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# INTRODUCTION: ANTITRUST, STANDARD ESSENTIAL PATENTS, AND THE FALLACY OF THE ANTICOMMONS TRAGEDY: LEGAL AND INDUSTRIAL POLICY CONCERNS

*Sohvi Leih<sup>†</sup> & David J. Teece<sup>††</sup>*

At the turn of the millennium, David Teece noted that fundamental changes in the global economy were changing the basis of competitive advantage.<sup>1</sup> These changes strip away traditional sources of competitive differentiation and expose a new foundation for wealth creation: the development, astute deployment, and utilization of intangible assets, of which knowledge, capabilities, and intellectual property are the most significant.<sup>2</sup>

The development of markets for knowhow and intellectual property has broken the traditional nexus between tangible and intangible assets. Previously, the principal business model firms employed for extracting value from inventive and creative activities was to both create and commercialize new ideas and technology. Firms bundled ideas, inventions, and the results of creative activities into tangible objects and offered them for sale to capture value from the creative idea. In the case of music, for example, a creative entity might sell records or CDs. For quite some time, as intellectual property regimes have strengthened, it has been possible to specialize in what one did well—either the tangible objects or the abstract ideas. In the case of an “idea” generator, the creators and inventors can simply license their ideas to other entities that are better equipped to implement the idea.

A system of properly designed and adequately enforced IP rights benefits not simply the creative individuals, groups, and organizations that generate intangible assets, but also consumers. New technologies such as

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1. See David J. Teece, *Capturing Value from Knowledge Assets: The New Economy, Markets for Know-How, and Intangible Assets*, 40 CAL. MGMT. REV. 3, 55–62 (1998).

2. See *id.* at 62–63.

artificial intelligence, machine learning, and automation are becoming increasingly important. Soon, robots will make robots, more products will be 3D-printed, and robots will deliver services. The work of creative and inventive people is going to be even more salient to the United States economy in the future.<sup>3</sup> As such, it is incredibly important to properly protect intellectual property rights. Otherwise, the inventive and creative activities—the lifeblood of economies—will decline or, at a minimum, be put at risk. Rights over intangible property must not be second-class.

At this critical junction in the evolution of our society and the economy, if policymakers and courts reward the production of tangible goods while shortchanging intangibles, they will be out of step with technological progress and the march of civilization. Creative and inventive people may have to revert to making a living by producing tangible assets within large, vertically-integrated firms. Such firms take ideas, embed them in objects, and then move them from the laboratory to the market. If a failure to enforce intellectual property relegates creative innovators to low-wage activities, the development of highly innovative small- and medium-sized enterprises will be stunted because they will not have the resources, capabilities, or passion to vertically integrate. Instead, large-scale vertically integrated firms—that pay low wages and experience lackluster growth with only modest levels of innovation—will populate the landscape.

This special issue of *Berkeley Technology Law Journal* is based on a special symposium, wherein the authors expressed deep concern that some legal scholars and economists who engage in debates about the patent system and FRAND licensing appear unfamiliar with, or do not consider, the empirical evidence (or lack thereof) on patent holdups and patent thickets that allegedly stifle innovation. They have mounted attacks on intellectual property—patents in particular—but typically have not stated the implicit assumptions in their theories. These critics frequently assert that patent holders too often engage in holdup, charge too much for a license to patent rights, and generally hinder the system of innovation itself through

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3. A Brookings Institute report revealed that industries such as tech-driven manufacturing (pharmaceuticals, automobiles, chemicals), energy (metal ore mining and gas extraction), and service (management and scientific consulting, architecture, software) industries generated \$2.7 trillion—roughly seventeen percent of U.S. gross domestic product—in 2013, while employing just 9 percent of the workforce, or 12.3 million American workers. MARK MURO ET AL., BROOKINGS INSTITUTION, AMERICA'S ADVANCED INDUSTRIES: WHAT THEY ARE, WHERE THEY ARE, AND WHY THEY MATTER 3 (2015), [www.brookings.edu/wp-content/uploads/2015/02/AdvancedIndustry\\_FinalFeb2lores-1.pdf](http://www.brookings.edu/wp-content/uploads/2015/02/AdvancedIndustry_FinalFeb2lores-1.pdf)

patent thickets.<sup>4</sup> These arguments have gained momentum and even impacted court opinions. Maureen Ohlhausen, as acting chair of the FTC, recently noted, “U.S. and international antitrust agencies have lost their way in recent interventions in standard setting space . . . [which] threatens to upset the balance between patent holders’ rights and consumers’ access to technology.”<sup>5</sup> Makan Delrahim, the U.S. Assistant Attorney General for the Antitrust Division of the Department of Justice, would seem to agree.<sup>6</sup>

The situation echoes the concerns of famous economist John Maynard Keynes that those “in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back.”<sup>7</sup> More recently, Columbia University economist Paul Romer identified a “disturbing blind spot” in economics and explained that “the trouble is not so much that macroeconomists say things that are inconsistent with the facts. The real trouble is that other economists do not care.”<sup>8</sup> He further noted that “an indifferent tolerance of obvious error is ever more corrosive to science than committed advocacy of error.”<sup>9</sup>

Each contributor to this special issue is endeavoring not to fall into the trap Romer warned about. Indeed, reflecting similar concerns to Romer, our first contributor, Jonathan M. Barnett asks: “Has the Academy Led Patent Law Astray?”<sup>10</sup> He questions the allegedly adverse effects of a strong patent system and examines the disconnect between theory and evidence on this subject.<sup>11</sup> Barnett determines that the assumptions underlying patent holdup and stacking models strip away the reality of sophisticated repeat

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4. See generally Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991 (2007).

5. Maureen K. Ohlhausen, *The Elusive Role of Competition in the Standard Setting Antitrust Debate*, 20 STAN. TECH. L. R. 93, 97–98 (2017).

6. “I worry that we as enforcers have strayed too far in the direction of accommodating the concerns of technology implementers who participate in standard setting bodies, and perhaps risk undermining incentives for IP creators . . .” Makan Delrahim, Assistant Att’y Gen., U.S. Dep’t. of Justice, Assistant Attorney General Makan Delrahim Delivers Remarks at the USC Gould School of Law’s Center for Transnational Law and Business Conference (Nov. 10, 2017), [www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-usc-gould-school-laws-center](http://www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-usc-gould-school-laws-center).

7. JOHN MAYNARD KEYNES, *THE GENERAL THEORY OF EMPLOYMENT, INTEREST, AND MONEY* 383 (1936).

8. Paul Romer, *The Trouble with Macroeconomics* 22 (Sept. 14, 2016) (unpublished manuscript), <https://paulromer.net/wp-content/uploads/2016/09/WP-Trouble.pdf>.

9. *Id.*

10. Jonathan Barnett, *Has the Academy Led Patent Law Astray?*, 32 BERKELEY TECH. L.J. 1313 (2016).

11. *Id.* at 1318.

players and standards evolution.<sup>12</sup> He finds little evidence of thickets or holdup and stacking effects.<sup>13</sup> He thus revisits the theoretical models used to support predictions of transactional blockages and harm to innovation.<sup>14</sup>

Barnett is also deeply critical of ongoing and proposed restrictions on injunctions.<sup>15</sup> His assessment is that there are substantial social costs in substituting liability rules for property rules.<sup>16</sup> He also notes that the patent ambush literature received widespread endorsement after early Rambus cases.<sup>17</sup> Indeed, the FTC case against Rambus became the “poster child for patent holdup” even though, ironically, the “government *lost* . . . twice.”<sup>18</sup> Barnett concludes that given Rambus’s vindication, this is “not an especially compelling illustration of patent holdup.”<sup>19</sup>

The predicament described resonates well with Romer’s concerns mentioned earlier. Too many scholars have an “indifferent tolerance of obvious error.”<sup>20</sup> Barnett points out that “the conceptual triplet” of stacking, holdup, and thickets, has “been presented in the context of stylized theoretical settings” but has never “matured into descriptively reliable statements about real-world markets.”<sup>21</sup> He asserts that “remarkably, all available empirical evidence fails to confirm these . . . theories.”<sup>22</sup>

The above are only a selection of Barnett’s trenchant comments and conclusions. We intend them to pique the reader’s interest in his Article and his call for courts and regulators to revisit recent decisions displacing property rules with liability rule protections.

Richard A. Epstein and Kayvan B. Noroozi follow Barnett’s analysis with a more specific focus on standards–essential patents (SEPs).<sup>23</sup> They focus on similar issues to Barnett, but their Article is more specific to FRAND and mobile phones. They are highly cognizant of the changing economic landscape and the importance of intellectual property rights to the advancement of an emerging knowledge economy, where objects made by

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12. *Id.* at 1319.

13. *Id.* at 1338–39.

14. *Id.*

15. *Id.* at 1361.

16. *Id.*

17. *Id.* at 1330–31.

18. *Id.* at 1331.

19. *Id.* at 1332.

20. Romer, *supra* note 8, at 22.

21. Barnett, *supra* note 9, at 1338.

22. *Id.*

23. Richard A. Epstein & Kayvan B. Noroozi, *Why Incentives for ‘Patent Holdout’ Threaten to Dismantle FRAND, and Why It Matters*, 32 BERKELEY TECH. L.J. 1381 (2017).



machines are ubiquitous and creative works generated by people are scarce.<sup>24</sup> Epstein and Noroozi are also acutely aware of how a well-functioning system of intellectual property and FRAND licensing has powered the highly dynamic mobile phone industry.<sup>25</sup> They recognize that the European Telecommunications Standards Institute (ETSI) and the FRAND framework support the powerful technologies underlying standards development that have enabled establishment and growth of a global mobile telecommunications industry.<sup>26</sup>

Epstein and Noroozi remind readers that standards are not just about interoperability rules. They note that new technologies enable new standards and orders-of-magnitude improvement in upload and download speeds on a limited spectrum, in addition to enhancing many other aspects of wireless performance. Innovators and implementers work together in standards development organizations (SDOs) to select new enabling technologies developed and tested by members and others. The best technologies get incorporated into new standards that are then made available to all, subject to a FRAND royalty contract. Implementers are third-party beneficiaries of the FRAND licensing contract. Epstein and Noroozi acknowledge that ETSI, the leading SDO in mobile phone technology, is the manifestation of what distinguished patent law expert Professor Robert Merges calls “an institution that lowers the cost of IPR exchange.”<sup>27</sup>

Epstein and Noroozi further contend that the historic high performance of the intellectual property rights (IPR) marketplace is put at risk once the bargain between innovator and implementer is revised or reinterpreted in ways that shortchange innovators upstream or downstream.<sup>28</sup> They point to the first ETSI IPR rules of 1992, which included Most Favored Nation (MFN) and other provisions unpalatable to upstream innovators.<sup>29</sup> In 1994, when ETSI adopted a balanced approach that respected the patent rights of contributors to the SDO, innovation and concomitant standards development gained momentum. Epstein and Noroozi do recognize, however, that the balance that ETSI intended is not spelled out in detail but is left to the parties to negotiate.<sup>30</sup> They note that in the context of deep

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24. *See id.* at 1389.

25. *Id.* at 1390–94.

26. *See id.* at 1395.

27. *See id.* at 1394–95; *see also* Robert P. Merges, *Of Property Rules, Coase, and Intellectual Property*, 94 COLUM. L. REV. 2655, 2655 (1996).

28. Epstein & Noroozi, *supra* note 22, at 1394.

29. *Id.* at 1395.

30. *Id.* at 1396.

heterogeneity of circumstances facing licensors and licensees, the nature of the exchange is “deliberately vague,” allowing room for negotiation.<sup>31</sup> They see this as a virtue and not as “an invitation for courts to fill in the gaps or clarify the boundaries . . . .”<sup>32</sup>

Epstein and Noroozi draw attention to “an influential body of literature, led by Mark Lemley and Carl Shapiro, [that] has . . . focused primarily on the risk of ‘patent holdup’ . . . while paying short shrift to the correlative risk of ‘patent holdout’ . . . .”<sup>33</sup> They also note that “the principal focus of Lemley and Shapiro’s work has been to discourage the availability of injunctions in the context of products that practice multiple patents . . . .”<sup>34</sup> Citing to work by Robert Merges, Epstein and Noroozi maintain that “strong property rights rule[s] for patents facilitates contractual solutions . . . whereas liability rules ‘work against the flexible, voluntary institutions that are formed to overcome the costs faced by transactors’.”<sup>35</sup> They are critical of *eBay, Inc. v. MercExchange, L.L.C.*<sup>36</sup> for having “jettisoned that subtle and flexible mixed remedial approach and instead reverted to a stark and simplistic opposition between ‘property rules’ and ‘liability rules.’”<sup>37</sup>

Epstein and Noroozi vividly attack the “royalty stacking” paradigm and view it as nothing more than a “horror fiction.”<sup>38</sup> They are likewise critical of recent court decisions that they see eroding the FRAND framework, including *Apple v. Motorola*<sup>39</sup> and *Microsoft v. Motorola*.<sup>40</sup> They worry that, under *Microsoft*, perhaps one can no longer make an offer outside of the FRAND range even as an opening bid; it must somehow be FRAND from the outset. Implementers, of course, like to make counteroffers; yet, the net effects of *Microsoft* and *Apple* are that “innovators are pressured to begin at FRAND, and only go lower.”<sup>41</sup> Epstein and Noroozi raise concerns of a slippery slope under the nondiscriminatory component of FRAND, with each implementer trying to convert the nondiscriminatory term into a de facto most-favored licensee clause. The authors’ concern appears to be that under the specter of *Microsoft*, *Apple*, and government antitrust

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31. *Id.*

32. *Id.*

33. *Id.* at 1405–06.

34. *Id.* at 1406.

35. *Id.* at 1412 n.83.

36. 547 U.S. 388 (2006).

37. Epstein & Noroozi, *supra* note 22, at 1407.

38. *Id.* at 1411.

39. 757 F.3d 1286 (Fed. Cir. 2014).

40. 795 F.3d 1024 (9th Cir. 2015).

41. Epstein & Noroozi, *supra* note 22, at 1419.

intervention into leveraging activities, there is a drift towards litigation and a movement away from negotiated resolutions of licensing issues.<sup>42</sup> The primary culprit is a misallocation of rights, as implementers in the United States now face virtually no credible injunction risk. Meanwhile, breach of contract, and breach of duty of good faith and fair dealing claims based on opening offers alone threaten upstream innovators.<sup>43</sup>

Finally, Epstein and Noroozi question the wisdom of *Commonwealth Scientific and Industrial Research Organisation (CSIRO) v. Cisco Systems, Inc.* if it means the benefits of standardization flow to implementers and not upstream to innovators.<sup>44</sup> They find the Federal Circuit's interpretation "misguided" and are critical of decisions that fail to recognize that new technologies typically undergird new standards. When this occurs, upstream innovators should be rewarded and not have their contributions diminished because they have been embedded in a standard—especially if the standard would never be promulgated but for the new and patented technology contributed by others. The authors provide insightful policy implications: legal rules must recognize and allocate value to innovation, while also embracing a new economic order in which the development of commercial embodiments becomes a low-margin industry.<sup>45</sup> Most notably, an efficient marketplace for innovation necessarily allows specialization between innovators and implementers, rather than forcing an increasingly inefficient vertical integration between the two.<sup>46</sup> Thus in Silicon Valley 2.0, brilliant young entrepreneurs should not be distracted by developing and selling their innovations as products, but rather should be able to develop firms that

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42. *Id.*

43. *Id.*

44. *See id.* at 1425. *See also* Jorge L. Contreras, *CSIRO v. Cisco: The Convergence of RAND and non-RAND Royalties for Standards-Essential Patents*, PATENTLY-O (Dec. 7, 2015), <https://patentlyo.com/patent/2015/12/convergence-royalties-standards.html>. Professor Contreras explains that in *Commonwealth Scientific and Industrial Research Organisation v. Cisco Systems, Inc.*, the Federal Circuit:

established important new guidelines for the calculation of 'reasonable royalty' damages for standards-essential patents (SEPs), even in the absence of the patent holder's commitment to license on reasonable and nondiscriminatory (RAND) terms . . . The decision signals another important step toward the convergence of 'reasonable royalty' damages in RAND and other patent cases.

*Id.* Note that, with compensation, some of this ought to be transferred to consumers; but even if true in the short run, in the long run consumers are harmed by diminished innovation.

45. Epstein & Noroozi, *supra* note 22, at 1420.

46. *Id.* at 1430.

occupy the far more impactful and lucrative role of generating and transacting ideas alone.<sup>47</sup>

The contribution from Alexander Galetovic, Stephen Haber, and Lew Zaretzki delves even deeper into the anticommons thesis.<sup>48</sup> They focus exclusively on smartphones and describe how concerns about royalty stacking are empirically inaccurate. While the royalty stacking thesis is highly questionable as a theoretical matter—since patents are not self-enforcing—the authors conduct empirical research to provide additional insight. Their methodology involves taking a royalty stacking model, using it to calculate the expected cumulative royalty, and showing that the observed reality is very distant from what the royalty stacking model predicted.<sup>49</sup> Their stacking model predicts a 79.5 percent cumulative royalty if stacking occurs versus an sixty-seven percent rate if the patent holders could collude.<sup>50</sup> They find that the actual rate is 3.4 percent, leading them to remark that “the actual yield is more than 20 times lower than . . . the yield predicted by the anticommons royalty stacking model . . . .”<sup>51</sup>

As they explain: “The implication is straightforward: patent holders in the world smartphone value chain do not exercise any meaningful monopoly power to raise prices to the levels that monopoly and royalty stacking theory predict.”<sup>52</sup> The authors go on to note that “patent holders are not monopolists, and that they confront competitive pressure, perhaps from other technologies.”<sup>53</sup> They also explain that other factors limit potential monopoly power, including the difficulty of obtaining injunctions and the fact that patents are not self-enforcing. The FRAND contract is perhaps a factor, too, as it does have teeth. The authors leave the reader with a political economy puzzle that they do not attempt to unlock: why have public officials turned their attention to royalty stacking in mobile phones when the evidence against it is so strong?<sup>54</sup>

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47. *Id.*

48. Alexander Galetovic et al., *Is There an Anticommons Tragedy in the World Smartphone Industry?*, 32 BERKELEY TECH. L.J. 1527 (2017).

49. *Id.* at 1532–33.

50. *Id.* at 1532.

51. *Id.* at 1532–33.

52. *Id.* at 1533.

53. *Id.* at 1556.

54. *Id.* at 1556–57.

David J. Teece's Article contributes a trenchant review of the "patent thickets" and "tragedy of the anticommons" literatures.<sup>55</sup> His Article points out that the theoretical possibility of underusage—key to the anticommons paradigm—is not borne out of practice. Notwithstanding, the anticommons literature seems to have a life of its own, in part because infringers readily seize upon it as an excuse to continue infringing, particularly after *eBay*, since injunctions are now quite hard for U.S. patent owners to secure. Teece points out that the anticommons literature is erroneous perhaps because the paradigm arose by observing problems with real property rights clutter. However, there is an important difference between property rights over real property and property rights covering inventions: the latter are not self-enforcing.<sup>56</sup> Whereas an owner of real property can occupy or control access to the asset through private actions (such as locks and security guards), the owner of patents must rely on the courts to stop trespassers or infringers. Moreover, in the context of standards-essential patents, FRAND agreements impose contractual obligations on patent owners to "make licenses available," further limiting any power of the patent owner to block follow-on or complementary innovation.

Teece identifies a different "tragedy" for policymakers to worry about. However, it is not the anticommons tragedy of underuse; rather, it is the tragedy of infringement, sometimes widespread. For instance, as the author notes, in the telecommunications field, firms often make and sell standards-compliant products without taking licenses under all of the claimed SEPs and without paying royalties, at least not in a timely fashion, to many—and perhaps most—patent holders.<sup>57</sup> Thus, contrary to the "underuse" anticommons theory, one frequently sees a situation of uncompensated use. The fact that firms use others' patented technology without paying suggests that, if anything, there is overuse, not the underuse that anchors the anticommons paradigm. In short, Teece argues that in invention-rich environments, unpaid use is likely the bigger problem. Furthermore, undercompensation may persist even in cases where infringement was found depending on how the court set damages.<sup>58</sup> As a consequence of the

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55. David J. Teece, *The "Tragedy of the Anticommons" Fallacy: A Law and Economics Analysis of Patent Thickets and FRAND Licensing*, 32 BERKELEY TECH. L.J. 1489 (2017).

56. *Id.* at 1498.

57. *Id.* at 1511.

58. Whether undercompensation will persist in the face of a court finding of infringement depends on how the court sets damages following a verdict of validity and infringement. *Id.* at 1513. If the court only orders the infringer to pay the same level of royalties that it could have negotiated ex ante, prior to a finding of validity and

reduced rewards for innovation because of free riding, society will not achieve the level of investment in innovation that it would otherwise enjoy.

Interestingly, the problem of undercompensation is likely to be amplified further not only when the environment is patent rich, but when those patents cover enabling or general-purpose technologies. To allow the issue to be seen in a clear light, Teece reviews the social returns to innovation literature and discusses the special circumstance of general purpose and enabling technologies.

It is well recognized in the economics literature that society underinvests in research and development (R&D) because of positive externalities that go unrewarded. There is often a sizeable gap between the private return to successful innovators and the social return of such innovations to society as a whole. The phenomenon is overusage, or at least underpayment for the use that occurs. These concerns are especially significant in the context of enabling general purpose technologies. That is, the business model appropriability problems associated with licensing alluded to above are amplified in the presence of enabling technologies that are relevant to multiple downstream applications.

Teece concludes that the real tragedy is uncritical acceptance of the anticommons thesis. Anticommons and “royalty stacking” concerns have led some courts and arbitration panels to reduce patent royalties for SEPs. The far more serious problem is the prospect of undercompensation to the patent owner, especially when technologies exhibit enabling and general-purpose characteristics.<sup>59</sup> Accordingly, the tragedy, if there is one, is underpayment for technologies that have high social returns, resulting in underinvestment in R&D and, in the longer run, lower innovation and growth than society desires and is willing to pay for.<sup>60</sup>

David Kappos and the Honorable Paul R. Michel address the origins, development, and future of smallest salable patent-practicing unit (SSPPU) legal doctrine as they seek to dispel confusion about its role in U.S. patent

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infringement, then the infringer plays a “heads I win, tails I break even” game, which encourages infringement and results in overuse and undercompensation. *Id.* However, following a verdict in the patent holder’s favor, the court may require the infringer to pay a royalty rate appropriate for a proven-valid-and-infringed patent, rather than the (discounted) rate that it could have negotiated ex ante for what might be termed an “untested” patent for which the issues of validity and infringement have not been litigated, and which may be seriously disputed. *Id.* In this case, appropriate compensation is only delayed (assuming appropriate prejudgment interest is awarded), rather than eliminated entirely. *Id.*

59. *Id.* at 1520.

60. *Id.* at 1525.

law and licensing.<sup>61</sup> They note that the concept first appeared in the context of an evidentiary ruling on the admissibility of damages and that some commentators have advanced it into a rule prescribing how to calculate patent damages and royalty units.<sup>62</sup> However, the Federal Circuit rejected its universality in *CSIRO*. Even if applicable for calculating damages, it does not “dictate how negotiating parties may arrive at mutually agreeable licensing terms. It certainly does not require that the prices of inputs to the manufacture of an infringing product determine the proper royalty base.”<sup>63</sup> The authors see SSPPU as being limited primarily to jury trials for damages.

More significantly, the authors state that “the concern animating the SSPPU approach does not exist . . . outside the jury context.”<sup>64</sup> Nor does it provide support for the notion that using the SSPPU as a royalty base is a requirement for FRAND or that it should prevail over market determined royalty bases.<sup>65</sup> Kappos and Michel conclude that “[n]o court has ever held that SSPPU is a hard-and-fast substantive requirement of patent law, and indeed the Federal Circuit has held just the opposite in *CSIRO*.”<sup>66</sup> Their view is that SSPPU is quite simply not the law; and, if it were, it would be bad economics and would reduce incentives for innovation.

Contreras et al. examine litigation relating to standard essential patents, including litigation by nonpracticing entities (NPEs) in Europe.<sup>67</sup> Based on case-level data from Germany and the United Kingdom, as well as declared patents in the SEP database, they analyzed all assertions of SEPs by NPEs, in terms of frequency of assertion, timing of assertion, plaintiff characteristics, and litigation outcome. They found that while large numbers of NPEs operate in the United States, few availed themselves of the European courts during the periods studied.<sup>68</sup> The large majority of NPE SEP assertions in Europe during the periods studied were by Europe-based NPEs, not U.S. entities.<sup>69</sup>

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61. David Kappos & Paul R. Michel, *The Smallest Salable Patent-Practicing Unit: Observations on Its Origins, Development, and Future*, 32 BERKELEY TECH. L.J. 1433 (2017).

