J., Dec. 28, 2016.

IV. Conclusion

The frequency and vigor with which thicket, holdup and stacking theories are promoted or adopted by some scholars, courts and antitrust agencies does not match the weak evidence for these theories. If we take a broader view of technology markets, this lack of empirical support is unsurprising. While much of the academic literature has been foretelling the downfall of technology markets under the weight of a purportedly overgrown patent system, those same markets have thrived and expanded, delivering innovations that were once unimaginable and at prices that are affordable to a broad range of the consumer population. Over the course of several decades, remarkable innovations in computing and communications technologies—often standardized through the SSO process in which thicket, holdup and stacking are alleged to pose such serious risks—have not only drastically reduced data processing and communications costs but have done so at rapidly declining quality-adjusted prices, resulting in a social “win-win” of increasing innovation and decreasing prices. If all this has been achieved under the “burden” of intensive patent issuance and enforcement (and principally in the jurisdiction in which patent protection has been most “burdensome”), then perhaps it is time to reconsider whether that property-rights system is such a burden after all. The mismatch between academic theory and empirical reality calls for a rethinking of actions by courts and regulators that have already partially displaced property-rule protections with liability-rule protections for intellectual assets. Without a secure expectation of injunctive relief and compensatory damages, false prophecies of too many patents may result in too little innovation.