62. *See id.* at 1434–35.

63. *Id.* at 1436.

64. *Id.* at 1445.

65. *See id.* at 1449–50.

66. *Id.* at 1455.

67. Jorge L. Contreras et al., *Litigations of Standards-Essential Patents in Europe: A Comparative Analysis*, 32 BERKELEY TECH. L.J. 1457 (2017)

68. *Id.* at 1485.

69. *Id.*



The totality of these Articles constitutes a fresh look at the law and economics of patents in today's world of complex products, which incorporate patented and non-patented inventions, where some patents might be standards essential. The Articles in this special issue of the *Berkeley Technology Law Journal* convey a message that the market for knowhow has worked reasonably well historically, despite the plethora of patents and the problematic nature of validity and infringement. However, while market processes have worked well in the past, generally unfounded antitrust concerns and judicial mistakes threaten the proper operation of intellectual property markets and the global innovation system.<sup>70</sup>

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70. For a discussion of similar concerns, see generally Ohlhausen, *supra* note 5.



# HAS THE ACADEMY LED PATENT LAW ASTRAY?

*Jonathan M. Barnett<sup>†</sup>*

## 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” burdening innovation with transaction and litigation costs; “patent holdup” resulting in excessive payouts to opportunistic patent holders; and “royalty stacking” causing 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, legislators, and antitrust agencies 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. 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 renegotiation. 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 lobbying behavior by downstream intermediate users in the smartphone market, who advocate limiting injunctive relief for significant categories of patent holders. These potential welfare losses, combined with the paucity of evidence for thicket, holdup, and

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stacking effects, recommend against policy actions that have weakened the remedies available to patent holders in information technology markets.

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## I. INTRODUCTION

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, commentators claim that a strong patent system induces “patent thickets” that slow down innovation in a web of dispute-resolution and licensing costs.<sup>1</sup> Second, they assert that a strong patent system induces “patent holdup”—a variant of the standard economic 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.<sup>2</sup> Third, they assert 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.<sup>3</sup> 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 and settlement 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.

To be sure, not all scholars and commentators have adopted this narrative and some have expressly criticized it.<sup>4</sup> However, these alleged adverse effects of a strong patent system have been widely asserted in scholarly and policy discussions<sup>5</sup> and are embedded within a broader set of concerns regularly voiced by legal scholars and some economists over “excessively” strong or numerous patents.<sup>6</sup> These prevailing academic

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1. See *infra* Section II.A.1.

2. See *infra* Section II.A.2.

3. See *infra* Section II.A.3.

4. For some existing critiques, see *infra* notes 13 and 237 and accompanying text.

5. For citation data as an indicator of the influence of these views among academics and policymakers, see *infra* notes 43–46, 112 and 141. For data on Supreme Court amicus briefs as an indicator of the prevalence 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) (noting that 74% of amicus briefs filed by academics in patent-related Supreme Court cases during 2008–2015 favor alleged infringer).

6. For some of the most influential publications, see generally MICHELE BOLDRIN & DAVID K. LEVINE, *AGAINST INTELLECTUAL MONOPOLY* (2008); JAMES BESSEN & MICHAEL J. MEURER, *PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT*

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, L.L.C.*,<sup>7</sup> and over a decade of case law interpreting that decision, which has significantly limited the circumstances in which a patent holder can secure injunctive relief.<sup>8</sup> 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") industries.<sup>9</sup> 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 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.<sup>10</sup>

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.<sup>11</sup>

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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).

7. 547 U.S. 388 (2006) (rejecting the principle that a patent holder who defends validity and shows infringement is presumptively entitled to injunctive relief).

8. See *infra* Section II.B.1.

9. See *infra* Section II.B.3–4.

10. 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).

11. See generally HERNANDO DE SOTO, *THE MYSTERY OF CAPITAL: WHY CAPITALISM TRIUMPHS IN THE WEST AND FAILS EVERYWHERE ELSE* 5–10 (2000) (arguing that secure property-rights institutions account for economic growth in the West relative to other regions); DOUGLASS C. NORTH & ROBERT PAUL THOMAS, *THE RISE OF THE*

Given this analytical presumption, any significant deviation from the market pricing principle in an area of commercially vital activity should rest on strongly persuasive grounds. Yet that is demonstrably not the case for the three assertions that have provided the putative grounds for the partial deproportionization 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 multicomponent 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.<sup>12</sup> 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 arguments<sup>13</sup>—my critique is primarily empirical and relies on more recent

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WESTERN WORLD: A NEW ECONOMIC HISTORY 1–8 (1973) (arguing that property rights promote economic growth by aligning private with social investment incentives, as illustrated by economic development in Western Europe during 900 A.D. to 1700 A.D.).

12. See *infra* Section III.

13. See Einer Elhauge, *Do Patent Holdup and Royalty Stacking Lead to Systematically Excessive Royalties?*, 4 J. COMPETITION L. & ECON. 535, 535 (2008) (“[P]redicted royalty rates are overstated because of incorrect assumptions about constant demand, one-shot bargaining, and informational symmetry.”); 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, 732 (2008) (“Lemley and Shapiro employ the wrong framework for determining the optimal rule for injunctive relief. Moreover, even within their flawed framework, Lemley and Shapiro establish a downwardly biased benchmark for the reasonable royalty rate. . . . These assumptions skew the results of their model in favor of the infringing party.”); Damien Geradin & Miguel Rato, *Can Standard Setting Lead to Exploitative Abuse? A Dissonant View on Patent Hold-Up, Royalty Stacking and the Meaning of FRAND*, 3 EUR. COMPETITION J. 101, 122–29 (2007) (surveying and criticizing anticommons, patent thicket, patent holdup, and royalty

examinations of those arguments' descriptive force in contemporary and historical technology markets.<sup>14</sup> Given that those studies find little evidence of thicket, holdup, and stacking effects, 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, this Article presents 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. Given 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

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stacking literature); Vincenzo Denicolò, Damien Geradin, Anne Layne-Farrar & A. Jorge Padilla, *Revisiting Injunctive Relief: Interpreting eBay in High-Tech Industries with Non-Practicing Patent Holders*, 4 J. COMPETITION L & ECON. 571, 582–85 (2008) (arguing that Lemley and Shapiro's holdup model relies on several restrictive assumptions and may apply only in limited circumstances that do not justify broadly denying injunctions); John Golden, *"Patent Trolls" and Patent Remedies*, 85 TEX. L. REV. 2111, 2124–35 (2007) (arguing that Lemley and Shapiro's holdup model fails to address undercompensation risk, given uncertainty over judicial outcomes and damage awards, resource constraints and litigation costs, which may offset overcompensation risk due to holdup effects); David E. Adelman, *A Fallacy of the Commons in Biotech Patent Policy*, 20 BERKELEY TECH. L.J. 985, 986 (2005) ("This often implicit presumption is contradicted by the overabundance of research opportunities created by recent advances in genomics (and other biotech fields), which have transformed biomedical science into an unbounded resource. The uniquely open-ended nature of biomedical science requires a reassessment of how patenting affects biotech research and innovation.").

14. For earlier contributions that reviewed the then-existing empirical evidence on royalty stacking, see Damien Geradin, Anne Layne-Farrar & A. Jorge Padilla, *The Complements Problem Within Standard Setting: Assessing the Evidence on Royalty Stacking*, 48 B.C. L. REV. 149 (2007); Denicolò et al., *supra* note 13, at 596–600. This Article looks at evidence relating to a broader set of related theories and, given the passage of time, covers a broader pool of relevant evidence.



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 shield informational assets against expropriation and thereby enable transactions with third parties that can most efficiently implement the commercialization functions that are necessary for an innovation to reach market.<sup>15</sup> Withdrawing those legal envelopes may inefficiently drive innovation and commercialization activities within the confines of large firms that can reach market through 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, resulting in long-term dynamic efficiency losses that outweigh short-term static efficiency gains.

Organization is as follows. Part II describes the concepts of patent thickets, holdup, and royalty stacking, and shows 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. Part III assesses 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. Part IV presents a cost-benefit approach that supports reinstating the historical presumption in favor of injunctive relief for valid and infringed patents. Part V briefly concludes.

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15. On the expropriation risks inherent to contracting over informational assets, see *infra* note 243 and accompanying text



## II. THICKETS, HOLDUP, AND STACKING

This Part describes briefly the patent thicket, holdup, and stacking propositions that are widely asserted in the academic literature. It then shows how these propositions have had an impact on, 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 owners is likely to depress innovation by burdening innovators with significant transaction costs relating to dispute resolution or licensing activities.<sup>16</sup> 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 or below.<sup>17</sup> Transaction costs refer generally to the coordination costs required to reach agreement among

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16. For commonly cited sources, see MICHAEL A. HELLER, *THE GRIDLOCK ECONOMY* 4–6, 49–53 (2008) (arguing that issuance of large numbers of patents to dispersed holders can generate transaction costs that impede innovation); Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in 1 *INNOVATION POLICY AND THE ECONOMY* 120–21 (Adam B. Jaffe, Josh Lerner & Scott Stern eds. 2001) (noting concerns about a “patent thicket” that can impose “an unnecessary drag on” innovation); and Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 *SCIENCE* 698, 698 (1998) (arguing that the proliferation of patent rights in biomedical research may generate “blocking” effects that hinder innovation). Notably, in response to empirical studies concerning anticommons effects, Professor Eisenberg has qualified her initial position. See Rebecca S. Eisenberg, *Noncompliance, Nonenforcement, Nonproblem? Rethinking the Anticommons in Biomedical Research*, 45 *HOUS. L. REV.* 1059, 1098 (2008) (noting limited evidence for the anticommons thesis and modifying the thesis to address transaction costs associated with contractual negotiations relating to use of research materials).

17. Heller & Eisenberg, *supra* note 16, at 698 (“[A]voiding tragedy requires overcoming transaction costs, strategic behaviors, and cognitive biases of participants . . . . Once an anticommons emerges, collecting rights into usable private property is often brutal and slow.”) (citations omitted).

multiple parties, which could encompass the costs relating to holdout behavior by patent owners.<sup>18</sup> 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 owner has an incentive to withhold agreement so it can capture the largest portion of the value embodied in the product.<sup>19</sup> If each patent owner adopts this individually rational waiting strategy, then collective irrationality ensues: the transaction cannot move forward and innovation gets stuck in the patent thicket.

## 2. Royalty Stacking

Royalty stacking is an application of the standard double marginalization problem in the economics of industrial organization.<sup>20</sup> 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 essential components, each of those components are patented, and the patents are held by multiple parties.<sup>21</sup> In that case, each patent owner

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18. Heller & Eisenberg, *supra* note 16, at 698; Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L.J. 1478, 1482 (2005) (describing transaction costs as understood by the anticommons literature).

19. James M. Rice, *The Defensive Patent Playbook*, 30 BERKELEY TECH. L.J. 725, 732 (2015) (“When SSOs incorporate patented technology into a standard, the patent holder gains leverage and the power to holdout for inflated licensing rates because of the expense of switching to a different standard.”).

20. For the original source, see AUGUSTIN COURNOT, *RESEARCHES INTO THE MATHEMATICAL PRINCIPLES OF THE THEORY OF WEALTH* (Nathaniel Bacon trans., MacMillan Co. 1897) (1838). For a more modern discussion, see generally Carl Shapiro, *Theories of Oligopoly Behavior*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 329 (Richard Schmalensee & Robert Willigs eds., 1989).

21. See Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991, 2013–16 (2007) (noting that double marginalization arises in the patent context when multiple component suppliers hold patents over essential inputs required by a downstream firm); Mark A. Lemley, *Ten Things to Do About Patent Holdup of Standards (and One Not to)*, 48 B.C. L. REV. 149, 152 (2007) (providing hypothetical illustration of stacking problem where Intel must pay 1% royalty to each of 5,000 component suppliers, eliminating any possible profit).

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 owners as a group.<sup>22</sup>

### 3. *Patent Holdup*

The concept of holdup was pioneered by Nobel Prize winner, Oliver Williamson.<sup>23</sup> 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.<sup>24</sup> To preserve consistency with

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22. Benjamin C. Li, *The Global Convergence of FRAND Licensing Practices: Towards “Interoperable” Legal Standards*, 31 BERKELEY TECH. L.J. 429, 432 (2016) (“A royalty rate that may have seemed reasonable on its own is not reasonable when a company developing a particular technology must pay several thousand separate royalties to account for all of the patents implicated by its technology. Stacking all of these royalties on top of each other can make a product too expensive to bring to market.”); Zelin Yang, *Damaging Royalties: An Overview of Reasonable Royalty Damages*, 29 BERKELEY TECH. L.J. 647, 652 (2014) (“The cumulative effect of potentially overcompensating thousands of patentees represents a crushing cost for producers and stifles innovation.”); Joseph Farrell, John Hayes, Carl Shapiro & Theresa Sullivan, *Standard Setting, Patents and Hold-Up*, 74 ANTITRUST L.J. 603, 608 (2007) (“[S]tandards hold-up is . . . a public policy concern because downstream consumers are harmed when excessive royalties are passed on to them.”).

23. See OLIVER E. WILLIAMSON, *THE ECONOMIC INSTITUTIONS OF CAPITALISM* 46–52, 64–67 (1985).

24. See Lemley & Shapiro, *supra* note 21, at 1993 (describing holdup as a situation “in which the defendant has already invested heavily to design, manufacture, market, and sell the product with the allegedly infringing feature”); Daniel G. Swanson & William J. Baumol, *Reasonable and Nondiscriminatory (RAND) Royalties, Standards Selection, and Control of Market Power*, 73 ANTITRUST L.J. 1, 19–21 (2005) (describing circumstance in which a licensor holds a patent to a critical element of a technology standard and then “holds up” licensees who are locked in after having made relationship-specific investments in the standard).

Williamson's original definition of holdup, 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.<sup>25</sup> This last assumption is sometimes dropped in looser uses of the term "holdup" that have become current in some patent commentary, as reflected in statements by practitioners,<sup>26</sup> antitrust agencies,<sup>27</sup> courts,<sup>28</sup> and some scholars.<sup>29</sup>

#### 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 late 1990s, notions of thickets, holdup, and stacking began to appear in academic publications<sup>30</sup> and, starting in the early 2000s, those notions then began to appear in statements and reports issued by the federal antitrust agencies,<sup>31</sup> and

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25. See, e.g., Gerald F. Masoudi, *Antitrust Enforcement and Standard Setting: The VITA and IEEE Letters and the "IP2" Report*, U.S. DEP'T JUST. (May 10, 2007), [www.justice.gov/atr/speech/antitrust-enforcement-and-standard-setting-vita-and-ieee-letters-and-ip2-report](http://www.justice.gov/atr/speech/antitrust-enforcement-and-standard-setting-vita-and-ieee-letters-and-ip2-report). These remarks were delivered by the author when he served as Deputy Assistant Attorney General in the Department of Justice, Antitrust Division.

26. 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).

27. See *infra* Section II.B.2, 3, 5.

28. See *infra* Section II.B.1, 4.

29. Reflecting this looser understanding, Professors 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. See Jorge L. Contreras & Richard J. Gilbert, *A Unified Framework for RAND and Other Reasonable Royalties*, 30 BERKELEY TECH. L.J. 1451, 1456–60 (2015). 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. *Id.* at 1492–93. As I discuss subsequently, *infra* notes 229, 230 and 235 and accompanying text, this line of argument invites potential licensees to infringe and wait to be sued, shifting the pricing of IP assets from the market to the courts.

30. For early publications on patent thickets, see Heller & Eisenberg, *supra* note 16, and Shapiro, *supra* note 16, at 121, 124–26; on patent holdup, see Shapiro, *supra* note 16, at 121, 124–26; on royalty stacking, see Shapiro, *supra* note 16, at 122 and T. Randolph Beard & David L. Kaserman, *Patent Thickets, Cross-Licensing and Antitrust*, 47 ANTITRUST BULL. 345, 356 (2002). For other academic publications on these concepts, see *supra* Sections II.A.1–3.

31. For an indicative statement, see Timothy J. Muris, Chairman, Fed. Trade Comm'n, *Competition and Intellectual Property Policy: The Way Ahead* (Nov. 15, 2001), <https://www.ftc.gov/public-statements/2001/11/competition-and-intellectual-property->

subsequently, proliferated in court opinions in antitrust and patent infringement actions.<sup>32</sup> I identified use of the terms “patent thicket,” “patent holdup,” or “royalty stacking” (and close variants) in sixty-eight federal court decisions, twenty decisions issued in International Trade Commission (“ITC”) proceedings,<sup>33</sup> and fourteen decisions issued in FTC proceedings.<sup>34</sup> Two examples can illustrate the practical impact these theories can have on the strength of patent rights in the marketplace. 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.<sup>35</sup> In a 2015 decision (discussed in further detail subsequently<sup>36</sup>), the Court of Appeals for the Federal Circuit—the nation’s appeals court for patent litigation—specifically cited scholarly arguments concerning holdup risk in upholding an award of attorney’s fees *against* a SEP holder that sought injunctive relief against an infringer.<sup>37</sup>

The FTC and the Department of Justice (“DOJ”), which periodically undertake patent-related antitrust enforcement actions, often have referred to thicket, holdup, and stacking theories in policy statements and sometimes cite scholarly publications that support those theories.<sup>38</sup> The Table below

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policy-way-ahead (citing scholarly assertions of a “patent thicket”). For agency reports that mention these concepts, see *infra* Table I.

32. For court opinions mentioning patent thickets, see *infra* notes 56, 113 and 142; for opinions mentioning holdup and stacking, see *infra* note 87.

33. 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 (2012); Daniel E. Valencia, *Appeals from the International Trade Commission: What Standing Requirement?*, 27 BERKELEY TECH. L.J. 1171, 1176 (2012) (“A typical exclusion order, limited or general, might direct CBP to exclude from entry articles ‘that infringe’ or ‘are covered by’ one or more specified claims of a specified patent.”).

34. Federal court, ITC, and FTC decisions were identified through searches on January 9–14, 2018 in the LexisNexis, Westlaw, and Cheetah Antitrust and Competition Law databases. Search terms used: “patent thicket,” “patent thickets,” “patent holdup,” “patent hold-up,” “patent holdup,” or “royalty stacking.”

35. *Ass’n for Molecular Pathology v. U.S. Patent & Trademark Office*, 702 F. Supp. 2d 181, 208–09 (S.D.N.Y. 2010) (stating that the “proliferation of intellectual property rights directed to genetic material has . . . been postulated to contribute to ‘the tragedy of the anti-commons’” and citing to scholarly articles in support of this view), *aff’d in part, rev’d in part*, 653 F.3d 1329 (Fed. Cir. 2011), *cert. granted, judgment vacated sub nom.* *Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 566 U.S. 902 (2012).

36. See *infra* notes 93–95 and accompanying text.

37. *Microsoft Corp. v. Motorola, Inc.*, 795 F.3d 1024, 1051–52 (9th Cir. 2015).

38. See, e.g., FED. TRADE COMM’N, *THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION* 56–57 (2011), [www.ftc.gov/sites/default/files/documents/reports/evolving-ip-marketplace-aligning-patent-notice-and-](http://www.ftc.gov/sites/default/files/documents/reports/evolving-ip-marketplace-aligning-patent-notice-and-)

shows the number of times the terms, “thicket,” “hold-up,” and “stacking” (and close variants), have been substantively mentioned<sup>39</sup> in major reports issued since 2003 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 Antitrust Modernization Committee (“AMC”), an entity formed by congressional action in 2002.<sup>40</sup> In a notable recent deviation from these trends, the newly-appointed head of the Antitrust Division, Assistant Attorney General Makan Delrahim, called on November 10, 2017 for a reevaluation of antitrust policies toward SEPs in view of what he called a “one-sided focus on the hold-up issue.”<sup>41</sup>

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remedies-competition-report-federal-trade/110307patentreport.pdf (noting that “IT products are often surrounded by ‘patent thickets’” that can generate liability risk and transaction costs that deter innovation and citing scholarly articles in support of this view).

39. For this purpose, I excluded references to those terms if the reference solely consisted of the title of another publication or a cross-reference to another use of the term in the same report.

40. Antitrust Modernization Commission Act of 2002, Pub. L. No. 107-273, 116 Stat. 1856.

41. Makan Delrahim, Assistant Att’y Gen., U.S. Dep’t. of Justice, Assistant Attorney General Makan Delrahim Delivers Remarks at the USC Gould School of Law’s Center for Transnational Law and Business Conference (Nov. 10, 2017), [www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-usc-gould-school-laws-center](http://www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-usc-gould-school-laws-center).



Table 1: Major Government Reports on Antitrust &amp; Intellectual Property (2003–2013)

Year Issued	Agency	References to “Thicket” or “Thickets”	References to “Holdup” or “Hold Up” or “Hold-Up”	References to “Stacking”
2003 <sup>42</sup>	FTC	93	35	22
2007 <sup>43</sup>	FTC, DOJ	13	9	18
2007 <sup>44</sup>	AMC	0	5	0
2011 <sup>45</sup>	FTC	5	115	0
2013 <sup>46</sup>	DOJ, PTO	0	5	0

In the discussion that follows, *this Section* describes in more detail how the conceptual triplet of thicket, holdup and stacking theories have had a material effect on, or are consistent with, actions taken by courts, agencies and other policymaking entities that have contributed to the depropertization of the patent system.

1. *The Seminal Case: eBay Inc. v. MercExchange, L.L.C. (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.*<sup>47</sup> The Court’s decision and, in particular, the

42. FED. TRADE COMM’N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY (2003), [www.ftc.gov/sites/default/files/documents/reports/promote-innovation-proper-balance-competition-and-patent-law-and-policy/innovationrpt.pdf](http://www.ftc.gov/sites/default/files/documents/reports/promote-innovation-proper-balance-competition-and-patent-law-and-policy/innovationrpt.pdf). For references to “thickets,” see *id.* Exec. Summary at 6, 7, 15; for references to “hold-up,” see *id.* ch. 3 at 30, 37, 38; for references to “stacking,” see *id.* ch. 1 at 33; ch. 2 at 3; and ch. 4 at 5.

43. FED. TRADE COMM’N & U.S. DEP’T OF JUSTICE, ANTITRUST ENFORCEMENT AND INTELLECTUAL PROPERTY RIGHTS: PROMOTING INNOVATION AND COMPETITION (2007), <https://www.justice.gov/sites/default/files/atr/legacy/2007/07/11/222655.pdf>. For references to “thickets,” see *id.* at 8, 42, 57; for references to “hold-up,” see *id.* at 8, 35 n.11, 42; for references to “stacking,” see *id.* at 8, 57, 95.

44. DEBORAH A. GARZA ET AL., ANTITRUST MODERNIZATION COMM’N, REPORT AND RECOMMENDATIONS (2007), [https://govinfo.library.unt.edu/amc/report\\_recommendation/amc\\_final\\_report.pdf](https://govinfo.library.unt.edu/amc/report_recommendation/amc_final_report.pdf). For references to “hold-up,” see *id.* at 407–08.

45. FED. TRADE COMM’N, *supra* note 38. For references to “thickets,” see *id.* at 56, 147, 147 n.35; for references to “hold-up,” see *id.* at 5, 10, 15.

46. U.S. DEP’T OF JUSTICE & U.S. PATENT & TRADEMARK OFFICE, POLICY STATEMENT ON REMEDIES FOR STANDARDS-ESSENTIAL PATENTS SUBJECT TO VOLUNTARY F/RAND COMMITMENTS (2013), <https://www.justice.gov/sites/default/files/atr/legacy/2014/09/18/290994.pdf> [hereinafter JOINT POLICY STATEMENT] For references to “hold-up,” see *id.* at 4, 6 n.13.

47. 547 U.S. 388 (2006).

concurrency authored by Justice Kennedy,<sup>48</sup> reflects holdup concerns that had been expressed in the academic literature<sup>49</sup> and the FTC's 2003 report (see Table 1). Additionally, amicus briefs filed in the *eBay* case with the Court (including a brief in support of the defendant filed by fifty-two intellectual property professors<sup>50</sup>) referred to "patent holdup" and "patent thickets" and called for imposing limits on injunctive relief.<sup>51</sup> 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 were entitled to a permanent injunction after defending the presumption of validity and showing infringement.<sup>52</sup> 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.<sup>53</sup> However, the majority opinion emphasized that judicial determinations under the *eBay* standard should not take into account the type of patent holding entity<sup>54</sup> and three concurring justices added that the historical presumption should stand in most cases.<sup>55</sup> By contrast, the concurrence by Justice Kennedy and three 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."<sup>56</sup>

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

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48. *Id.* at 396–97 (Kennedy, J., concurring).

49. *See* Shapiro, *supra* note 16, at 124–26; Baumol & Swanson, *supra* note 24, at 19–21.

50. Brief Amici Curiae of 52 Intellectual Property Professors in Support of Petitioners, *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006) (No. 05–130), 2006 WL 1785363.

51. *See, e.g., id.* at 6–8; Brief of Time Warner Inc. et al. in Support of Petitioners at 8–12, *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006) (No. 05–130), 2006 WL 235010; Brief of Business Software Alliance et al. in Support of Petitioners at 5–12, *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006) (No. 05–130), 2006 WL 207730; Brief for Amicus Curiae Computer & Communications Industry Association in Support of Petitioners at 2–3, 7–8, *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006) (No. 05–130), 2006 WL 235011.

52. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1247 (Fed. Cir. 1989).

53. *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 391–92 (2006).

54. *See id.* at 393.

55. *See id.* at 395 (2006) (Roberts, J., concurring).

56. *See id.* at 396 (2006) (Kennedy, J., concurring) (citing FED. TRADE COMM'N, *supra* note 42).



relief; while (ii) non-practicing entities are typically only entitled to a continuing royalty for future infringement.<sup>57</sup> This de facto application of *eBay* stands in tension with long-standing precedent rejecting a working requirement for patent holders.<sup>58</sup>

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 a practicing patentee and a direct competitor. In the headline patent litigation between Apple (the patentee–plaintiff) 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, on the ground that irreparable harm (one of the *eBay* factors to be considered in determining whether injunctive relief should be granted) was not shown, principally because the patent holder had not sufficiently demonstrated a “causal nexus” between Samsung’s infringement of certain patented features of Apple’s iPhone product and Apple’s alleged harm.<sup>59</sup> While the Federal Circuit overturned the district court’s denial of injunctive relief,<sup>60</sup> it did so in a split decision, with the Chief Judge arguing in favor of upholding the district court decision.<sup>61</sup> 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.<sup>62</sup> There is no clearer illustration of the depropertization phenomenon.

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57. 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. *Id.* at 1983, 1988. This compares with a 95% grant rate in the period prior to *eBay*. *Id.* at 1969.

58. *Cont’l Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405, 422–30 (1908) (rejecting argument that use of a patent is a condition for enforcement against infringers); Stuart J.H. Graham & Ted Sichelman, *Why Do Start-Ups Patent?*, 23 BERKELEY TECH. L.J. 1063, 1075 & n.45 (2008) (noting well-settled rejection of a “working requirement” in patent law).

59. *Apple, Inc. v. Samsung Elecs. Co.*, No. 12-CV-00630-LHK, 2014 WL 7496140, at \*6–16, \*23 (N.D. Cal. Aug. 27, 2014).

60. *Apple Inc. v. Samsung Elecs. Co.*, 809 F.3d 633 (Fed. Cir. 2015).

61. *Id.* at 656–63 (Prost, C.J., dissenting).

62. 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 57, 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 multicomponent context, permanent injunctive relief was initially denied.

## 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 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 claims;<sup>63</sup> (ii) Rambus, a semiconductor design firm in the memory chip market, which was filed in 2002 and finally adjudicated in 2008 (in Rambus’ favor);<sup>64</sup> and (iii) Negotiated Data Solutions (known as “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 its patents unless it offered a license based on the commitment made by the original owner to the SSO.<sup>65</sup> These cases are generally cited as “holdup” scenarios in which the patentee strategically fails to disclose its patent position, which then enables it to pursue opportunistic litigation against “locked-in” firms that have 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.<sup>66</sup> 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

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63. Dell Comput. Corp., 121 F.T.C. 616 (1996) (consent order).

64. Rambus Inc. v. FTC, 522 F.3d 456 (D.C. Cir. 2008).

65. Decision and Order, *In re* Negotiated Data Solutions LLC, FTC File No. 051-0094, Docket No. C-4234 (Jan. 23, 2008). Note that I omit from this discussion litigations brought by private parties that involve “patent ambush” theories in the SSO context.

66. See, e.g., Mark A. Lemley & Carl Shapiro, *A Simple Approach to Setting Reasonable Royalties for Standards-Essential Patents*, 28 BERKELEY TECH. L.J. 1135, 1137 n.3 (2013) (claiming that “disclosure-only policies have fallen into disfavor” with SSOs “in part because of abuse of those policies by companies like Rambus”); Jorge L. Contreras, *From Private Ordering to Public Law: The Legal Frameworks Governing Standards-Essential Patents*, 30 HARV. J.L. & TECH. 211, 217 & n.35 (2017).

“reasonable and nondiscriminatory” (“RAND”)<sup>67</sup> royalty standard and to demand “exorbitant” royalties after the standard had been set.<sup>68</sup>

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 Commission<sup>69</sup> as did the D.C. Circuit in the subsequent appellate proceedings.<sup>70</sup> 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.<sup>71</sup> 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.<sup>72</sup> In 2010, European Union antitrust authorities reached similar findings, including an attempt by these and other chip manufacturers to “coordinate and monitor prices” for “Rambus DRAMs.”<sup>73</sup> Taking these omitted facts into account, the Rambus

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67. Some commentators and practitioners use the term “FRAND” (fair, reasonable, and nondiscriminatory) in lieu of RAND. As is generally understood in the academic literature, I treat the two terms as substantively equivalent. See Thomas H. Chia, *Fighting the Smartphone War with RAND-Encumbered Patents*, 27 BERKELEY TECH. L.J. 209, 209 n.3 (2012).

68. Complaint, *In re Rambus Inc.*, FTC File No. 011-0017, Docket No. 9302, at 13 ¶ 46 (June 18, 2002).

69. Initial Decision, *In re Rambus Inc.*, FTC File No. 011-0017, Docket No. 9302, at 334 (Feb. 24, 2004).

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

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

72. Press Release, U.S. Dep’t of Justice, Samsung Agrees to Plead Guilty and to Pay \$300 Million Criminal Fine for Role in Price Fixing Conspiracy (Oct. 13, 2005), [www.justice.gov/archive/atr/public/press\\_releases/2005/212002.htm](http://www.justice.gov/archive/atr/public/press_releases/2005/212002.htm); Laurie J. Flynn, *Samsung to Pay Large Fine in Price-Fixing Conspiracy*, N.Y. TIMES (Oct. 14, 2005), <http://www.nytimes.com/2005/10/14/technology/samsung-to-pay-large-fine-in-pricefixing-conspiracy.html> (noting fines paid by Samsung, Hynix, and Infineon in price-fixing prosecution). 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, 11:38 PM), [www.anandtech.com/show/5122/rambus-loses-major-antitrust-case-again-hynix-micron](http://www.anandtech.com/show/5122/rambus-loses-major-antitrust-case-again-hynix-micron). In 2013, Rambus settled separately all patent and antitrust claims with Hynix and Micron through a patent cross-licensing agreement. See John Ribeiro, *Rambus, Micron Settle Patent, Antitrust Disputes*, PCWORLD (Dec. 9, 2013, 9:15 PM), [www.pcwORLD.com/article/2071400/rambus-micron-settle-patent-antitrust-disputes.html](http://www.pcwORLD.com/article/2071400/rambus-micron-settle-patent-antitrust-disputes.html).

73. Commission Decision COMP/38511 of May 19, 2010 (EC), [http://ec.europa.eu/competition/antitrust/cases/dec\\_docs/38511/38511\\_1813\\_5.pdf](http://ec.europa.eu/competition/antitrust/cases/dec_docs/38511/38511_1813_5.pdf).

case is not an especially compelling 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.<sup>74</sup>

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.<sup>75</sup> 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.<sup>76</sup> Since the precise meaning of RAND is unclear (as evidenced by litigation over these points<sup>77</sup>), even patentees whose technology has been included in a standard 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” mechanism<sup>78</sup>), the DOJ issued letters in 2006, 2007 and 2015 that signaled tolerance for this practice, subject to certain limitations.<sup>79</sup> In 2015, the Institute for Electrical and Electronics

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74. See *infra* Section IV.B.3.

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

76. See, e.g., IEEE, IEEE-SA STANDARDS BOARD OPERATIONS MANUAL 38–39 (2017), [http://standards.ieee.org/develop/policies/opman/sb\\_om.pdf](http://standards.ieee.org/develop/policies/opman/sb_om.pdf).

77. See *infra* Section II.4.

78. 28 C.F.R. § 50.6 (2017).

79. See Letter from Thomas O. Barnett, Assistant Att’y Gen., U.S. Dep’t of Justice, to Robert A. Skitol, Drinker, Biddle & Reath, LLP (Oct. 30, 2006), [www.justice.gov/sites/default/files/atr/legacy/2006/10/31/219380.pdf](http://www.justice.gov/sites/default/files/atr/legacy/2006/10/31/219380.pdf) (responding to request from VITA with respect to standard setting process); Letter from Thomas O. Barnett, Assistant Att’y Gen., U.S. Dep’t of Justice, to Michael A. Lindsay, Dorsey & Whitney LLP (Apr. 30, 2007),

Engineers (the “IEEE”), a major SSO, 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.<sup>80</sup>

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.<sup>81</sup> 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.”<sup>82</sup> In particular, collective pre-specification of royalty rates raises concerns (as the DOJ has acknowledged<sup>83</sup>) 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 sources in the technology supply chain, as indicated by comparatively low R&D intensities.<sup>84</sup> As I discuss subsequently, additional factors suggest that these oligopsony risks are most salient in the smartphone market with

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<https://www.justice.gov/sites/default/files/atr/legacy/2007/04/30/222978.pdf> (responding to request from Institute of Electrical and Electronics Engineers, Inc. with respect to standard setting process); Letter from Renata B. Hesse, Acting Assistant Att’y Gen., U.S. Dep’t of Justice, to Michael A. Lindsay, Dorsey & Whitney LLP (Feb. 2, 2015), <https://www.justice.gov/file/338591/download> (responding to request from Institute of Electrical and Electronics Engineers, Inc. with respect to certain amendments to the standard setting process).

80. 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\\_2015.html](http://www.ieee.org/about/news/2015/8_february_2015.html).

81. On this point, see J. Gregory Sidak, *The Antitrust Division’s Devaluation of Standard-Essential Patents*, 104 GEO. L.J. ONLINE 48, 68 (2015).

82. Pub. L. No. 108-237, 118 Stat. 661 (codified at 15 U.S.C. §§ 4301 et seq.).

83. See Hesse, *supra* note 79, at 7 (recognizing concerns that change to SSO policy, which permits pre-specification of royalty rates by SSO members, could facilitate economic interests of “parties desiring lower royalty rates”); Letter from Charles A. James, Assistant Att’y Gen., U.S. Dep’t of Justice, to Ky P. Ewing, Vinson & Elkins L.L.P. 12 (Nov. 12, 2002), [www.justice.gov/sites/default/files/atr/legacy/2006/04/27/200455.pdf](http://www.justice.gov/sites/default/files/atr/legacy/2006/04/27/200455.pdf).

84. See Jonathan M. Barnett, *From Patent Thickets to Patent Networks: The Legal Infrastructure of the Digital Economy*, 55 JURIMETRICS 1, 28–29, 34–35 (2014).

respect to which patent holdup and stacking concerns are most commonly expressed.<sup>85</sup>

4. *Judicial Erosion of Injunctions: RAND Litigations (2013–2017)*

In several recent litigations, federal courts have addressed two key questions concerning the remedies available to the holders of SEPs subject to a RAND commitment: first, how RAND royalties should be calculated in damages determinations; and second, whether SEP holders that are subject to a RAND commitment may seek injunctive relief against infringers.<sup>86</sup> Referencing holdup and stacking concerns,<sup>87</sup> courts in these litigations have taken notable steps toward “deproperitizing” the patent grant by both royalty–valuation methodologies that discount market licensing practices and in general induce a downward bias in damages determinations for RAND–encumbered patents.<sup>88</sup> To focus the discussion, this subsection will focus on the former development.

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85. See *infra* Section IV.B.3.c.

86. TCL Commc’n Tech. Holdings, Ltd. v. Telefonaktiebolaget LM Ericsson, No. CV 15-2370 JVS(DFMX), 2017 WL 6611635 (C.D. Cal. Dec. 21, 2017); Apple Inc. v. Motorola, Inc., 757 F.3d 1286 (Fed. Cir. 2014), *overruled on other grounds by* Williamson v. Citrix Online, LLC, 792 F.3d 1339 (Fed. Cir. 2015); Ericsson, Inc. v. D-Link Sys., Inc., 773 F.3d 1201 (Fed. Cir. 2014); Realtek Semiconductor Corp. v. LSI Corp., 946 F. Supp. 2d 998 (N.D. Cal. 2013); *In re Innovatio IP Ventures, LLC Patent Litig.*, No. 11 C9308, 2013 WL 5593609 (N.D. Ill. Oct. 3, 2013); Microsoft Corp. v. Motorola, Inc., 795 F.3d 1024 (9th Cir. 2015). In an additional case, the court applied RAND royalty determination methodologies even though the patent holder had specifically refused to provide the SSO with a “letter of assurance” undertaking a RAND commitment. See *Commonwealth Sci. & Indus. Research Org. v. Cisco Sys., Inc.*, 809 F.3d 1295, 1304–05 (Fed. Cir. 2015).

87. See, e.g., TCL Commc’n Tech. Holdings, 2017 WL 6611635, at \*15, \*25–26 (justifying a “top-down” approach to determining RAND royalty because it reduces stacking and holdup risks); *Microsoft Corp.*, 795 F.3d at 1031 (“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.’”); *In re Innovatio IP Ventures, LLC Patent Litig.*, 2013 WL 5593609, at \*8 (“[O]ne of the primary purposes of the RAND commitment is to avoid patent hold-up . . .”). Another court acknowledged the relevance of holdup and stacking effects but held that actual evidence of such effects in a particular case is required in order to instruct a jury to take those effects into account for purposes of the damages determination. See *Ericsson*, 773 F.3d at 1209, 1233–34.

88. See Richard A. Epstein & Kayvan B. Noroozi, *Why Incentives for “Patent Holdout” Threaten to Dismantle FRAND, and Why It Matters*, 32 BERKELEY TECH. L.J. 1831 (2017); David J. Teece & Edward F. Sherry, *A Public Policy Evaluation of RAND Decisions in U.S. Courts*, 1 CRITERION J. ON INNOVATION 113, 124 (2016).



In 2012, the Ninth Circuit expressed the view that injunctive relief is generally unavailable to holders of RAND-encumbered patents<sup>89</sup> and Judge Richard Posner of the Court of Appeals for the Seventh Circuit, sitting by designation in a district court proceeding, issued a ruling that was understood to take a similar view.<sup>90</sup> The Federal Circuit rejected any such categorical interpretation of Judge Posner's denial of injunctive relief, stating: "To the extent that the district court applied a per se rule that injunctions are unavailable for SEPs, it erred."<sup>91</sup> Other courts have taken a similarly attenuated position, holding that a RAND commitment implicitly includes a commitment not to seek an injunction against an infringing party but only so long as that party is willing to pay what is deemed to be the RAND rate.<sup>92</sup> Even though this view safeguards some possibility of injunctive relief, it delivers little certainty to holders of RAND-encumbered patents as a practical matter, since the possibility of injunctive relief is predicated on whatever rate it is expected that a court would determine in litigation to be a "reasonable" rate. Failure to accurately forecast that moving judicial benchmark can result in a financial penalty for the patent holder: one court held that a jury could reasonably award attorney's fees to the *defendant-infringer* on the ground that even *seeking* injunctive relief against a licensee willing to pay a royalty within the "RAND range" was contrary to the RAND commitment.<sup>93</sup> Citing the risk of holdup (and

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89. See *Microsoft Corp. v. Motorola, Inc.*, 696 F.3d 872, 877, 884 (9th Cir. 2012). A lower court has expressed sympathy with that view, see *In re Innovatio IP Ventures, LLC Patent Litigation*, 921 F. Supp. 2d 903, 915–17 (N.D. Ill. 2013). Additionally, in the *Apple v. Motorola* litigation, Chief Judge Prost of the Federal Circuit expressed the view that the holder of a SEP should not be entitled to injunctive relief, even if the infringer had engaged in bad-faith licensing negotiations. See *Apple*, 757 F.3d at 1342–43 (Prost, C.J., concurring in part, dissenting in part).

90. *Apple Inc. v. Motorola, Inc.*, 869 F. Supp. 2d 901, 914–15 (N.D. Ill. 2012). A close reading of the district court's opinion suggests that Judge Posner took the more qualified view that injunctive relief is unavailable to holders of RAND-encumbered patents unless the alleged infringer refuses to accept a RAND-compliant license. See *id.*

91. See *Apple*, 757 F.3d at 1331–32.

92. See *Microsoft Corp.*, 795 F.3d at 1048 n.19; *Realtek Semiconductor Corp.*, 946 F. Supp. 2d at 1006–07; see also *Microsoft Corp. v. Motorola, Inc.*, 963 F. Supp. 2d 1176, 1190 (W.D. Wash. 2013) (holding that the RAND commitment does not bar injunctive relief in all cases, but seeking injunctive relief may constitute breach of the SEP holder's implied duty of good faith and fair dealing in connection with its RAND commitment). The Federal Circuit has taken a somewhat more generous view, holding that injunctions may issue for SEPs "where an infringer unilaterally refuses a FRAND royalty or unreasonably delays negotiations to the same effect." *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1332 (Fed. Cir. 2014).

93. *Microsoft Corp.*, 963 F. Supp. 2d at 1193–95. The court's ruling relied on a doctrine adopted by some states, which supports shifting attorney's fees when a litigant has

referring to legal scholarship in support of that view<sup>94</sup>), the Federal Circuit upheld this fee-shifting award.<sup>95</sup> 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"), the prospect of a fee-shifting award discourages SEP-holders from even seeking injunctive relief and, in turn, encourages recalcitrant licensees to resist offers from the SEP holder as "unreasonable".

Patent holders' current state of uncertainty is exacerbated by "soft law" in the form of statements issued by the antitrust agencies, which have expressed the view that a SEP holder could be subject to liability under the antitrust laws for seeking injunctive relief against a "willing licensee" (again, defined based on a vaguely defined "RAND range"). This view is reflected in two FTC consent decrees in 2013,<sup>96</sup> an amicus brief filed by the FTC in a 2012 Federal Circuit litigation,<sup>97</sup> and a joint statement in 2013 by the Antitrust Division and the USPTO.<sup>98</sup> 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.<sup>99</sup> This judicial and regulatory suppression of the injunctive remedy "flips the table" in patent litigation (and hence, in any accompanying settlement negotiations) in favor of alleged infringers, who (in the case of a RAND-encumbered patent) are not only shielded against the threat of

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breached a covenant not to sue. Remarkably, no Washington court had considered this doctrine, but the federal court took the view that, if a Washington court had the opportunity to consider adopting this doctrine, it would likely do so, taking into account the underlying contractual duty of good faith and fair dealing. See *id.* at 1193–94.

94. *Microsoft Corp.*, 795 F.3d at 1051–52.

95. See *id.* at 1049–52.

96. Decision and Order, *In re Robert Bosch GmbH*, FTC File No. 121-0081, Docket No. C-4377, at 14 (Apr. 23, 2013); Decision and Order, *In re Motorola Mobility LLC & Google Inc.*, FTC File No. 121-0120, Docket No. C-4410, at 4, 7 (July 24, 2013).

97. Brief of Amicus Curiae Federal Trade Commission Supporting Neither Party at 1, *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286 (Fed. Cir. 2014) (Nos. 2012–1548, 2012–1549), 2012 WL 6655899.

98. JOINT POLICY STATEMENT, *supra* note 46.

99. NAT'L RESEARCH COUNCIL, PATENT CHALLENGES FOR STANDARD-SETTING IN THE GLOBAL ECONOMY: LESSONS FROM INFORMATION AND COMMUNICATIONS TECHNOLOGY 96–97 (2013) ("There is a consensus among competition authorities that injunctive relief in connection with a FRAND-encumbered SEP should be a remedy of last resort. They have uniformly taken the position that potential licensees who are willing to enter into a license agreement on FRAND terms must have the opportunity to have disputes between the parties resolved before any injunctive relief can be pursued against them.").



injunctive relief but can wield the sword of antitrust and other damages theories against the patent holder.

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, has been deemed by the Federal Circuit not to be bound by the *eBay* precedent.<sup>100</sup> 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.<sup>101</sup> 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.<sup>102</sup> 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 SEPs;<sup>103</sup> in 2012, a group of law and economics professors, filed the equivalent of an amicus brief with the ITC, making a similar argument;<sup>104</sup> in 2013, the DOJ and USPTO issued a joint statement to the same effect.<sup>105</sup>

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100. *Spansion, Inc. v. Int’l Trade Comm’n*, 629 F.3d 1331, 1359 (Fed. Cir. 2010).

101. 19 U.S.C. § 1337 (2012).

102. Ryan Davis, *Pitfalls Abundant, but Avoidable, for ITC Newcomers*, LAW360 (Sept. 15, 2009, 1:39 PM), <https://www.law360.com/articles/117770/pitfalls-abundant-but-avoidable-for-its-newcomers> (“General exclusion orders . . . bar imports of an entire class of product regardless of manufacturer . . . .”); Gary M. Hnath, *General Exclusion Orders Under Section 337*, 25 NW. J. INT’L L. & BUS. 349, 351 (2005) (“A general exclusion order is broader, and prevents any infringing articles from entering the United States, regardless of source. Thus, a general exclusion order is not limited to the parties named as respondents at the ITC, and is the strongest and most effective remedy available under Section 337.”).

103. Press Release, Fed. Trade Comm’n, FTC Testimony Expresses Concern that Owners of “Standard-Essential” Patents May Obtain Injunctions Enabling Them to Hold Up Other Firms (July 11, 2012), <https://www.ftc.gov/news-events/press-releases/2012/07/ftc-testimony-expresses-concern-owners-standard-essential-patents>.

104. Colleen V. Chien et al., *RAND Patents and Exclusion Orders: Submission of 19 Economics and Law Professors to the International Trade Commission* (Santa Clara Univ. Legal Studies Research Paper, Paper No. 07-12, 2012), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2102865](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2102865).

105. JOINT POLICY STATEMENT, *supra* note 46.

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).<sup>106</sup> 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),<sup>107</sup> 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).<sup>108</sup> Given these limitations, no potential licensee would explicitly reject any such offer (or would take the position that any royalty proposed by the patent holder is inconsistent with the RAND commitment) and thereby trigger the narrow set of circumstances under which injunctive relief would still be theoretically possible under the consent decree.

### III. 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 actions that have significantly limited the availability of injunctive relief for certain groups of patent holders and limited 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

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106. Letter from Michael B. G. Froman, U.S. Trade Representative, to the Honorable Irving A. Williamson, Chair, Int'l Trade Comm'n (Aug. 3, 2013), [https://ustr.gov/sites/default/files/08032013%20Letter\\_1.PDF](https://ustr.gov/sites/default/files/08032013%20Letter_1.PDF).

107. Decision and Order, *In re* Motorola Mobility LLC & Google Inc., FTC File No. 121-0120, Docket No. C-4410, at 8 (July 24, 2013).

108. *See id.*

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 Professors Rebecca Eisenberg and Michael Heller published in 1998,<sup>109</sup> which Heller has expanded upon in portions of a book-length treatment published in 2008<sup>110</sup> and which Eisenberg has significantly qualified in a subsequent paper.<sup>111</sup> The original article is undoubtedly influential: it has been cited widely in the academic literature,<sup>112</sup> two federal court opinions,<sup>113</sup> and congressional deliberations on patent reform.<sup>114</sup> At this stage, we are in a good position to assess the papers' 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 extents<sup>115</sup>). 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.

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109. See Heller & Eisenberg, *supra* note 16.

110. See HELLER, *supra* note 16.

111. See Eisenberg, *supra* note 16.

112. As of December 31, 2017, Google Scholar reports that the Heller and Eisenberg article has been cited in 3,001 academic publications and working papers.

113. Ass'n for Molecular Pathology v. U.S. Patent & Trademark Office, 702 F. Supp. 2d 181, 208 (S.D.N.Y. 2010); Bd. of Trs. of Leland Stanford Junior Univ. v. Roche Molecular Sys., Inc., 563 U.S. 776, 795–96 (2011). A dissenting Federal Circuit judge took note of the theory but observed that it has not been supported empirically. See *Momenta Pharm., Inc. v. Amphastar Pharm., Inc.*, 686 F.3d 1348, 1374–75 (2012) (Rader, C.J., dissenting).

114. See, e.g., 153 CONG. REC. H10250 ("[T]he 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.").

115. 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) & David J. Teece, *The "Tragedy of the Anticommons" Fallacy: A Law and Economics Analysis of Patent Thickets and FRAND Licensing*, 32 BERKELEY TECH. L.J. 1489 (2017). 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).

This research segment is important 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<sup>116</sup> 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.<sup>117</sup> Interviewees widely reported the use of workarounds to potential patent thickets, including nonenforcement by the patentholder,<sup>118</sup> nominal fees being assessed by the patent holder,<sup>119</sup> design arounds,<sup>120</sup> licenses or informal industry understandings.<sup>121</sup> 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 . . . .”<sup>122</sup>

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116. These concerns were due in part to passage of the Bayh-Dole Act, Pub. L. No. 96-517, 94 Stat. 3019 (1980), which enabled institutional recipients of federal research funding to seek patents on innovations developed using that funding.

117. 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, 285 (Wesley M. Cohen & Stephen A. Merrill eds. 2003) (based on survey of limited sample of industry and academic researchers, finding little evidence that access restrictions or other anticommons effects attributable to patents delayed or stopped research projects or had significant effects on knowledge-sharing among researchers); John P. Walsh, Charlene Cho & Wesley M. Cohen, *View from the Bench: Patents and Material Transfers*, 308 SCIENCE 2002, 2002 (2005) (based on survey of 414 academic biomedical researchers, finding that only one percent of interviewees reported any delay 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 8 INNOVATION POLICY AND THE ECONOMY 1, 12 (Adam B. Jaffe, Josh Lerner & Scott Stern eds., 2008) (based on surveys of biomedical researchers, 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 BIOTECHNOLOGY 36, 36 (2009) (reporting survey findings that scientists “do not [generally] encounter an anticommons 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).

118. See Cohen & Walsh, *supra* note 117, at 12; Walsh, Cho & Cohen, *supra* note 117, at 2002; Lei et al., *supra* note 117, at 37, 39.

119. See Walsh, Cho & Cohen, *supra* note 117, at 2002.

120. See Cohen & Walsh, *supra* note 117, at 12; Walsh, Arora & Cohen, *supra* note 117, at 323.

121. See Walsh, Arora & Cohen, *supra* note 117, at 325–27; Cohen & Walsh, *supra* note 117, at 3.

122. See Cohen & Walsh, *supra* note 117, at 17.

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 to 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.<sup>123</sup> In an early contribution that predates the “anticommons” literature, Professor Robert Merges had argued that firms use contractual arrangements to preempt or resolve IP roadblocks through pooling and cross-licensing mechanisms.<sup>124</sup> 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.<sup>125</sup> Building on this line of inquiry in subsequent research, I identified over one hundred documented IP (mostly patent) pooling arrangements from 1900 through 2014, finding that content and 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.<sup>126</sup> 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.<sup>127</sup> 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.<sup>128</sup> Contrary to the thicket thesis, widely dispersed ownership of large numbers of patents relating to critical

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123. Professor Teece pithily articulates the market correction argument by noting that even if there may be an anticommons, “there is no ‘tragedy’” that results from it. *See* Teece, *supra* note 115, at 1501.

124. *See* Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rules and Collective Rights Organizations*, 84 CALIF. L. REV. 1293, 1295 (1996) (“IPR owners in various industries have demonstrated the workability of these private transactional mechanisms.”).

125. *See id.* (explaining how “collective copyright licensing organizations such as ASCAP and BMI” had efficiently administered widely held copyrights).

126. *See* Barnett, *supra* note 115, at 147–51.

127. *See* Barnett, *supra* note 84.

128. *See id.*

technologies has not impeded rapid dissemination of these technologies to the end-user market.

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

Ron Katznelson, John Howells, and I have revisited classic patent litigations 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 industry,<sup>129</sup> litigation over the “De Forest” and other patents in the early radio communications industry,<sup>130</sup> and litigation over the “Selden” patent in the early automotive industry.<sup>131</sup> 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.<sup>132</sup> I confirmed those findings through a review of the authors’

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129. 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 Assistant Att’y Gen., Dept. of Justice, Cross-Licensing and Antitrust Law (May 2, 1997), <https://www.justice.gov/atr/speech/cross-licensing-and-antitrust-law>; HELLER, *supra* note 16, at 30–31; and Michele Boldrin & David K. Levine, *The Case Against Patents*, 27 J. ECON. PERSP. 3, 10 (2013).

130. For examples of scholars and agencies asserting that litigation over radio communications patents impeded industry growth, see NAT’L ACAD. OF SCI., A PATENT SYSTEM FOR THE 21ST CENTURY 26 (Stephen A. Merrill, Richard C. Levin and Mark B. Myers eds., 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 RES. POL’Y 273, 280 (1998); Robert P. Merges, *Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents*, 62 TENN. L. REV. 75, 84–89 (1994).

131. For examples of agencies or scholars asserting that the Selden patent litigation blocked innovation in the automotive industry, see FED. TRADE COMM’N, *supra* note 42, at 3; Tim Wu, *Intellectual Property, Innovation, and Decentralized Decisions*, 92 VA. L. REV. 123, 136–37 (2006).

132. See John Howells & Ron Katznelson, *The Myth of the Early Aviation Patent Hold-Up—How a U.S. Government Monopsony Commandeered Pioneer Airplane Patents*, 24 INDUS. & CORP. CHANGE 1, 2 (2014); John Howells & Ron D. Katznelson, *The Coordination of Independently-Owned Vacuum Tube Patents in the Early Radio Alleged Patent “Thicket”* 20–21 (Nov. 20, 2015) (unpublished manuscript), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2450025](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2450025). 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 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, *supra* note 115, at 170–72, 179–82.



primary sources (as well 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 product and process innovations into the market.<sup>133</sup> 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.<sup>134</sup> 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 on innovation, even without taking into account positive effects on innovation incentives and transactional opportunities.

#### 4. *Reevaluation: 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 logic,<sup>135</sup> 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

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133. See Barnett, *supra* note 115, at 127–29.

134. See *id.*

135. See R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

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. These holders 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 devise pooling and licensing solutions that can suppress actual or potential thickets among multiple patent holders.<sup>136</sup> Since the effective lifting of the de facto prohibition on patent pools following release of the 1995 revised antitrust guidelines on IP licensing<sup>137</sup> and a business review letter issued by the DOJ in 1997 (in connection with a proposed patent pool),<sup>138</sup> this externally administered structure has become the most prevalent pooling structure in ICT markets.<sup>139</sup> This type of transactional engineering may explain why contemporary ICT markets have enjoyed rapid and widespread 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 multicomponent 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 Cournot’s 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. First, I examine the evidence presented in the original and most widely–cited article on holdup and stacking by

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136. See Barnett, *supra* note 115, at 140, 160–63.

137. U.S. DEP’T OF JUSTICE & FED. TRADE COMM’N, ANTITRUST GUIDELINES FOR THE LICENSING OF INTELLECTUAL PROPERTY (1995), <https://www.justice.gov/sites/default/files/atr/legacy/2006/04/27/0558.pdf>.

138. See Letter from Joel I. Klein, Assistant Att’y Gen., U.S. Dep’t. of Just., to Gerrard R. Beeney, Sullivan & Cromwell 1, 16 (June 26, 1997), <https://www.justice.gov/sites/default/files/atr/legacy/2006/10/17/215742.pdf> (indicating no intention to initiate antitrust enforcement against proposed patent licensing arrangement).

139. See Barnett, *supra* note 115, at 186 tbl. 3.



Professors Mark Lemley and Carl Shapiro.<sup>140</sup> Second, 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 technology markets.

### 1. Evidence in the “2007 Article”

Lemley and Shapiro’s 2007 article is undoubtedly influential: it has been cited widely by not only academics<sup>141</sup> but policymaking entities, including three federal court opinions,<sup>142</sup> an FTC amicus brief,<sup>143</sup> two agency business review letters,<sup>144</sup> and various legislative deliberations on patent reform, including a 2007 Senate committee report.<sup>145</sup> While other commentators have made related claims before and since,<sup>146</sup> it is clearly the

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140. See Lemley & Shapiro, *supra* note 21. Two other contemporaneously published articles, one authored separately by Lemley and another coauthored by Shapiro, set forth similar claims. See Lemley, *supra* note 21; Farrell et al., *supra* note 22, at 613. Related patent holdup concerns had been addressed in a 2005 publication, see Swanson & Baumol, *supra* note 24, at 19–21, and in a 2001 publication authored by Shapiro, see Shapiro, *supra* note 16, at 124–26. The phrase “patent holdup” seems to derive from “patent ambush,” a phrase that apparently originated in a 1999 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 (1999).

141. As of December 31, 2017, it had been cited in 1,118 publications or working papers, according to Google Scholar.

142. 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); NetAirus Techs., LLC v. Apple, Inc., No. LACV1003257JAKEX, 2013 WL 11237200, at \*6 (C.D. Cal. Oct. 23, 2013). The last opinion cites the Lemley and Shapiro article but states that it does not rely on the article “for any conclusions reached in [the] Order” because “Apple, along with a number of other technology companies, provided funding for the research Lemley & Shapiro report in the article.” *Id.* at \*6 n.7.

143. Brief of Amicus Curiae Federal Trade Commission Supporting Neither Party at 7, 13, Apple Inc. v. Motorola, Inc., 757 F.3d 1286 (Fed. Cir. 2014), (Nos. 2012–1548, 2012–1549), 2012 WL 6655899.

144. See Letter from William J. Baer, Assistant Att’y Gen., U.S. Dep’t of Justice, to Garrard R. Beeney, Sullivan & Cromwell LLP (Mar. 26, 2013), <https://www.justice.gov/sites/default/files/atr/legacy/2013/03/28/295151.pdf> (with respect to Intellectual Property Exchange International, Inc.); Hesse, *supra* note 79 (with respect to Institute of Electrical and Electronics Engineers).

145. S. REP. NO. 110-259, at 7 n.24 (2008).

146. A search in the Westlaw “Secondary Sources—Law Reviews & Journals” database for articles that mention “patent holdup,” “patent hold-up,” “patent hold up,” “royalty stacking” or “royalty stack” identified 1,029 articles (as of January 15, 2018). For

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 extensively<sup>147</sup>), and (ii) empirical evidence presented in support of the model. Lemley and Shapiro conclude that the “evidence suggests that there are indeed very real problems associated with royalty stacking”<sup>148</sup> and, in particular, state that “problems of holdup and royalty stacking can be severe in the case of private standard setting.”<sup>149</sup>

A closer look supports at best a far more ambiguous conclusion. Lemley and Shapiro present three types of evidence. First, holdup is illustrated by anecdotal examples which, while dramatic,<sup>150</sup> 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 some reliable measure of intrinsic value. Second, stacking is supported by evidence from a sample of reasonable royalty awards in forty-seven 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.<sup>151</sup> This evidence suffers from small sample size and selection effects, which are likely to bias upwards the royalty rate

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other contributors that made similar claims previously or contemporaneously to the Lemley and Shapiro article, see *supra* note 140. For representative examples of contributors who have made similar claims subsequently, see Contreras & Gilbert, *supra* note 29; 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 BULL. 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 TEX. L. REV. 783 (2007). For substantially more qualified views, see Colleen V. Chien, *Holding Up and Holding Out*, 21 MICH. TELECOMM. & TECH. L. REV. 1, 26–33 (2014) (acknowledging holdup by patentees and holdout by infringers); Thomas F. Cotter, *Patent Holdup, Patent Remedies and Antitrust Responses*, 34 J. CORP. L. 1151, 1154 (2008) (recognizing that overly broad definitions of holdup can capture legitimate patent enforcement activity and recommending error-cost approach for addressing potential patent holdup).

147. See *supra* note 13.

148. See Lemley & Shapiro, *supra* note 21, at 1994. Writing separately and concurrently, Professor Lemley asserted: “Time and time again, we have seen this sort of royalty stacking problem arise.” See Lemley, *supra* note 21, at 152.

149. Lemley & Shapiro, *supra* note 21, at 2016.

150. The most notable anecdotal example was the \$613 million payout by RIM to a patent holding entity suing with respect to a component of the then-dominant Blackberry device. See Lemley & Shapiro, *supra* note 21, at 2009 & n.36.

151. See Lemley & Shapiro, *supra* note 21, at 2032–34.

given other research showing that litigated patents tend to represent the most valuable patents<sup>152</sup> (as would be expected based on standard litigation models). Further, even apparently high royalty rates may not be exorbitant in any individual case without making reference to a reliable valuation metric.<sup>153</sup> 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 Wi-Fi 802.11 standard.<sup>154</sup> 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 holdup and stacking concerns have been most widely discussed.

This case study evidence consists of a three-part argument that (i) observes large numbers of patents held by multiple entities relating to a particular wireless standard (in this case, “3G”); (ii) refers to individual cases of double-digit royalty rates or other third-party reports of unusually high royalty rates; and (iii) implicitly multiplies the number of patents in (i) by reported rates in (ii) to conclude that collective royalty rates are likely “exorbitant.”<sup>155</sup> This argument 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 Lemley and Shapiro<sup>156</sup>), especially by licensees that have

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152. See Jean O. Lanjouw & Mark A. Schankerman, *Characteristics of Patent Litigation: A Window of Competition*, 32 RAND J. ECON. 129, 141 (2000) (“[L]itigated patents have both more claims and more valuable claims.”).

153. See Geradin et al., *supra* note 14, at 160.

154. “CDMA” stands for code-division multiple access. Andrew T. Dufresne, *The Exhaustion Doctrine Revived? Assessing the Scope and Possible Effects of the Supreme Court’s Quanta Decision*, 24 BERKELEY TECH. L.J. 11, 37 n.200 (2009). 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. *Id.* For further discussion, see HSIAO-HWA CHEN, *THE NEXT GENERATION CDMA TECHNOLOGIES* 1–2, 181–82 (2007).

155. See Lemley & Shapiro, *supra* note 21, at 2025–27 (observing that thousands of patents apply to wireless technology standards and are held by forty-one companies, citing third-party reports of double-digit royalty rates for patents relating to mobile phones with online functions, and presenting evidence as example of royalty stacking).

156. See Lemley & Shapiro, *supra* note 21, at 2026.

significant IP portfolios to use as a bargaining chip.<sup>157</sup> The combination of these two factors raises the possibility that some licensees may 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, Lemley and Shapiro sometimes acknowledge these complexities, observing that “[i]t is not clear what the total cost of these stacked royalties is.”<sup>158</sup> Nonetheless the 2007 article, and specifically its assertion that stacking is an empirically salient issue, does rely to a significant extent on reports of royalty rates of 20% for “internet functionality” features in a smartphone (after cross–licensing offsets),<sup>159</sup> 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 “UMTS” standard) and 15–20% for GSM technology (a type of “2G” wireless communications technology).<sup>160</sup> Lemley and Shapiro further note that these estimates may be underinclusive to the extent that they do not reflect royalties owing to holders of patents that were not declared “essential” to the relevant standard.<sup>161</sup> The clear implication is that handset manufacturers may operate under an aggregate royalty burden in excess of 30%, and perhaps substantially higher.<sup>162</sup> While Lemley and Shapiro did note in part that cross–licensing offsets may adjust these rates downward,<sup>163</sup> that detail has often if not typically been ignored or minimized in subsequent scholarly

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157. See Damien Geradin, *What's Wrong with Royalties in High-Technology Industries?*, in COMPETITION POLICY AND PATENT LAW UNDER UNCERTAINTY 462, 471 (Geoffrey A. Manne & Joshua D. Wright eds., 2011) (“In fact, vertically integrated firms with significant portfolios of essential patents will, thanks to their ability to cross-license, face a much lower royalty burden than pure manufacturers holding no IP.”).

158. See Lemley & Shapiro, *supra* note 21, at 2026.

159. See *id.* (citing Rudi Bekkers & Joel West, *The Effect of Strategic Patenting on Cumulative Innovation in UMTS Standardization* 10, 22 (DIME Working Papers on Intellectual Prop. Rights, Working Paper No. 9, 2006), [http://www.dime-eu.org/files/active/1/IPR-WORKING-PAPER-9\\_BekkersWest.pdf](http://www.dime-eu.org/files/active/1/IPR-WORKING-PAPER-9_BekkersWest.pdf)).

160. See Lemley & Shapiro, *supra* note 21, at 2027 (citing Michael W. Thelander, *The IPR Shell Game*, SIGNALS AHEAD, June 6, 2005, at 1, 7).

161. See Lemley & Shapiro, *supra* note 21, at 2027.

162. Writing separately and concurrently, Lemley described a call for essential patents by a SSO relating to the 3G wireless platform, which resulted in responses “totaling over 6000 ‘essential’ patents and the cumulative royalty rate turned out to be 130%.” See Lemley, *supra* note 21, at 152.

163. See Lemley & Shapiro, *supra* note 21, at 2026.

and popular discussions, as well as amicus briefs filed in litigation,<sup>164</sup> which focused on the global assertion that stacking is an empirically significant phenomenon.<sup>165</sup>

Closer scrutiny shows that taking into account cross–licensing makes a critical difference. Given cross–licensing opportunities, there is great doubt that major handset manufacturers incurred double–digit royalty rates during the relevant period. The 2006 working paper that is cited by Lemley and Shapiro for the 20% figure mentioned above, authored by Professors Rudi Bekkers and Joel West, does report estimated total royalties of 20% for UMTS/WCDMA technology<sup>166</sup> (most likely the “internet functionality” to which Lemley and Shapiro had referred<sup>167</sup>), supported by a citation to a press release relating to an unpublished report by a private consulting

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164. See, e.g., Brief of Amicus Curiae Law Professors Thomas F. Cotter, Shubha Ghosh, A. Christal Sheppard, & Katherine J. Strandburg in Support of Apple Inc. and Affirmance in Motorola, Inc.’s Cross-Appeal, *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286 (Fed. Cir. 2014), (Nos. 2012–1548, 2012–1549), 2013 WL 1151016. The brief states that holdup risk is “increasingly pervasive,” *id.* at \*7, and like Lemley and Shapiro, cite to the same Bekkers and West paper (in the form published in 2009) to demonstrate double–digit total royalty rates in the smartphone market, *id.* at \*11 n.7, but omit (as noted in the Bekkers and West paper) that cross–licensing substantially reduces those rates for major device manufacturers. See Rudi Bekkers & Joel West, *The Limits to IPR Standardization Policies as Evidenced by Strategic Patenting in UMTS*, 33 TELECOMM. POL’Y 80, 92 (2009).

165. For an example of scholarly commentary that asserts double–digit aggregate royalty stacks in the smartphone market, see Robert G. Harris, *Patent Assertion Entities & Privateers: Economic Harms to Innovation and Competition*, 59 ANTITRUST BULL. 281, 294 (2014). The author makes no allowance for cross–licensing and relies on the same 2005 consulting research study cited by Lemley and Shapiro in their case study of the “3G” wireless market (see *supra* note 160 and accompanying text). As I note subsequently (see *infra* note 176 and accompanying text), that research study notes that double–digit royalties are typically *not* incurred by device manufacturers with significant IP portfolios that can be used for cross–licensing purposes. For an example of popular commentary that makes the same assertion, see Jack Schofield, *Patent Insanity: Royalty Fees Could Reach \$120 on a \$400 Smartphone*, ZDNET (May 31, 2014, 9:49 PM), <http://www.zdnet.com/article/patent-insanity-royalty-fees-could-reach-120-on-a-400-smartphone/>. The author refers to a working paper published in 2014 by other authors, who rely on announced, rather than finally negotiated and actually paid, 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 & Timothy D. Syrett, *The Smartphone Royalty Stack: Surveying Royalty Demands for the Components Within Modern Smartphones* (WilmerHale Working Paper, 2014), [https://www.wilmerhale.com/uploadedFiles/Shared\\_Content/Editorial/Publications/Documents/The-Smartphone-Royalty-Stack-Armstrong-Mueller-Syrett.pdf](https://www.wilmerhale.com/uploadedFiles/Shared_Content/Editorial/Publications/Documents/The-Smartphone-Royalty-Stack-Armstrong-Mueller-Syrett.pdf).

166. See Bekkers & West, *supra* note 159, at 22.

167. See Lemley & Shapiro, *supra* note 21, at 2026.



group.<sup>168</sup> However, Bekkers and West note that those rates may be adjusted downward after cross-licensing offsets<sup>169</sup> and that “leading GSM vendors paid *little or nothing* due to cross-licensing.”<sup>170</sup> Similarly, in the 2009 published version of the same paper, Bekkers and West note that the 20% royalty for UMTS-related patents are the rates paid by “*non-IPR* holders” and that “an undetermined number of firms reduce or avoid royalties through cross-licenses.”<sup>171</sup> In another publication in 2006, Professor West had written separately that (i) in the GSM cellular market, major European handset manufacturers “were believed *exempt* from patent royalties through cross-licensing”<sup>172</sup> 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.<sup>173</sup> Similarly, the consulting study cited by Lemley and Shapiro to support the assertion that European dual-band (GSM and UMTS/W-CDMA) smartphone manufacturers may incur over 30% in total royalties<sup>174</sup> noted that, with respect to GSM technology, “those companies that have essential patents are not subject to those rates due to cross-licensing arrangements”<sup>175</sup> and, with respect to UMTS/W-CDMA technology, the maximum expected royalty rates applied to companies “that lack any IPR.”<sup>176</sup> Hence, the best reading of the available evidence seems to be that the then-largest European handset manufacturers, such as Ericsson and Nokia, which held significant IP portfolios that could be used to secure cross-licensing offsets,<sup>177</sup> likely

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168. See Bekkers & West, *supra* note 159, at 22 (citing Press Release, PA Consulting Grp., Essential Patent Rights in 3G Wireless Will Win or Lose Companies Millions (Sept. 11, 2002). The press release (but not the underlying report) can be found at the Cambridge Network. See *Essential Patent Rights in 3G wireless Will Win or Lose Companies Millions, Says PA Consu...*, CAMBRIDGE NETWORK (Nov. 9, 2002), [www.cambridgenetwork.co.uk/news/essential-patent-rights-in-3g-wireless-will-win-or-lose/](http://www.cambridgenetwork.co.uk/news/essential-patent-rights-in-3g-wireless-will-win-or-lose/).

169. See Bekkers & West, *supra* note 159, at 7.

170. See *id.* at 22 (emphasis added).

171. See Bekkers & West, *supra* note 164, at 92.

172. See Joel West, *Does Appropriability Enable or Retard Open Innovation?*, in OPEN INNOVATION: RESEARCHING A NEW PARADIGM 109, 126–27 (Henry Chesbrough, Wim Vanhaverbeke & Joel West eds., 2006) (emphasis added). Bekkers and West also note this in their 2006 working paper. See Bekkers & West, *supra* note 159, at 22.

173. West, *supra* note 172, at 126–27. In a 2001 business case study, Professor West had mentioned the same 4.5% figure with respect to Qualcomm’s CDMA licensing. See Joel West, *Qualcomm in China (A)*, 6 ASIAN CASE RES. J. 85, 95 (2002).

174. See Lemley & Shapiro, *supra* note 21, at 2027 (citing Thelander, *supra* note 160, at 1, 7).

175. See Thelander, *supra* note 160, at 6.

176. See *id.* at 7.

177. See Bekkers & West, *supra* note 159, at 10, tbl. 3 (documenting that, during the UMTS standardization process, Nokia and Ericsson, two large handset manufacturers,

paid (i) 0% for “2G” GSM technology and (ii) approximately 4.5% for “3G” UMTS/WCDMA technology.<sup>178</sup> Clearly that total “royalty stack” does not approach the double-digit rates that the 2007 Lemley and Shapiro article had suggested were sometimes being incurred in the case of dual-band mobile telephones.

## 2. *Recent Evidence*

Lemley and Shapiro arguably describe a theoretically plausible set of circumstances in which patent holdup and royalty stacking may arise.<sup>179</sup> However, they did not provide persuasive empirical evidence that this is a frequently or even occasionally realized scenario. Of course, it may 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 “3G” and “4G” wireless communications technologies during the past decade.<sup>180</sup> While no study described below definitively resolves the 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 smartphone and other patent-intensive IT markets in which those effects should, as a theoretical matter, be most salient.

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were among four firms that held the largest number of “essential” patents with respect to the standard); Thelander, *supra* note 160, at 5 fig. 1, 7 fig. 4 (showing that Nokia and Ericsson were among the three largest holders of GSM and UMTS/W-CDMA patents declared as being “essential” to the governing standardization body).

178. As described subsequently, that estimated single-digit total royalty burden is consistent with recent findings based on systematic empirical studies of smartphone markets. *See infra* Section III.B.2.d.

179. Scholars who have focused on Lemley and Shapiro’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 13. I am largely abstracting away from these critiques.

180. *See* Alexander Galetovic & Kirti Gupta, *Royalty Stacking and Standard Essential Patents: Theory and Evidence from the World Mobile Wireless Industry* 19–20 (Hoover Inst. Working Grp. on Intellectual Prop., Innovation, & Prosperity, Working Paper No. 15012, 2016), <https://hooverip2.org/wp-content/uploads/ip2-wp15012-paper.pdf> (“During the last 20 years the number of SEP holders for 3G and 4G standards grew from 2 in 1994 to 130 in 2013 and the number of SEPs rose from fewer than 150 in 1994 to more than 150,000 in 2013.”).

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

Multiple industry reports provide reason to contemplate the possibility—more rigorously tested, as I describe subsequently,<sup>181</sup> by empirical researchers—that the total royalty burden in the 3G smartphone market does not typically venture into the double-digit range commonly asserted in scholarly and policy discussions. 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%;<sup>182</sup> and (ii) in 2007, Nokia reported a total royalty rate burden for UMTS/WCDMA handsets of 3%.<sup>183</sup> 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.<sup>184</sup> At a 2009 conference, Qualcomm’s Chief Operating Officer reportedly stated that Qualcomm assessed a royalty rate of 4–5% on its 3G CDMA licenses.<sup>185</sup> 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 2015,<sup>186</sup> and rates of 5.25–5.75% have been

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181. See *infra* Sections III.B.2.b–d.

182. See Geradin et al., *supra* note 14, 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”).

183. Press Release, Nokia, Nokia Has Paid Less Than 3 Per Cent Gross Royalty Rate for WCDMA Handsets (Apr. 12, 2007), [https://www.nokia.com/en\\_int/news/releases/2007/04/12/nokia-has-paid-less-than-3-per-cent-gross-royalty-rate-for-wcdma-handsets](https://www.nokia.com/en_int/news/releases/2007/04/12/nokia-has-paid-less-than-3-per-cent-gross-royalty-rate-for-wcdma-handsets)

184. See Mark Halper, *Nokia Battles Qualcomm Over Royalties*, FORTUNE (Dec. 19, 2006, 4:17 PM), [http://archive.fortune.com/magazines/fortune/fortune\\_archive/2006/12/25/8396726/index.htm](http://archive.fortune.com/magazines/fortune/fortune_archive/2006/12/25/8396726/index.htm); Tammy Parker, *Qualcomm Focused on Bilateral Deals for LTE IPR*, TELECOMS.COM (Feb. 9, 2009, 1:16 PM), <http://telecoms.com/opinion/qualcomm-focused-on-bilateral-deals-for-lte-ipr/>; Don Clark, *Qualcomm’s Main Profit Driver is Under Pressure*, WALL ST. J. (Apr. 13, 2015, 7:36 PM), <https://www.wsj.com/articles/qualcomms-main-profit-driver-is-under-pressure-1428967051>.

185. See Scott Moritz, *Tech Rumor of the Day: Qualcomm*, THESTREET (June 24, 2009, 1:29 PM), <https://www.thestreet.com/story/10526160/1/tech-rumor-of-the-day-qualcomm.html>.

186. See Qualcomm, Annual Report (Form 10-K), at 10–11 (Nov. 4, 2015) (noting that Qualcomm had agreed with Chinese authorities to assess a royalty rate of 5% for 3G



reported in connection with Qualcomm licenses to Korean firms.<sup>187</sup> 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.<sup>188</sup> As discussed further below,<sup>189</sup> 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

Professors 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.<sup>190</sup> 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 shows the opposite is true.<sup>191</sup> In this comparison, which mostly covers 1997–2013, SEP-reliant industries<sup>192</sup> have faster quality-adjusted price declines relative to non-SEP-reliant industries.<sup>193</sup> 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

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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).

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

188. See DAVID S. EVANS, ANDREI HAGIU & RICHARD SCHMALENSSEE, *INVISIBLE ENGINES: HOW SOFTWARE PLATFORMS DRIVE INNOVATION AND TRANSFORM INDUSTRIES* 191 n.13 (2006). Evans et al. note 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. See *id.*

189. See *infra* Section III.B.2.d.

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

191. *Id.* at 554 (“In examining the dynamics of quality-adjusted prices, we do not find support for the SEP holdup hypothesis. On the contrary, we find that products that are SEP-reliant have experienced faster price declines than any other good in the Consumer Price Index (CPI) over the past 16 years.”)

192. *Id.* at 551–52. These include, for example, smartphone, computing, and certain other electronics industries. *Id.* at 552.

193. *Id.* at 552–53. Non-SEP-reliant industries that Galetovic et al. examined include, for example, the automotive industry. *Id.*

Law<sup>194</sup> (used as a proxy for innovative intensity).<sup>195</sup> The same result holds: SEP-reliant industries still experience faster quality-adjusted price declines than non-SEP-reliant industries.<sup>196</sup> 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.

### c) Indirect Indicators of Holdup and Stacking

In a 2015 paper and a 2016 paper coauthored with Professor Galetovic, Dr. Kirti Gupta assessed indirect indicators of potential holdup and stacking effects in the “3G” and “4G” mobile wireless communications markets.<sup>197</sup> 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 investment,<sup>198</sup> increasing participation in standard-setting efforts,<sup>199</sup> and little change in gross profit margins.<sup>200</sup> 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),<sup>201</sup> the number of unique manufacturers of mobile wireless devices increased,<sup>202</sup> and there was

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194. Moore’s Law states that the number of transistors in an integrated circuit doubles approximately every two years. See Christian Chessman, A “Source” of Error: Computer Code, Criminal Defendants, and the Constitution, 105 CALIF. L. REV. 179, 180 (2017) (noting that Moore’s Law “has remarkably held true for the last fifty years”).

195. Galetovic et al., *supra* note 190 at 571–72.

196. *See id.*

197. Galetovic & Gupta, *supra* note 180; Kirti Gupta, *Technology Standards and Competition in the Mobile Wireless Industry*, 22 GEO. MASON L. REV. 865 (2015).

198. *See* Gupta, *supra* note 197, at 889–90; Galetovic & Gupta, *supra* note 180, at 3–5.

199. *See* Gupta, *supra* note 197, at 888–89.

200. *See id.* at 891–92; Galetovic & Gupta, *supra* note 180, at 24–25.

201. *See* Gupta, *supra* note 197, at 892–93.

202. *See id.* at 893–94.

frequent turnover in market share among leading manufacturers.<sup>203</sup> 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.<sup>204</sup> 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 2015 and 2016, respectively, Keith Mallinson and J. Gregory Sidak have sought to estimate the aggregate “royalty stack” associated with SEPs in a smartphone device.<sup>205</sup> In a 2018 publication, Alexander Galetovic, Stephen Haber, and Lew Zaretski developed a dataset for purposes of estimating the total royalty payments earned by licensors on SEPs and non-SEP patents in the mobile phone market.<sup>206</sup> These empirical efforts go to the heart of the stacking thesis, which holds that the royalty stack inflates the price of the 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 (principally, licensing revenues disclosed in securities filings by IP licensors) on, or make estimates of, the revenues of large public firms, patent pools, and smaller private firms derived from licensing out patents in

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203. See *id.* at 893–94.

204. 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).

205. See J. Gregory Sidak, *What Aggregate Royalty Do Manufacturers of Mobile Phones Pay to License Standard-Essential Patents?*, 1 CRITERION J. ON INNOVATION 701 (2016); Mallinson, *supra* note 204; Keith Mallinson, *Cumulative Mobile-SEP Royalty Payments No More Than Around 5% of Mobile Handset Revenues*, WISEHARBOR (Aug. 19, 2015), <http://www.wisearbor.com/pdfs/Mallinson%20on%20cumulative%20mobile%20SEP%20royalties%20for%20IP%20Finance%202015Aug19.pdf>. Mallinson first presented the methodology for estimating the aggregate royalty burden in smartphone markets in a 2014 online publication. See Keith Mallinson, *Stacking the Deck in Analysis of Smartphone Licensing Costs*, IP FIN. (Sept. 19, 2014), <http://www.ip.finance/2014/09/stacking-deck-in-analysis-of-smartphone.html>.

206. See Alexander Galetovic, Stephen H. Haber & Lew Zaretski, *An Estimate of the Average Cumulative Royalty Yield in the World Mobile Phone Industry: Theory, Measurement and Results*, TELECOMM. POL’Y (forthcoming 2018).

the mobile phone market.<sup>207</sup> Based on certain conservative assumptions and slightly different methodologies, all three studies reach the conclusion that royalties paid to SEP owners (or patent owners more broadly) in 2013, 2014, 2015 and 2016 for mobile handset devices fell within a range of 3–5.6% of global handset revenues.<sup>208</sup> 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. *Reevaluation: 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.<sup>209</sup> 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.<sup>210</sup> Hence, patent holders

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207. All three papers rely on licensing revenues disclosed in audited financial statements filed by publicly traded patent licensors, maximum possible royalty rates based on patent pools’ publicly listed fee schedule, and inferred royalties earned by private IP licensors. *See id.* at 7–9; Sidak, *supra* note 205, at 703–19; Mallinson, *supra* note 205, at 4–5. Note that the bulk of the royalties paid in the mobile phone market are earned by five publicly traded patent holders and the data for those providers’ licensing revenues is the most reliable, *see* Sidak, *supra* note 205, at 718 tbl. 9; Mallinson, *supra* note 205 at 1–2; Galetovic, Haber & Zaretzki, *supra* note 206, at 10.

208. Specifically, Mallinson estimates a total royalty rate payable to SEP owners in 2014 equal to approximately 5% of handset revenues, Mallinson, *supra* note 205, at 1; Sidak finds a total royalty rate payable to SEP owners in 2013 and 2014 equal to 4–5% of handset revenues, Sidak, *supra* note 205, at 701–02; and Galetovic, Haber & Zaretzki find a total royalty rate payable to SEP and non-SEP owners in 2016 ranging from 3.4%–5.6% (depending on certain assumptions) of handset revenues, *supra* note 206, at 10–12.

209. On this point, *see* Gupta, *supra* note 197, at 869–74.

210. *See* Rana Pratap & Rahul Vijh, *5G Mobile Networks: The Next Big Battleground*, IPWATCHDOG (Mar. 31, 2016), <http://www.ipwatchdog.com/2016/03/31/5g-mobile->

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.<sup>211</sup>

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 to protect against “stacking” by using contract clauses that set a cap on the total royalty burden.<sup>212</sup> Given licensee foresight into potential holdup and stacking behavior, it follows that 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 time<sup>213</sup> and some patent pools offer “post-netting” policies that reduce a licensee’s royalty rate to reflect royalty obligations to other technology holders.<sup>214</sup> Perceived “excessive” royalty

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networks-next-big-battleground/id=67632/ (describing the evolution in smartphone technology from 2G through 5G).

211. 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 197, at 869-74.

212. See, e.g., Erik Verbraeken, *Drafting of Royalty Clauses: 30 Ways to Head for Windfall or Pitfall*, LES NOUVELLES 169-70 (Sept. 2011), [http://lesnouvelles.lesi.org/lesnouvelles2011/les-Nouvelles\\_PDF-0911/3-Drafting-Of-Royalty-Clauses.pdf](http://lesnouvelles.lesi.org/lesnouvelles2011/les-Nouvelles_PDF-0911/3-Drafting-Of-Royalty-Clauses.pdf); Sharon Finch, *Royalty Rates: Current Issues and Trends*, 7 J. COM. BIOTECHNOLOGY 224, 229-30 (2001).

213. 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 Parker, *supra* note 184.

214. 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*

rates for any particular release trigger market punishment by promoting infringement and discouraging adoption, thereby endangering investment of time and resources in the R&D required to launch and then build upon a new technology.

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.<sup>215</sup> 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.<sup>216</sup> 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 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 in which Qualcomm did not have a patent position.<sup>217</sup> Second, Qualcomm’s pricing decisions are

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*Patent Pools in High-Tech*, INTELL. ASSET MGMT. 40 (Sept./Oct. 2011), [http://www.oneblue.com/data/downloadables/4/5/iam-magazine\\_september-october-2011\\_article-oneblue.pdf](http://www.oneblue.com/data/downloadables/4/5/iam-magazine_september-october-2011_article-oneblue.pdf).

215. See Mallinson, *supra* note 204, at 991–92.

216. See Barnett, *supra* note 84, at 41–43. On inter-standard competition in technology markets, see Gupta, *supra* note 197, at 871–72.

217. See MOCK, *supra* note 187, at 231.



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.<sup>218</sup> 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, conventional wisdom proposes either that antitrust regulators permit SSOs to set prespecified royalty caps; or 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 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 Table 2, major upstream technology providers issued statements indicating expected royalties in connection with the release of 3G and 4G LTE devices.<sup>219</sup>

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218. Press Release, Qualcomm, LTE/WiMax Patent Licensing Statement (Dec. 2008), <https://www.qualcomm.com/media/documents/files/lte-wimax-patent-licensing-statement.pdf>. As of 2015, industry commentary is consistent with this commitment, indicating that Qualcomm typically assesses a royalty of 3.5% on 4G devices. See Junko Yoshida, *China Deal Squeezes Royalty Cuts from Qualcomm*, EETIMES (Feb. 10, 2015, 10:15 AM), [https://www.eetimes.com/document.asp?doc\\_id=1325631](https://www.eetimes.com/document.asp?doc_id=1325631).

219. The statements below were initially sourced through Eric Stasik, *Royalty Rates and Licensing Strategies for Essential Patents on LTE (4G) Telecommunication Standards*, LES NOUVELLES 115 (Sept. 2010), <https://pdfs.semanticscholar.org/6eb5/1955ffbc2af76ff610dd7779e439a2b3825c.pdf>.

Table 2: Licensor Statements Relating to 3G and 4G Wireless Technology Royalties

Firm	Date	Statement
Nokia	2002	Advocates industry-wide commitment to 5% cumulative royalty for W-CDMA technology. <sup>220</sup>
Alcatel-Lucent	2008	Commits to single-digit maximum aggregate royalties for LTE essential IPR in handsets. <sup>221</sup>
Ericsson	2008	Same as above. <sup>222</sup>
Qualcomm	2008	Commits to not increase royalties on 4G LTE above existing royalties on 3G CDMA devices. <sup>223</sup>
Nokia	2010	“To avoid unfavorable effects of royalty stacking,” Nokia pledges not to charge royalties greater than 2%. <sup>224</sup>

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 earns a majority percentage of licensing fees from SEPs used in mobile handsets,<sup>225</sup> four of which issued statements as shown above. Consistent

220. Press Release, Nokia, Nokia Advocates Industry-Wide Commitment to 5% Cumulative IPR Royalty for WCDMA (May 8, 2002), [https://www.nokia.com/en\\_int/news/releases/2002/05/08/nokia-advocates-industry-wide-commitment-to-5-cumulative-ipr-royalty-for-wcdma](https://www.nokia.com/en_int/news/releases/2002/05/08/nokia-advocates-industry-wide-commitment-to-5-cumulative-ipr-royalty-for-wcdma).

221. Press Release, Ericsson, Wireless Industry Leaders Commit to Framework for LTE Technology IPR Licensing (Apr. 14, 2008, 12:44 PM), <https://www.ericsson.com/en/press-releases/2008/4/wireless-industry-leaders-commit-to-framework-for-lte-technology-ipr-licensing>

222. *See id.*

223. Press Release, *supra* note 218.

224. *See* Stasik, *supra* note 219 (citing Press Release, Nokia, Nokia Licensing Policy on Long Term Evolution and Service Architecture Evolution Essential Patents, July 21, 2009, <http://web.archive.org/web/20101015065029/http://www.nokia.com/press/ipr-information/statement/nokia-licensing-policy-on-long-term-evolution-and-service-architecture-evolution-essential-patents> (last visited Dec. 31, 2017)).

225. These are Qualcomm, Ericsson, Nokia, Alcatel-Lucent, and InterDigital. *See* Sidak, *supra* note 205, at 718 tbl. 9; Mallinson, *supra* note 205, at 1–2.



with signaling models used in the context of tacit collusion to maintain pricing discipline among cartel members, small-numbers and repeat-play environments provide the most hospitable conditions in which signaling can plausibly influence third-party pricing behavior to mitigate double marginalization outcomes.

#### IV. RE-APPRECIATING THE IMPORTANCE OF INJUNCTIVE REMEDIES

So far three propositions have been established. First, courts and agencies rely to some significant extent on thicket, holdup, and stacking theories. Second, that reliance has translated into policy actions that have significantly limited the availability of injunctive relief and other remedies for important portions of the patentee population—including, it should be noted, certain firms that specialize in the upstream R&D that drives technology markets. Third, available data do not 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 shutdown in 1990 of Kodak's instant camera business as a result of its loss in a patent infringement litigation brought by Polaroid.<sup>226</sup> Contemporary reports noted that the ruling "sent a message" that infringement resulted not just in a monetary penalty but a potential business shutdown.<sup>227</sup> For commentators concerned with thicket, holdup, and stacking effects, the Kodak decision in 1990 planted the seeds for the "exorbitant" Blackberry settlement in 2006, to which the *eBay* decision effectively responded later that same year. As discussed above, the lower courts' application of *eBay*, coupled with actions undertaken by the antitrust agencies and court decisions relating to the determination of RAND royalties, have imposed significant limitations on patent holders' ability to seek injunctive relief.

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226. See *Polaroid Corp. v. Eastman Kodak*, 641 F. Supp. 828 (D. Mass. 1985).

227. For contemporary observations to this effect, see Nancy J. Perry, *The Surprising New Power of Patents*, FORTUNE (June 23, 1986), [http://archive.fortune.com/magazines/fortune/fortune\\_archive/1986/06/23/67747/index.htm](http://archive.fortune.com/magazines/fortune/fortune_archive/1986/06/23/67747/index.htm).

This is a potentially dramatic step since injunctive relief supplies the legal bedrock on which patent licensing negotiations take place. In more recent contributions to the policy conversation, this risk has been emphasized by a handful of scholarly commentators<sup>228</sup> and prominent policymakers (including the new head of the Antitrust Division in the Department of Justice<sup>229</sup> and the acting Chair of the Federal Trade Commission<sup>230</sup>). Specifically, efforts to counteract perceived risks of holdup by patent owners inherently give rise to the potentially countervailing risk of *holdout* by third-party infringers, who strategically “renegotiate” royalties through protracted litigation in lieu of market negotiation. As discussed below, patent holdout is part of a broader set of market distortions that can arise from erosion of the injunction remedy in patent-intensive technology environments. Given those countervailing effects, policy actions that circumscribe the injunctive right (and truncate the damages spectrum) merit a careful balancing of the social costs and benefits associated with those actions.

#### B. COST-BENEFIT ANALYSIS

The literature on thickets, 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 and stacking effects, potentially resulting in some combination of dynamic efficiency gains in the form of more innovation and static efficiency gains in the form of reduced prices. Based on currently available evidence, however, these gains would appear to be limited since neither

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228. See Epstein & Noroozi, *supra* note 88, at 20–23; J. Gregory Sidak, *The Meaning of FRAND, Part II: Injunctions*, 11 J. COMP. L. & ECON. 201, 234–37 (2015); 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); John M. Golden, *Principles for Patent Remedies*, 88 TEX. L. REV. 505, 580 (2010). For discussions that address both holdup and holdout concerns, see Chien, *supra* note 146; Cotter, *supra* note 146.

229. See *supra* note 41 (arguing that antitrust policy with respect to standard-setting organizations has overemphasized the risk of patent holdup and overlooked the risk of patent holdout when patent owners lack an injunctive remedy).

230. See Maureen K. Ohlhausen, *The Federal Trade Commission’s Path Ahead*, 2 CRITERION J. ON INNOVATION 31, 33–34 (2017) (noting weak evidence for patent holdup and recognizing possibility of patent holdout by infringers).

holdup nor stacking appears to be a regular and persistent occurrence in patent-intensive markets. The potential countervailing effect of retracting injunctive relief and limiting patent owners' remedies menu 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 reduced threat of infringement litigation. Relatedly, and what has not been sufficiently discussed in an otherwise rich literature on patent remedies,<sup>231</sup> eroding injunctive relief endangers the viability of knowledge transfer transactions among specialized parties that can execute different stages of the commercialization process most efficiently. Specifically, eroding the property-rights infrastructure in intangible goods markets is likely to give rise to efficiency losses in the form of three forms of resource misallocation: (i) asset mispricing; (ii) organizational distortion; and (iii) oligopsonistic collusion. While empirical inquiry is required to more precisely identify the likelihood and magnitude of these distortionary effects, I discuss preliminary illustrations of these effects based on the organizational and lobbying behavior of various participants in the mobile wireless market in which holdup and stacking concerns have been most commonly expressed.

### 1. *Legal Mispricing*

It is often stated (including in Justice Kennedy's 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.<sup>232</sup> 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 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.

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231. For excellent reviews of the literature and the full range of policy tradeoffs, see THOMAS F. COTTER, *COMPARATIVE PATENT REMEDIES: A LEGAL AND ECONOMIC ANALYSIS* 39–75 (2013); Golden, *supra* note 228, at 525–51.

232. *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 395–97 (2006) (Kennedy, J., concurring).

## 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.<sup>233</sup> 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.<sup>234</sup> 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.<sup>235</sup> 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 relative to an efficient pricing benchmark. Even granting that possibility, however, the strength of this objection 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. If that is the case, then 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.

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233. For similar views, see COTTER, *supra* note 231, at 53–55.

234. See F.A. Hayek, *The Use of Knowledge in Society*, 4 AM. ECON. REV. 519, 525–27 (1945).

235. On the strategic use of patent litigation to set licensing terms in lieu of market negotiation, see Epstein & Noroozi, *supra* note 88, at 20–23; Sidak, *supra* note 228, at 234–37 (2015); Kieff & Layne-Farrar, *supra* note 228, at 1099–1100; Epstein, Kieff & Spulber, *supra* note 228, at 26–27 (2012); Golden, *supra* note 228, at 580.

## b) Transaction Costs

Even if the royalty could be calculated correctly by courts, licensors must incur 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 as compared to the adjudicative process. Litigation costs would almost certainly dwarf the costs typically 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 shown,<sup>236</sup> 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 well-resourced intermediate users rationally 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 that may be included in a negotiated license.<sup>237</sup> In an unusual post-*eBay* opinion in which a court awarded injunctive relief to a nonpracticing patent holder (in this case, a research institute), the court astutely justified its ruling in part on the ground that a monetary damages award in the form of a "reasonable royalty" would not reflect the non-price terms that are typically part of a negotiated license transaction.<sup>238</sup> Specifically, the court stated: "[A] royalty payment does not necessarily include other non-monetary license terms that are as important

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236. The general principle that parties bear their own costs is known as the "American Rule." Hannah Jiam, *Fee-Shifting and Octane Fitness: An Empirical Approach Toward Understanding "Exceptional"*, 30 BERKELEY TECH. L.J. 611, 613 (2015) (discussing the American Rule and the Supreme Court's recent changes to it in patent law). For the governing statute, see 15 U.S.C. §284 (2012).

237. For similar observations, see J. Gregory Sidak, *Mandating Final-Offer Arbitration of FRAND Royalties for Standard-Essential Patents*, 18 STAN. TECH. L. REV. 1, 14 (2014).

238. *See id.*

to a licensor . . . .”<sup>239</sup> Similarly, for purposes of determining the “reasonable royalty” damages awarded in the most recent RAND royalty decision, the court devoted extensive effort to evaluating experts’ efforts to translate comparable licenses into a royalty rate that reflects cross–licenses, legal releases and other non–monetary forms of consideration.<sup>240</sup> While it is conceivable that courts could craft damages awards that would take into account the mix of price and non–price terms to perfectly mimic the 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.<sup>241</sup> 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 shift attorneys’ fees or 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

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239. *Commonwealth Sci. Indus. Research Org. v. Buffalo Tech. Inc.*, 492 F. Supp. 2d 600, 606 (E.D. Tex. 2007) (“[A] royalty payment does not necessarily include other non-monetary license terms that are as important to a licensor . . .”).

240. *See TCL Comm’n Tech. Holdings, Ltd. v. Telefonaktiebolaget LM Ericsson*, No. CV 15-2370 JVS(DFMX), 2017 WL 6611635, at \*54–55, \*61–89 (C.D. Cal. Dec. 21, 2017).

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



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 in a commercially viable form 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.<sup>242</sup> From an efficiency perspective, we are indifferent to the firm’s make/buy decision at any specific point on the supply chain—namely, whether it executes a particular 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.<sup>243</sup> 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 rights.<sup>244</sup> 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

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242. For the seminal sources, see WILLIAMSON, *supra* note 23; R. H. Coase, *The Nature of the Firm*, 4 *ECONOMICA* 386 (1937).

243. 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* 609 (1962).

244. 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.



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, are 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—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.<sup>245</sup> Fabless firms, which primarily have capacities in semiconductor chip design, contract with stand-alone “foundries” for manufacturing functions. The fabless structure lowers entry costs by relieving the 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.<sup>246</sup> 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

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245. For a more extended analysis, see Jonathan M. Barnett, *Intellectual Property as a Law of Organization*, 84 S. CAL. L. REV. 785, 838–52 (2011).

246. *See id.*

downstream market or outsourcing the manufacturing and other tasks that must be executed to complete the pathway to market.<sup>247</sup> As of 2015, Rambus earned 92% of its revenues from technology and patent licenses, the majority of which covers technology developed internally in a process of vertical disintegration.<sup>248</sup> Qualcomm's history illustrates a progressive movement up the technology supply chain. In 1999, Qualcomm sold its wireless infrastructure business<sup>249</sup> and handset manufacturing business,<sup>250</sup> 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 Table 3, 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.

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247. See Qualcomm, Annual Report (Form 10-K), at 9 (Nov. 4, 2015) (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 our proprietary designs"); Rambus Inc., Annual Report (Form 10-K), at 5 (Feb. 20, 2015) (noting that a majority of the company's revenues are derived from patent licenses).

248. Rambus Inc., Annual Report (Form 10-K), at 5 (Feb. 20, 2015).

249. See Mark LaPedus, *Qualcomm, Ericsson Settle CDMA Squabble as Part of Larger Agreement*, EE TIMES (Mar. 25, 1999, 6:19 PM), [https://www.eetimes.com/document.asp?doc\\_id=1120987](https://www.eetimes.com/document.asp?doc_id=1120987).

250. See Loring Wirbel, *Qualcomm Sells CDMA Phone Division to Kyocera*, EE TIMES (Dec. 22, 1999, 7:48 PM), [https://www.eetimes.com/document.asp?doc\\_id=1230103](https://www.eetimes.com/document.asp?doc_id=1230103).

Table 3: R&D Intensities for Selected Leading IT Firms<sup>251</sup>

Firm	R&D Intensity (Fiscal Year 2016)	Primarily Upstream Activities?
Rambus	38.6%	Y
Marvell	35.9%	Y
Nvidia	21.2%	Y
Intel	21.5%	N
Qualcomm	21.9%	Y
Dolby	21.6%	Y
Broadcom (Avago)	18.7%	Y
Google (Alphabet)	15.5%	N
Oracle	16.3%	N
Microsoft	14.5%	N
Cisco	12.6%	N
Samsung	7.3%	N
IBM	7.5%	N
Panasonic	5.9%	N
Sony	5.9%	N
Toshiba	6.1%	N
LG	4.5%	N
HP	2.5%	N

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

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251. Figures calculated by author, based on disclosures in each firm’s most recent 10-K or 20-F filing with the SEC or, in the case of certain foreign companies, the annual report available on the firm’s website (in each case, for the 2016 fiscal year). 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 reports. A broader understanding of “upstream activities” might reasonably 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.

manufacturing infrastructure. These entrants' disintegrated structures rely on a secure patent portfolio backed up by a credible litigation threat. By implication, weakening the security of patent rights would be expected to induce firms to integrate forward and internalize commercialization functions that had formerly been executed externally. 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.<sup>252</sup> Other leading fabless chip designers, such as Qualcomm and Broadcom, have recently entered into acquisition transactions involving firms with chip manufacturing capacities.<sup>253</sup> 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.<sup>254</sup>

### 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 their close organizational relative patent pools, adopt structural features that are designed to limit collusion risk.<sup>255</sup> 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

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252. See Don Clark, *Rambus Expands with Its Own Chip Brand*, WALL ST. J. (Aug. 17, 2015, 12:00 AM), <https://www.wsj.com/articles/rambus-expands-with-its-own-chip-brand-1439784003>.

253. In October 2016, Qualcomm announced its acquisition of NXP Semiconductor, which has chip manufacturing capacities. See Don Clark & Tim Higgins, *Qualcomm to Buy NXP Semiconductors for \$39 Billion*, WALL ST. J. (Oct. 27, 2016, 6:37 PM), [www.wsj.com/articles/qualcomm-to-buy-nxp-semiconductors-1477565063](http://www.wsj.com/articles/qualcomm-to-buy-nxp-semiconductors-1477565063). 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 & Ian King, *Avago to Buy Broadcom for \$37 Billion in Biggest Tech Deal Ever*, BLOOMBERG (May 28, 2015, 1:25 PM), <https://www.bloomberg.com/news/articles/2015-05-27/avago-said-near-deal-to-buy-wireless-chipmaker-broadcom>.

254. Clark, *supra* note 252 ("Rambus said the products, designed to boost the performance of server systems, are the latest step in a multiyear strategy to leave behind a business model linked to litigation.").

255. See Barnett, *supra* note 84, at 16.

incorporated in the standard.<sup>256</sup> 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.<sup>257</sup> 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).<sup>258</sup>

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.<sup>259</sup> 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 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 3).<sup>260</sup> That suggests that these firms are net technology

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256. See, e.g., Masoudi, *supra* note 25 (“[T]he IEEE policy permits its members to consider such costs only in generalized or non-collaborative ways. The policy ‘prohibits discussion of specific licensing terms within . . . standards development meetings’ . . .”).

257. See Barnett, *supra* note 84, at 21, 41–43.

258. See *id.* at 37–38.

259. For the only dedicated exploration of this possibility, see J. Gregory Sidak, *Patent Holdup and Oligopsonistic Collusion in Standard-Setting Organizations*, 5 J. COMPETITION L. & ECON. 123, 124 (2009) (“This rule-of-reason approach, however, is problematic because it conflicts with both the body of economic research on bidder collusion and with the antitrust jurisprudence on information exchange and facilitation of collusion.”).

260. See Barnett, *supra* note 84, at 28–29, 34.

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. Corroborative evidence derives from the absence of Qualcomm (again, a regular target of litigation that targets “excessive” patent royalty rates) in patent pooling arrangements.<sup>261</sup> 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.<sup>262</sup> 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 recent SEP-related litigations concerning the determination of reasonable royalties for damages purposes and the availability of injunctive relief for RAND-encumbered patents. Those preferences can be imperfectly identified through the positions expressed in amicus briefs filed in those litigations. For purposes of the Table 4, 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.<sup>263</sup>

In general, firms’ revealed preferences on injunctive relief and royalty determination methodologies track the predominant location of a firm on the supply chain. More specifically, firms primarily active at upstream

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261. *See id.* at 34–35, 46–47.

262. *See id.* at 42–43.

263. Note that, in some cases, a firm may have been deemed to substantively favor the interests of patentees or infringers even if the firm’s amicus brief stated that it favored “neither party.”

portions of the supply chain (e.g., Qualcomm, Dolby and, in the smartphone market, Ericsson and Nokia) 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, Verizon, 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 (for example, some upstream chip design firms disfavor the patentee in certain litigations<sup>264</sup>) 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 a public interest in protecting consumers by constraining “exorbitant” payments to patent holders.

**Table 4: Amicus Briefs Filed by Large Firms in “RAND” Royalty Litigations<sup>265</sup>**

**Legend:** CD = chip design; CM = chip manufacturer; H = hardware; IPL = IP licensor; S = software; OEM = original equipment manufacturer

Filer	<i>Apple v. Motorola</i> (2014): Favors Patentee?	<i>Ericsson v. D-Link</i> (2014): Favors Patentee?	<i>Microsoft v. Motorola</i> (2015): Favors Patentee?	<i>CSIRO v. Cisco</i> (2015): Favors Patentee?	Principal Activities on Supply Chain <sup>266</sup>
Dolby		Y			IPL
Nokia	Y	Y	Y	Y	IPL, H, S
Ericsson	Y* <sup>267</sup>			Y	IPL, H
Qualcomm	Y	Y	Y	Y	IPL, CD
Broadcom		N			CD

264. The firms are Broadcom, Marvell, MediaTek and Xilinx.

265. Companies are arranged from approximately upstream to downstream positions on the technology supply chain. All briefs filed as part of: (i) *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286 (Fed. Cir. 2014); (ii) *Ericsson, Inc. v. D-Link Systems, Inc.*, 773 F.3d 1201 (Fed. Cir. 2014); (iii) *Microsoft Corp. v. Motorola Inc.*, 795 F.3d 1024 (9th Cir. 2015); and (iv) *Commonwealth Scientific and Industrial Research Organization v. Cisco Systems, Inc.*, 809 F.3d 1295 (Fed. Cir. 2015).

266. Information in this column reflects the author’s judgment based on the firm’s description of its business operations, business strategies, key competitors, and core market segments as set forth in its most recent annual report filed with the SEC or available on the firm’s website and, in some cases, in the business press.

267. Ericsson’s amicus brief was filed in a closely related litigation originating in another federal court and involving the same parties, see Brief of Amicus Curiae, Ericsson Inc. in Support of Affirmance for Defendant Cross-Appellant Motorola Mobility LLC, *Apple Inc. v. Motorola Mobility LLC*, Nos. 2013-1150, 2013-1182 (Fed. Cir. Dec. 3, 2013), 2013 WL 663218.



Marvell		N			CD
MediaTek		N			CD
Xilinx	N		N		CD
Intel	N		N	N	CD, CM
RIM	Y				S
Microsoft	N	N			S
Apple			N	N	H, S
Cisco	N	N			H, S
Vizio			N		OEM (TV)
Dell			N	N	OEM (PC)
HP	N	N	N	N	OEM (PC)
Ford	N				OEM (Auto)
Verizon	N				Telecom
T-Mobile			N		Telecom

### 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.

#### i) 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.<sup>268</sup> Patents were not emphasized by system operators, which enjoyed government-sanctioned national monopolies, or by equipment manufacturers, which had limited ability to capture rents in a market dominated by what were effectively legally protected procurement monopolies.<sup>269</sup> In the European wireless telecom market, the “GSM” standard initially dominated (starting in the early 1990s), at which time the largest European handset manufacturers (specifically Ericsson, Nokia, Siemens, and Alcatel) and one American firm (Motorola)<sup>270</sup> reportedly operated under cross-licensing arrangements that substituted technology-

268. See Rudi Bekkers, Geert Duysters & Bart Verspagen, *Intellectual Property Rights, Strategic Technology Agreements and Market Structure: The Case of GSM*, 3 RES. POL'Y 1141, 1144 (2002).

269. See *id.*

270. See *id.* at 1147.

sharing for royalty payments among the participating firms.<sup>271</sup> At approximately 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.<sup>272</sup> Both cooperative actions appear to have had a common objective: namely, to commoditize 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.<sup>273</sup> While this cross–licensing arrangement operated to the advantage of these five major firms (who then constituted approximately 85% of the European GSM market<sup>274</sup>), it effectively operated as an entry barrier into the European GSM market for other firms (in particular, Korean, Japanese and smaller European manufacturers), who could not access the required technology or could only do so after considerable delay or at significantly higher royalty rates.<sup>275</sup>

Once the “3G” (also known in Europe as the “UMTS”) wireless standard was developed in the early 2000s and endorsed by European regulators, GSM was substantially displaced by the technically superior CDMA technology (that had been pioneered by Qualcomm and in which it held a dominant patent position).<sup>276</sup> Unlike the club of European handset makers that dominated the GSM market, Qualcomm has licensed its CDMA technology widely to hundreds of licensees across the wireless device

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271. See West, *supra* note 172, at 126–27; Rudi Bekkers, Bart Verspagen & Jan Smits, *Intellectual Property Rights and Standardization: The Case of GSM*, 26 TELECOMM. POL’Y 171, 179–80 (2002).

272. See EVANS ET AL., *supra* note 188, at 194–95.

273. On this interpretation of the Symbian OS joint venture, see EVANS ET AL., *supra* note 188, at 270.

274. See Bekkers et al., *supra* note 268, at 1143.

275. See Whasun Jho, *Global Political Economy of Technology Standardization: A Case of the Korean Mobile Telecommunications Market*, 31 TELECOMM. POL’Y 124, 129 (2007) (noting that dominant European wireless firms would not supply Korean firms with access to required technology); Bekkers et al., *supra* note 271, at 180 (noting that cross–licensing among European firms posed entry barriers and Japanese terminal suppliers experienced a six–year delay in obtaining licenses to the necessary GSM technology). Bekkers et al., *supra* note 268, at 1147, 1158 (noting that inability to secure necessary licenses to GSM technology blocked Japanese and smaller European suppliers from the market or compelled those suppliers to pay a high royalty).

276. On the technical superiority of CDMA relative to GSM, and the transition from GSM to CDMA, respectively, see HARALD GRUBER, *THE ECONOMICS OF MOBILE TELECOMMUNICATIONS* 23, 243–44 (2005). On the transition from GSM to CDMA, and the value of Qualcomm’s CDMA portfolio, respectively, see Bekkers & West, *supra* note 164, at 81–82 and *id.* at 85, 90–91.

market.<sup>277</sup> 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 handset manufacturers like Ericsson and Nokia now faced a positive royalty burden,<sup>278</sup> as well as competition from other manufacturers (most notably, Korean firms, Samsung and LG) that had entered the market by licensing Qualcomm's CDMA technology.<sup>279</sup> 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.<sup>280</sup>

## ii) 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" may simply represent an effort to reallocate industry rents to the advantage of downstream

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277. On Qualcomm's licensing practices, see Qualcomm, Annual Report (Form 10-K), at 7 (Nov. 2, 2016) (stating that Qualcomm has licensed its CDMA technology to more than 330 licensees, "including leading wireless device and infrastructure manufacturers"). On Qualcomm's licensing practices specifically in Korea, see Whasun Jho, *Global Political Economy of Technology Standardization: A Case of the Korean Mobile Telecommunications Market*, 31 TELECOMM. POL'Y 124, 129, 132 (2007).

278. See West, *supra* note 172, at 126–27.

279. See Jho, *supra* note 275, at 129 (noting that Qualcomm, unlike dominant European wireless firms, agreed in the 1990s to license wireless communications technology to Korean firms); *id.* at 135 (noting that, by 2003, Korean firms were among the world's leading handset manufacturers).

280. Press Release, European Comm'n, Commission Initiates Formal Proceedings Against Qualcomm (Oct. 1, 2007), [http://europa.eu/rapid/press-release\\_MEMO-07-389\\_en.htm](http://europa.eu/rapid/press-release_MEMO-07-389_en.htm). The release notes that the Commission had initiated formal antitrust proceedings against Qualcomm based on "abuse of a dominant market position" as the holder of IP rights in the CDMA and WCDMA technologies that "form[] part of the 3G . . . standard . . . ." *Id.* The investigation was subsequently withdrawn. See Adam Cohen, *European Commission Closes Qualcomm Investigation*, WALL ST. J. (Nov. 25, 2009), <https://www.wsj.com/articles/SB10001424052748704779704574555083176252374>.

implementer entities and the disadvantage of upstream R&D suppliers.<sup>281</sup> This is at least facially the case, for example, with respect to substantial fines recently assessed by competition authorities in several jurisdictions against Qualcomm, including: (i) China, which assessed a \$975 million fine in 2015 against Qualcomm, in connection with which Qualcomm reduced its royalty rates for local device manufacturers;<sup>282</sup> (ii) South Korea, which assessed an \$835 million fine in 2016 against Qualcomm with respect to its licensing practices toward local device manufacturers;<sup>283</sup> and (iii) Taiwan, which assessed a \$774 million fine in 2017 against Qualcomm with respect to its licensing practices toward local device manufacturers.<sup>284</sup> 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. But this 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 potentially 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.

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281. Relatedly, John Golden has cautioned that post-*eBay* legal reforms that preclude injunctive relief for patent licensors that lack manufacturing capacities privilege incumbents that already have those capacities. See Golden, *supra* note 228, at 556–57.

282. See Don Clark, *Qualcomm to Pay \$975 Million Antitrust Fine to China*, WALL ST. J. (Feb. 10, 2015, 4:37 AM), <https://www.wsj.com/articles/qualcomm-settles-china-probe-1423518143>. For further details on the agreed-upon royalty rate, see Qualcomm, Annual Report (Form 10-K), at 10–11 (Nov. 4, 2015).

283. See Eun-Young Jeong, *Qualcomm Faces \$835 Million Fine from South Korea Over Alleged Antitrust Violations*, WALL ST. J. (Dec. 28, 2016, 4:32 AM), [www.wsj.com/articles/qualcomm-fined-more-than-850-million-in-south-korea-for-alleged-antitrust-violations-company-to-fight-decision-1482894283](http://www.wsj.com/articles/qualcomm-fined-more-than-850-million-in-south-korea-for-alleged-antitrust-violations-company-to-fight-decision-1482894283).

284. See *Qualcomm Fined Record \$773 Million Fine in Taiwan Antitrust Probe*, BLOOMBERG NEWS (Oct. 11, 2017, 4:41 AM), <https://www.bloomberg.com/news/articles/2017-10-11/qualcomm-fined-773-million-in-taiwan-for-antitrust-violations>.

### 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 and patentees must rely on costly litigation in order to secure monetary damages through an institutional mechanism that is prone to error and delay. 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 in any particular market segment of maintaining, or diluting, the menu of injunctive and monetary remedies available to patent holders.<sup>285</sup> However, based on our current knowledge base, it *is* possible to state with relative confidence the likely range of policy consequences that would arise from doing so, at least in the SEP-intensive IT markets that have now been subjected to close empirical scrutiny. 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. Subject to further empirical inquiry, we *do* have reason to believe that eroding the availability of injunctive relief in those market segments 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.

### V. 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

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285. For similar observations on the inherent indeterminacy of a socially optimal damages regime for patent holders, see COTTER, *supra* note 231, at 51; Golden, *supra* note 228, at 511–12, 529. Cotter ultimately argues for a general presumption in favor of injunctive relief, with latitude for courts to make exceptions and tailor remedies in cases that indicate a high risk of holdup or present other public interest considerations. See COTTER, *supra* note 231, at 74.

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 thickets, holdup and stacking are alleged to pose such serious risks—have not only drastically reduced communications costs but have done so at rapidly declining quality-adjusted prices, resulting in a social “win-win” of increasing innovation and decreasing prices. The mismatch between scholarly 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. If information technology markets have grown and prospered 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.

# WHY INCENTIVES FOR “PATENT HOLDOUT” THREATEN TO DISMANTLE FRAND, AND WHY IT MATTERS

*Richard A. Epstein<sup>†</sup> & Kayvan B. Noroozi<sup>††</sup>*

## ABSTRACT

An increasing number of judges, legislators, and scholars, particularly in the United States, have wrongly come to believe that the commitment that standard-essential patents be licensed on “fair, reasonable, and nondiscriminatory terms” (“FRAND”) was principally created to advance the interests of technology implementers, and have too often given a preference toward implementers’ interests in interpreting FRAND agreements. That premise has led American courts to take a categorically hostile view toward awarding injunctions against implementers who infringe valid standard-essential patents, fearing that the injunctive remedy would give innovators undue leverage. Indeed, American courts have been so unilaterally concerned with innovators’ conduct that some have even allowed implementers to sue innovators simply for making an opening licensing offer that is later deemed “too high,” even if the implementer refused to make any counteroffer at all. An implementer-centric view of FRAND has also caused several courts to conclude that innovators are not entitled to any share of the commercial benefits arising from the standardization of their technologies, and that all such benefits must go to implementers alone.

This Article argues that an implementer-centric view of FRAND’s origins and purposes is false. FRAND is a contractual agreement that reflects a voluntary reciprocal exchange of benefits and obligations driven by the need to solve significant coordination problems in the face of otherwise prohibitive transaction costs. As part of that bargain, innovators agree to disclose their latest, confidential discoveries to standard-development organizations and to waive their injunction rights as to eventual patents on those discoveries, in exchange for contractual protection against “patent holdout” by implementers. Those implementers are then permitted to use standard-essential patents on the condition that they agree to pay fair and adequate royalties for that use, with the royalty amount to be set through mutual good-faith negotiations.

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Accordingly, this Article stresses that FRAND is not intended to be, and should not be interpreted as, a one-sided transfer from innovators to implementers. Rather, implementers too owe a significant duty to negotiate FRAND licenses in good faith—a duty that many courts have overlooked and underenforced. This Article demonstrates that implementers' good faith obligations are a critical component of the basic FRAND architecture and that enforcement of those obligations is strictly necessary to the continued development of innovation-driven standards.

This Article further observes that the FRAND bargain is not simply meant to give innovators a way to monetize their intellectual property. Rather, and perhaps more significantly, FRAND creates an agreed bargaining framework that allows implementers to access innovators' otherwise-confidential discoveries—inventions so recent that they are not otherwise disclosed in patents or published applications. In this way, FRAND supplies a solution to an iteration of Kenneth Arrow's paradox of information, enabling the standards development effort to yield commercial benefits that would not exist absent innovators' voluntary participation. Stated otherwise, innovators agree to give implementers access—and a fair license—to their most groundbreaking technologies because innovators believe that implementers will reciprocally later agree to take a license in good faith for using those highly-valuable innovations. This Article shows both theoretically and empirically that courts' failure to appreciate these aspects of the FRAND bargain, combined with their overreliance on liability rules (i.e., damages over injunctions) incentivizes the very patent holdout problem FRAND was intended to avoid. That “efficient infringement” outcome, in turn, has motivated innovators to reduce their participation in FRAND bargains, threatening to unravel a massive innovation-commercialization marketplace and its innumerable positive externalities for all parties.

To reverse these harms, this Article recommends that courts automatically issue an injunction where an implementer is found to infringe valid FRAND-committed patents that it did not attempt to license in good faith. This Article also recommends that a proper FRAND licensing rate should include some portion of the benefits achieved through standardization of the innovations in question.

More broadly, this Article suggests that courts, policymakers, and academic commentators have wrongly favored implementation over innovation—“things” over ideas—unwisely frustrating the emergence of an “ideas economy” that should rightly assign significant profits to upstream innovators and not to the low-margin manufacturing firms that specialize in turning those innovations into tangible products.

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### **I. INTRODUCTION**

In this Article, we wade into an intellectual thicket that ultimately reduces to one question: How should courts and policymakers interpret and allocate the corresponding rights and obligations on both sides of the FRAND bargain—that is, the contractual agreement between technology innovators<sup>1</sup> and implementers<sup>2</sup> to license standard-essential patents on fair, reasonable, and nondiscriminatory terms? And more specifically, to what degree should courts and policymakers continue to fear the possibility of “patent holdup”—a chief concern underlying a number of regulatory and judicial interventions in the space for more than a decade—as opposed to the countervailing risk of “patent holdout” or “efficient infringement”?

This issue has made it right to the top of the political agenda. As this Article was being prepared for publication, its topic became the subject of an address on March 16, 2018 by Makan Delrahim, the Assistant Attorney General for Antitrust. In a speech titled, *The “New Madison” Approach to Antitrust and Intellectual Property Law*, Mr. Delrahim relied on an earlier draft of this Article to support, among other points, the observation that

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1. An “innovator” company may also be an “implementer,” or may focus purely on developing innovations. As used herein, the relevant characteristic of an “innovator” is its ability, on net, to export innovation to others in the industry.

2. As used herein, the term “implementer” refers to a company that is responsible for manufacturing and/or commercializing products for sale to end users. The term does not exclude the possibility that an “implementer” company may also be an “innovator,” either in the same market or in some downstream market.

“proponents of using antitrust law to police FRAND commitments principally rely on models devoid of economic or empirical evidence that hold-up is a real phenomenon, much less one that harms competition.”<sup>3</sup> The chief function of this Article is to make good on that proposition by offering a comprehensive discussion of the considerations that have led both Mr. Delrahim, and us, to reach that conclusion. In particular, we demonstrate and conclude that courts and policymakers in the United States should be far more concerned with the risk of “patent holdout”—a problem they have not only largely overlooked, but have actually exacerbated through a series of missteps in recent years.

We use the terms “patent holdup” and “patent holdout” as they have been used in the extensive patent literature, and in the general economics literature on holdup and holdout problems. In general, by “patent *holdup*” we mean the theoretical claim that innovators of standard-essential patents attempt to extract excessively large royalties from implementers after those implementers have committed to a particular technological standard that requires the use of the patent(s) in question—that is, a standard that renders the patent(s) “essential.” Under the “patent holdup” theory, the royalties in question are excessively large because they exceed the “true” value of the invention(s) in question, and are derived (so the theory goes) because the innovator can leverage the implementer’s sunk cost in committing to the standard to extract more than a fair royalty.<sup>4</sup> By “patent *holdout*” we mean the converse problem—that an implementer refuses to negotiate in good faith with an innovator for a license to valid patent(s) that the implementer infringes, and instead forces the innovator to either undertake significant litigation costs and time delays to extract a licensing payment through a court order, or else to simply drop the matter because the licensing game is no longer worth the candle. We also use the term “efficient infringement” synonymously with “patent holdout” here.

The “holdout” or “efficient infringement” problem is, of course, not limited to the standard-essential patent context or even to patent cases as a

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3. Makan Delrahim, Assistant Att’y Gen., U.S. Dep’t of Justice, The “New Madison” Approach to Antitrust and Intellectual Property Law 9 & n.30 (Mar. 16, 2018), [www.justice.gov/opa/speech/file/1044316/download](http://www.justice.gov/opa/speech/file/1044316/download). Our Article was communicated to Delrahim in a letter of February 13, 2018, which was signed by several academics, including Epstein. Letter from Jonathan Barnett et al., Professor, USC Gould Sch. of Law, to Makan Delrahim, Assistant Att’y Gen., U.S. Dep’t of Justice (Feb. 13, 2018), <https://cpip.gmu.edu/wp-content/uploads/sites/31/2018/02/Letter-to-DOJ-Supporting-Evidence-Based-Approach-to-Antitrust-Enforcement-of-IP.pdf>.

4. See generally, e.g., Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991 (2007).

whole. The ongoing saga between Oracle and Google regarding Google’s copying of 11,500 lines of Java code indicates that “efficient infringement” is an (unfortunately) attractive business strategy in the copyright context as well, where the ability to take another’s computer code while refusing to pay for a license can result in wealth transfers in the billions of dollars.<sup>5</sup> By way of background, Google failed in 2005 to obtain a license from Sun (now Oracle) for implementing Java in Android mobile devices.<sup>6</sup> When Google failed in its own efforts to develop critical components on its own, it decided to lift them from Oracle—copying 11,500 lines of Oracle’s code verbatim into Android.<sup>7</sup> Google then undercut the market for products that incorporated (or could have incorporated) Oracle’s technology for a fee, refused to pay Oracle, and chose instead to litigate.<sup>8</sup> Thirteen years later, the dispute continues to work through the courts, despite two trials and two decisions on appeal. Most recently, the Court of Appeals for the Federal Circuit rejected Google’s fair use defense and remanded the case for a trial to determine the extent of Google’s liability for damages.<sup>9</sup> Here is a case where injunctive relief is called for to stop the theft—Google made all of its liability arguments and lost. It should have to settle, redesign its products to eliminate infringement, or be enjoined. Otherwise thirteen years of litigation can quickly become eighteen, with no end in sight—a modern version of Dickens’s Bleak House.<sup>10</sup> Yet the presiding district court judge—having twice ruled for Google and been twice reversed—appears to show little concern for Oracle’s predicament, and is unlikely to exercise his discretion to award an injunction.

While many of our observations here apply outside the context of standard-essential patents and FRAND, we nonetheless focus on that microcosm precisely because the question of FRAND’s proper interpretation is at the forefront of a number of broader issues that will ultimately shape this century’s “ideas economy.”

To address that question, Part II begins with an explanation of how FRAND bargaining was developed and how it functions in the context of

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5. See *Oracle Am., Inc. v. Google LLC*, Nos. 2017-1118, 2017-1202, 2018 WL 1473875, at \*19 (Fed. Cir. Mar. 27, 2018) (“It is undisputed, however, that Google copied 11,500 lines of code—11,330 more lines than necessary to write in Java.”).

6. See Peter S. Menell, *API Copyrightability Bleak House: Unraveling and Repairing the Oracle v. Google Jurisdictional Mess*, 31 BERKELEY TECH. L.J. 1515, 1542 (2016) (describing how license “negotiations unraveled” because of “Google’s unwillingness to agree to make Android fully compatible with the Java platform”).

7. *Oracle Am.*, 2018 WL 1473875, at \*19.

8. *Id.* at \*22.

9. *Id.* at \*23–24.

10. In fact, Professor Peter Menell has made this exact comparison in describing the protracted litigation. See Menell, *supra* note 6, at 1517–18.

Standards Developing Organizations (“SDOs”), which establishes the institutional framework for these negotiations. Part II approaches that question from its intellectual and factual foundations by first considering the market forces that engendered the FRAND framework, the nature of the FRAND agreement, and the purposes it is intended to serve. Part II then considers how FRAND obligations relate to traditional rate-making operations of common carriers and public utilities, and the lessons to be learned from the good-faith bargaining obligations in labor-management relationships, which are shaped by very different political forces. This discussion highlights the innumerable benefits that a properly functioning FRAND regime permits, as well as the mutuality of consideration that is necessary, both *ex ante* and *ex post*, to hold that voluntary regime together.

In particular, at their inception, FRAND obligations arose as contractual commitments intended to serve the interests of *both* innovators and implementers by making both sides to the exchange better off than before. To be sure, that contractual point has been recognized in the abstract in many cases,<sup>11</sup> but nonetheless it has been insufficiently appreciated in application. A proper understanding of FRAND principles thus begins not with a view toward patent law, antitrust law, or regulatory policy, but with reference to the underlying contractual architecture and *quid pro quo* of the FRAND bargain. Since FRAND contracts are willing agreements between highly competent parties, it logically follows that such agreements, correctly interpreted, must generate valuable benefits to innovators and implementers alike.

No one should underestimate the difficulty of realizing these benefits. In most situations it is easier to reach an agreement, or to develop a series of customary practices, when the two parties stand in a symmetrical relationship with each other as opposed to when they occupy distinct roles. Thus, the customary obligations of partners to each other are easier to determine than those of a buyer and seller, or a landlord and tenant, or a licensor and licensee. In these last three cases, the gains from trade may be enormous, but it is no longer possible to adopt parallel obligations on both parties. Therefore, it is necessary to determine how the differences in role

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11. *See, e.g.,* Microsoft Corp. v. Motorola, Inc., 854 F. Supp. 2d 993, 999 (W.D. Wash. 2012) (recognizing that FRAND commitments made through standards development organizations are contractual); Apple, Inc. v. Motorola Mobility, Inc., 886 F. Supp. 2d 1061, 1083 (W.D. Wis. 2012) (same); *In re Innovatio IP Ventures, LLC Patent Litig.*, No. 11 C 9308, 2013 WL 5593609, at \*4 (N.D. Ill. Oct. 3, 2013) (same).

determine obligations, a more complex problem for which the dominant solution is less clear and harder to ascertain.<sup>12</sup>

Part III applies these observations to a discussion of the prior academic contributions and concludes that, in view of the particularly high transaction costs at play and the significant informational advantage the parties hold over the courts, a correct and socially efficient treatment of FRAND disputes should shift the parties’ incentives toward negotiated solutions through a recognition of strong property rights. To achieve that aim, injunctions should be the presumptive remedy in infringement actions involving declared standard–essential patents. The defendant, in turn, can rebut that presumption (or obviate the question of remedies altogether) upon a showing that its own pre–suit negotiation conduct was in good faith—that is, that the defendant either made a good faith licensing offer in view of FRAND or else was justified in making no offer at all because it has proven noninfringement or invalidity of the patent(s) in suit. The damages remedy would occupy a subordinate, yet important position—growing in significance where mutual good faith discussions have reached a genuine impasse or when it is necessary to determine compensation for attorneys’ fees that are incurred due to a breach of the patent holder’s good faith covenant.

By contrast, any principal reliance on liability rules comes out second best because it is likely to miss the reciprocal benefits underlying the voluntary FRAND agreement and encourages implementers to engage in inefficient and opportunistic “holdout” from good faith discussions. With this in mind, Part III proposes a mixed system that is subtler and more flexible than an all–or–nothing choice between “property rules” and “liability rules,” as those terms were used by Guido Calabresi and A. Douglas Melamed in their path–breaking article on the subject.<sup>13</sup> That article, in an unspoken artificial limitation, only considered legal remedies that embodied the pure form of one or the other type of remedy, without asking what mix of the two forms of relief could outperform the exclusive reliance on one remedy or the other.<sup>14</sup> This approach also diverges from the writings of commentators like Mark Lemley and Carl Shapiro—who have

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12. For a discussion in connection with the emergence of custom, see Richard A. Epstein, *The Path to the T.J. Hooper: The Theory and History of Custom in the Law of Tort*, 21 J. LEGAL STUD. 1 (1992), dealing with both customary practices and specific contractual arrangements.

13. See generally Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089 (1972).

14. See *id.* at 1109–11.



expressed a near-categorical aversion to the injunctive remedy for fear of the risks of “patent holdup” and “royalty stacking.”<sup>15</sup> Instead, it incorporates the insights of others, like Robert Merges, who have recognized the superiority of strong property rights as a starting point for resolving the high transaction costs that are inherent to intellectual property exchanges in general and patents in particular.<sup>16</sup> The FRAND agreement is itself an example of the positive effect of a presumptive injunctive remedy, for FRAND obligations owe their existence to the presumption of injunctive relief. Part III also discusses the example of patent pools, which present another (and complementary) market solution to the problem of patent transaction costs, and further counsel against hasty judicial interventions into the complex machinations of the innovation marketplace.

Finally, Part III describes the detailed empirical studies that have all come to the same conclusion: theoretical concerns regarding patent holdup and royalty stacking have not borne out in industries subject to innovation-driven standardization, such as mobile handsets. Instead, the evidence points to the sharp lowering of prices, continuous innovation, low aggregate patent royalty payments, and increasing market penetration.<sup>17</sup>

Part IV then tests the framework described in Part III against recent court decisions and an intellectual property rights (“IPR”) policy revision by the Institute of Electrical and Electronics Engineers (“IEEE”).<sup>18</sup> In so doing, it identifies the significant distortions and social inefficiencies that arise from ex post, one-sided revisionism of the FRAND contract, which evidences the unjustified preference for liability rules over property rights. Part IV proposes, in particular, an alternative approach to the IEEE’s policy revision and to decisions such as *Apple v. Motorola*<sup>19</sup> and *Microsoft v. Motorola*<sup>20</sup>—all of which have failed to take a balanced view of the duty of good faith and fair dealing underlying the FRAND agreement. In particular,

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15. See Lemley & Shapiro, *supra* note 4.

16. See generally Robert P. Merges, *Of Property Rules, Coase, and Intellectual Property*, 94 COLUM. L. REV. 2655 (1994).

17. See, e.g., Jonathan M. Barnett, *Has the Academy Led Patent Law Astray?*, 32 BERKELEY TECH. L. J. 1313 (2017); Alexander Galetovic et al., *Is There Evidence of an Anticommons Tragedy in the Smartphone Industry?*, 32 BERKELEY TECH. L. J. 1527 (2017) (noting that the “average cumulative royalty yield from . . . 21 identified patent licensors. . . is 3.4 percent”); see also J. Gregory Sidak, *Testing for Bias to Suppress Royalties for Standard-Essential Patents*, 1 CRITERION J. ON INNOVATION 301, 301–02 (2016) (describing royalty-limiting steps taking by SSOs like the IEEE).

18. IEEE, IEEE-SA STANDARDS BOARD BYLAWS § 6.1 at 16 (2017), [http://standards.ieee.org/develop/policies/bylaws/sb\\_bylaws.pdf](http://standards.ieee.org/develop/policies/bylaws/sb_bylaws.pdf).

19. 757 F.3d 1286 (Fed. Cir. 2014).

20. 795 F.3d 1024 (9th Cir. 2015).



implementers should be held to a reciprocal duty to negotiate a FRAND license in good faith, the breach of which should automatically trigger an injunction upon a finding that the patents at issue are valid and infringed, unless the innovator’s pre-suit offer is itself found not to have been in good faith. In this context, we discuss the European Union Court of Justice’s decision in *Huawei v. ZTE*,<sup>21</sup> as well as the United Kingdom High Court’s more recent decision in *Unwired Planet v. Huawei*,<sup>22</sup> both of which have advanced rules similar to those proposed here. Part IV then turns to a discussion of another aspect of the IEEE’s policy revision, as well as two Federal Circuit decisions, which have incorrectly deprived innovators of any share of the benefits from the standardization of their technological contributions, creating further distortions in the FRAND framework with significant negative follow-on effects in the innovation marketplace.

Part V concludes with a broader discussion of the significance of these issues to the emergence of the “ideas economy,” in which it has become more critical than ever both to reduce transaction costs around the patent right and to protect and reward innovation. Part V observes the sharp disconnect between the philosophical underpinnings of redefining the FRAND contract in favor of implementers—a primacy of implementation over innovation—and the much larger forces shaping the future of the American and global economies. The current preference for, as it were, “things over ideas” is rooted in an implicit premise captured by the maxim, “easier said than done.” In other words, because our historical economic experience has taught that ideas are “easy,” but their execution is difficult, modern courts and commentators have exhibited a specious attraction to the notion that “building” tangible objects—even if through means like programming software—should capture more value than the simple contribution of “ideas” to that endeavor. Yet this conventional view is dangerously outdated.

Today, the United States is at the forefront of an ideas economy in which new forces such as globalization, 3D printing, and robotics (to name a few) are rapidly rendering it much easier to build an embodiment of a great innovation than to develop the innovation itself. Thus, for instance, two of the five top-selling smartphone manufacturers in the world are now Oppo

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21. See generally Case C-170/13, *Huawei Tech. Co. v. ZTE Corp.*, 2015 E.C.R. 477.

22. See generally Jorge L. Contreras, *Unwired Planet v. Huawei: An English Perspective on FRAND Royalties*, PATENTLY-O (Apr. 10, 2017), <https://patentlyo.com/patent/2017/04/unwired-perspective-royalties.html>.

and Vivo<sup>23</sup>—relatively new entrants with no history of developing significant smartphone innovations either as part of SDOs<sup>24</sup> or independently at a device-specific level. As another example, Tesla has vowed to build fully automated factories in which robots alone will build its fleet of vehicles without human involvement.<sup>25</sup> As yet a third example, ARM—the company behind the design of virtually every smartphone processor chip—does not make or sell any actual chips.<sup>26</sup> Instead, it designs groundbreaking and fundamental chip architecture, and licenses its architectural designs to nearly every major player in the smartphone space.<sup>27</sup>

In order for the ideas economy to develop and thrive in its most dynamic and accessible form, it is imperative that ideas be valued, protected, and rewarded in accordance with their contributions, without relying on outdated presuppositions favoring incumbents who own the means of production.

Thus, as this Article demonstrates, the prevailing mishandling of FRAND is a trend in precisely the wrong direction. As such, these recent developments are part of an important and broader misstep away from protecting and valuing intellectual property at precisely the wrong time.

## II. UNDERSTANDING FRAND: THE MANY GAINS FROM COOPERATION

The simple fact of standardization, independent of the specifics of any particular standard and absent any innovation, accrues important benefits to

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23. See *Worldwide Smartphone Shipments Up 1.0% Year over Year in Third Quarter Despite Samsung Galaxy Note 7 Recall, According to IDC*, INT'L DATA CORP. (Oct. 26, 2016), <https://www.idc.com/getdoc.jsp?containerId=prUS41882816> (gathering data from the third quarter of 2016).

24. The ETSI IPR Online Database does not list either Oppo or Vivo among the 239 companies that have declared nearly 200,000 patents related to ETSI's more than 8,500 cellular telecommunications standards. *ETSI IPR Online Database*, EUROPEAN TELECOMMS. STANDARDS INST., <https://ipr.etsi.org/SearchIPRD.aspx> (last visited February 13, 2018) (listing companies inside the “Declaring companies” box on the search page, which is visible after clicking “confirm to continue” on the disclaimer).

25. See Greg Kumparak, *A Glimpse Inside Tesla's Super Secretive Gigafactory*, TECHCRUNCH (July 29, 2016), <http://techcrunch.com/2016/07/29/a-glimpse-inside-teslas-super-secretive-gigafactory/> (quoting Elon Musk's description of one such factory as “a machine to build the machines”).

26. See *Architectures, Processors, and Devices*, ARM at 1-1 to 1-2 (May 19, 2009), [http://infocenter.arm.com/help/topic/com.arm.doc.dht0001a/DHT0001A\\_architecture\\_processors\\_and\\_devices.pdf](http://infocenter.arm.com/help/topic/com.arm.doc.dht0001a/DHT0001A_architecture_processors_and_devices.pdf).

27. See *id.*; see also Bowman Heiden & Jens Andreasson, *Reevaluating Patent Damages in the Knowledge Economy: The Intellectual Value Chain and the Royalty Base for Standard-Essential Patents*, 1 CRITERION J. ON INNOVATION 229, 266–69 (2016).

implementers. The cellular telecommunications market, for instance, is composed of two critical categories of participants—handset makers and cellular carriers—who must coordinate around innumerable implementation details to make the market function. Standardization, in such cases, solves coordination problems more efficiently than a series of bilateral negotiations. It also enlarges the market on both sides by growing the addressable consumer base through interoperability and network effects. In addition, it reduces marginal costs by reducing the number of options that each company must support and decreasing the contracting and coordination costs that would accrue absent standardization. Thus, implementers’ attraction to setting standards is easy to understand.

But standardization alone captures only a sliver of the coordination gains that are achievable in technology-driven markets. Once the standardization game is under way, it is not enough to merely set default rules (like picking a side of the road to drive on). In context, the key choices are not between two inconsequential alternatives but rather among rival technologies, some of which are necessarily better and some of which are necessarily worse. Certain superior technologies only work as alternatives, not complements, to certain inferior technologies. It is therefore not enough to simply pick a baseline and let individual firms find their way to better implementations. Rather, the choice of technologies becomes a focal endeavor, for there is no inherent reason for implementers to lock themselves into offering consumers a less compelling product than what the forefront of technology would otherwise allow. Innovation-driven standardization also provides a form of competitive insurance by reducing each implementer’s risk in a winner-take-all environment in which only a few companies offer critical innovations that leave others fully in the dust, e.g., by offering 4G LTE while other companies are only capable of offering 3G products. Behind the veil of ignorance with respect to comparative innovation, competitors will naturally seek to reduce the catastrophic risk of disruption by coordinating around a high baseline of innovation adoption. At the same time, incorporating key innovations into technical standards generates further marginal cost efficiencies with respect to marketing. As the number of companies advertising and explaining a next-generation technology increases, the necessary marketing expenditure per company decreases. The credibility of the message is enhanced because it is repeated consistently by several firms at once.

The desire to standardize innovations, however, gives rise to a series of challenges. Most notable are the questions of how to identify and efficiently license the innovations that should form the standard. With respect to identifying the set of innovations for consideration, one possible solution is

to look only to those innovations that have already resulted in issued patents, which are necessarily disclosed in publicly available publications. That approach proves suboptimal, however, as the most attractive innovations are often the newest ideas, which by their nature have not been disclosed in either issued patents or published patent applications. Implementers thus cannot learn about such discoveries by searching for them among public records; the information must come to them. At this point, the transaction challenge becomes particularly acute: if an innovator discloses its as-yet-unprotected invention, it has nothing left to sell. Alternatively, implementers cannot buy what they do not know is for sale—a variation of Arrow’s “paradox of information.”<sup>28</sup> The complications do not end there. Once a technology has been selected for incorporation into the standard, the question becomes how rights to the technology should best be acquired. Securing licenses to all of the necessary patents or patent applications prior to formally promulgating the standard will entail huge transaction costs.<sup>29</sup> The alternative of selecting the standard first and negotiating patent licenses second, however, is no less problematic: since each patent holder holds the right to exclude, any single patent holder may refuse to grant a license and instead seek an injunction in order to capture monopolistic rents through a conscious strategy of “patent holdup.”

From the implementers’ perspective, the solution is to form an innovation marketplace—that is, a means for innovative ideas to be presented to the implementers—thus reducing search costs, creating information aggregation effects regarding “state of the art” technologies, and providing access to the latest as-yet-unpatented discoveries. This, in turn, allows implementers to specialize more heavily in implementation instead of devoting inefficient and duplicative resources toward innovation. Critically, these cooperative efforts create an opportunity to contract around the risks of injunctions and patent holdup by imposing “terms of entry” restrictions on innovators who elect to participate in that marketplace.

But innovators will have no interest in entering such a marketplace unless they first receive assurances that they can expect a reasonable risk-adjusted profit that exceeds their opportunity cost. Most significantly, innovators would need assurances that, if they disclose their latest nonpublic discoveries and waive their categorical right to exclude unauthorized use of their inventions, they will be compensated through a

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28. See Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS* 609, 615 (1962).

29. See Merges, *supra* note 8, at 2661 (recognizing the high transactions costs inherent to intellectual property).

fair share of the ensuing benefits that leaves them better off than they would be by self-commercializing their inventions and maintaining exclusionary rights to their intellectual property. After all, once they have disclosed their inventions to implementers and waived their categorical right to an injunction, innovators have little leverage against the risk of widespread infringement and the need for costly litigation—that is, “patent holdout” or “efficient infringement.”

Yet these challenges have not proven insurmountable. To cut the Gordian knot, innovators and implementers have worked through standards developing organizations (“SDOs”) to develop the FRAND framework—a contractual solution whereby implementers agree to take a license to any standard-essential patent on fair, reasonable, and nondiscriminatory terms (“FRAND”), and to negotiate such terms in good faith. Innovators reciprocally agree to bring their latest discoveries to the marketplace, to notify the SDO of intellectual property rights (including patent applications) that would be infringed by the use of such disclosed technologies, to offer FRAND licenses for any eventual standard-essential patents (“SEPs”) in good faith, and to forego their categorical right to exclude willing licensees from the use of standard-essential innovations.<sup>30</sup> Critically, innovators are not forced or legally required to make FRAND commitments, but rather do so willingly and voluntarily.<sup>31</sup>

The FRAND contract is thus meant to solve a host of coordination problems between potential bilateral monopolists seeking technology-driven standardization. Their goal is to create innovation-driven standards that reward the efforts of each contributor. The FRAND agreement for standards development allows the emergence of an innovation marketplace that yields massive positive externalities, including benefits for downstream customers.<sup>32</sup> This win-win outcome is consistent with Robert Merges’

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30. See EUROPEAN TELECOMMS. STANDARDS INST., ETSI INTELLECTUAL PROPERTY RIGHTS POLICY (VERSION 37) 35–36, 42–43 (2017), [https://portal.etsi.org/directives/37\\_directives\\_apr\\_2017.pdf](https://portal.etsi.org/directives/37_directives_apr_2017.pdf) (discussing “[d]isclosure of IPRs” and “availability of [I]licenses”) [hereinafter *ETSI Intellectual Property Rights Policy*].

31. *Id.* at 37–38 (discussing “[n]on-availability of [I]licenses”).

32. See the ETSI’s policy objectives, which state:

It is ETSI’s objective to create STANDARDS and TECHNICAL SPECIFICATIONS that are based on solutions which best meet the technical objectives of the European telecommunications sector, as defined by the General Assembly. In order to further this objective the ETSI IPR POLICY seeks to reduce the risk to ETSI, MEMBERS, and others applying ETSI STANDARDS and TECHNICAL SPECIFICATIONS, that investment in the preparation, adoption and application of STANDARDS could be wasted as a result of an

observation that “in the presence of high transaction costs, industry participants have an incentive to invest in institutions that lower the costs of IPR exchange.”<sup>33</sup>

Indeed, as demonstrated above, the FRAND agreement owes its existence to the immutability of two significant transaction costs: the perceived threat of the injunction remedy and the lack of public disclosure of the most recent innovations. Because implementers fear that innovation standardization may give rise to ex post injunctions and “patent holdup,” they are motivated to bargain ex ante with innovators to establish voluntary institutions that facilitate contractual solutions.<sup>34</sup> And because innovators’ latest discoveries are not yet published in patents or patent applications, implementers need to offer innovators some substantial consideration to motivate them to reveal those discoveries, which can then be incorporated into workable standards. In exchange, innovators naturally seek assurances against “patent holdout” or “efficient infringement” by way of promises of adequate risk-adjusted and opportunity cost-adjusted profits whenever their inventions become standard-essential.

This mutuality of considerations has been at the heart of the voluntary FRAND bargain from the outset, given that any risks of holdup or misappropriation of information are bilateral—that is, such risks work in both directions. Unfortunately, the innovation marketplace it enables quickly unravels once the bargain is revised or reinterpreted in ways that shortchange innovators. Thus, in 1992, the European Commission observed that “the incentive to develop new products and processes on which to base

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ESSENTIAL IPR for a STANDARD or TECHNICAL SPECIFICATION being unavailable. In achieving this objective, the ETSI IPR POLICY seeks a balance between the needs of standardization for public use in the field of telecommunications and the rights of the owners of IPRs. IPR holders whether members of ETSI and their AFFILIATES or third parties, should be adequately and fairly rewarded for the use of their IPRs in the implementation of STANDARDS and TECHNICAL SPECIFICATIONS.

*Id.* at 35.

33. Merges, *supra* note 8, at 2655.

34. *See id.* (“[I]n the presence of high transaction costs, industry participants have an incentive to invest in institutions that lower the costs of IPR exchange.”); *see also* Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations*, 84 CALIF. L. REV. 1293, 1346 (1996) (“Without . . . property rights—backed by the threat of production-choking injunctions—the advantages conveyed by the [patent] pool would never have been realized.”).



future standardization will be lost if the standard-making process is carried out without due regard for intellectual property rights.”<sup>35</sup>

The European Telecommunications Standard Institute (“ETSI”)—one of the most active SDOs, which has been largely responsible for developing generations of cellular telecommunications standards—has learned that lesson the hard way. As Roger Brooks and Damien Geradin recount, ETSI’s initial efforts at crafting an IPR Policy sought to “advance” the prior norms by increasing restrictions on innovators through market-limiting measures such as maximum royalty rates, “automatic licensing,” total waivers of the injunction remedy, and mandatory arbitration.<sup>36</sup> These efforts, however, were met with fierce opposition and criticism from both members (some of whom threatened to withdraw from ETSI) and other, more experienced SDOs.<sup>37</sup> Ultimately in 1994, ETSI abandoned its innovation-restrictive policies and adopted a traditional FRAND policy that largely remains in place today.<sup>38</sup>

Thus, in its current form, the ETSI IPR Policy provides that its “objectives” are to “seek[] a balance between the needs of standardization for public use in the field of telecommunications and the rights of the owners of IPRs”; ETSI particularly notes that “IPR holders . . . should be adequately and fairly rewarded for the use of their IPRs in the implementation of STANDARDS and TECHNICAL SPECIFICATIONS.”<sup>39</sup>

That approach is consistent with other SDOs, like the International Telecommunications Union (“ITU”), which has stated that its IPR policy seeks “a working balance between the interests of SEP owners and implementers . . . by ensuring that owners of intellectual property will be motivated to contribute their patented technologies to the standards-development process and that the standards incorporating these technologies will remain widely available to implementers.”<sup>40</sup>

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35. COMM’N OF THE EUROPEAN COMMUNITIES, COMMUNICATION FROM THE COMMISSION: INTELLECTUAL PROPERTY RIGHTS AND STANDARDIZATION 1 (1992), <http://aei.pitt.edu/1222/1/1222.pdf>.

36. See Roger G. Brooks & Damien Geradin, *Interpreting and Enforcing the Voluntary FRAND Commitment*, 9 INT’L J. IT STANDARDS & STANDARDIZATION RES. 1, 17 (2011).

37. *Id.*

38. *Id.* at 21.

39. ETSI Intellectual Property Rights Policy, *supra* note 20, at 37.

40. *Balancing Innovation and Intellectual Property Rights in a Standards-Setting Context*, INT’L TELECOMM. UNION (2012), <https://itunews.itu.int/en/3049-Balancing-innovation-and-intellectual-property-rights-in-a-standards-setting-context.note.aspx>.



Notably, ETSI's 1994 FRAND framework was deliberately vague, leaving flexibility for parties to bilaterally negotiate its meaning in the context of their particular circumstances. Since adopting its 1994 IPR Policy, ETSI has twice rejected efforts to narrow and more tightly define FRAND.<sup>41</sup> The incomplete nature of the FRAND contract is therefore neither an oversight by SDOs nor an invitation for courts to fill in the gaps or clarify the boundaries, but rather an architectural design feature of the FRAND framework that has been critical to its success.

Indeed, that same structural flexibility was significant to the success of traditional forms of rate regulation rules that deal with common carriers and public utilities, to whom the FRAND rules originally applied and who—by virtue of their monopoly position—were long obligated to hold themselves out to provide services to all parties on fair, reasonable, and nondiscriminatory terms.<sup>42</sup> And a comparative analysis of FRAND's workings in that earlier context further informs a proper understanding of the FRAND bargain with respect to standard-essential patents.

To be sure, the complications inherent in the FRAND framework were more tractable in the earlier rate regulation context than in the patent space, and for three reasons. The first has to do with the nature of the regulated businesses. Common carriers and public utilities are all massive, unified operations whose value is embodied in a few key facilities of enormous value, such as power plants or distribution networks. The standard rate-making procedure to deal with public utility regulations assumes that there is no close substitute to the particular public utility, which is required to justify investment of heavy sums in the construction of its plant before it obtains any return from its more or less captive customer base. The large size of the investment means that the rate calculations are performed on a coherent set of assets and not on large, shifting portfolios of smaller assets that comprise the whole. Second, the rate of technical change in the public

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41. See Brooks & Geradin, *supra* note 26, at 18–21 (chronicling ETSI's decisions in 1994 and 2006 to reject "restrictions or interpretations identical or analogous to many of those advocated today by the proponents of the restrictive FRAND regimes," including automatic licensing, requiring a declaration of maximum royalty rates, and mandatory arbitration).

42. For a general account of the problem, see *Duquesne Light Co. v. Barasch*, 488 U.S. 299 (1989). The origins of the doctrine were set out by Sir Matthew Hale in his treatise *De Portis Maribus*, which noted that it was proper to impose price limitations on businesses "affected with the public interest, or monopolies." See Richard A. Epstein, *The Reflections and Responses of a Legal Contrarian*, 44 TULSA L. REV. 647, 669 n.61 (2008). That rule was incorporated into English law in *Allnut v. Inglis* in 1810. 104 Eng. Rep. 206 (K.B. 1810). Finally, in 1876, it worked its way into American law in *Munn v. Illinois*, 94 U.S. 113 (1876). The term "virtual monopoly," used in *Munn* to capture the difficulty of the subject, derives from *Allnut*. See Epstein, *supra* note 42, at 669 n.61.

utility and common carrier space has traditionally been relatively slow, so it is possible to make long-term calculations with a fair degree of certainty. And third, the rates are generally given to large classes of customers on a take-it-or-leave-it basis. Traditional rate regulation, therefore, does not contemplate the second round of negotiation that is perfectly routine today between the holder of a SEP and its infringers, who vary widely in size and their individual usages of their product in question. For instance, with certain key standards, such as those for Wi-Fi, the stakes are far larger than they are for any physical plant, given that these key standards work themselves into a staggeringly large set of downstream applications by large numbers of unrelated parties. Oftentimes, the value of the SEP can be determined only in relationship to the ultimate use that the licensee makes of the patent in its own business.

Nonetheless, there are certain features of standard rate regulation that do apply to FRAND negotiations over SEPs. The first of these is that rate regulation is intended to make sure that any given monopolist does not receive more than a competitive rate of return for the use of its products or services. One corollary of this proposition is that the system of rate regulation should never introduce into its rate structure cross-subsidies among different classes of users.<sup>43</sup> Those subsidies are not sustainable in competitive markets because those customers who are called upon to supply the subsidy will be able to switch easily to another supplier, thus rendering the entire cross-subsidization project a failure. But given that there are no close substitutes to a common carrier or public utility, the cross-subsidy possibility is real, but also destructive. The moment that these cross-subsidies are allowed, it introduces an element of jockeying whereby politically influential groups will seek to exert these disguised wealth transfers in their own favor. The new arrangement thus poses the well-known dangers of rent-seeking behavior that always arise when property rights are made indefinite, a result which in this instance is by design.

The traditional systems of rate regulation took steps to guard against transfer payments, such as those that might occur when the passenger business of a railroad is taxed to subsidize its freight division,<sup>44</sup> when the rate of return on a regulated portion of the business is reduced because the firm made sufficient profits from its unregulated activities,<sup>45</sup> or when a

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43. See generally Richard A. Epstein, *The History of Public Utility Regulation in the United States Supreme Court: Of Reasonable and Nondiscriminatory Rates*, 38 J. SUP. CT. HIST. 345 (2013).

44. See, e.g., *Norfolk & W. Ry. Co. v. Conley*, 236 U.S. 605 (1915).

45. See, e.g., *Brooks-Scanlon Co. v. R.R. Comm'n of La.*, 251 U.S. 396 (1920).

regulated firm is denied a guaranteed rate of return in any given period based on the regulator's promise to make up the shortfall in some future period.<sup>46</sup> These relatively hard-edged rules do not displace the higher level of judicial deference given in ratemaking cases when there is no clear method of accounting. For example, in the illustration above, the joint costs that are incurred to ship both freight and passenger cars on the same train. One danger with the common legal position that damages should be the first remedy in patent disputes is that, in the context of multiparty deals, it encourages the introduction of cross-subsidies through the back door.

The success of a rate-making system in dealing with these risks depends heavily on the level of scrutiny that is given to the entire operation. The low "rational basis" standard of constitutional law invites a level of cross-subsidization that is not tolerated when either an intermediate-scrutiny or strict-scrutiny standard is applied. In both these cases, the central test for government coercion is whether it brings the overall system closer to the competitive norm that can never be reached. But the opposite approach arises when the legal system introduces a set of institutions that seeks to create the very holdout problems that sound systems of rate regulation seek to eliminate.

The most instructive example of how these negotiations can backfire arises with mandatory collective bargaining under the National Labor Relations Act ("NLRA"),<sup>47</sup> the permutations of which have governed management-labor relations since 1935. Under the basic scheme, management is placed under a duty to bargain in good faith with a union that has been selected by majority vote within a designated bargaining unit, after which the union functions as the exclusive representative of all members of the unit, whether they voted for the union or not. Interestingly enough, the Taft-Hartley amendments to the statute added a duty on the union to negotiate in good faith with management in an effort to reach a deal. The turbulent history of labor relations shows that it is difficult to make these arrangements work in light of the high emotions that are often on both sides of the table. Indeed, the structure condemns these bargaining relationships to failure in ways that the FRAND negotiations are consciously designed to avoid.

As with FRAND--type arrangements, labor negotiations revolve around two related axes. The first addresses the internal relations among various union members over the division of the potential gains from

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46. See, e.g., *Bd. of Pub. Util. Comm'rs v. N.Y. Tel. Co.*, 271 U.S. 23 (1926). However, this principle was disregarded in *AT&T Corp. v. Iowa Utils. Bd.*, 525 U.S. 366 (1999).

47. 29 U.S.C. §§ 151-69 (2012).

negotiation with management. These issues are acute because unions often represent workers that have inherent conflicts with each other. Some workers have seniority that others do not. A small fraction of union members may have more skilled jobs than the majority of the members. To deal with this question, the law imposes a duty of fair representation on the union representative. This responsibility, however, has proven extraordinarily difficult to enforce judicially, so that in practice these conflicts are resolved by protracted and informal negotiations.<sup>48</sup>

The second axis concerns the pattern of negotiation between the union and management under the good-faith umbrella that applies to both sides. The question is what good faith means. In some contexts, it has a clear meaning. For example, a purchaser acts in good faith when she buys property from a party whom she thinks is the rightful owner, but who in fact is not. The good-faith defense often protects that innocent purchaser from a suit by the true owner to recover the property in question, leaving the owner with only a typically futile action against the thief or converter for damages. Closer to home, the duty of good faith in connection with partnership arrangements requires each partner in his various business dealings to weigh the interest of his partners equally with his own. By taking into account all costs and benefits, the duty encourages all parties to maximize the good of the whole. When followed uniformly by all such partners, it leads to the highest level of output. As an offshoot of that definition, it is commonly held that an insurance company that defends a claim against an insured party under a policy that offers only limited coverage is required to weigh the interest of the insured as equal to its own, which is the only way to minimize the expected cost of the suit, taking into account both the costs of litigation and settlement.<sup>49</sup> In all of these cases, the use of a good-faith standard tends to lead to an efficient resolution of conflicts of interest between the parties.

Unfortunately, this definition is not transferable to the labor context, where the two parties stand in a stark opposition to each other. In these cases, the resulting bilateral monopoly situation is inferior to the results that are obtained in a competitive market. Transaction costs are higher, the risk of bargaining breakdown is greater, and the prospect that workers will, through this system of negotiation, push wages above competitive levels necessarily distorts the operation of product markets. In these adversarial

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48. For the origins of this rule regarding intra-union tensions in the context of race relations, see *Steele v. Louisville & Nashville R.R.*, 323 U.S. 192 (1944). For a more general overview of a union's duties to individual members, see *Vaca v. Sipes*, 386 U.S. 171 (1967).

49. See *Merritt v. Reserve Ins. Co.*, 110 Cal. Rptr. 511 (Cal. App. 1973).

circumstances, there is no way in which the duty to bargain or act in good faith can either ensure the security of transactions or reduce conflicts of interest, which is its role in these other contexts.

The difficulty of the good faith concept as it applies in labor law is revealed through Section 158(d) of the NLRA, which provides:

For the purposes of this section [on the definition of unfair labor practices], to bargain collectively is the performance of the mutual obligation of the employer and the representative of the employees to meet at reasonable times and confer in good faith with respect to wages, hours, and other terms and conditions of employment, or the negotiation of an agreement, or any question arising thereunder, and the execution of a written contract incorporating any agreement reached if requested by either party, but such obligation does not compel either party to agree to a proposal or require the making of a concession.<sup>50</sup>

There are several instructive points in this solution that carry over to the FRAND obligations in the patent space. The first is that the duties to bargain in good faith are the *mutual* obligation of the employer and the union, notwithstanding the obvious asymmetry in their respective positions: the employer represents a coherent firm, while the union represents an array of workers with multiple and often clashing interests. The second is that imposing mutual duties on the parties does not exactly clarify what those duties are. The NLRA language quoted makes it clear the duty to bargain in good faith is not a duty to make specific concessions to the opposite side. Judicial decisions have held that this provision means what it says, even on the question of dues check-off.<sup>51</sup> This check-off arises when the union wants management to deduct worker dues from their paychecks to spare the union the serious risk of non-collection of dues from wayward employees (some of whom may not even be union members). The refusal to follow this no-concession rule would put the courts in the impossible position of having to decide which party should make what concession in the event of an impasse.

At this point, the overall system of private voluntary negotiations would surely become unglued. Once it is clear which side is favored by the arbitrator, the parties will then bargain in the shadow of that external yardstick. After all, why should either party yield to any terms that are worse than those which it can get from the all-powerful third party? Hence by a combination of direct order and influence, the judicial decision maker will take over an entire proceeding that it is singularly ill-suited to manage due

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50. 29 U.S.C. § 158(d) (2012).

51. See *H.K. Porter Co. v. NLRB*, 397 U.S. 99 (1970).

to innumerable workforce and business–model differences among thousands of different union shops. Nonetheless, if the courts will not force the parties to an agreement, it is clear under current Supreme Court law that the employer can be required to disclose financial information on its overall profitability in the hope that a greater common pool of information will narrow the bargaining space and increase the likelihood of an agreement.<sup>52</sup> In modern times, the incidence of strikes has gone down, but that change is best explained by the increased competitiveness of the employer’s business environment, which sets the backdrop for all labor negotiations.

The notable exception to that rule comes in breakdowns in negotiations between unions and public employers in such sectors as transportation and education, both service industries, in which a cessation of service is felt immediately by a huge group of third parties whose serious economic losses are not diminished because the legal system tends to dismiss these losses as “incidental.” Public unions, moreover, present the additional danger that they are on both sides of the bargaining table, given that the power of their well-oiled political machines can drive the election of key political officials.<sup>53</sup> Since most of these local services are territorially based, these unions do not have to fear new entry, and hence are in a position to drive up their power in ways that leads, for example, to rules on job security and pensions that pose a deep threat to the overall political system. Further, it is hard to undo these changes since these pension benefits typically vest as of the time of employment, and thus for current employees cannot be cut back even for future payments under current contracts.<sup>54</sup> The good faith obligations for negotiation in this context do little to prevent the breakdown of labor markets for public employees. The situation is quite different in the private sector. The decline of tariff barriers and the deregulation of many key sectors, like telecommunications, reduces the potential for monopoly gains, and therefore undercuts the power that a union could enjoy when pitted against an employer that is a sole supplier in a larger marketplace.

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52. See *NLRB v. Truitt Mfg.*, 351 U.S. 149 (1956).

53. The matter is now coming to a head before the United States Supreme Court in *Janus v. American Federation of State, County, and Municipal Employees, Council 32*, which remains pending at the time of this writing. See Amy Howe, *Argument Preview: For the Third Time, Justices Take on Union-Fee Issue*, SCOTUSBLOG (Feb. 20, 2018, 10:30 AM), <http://www.scotusblog.com/2018/02/argument-preview-third-time-justices-take-union-fee-issue/>.

54. The key case is *Kern v. City of Long Beach*, 179 P.2d 799 (Cal. 1947). For an exhaustive discussion, see Amy Monahan, *Statutes as Contracts? The “California Rule” and Its Impact on Public Pension Reform*, 97 IOWA L. REV. 1029 (2012).



For these purposes, the key question is why the good-faith negotiations that are undertaken in the context of FRAND do not exhibit the pathologies that the good-faith obligations cannot effectively control in the context of labor relationships. The relevant features of SDOs help supply an explanation that covers the broad range of cases.<sup>55</sup> The initial point is that labor negotiations under the NLRA are negative sum games in which any bargain that ultimately emerges is going to be less efficient than the competitive solution in which firms are allowed, at low cost, to make workers take-it-or-leave-it offers. These offers in competitive markets will have to be high enough to attract workers, but low enough to permit firms to sell their own goods and services to their customer base. The FRAND negotiations will not be as efficient as the competitive labor markets, but they do share this characteristic. Indeed, FRAND negotiations are positive sum. The parties are not put together by judicial fiat. Instead, each party that enters into these negotiations hopes to help set a standard that will improve the economic prospects of all the firms involved by allowing them to cooperate with each other by designing a better product leading to a larger market for all participants' inputs.

The success of these negotiations therefore depends on the ability to elicit cooperation from all members. One way that this is done is to separate the standard development process from the competitive process that will take place once the standards have been put in place. Accordingly, the standard development operation is handled by engineers and other technical experts who are separated from the business arms of their various firms. That separation is enforced because the standard chosen is not set with respect to any given patent. Rather, the standard is first chosen on technical grounds, albeit with the assurance that known essential patents will be available for license on FRAND terms. Only later is it decided which patents read onto the standard that has been selected. It is thus common that a standard championed by representatives of firm A will require the incorporation of technology patented by firm B, or a set of processes that have yet to be reduced to patents by anyone. In effect, these negotiations are conducted, as it were, behind a veil of ignorance in which the many participants will best advance their own interests if the organization sets a standard preferred by the greatest number of members. Indeed, it is common in many SDOs for the representatives of the end users to participate in the discussion about standards even if they are not in a position to vote on what standard is set. Their simple presence in the room is an added check against various forms of opportunism, for their voice in these deliberations has a

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55. See, e.g., Richard A. Epstein et al., *The FTC, IP and SDOs: Government Hold-Up Replacement Private Coordination*, 8 J. COMPETITION L. & ECON. 1, 8–15 (2012).



key role in determining how the particular vote on any standard comes out. In addition, there is generally an obligation to disclose any patent that a firm has that reads onto a standard, so the potential conflict of interest is further limited. Unlike the labor situation, the parties know that they do not enjoy any monopoly position because the selection of any given standard does not guarantee that some rival standard will not emerge to deal with the same problem; all the parties therefore are aware that any unilateral effort to degrade the standard for partisan advantage could result in the inability of the inferior standard to hold its own in the marketplace. Hence, the strong insistence by SDOs to avoid the holdup or bargaining problems which are, by contrast, routine in collective bargaining between management and labor.<sup>56</sup>

In sum, as the above discussion has demonstrated, the FRAND bargain, in the context of innovation-driven standardization, is a voluntary reciprocal exchange of assurances that is central to the formation and continuing operation of a vibrant marketplace between innovators and implementers that generates enormous positive externalities. That the nature of the exchange is somewhat indefinite and vague is not an invitation for judicial intervention or interpretation, but a central and necessary feature of the framework itself. It is therefore critical to warn against hasty interventions in the rare, marginal cases that have the potential to disrupt the delicate balance of rights and obligations that lead to successful negotiated outcomes in the huge number of routine cases. What is necessary, rather, is an appreciation of the inherent reciprocity of the good-faith foundations of the FRAND exchange, as well as the ability of both sides to respond to violations of the good faith covenant on one side with reciprocal defections on the other side, such that an implementer can predict

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56. *Request for Comments and Announcement of Workshop on Standard Setting Issues*, 76 FR 28036 (May 13, 2011) (the “Request”) - Patent Standards Workshop, Project No. P11-1204, ALL. FOR TELECOMM. INDUS. SOLUTIONS 1 (June 14, 2011), (“ATIS has not experienced the hold up problem . . .”), [www.ftc.gov/sites/default/files/documents/public\\_comments/request-comments-and-announcement-workshop-standard-setting-issues-project-no.p111204-00015%2%A0/00015-60529.pdf](http://www.ftc.gov/sites/default/files/documents/public_comments/request-comments-and-announcement-workshop-standard-setting-issues-project-no.p111204-00015%2%A0/00015-60529.pdf); *Re: Federal Trade Commission Request for Comments and Announcement of Workshop on Standards-Setting Issues* (Patent Standards Workshop, Project No. P11-1204), INT’L COMM. FOR INFO. TECH. STANDARDS 1 (June 20, 2011), <https://goo.gl/43MuNC> (“The current officers and staff have not been notified of any active patent ‘hold-up’ problems with regards to INCITS standards.”); *Re: Federal Trade Commission Request for Comments and Announcement of Workshop on Standard-Setting Issues* (Patent Standards Workshop, Project No. P11-1204), TELECOMMS. INDUS. ASSOC. 4 (June 14, 2011), <https://goo.gl/YcNo6V> (“TIA has never received any complaints regarding such ‘patent hold-up’ and does not agree that ‘patent hold-up’ is plaguing the information and telecommunications technology (ICT) standard development processes.”).

that a failure to bargain in good faith on its end will trigger a corresponding request for an injunction by the innovator on the other. As the next Part explains, only the threat of escalating harms from defection can generate the equilibrium outcome in which both sides uphold their good-faith obligations.

### III. ENFORCING FRAND: BALANCING STRONG PROPERTY RIGHTS WITH LIABILITY RULES

As the previous discussion demonstrated, a central feature of the FRAND bargain is to provide implementers access to licenses for patents covering standardized innovations (i.e., SEPs) that implementers must necessarily infringe when practicing the relevant standard.<sup>57</sup> Thus, having voluntarily entered the FRAND contract, a patent holder waives its right to categorically refuse to grant a license, as well as its right to seek an injunction against an implementer without first attempting to engage in good faith negotiations in pursuit of a license on FRAND terms. The question arises, however, whether the injunction remedy should remain available to the innovator under any circumstance, most notably when an implementer refuses to engage in good-faith negotiations on FRAND terms. After all, that quid pro quo is at the heart of the FRAND deal ex ante. Indeed, absent the backstop of the injunction threat, implementers will have powerful incentives to breach their end of the FRAND contract and pursue their own ex post strategy of “patent holdout” or “efficient infringement.” That conduct could lead to suboptimal returns from playing the FRAND game, and thus an eventual breakdown of the FRAND-enabled innovation marketplace.<sup>58</sup>

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57. See, e.g., the ETSI’s policy objectives, which state:

In order to further this objective the ETSI IPR POLICY seeks to reduce the risk to ETSI, MEMBERS, and others applying ETSI STANDARDS and TECHNICAL SPECIFICATIONS, that investment in the preparation, adoption and application of STANDARDS could be wasted as a result of an ESSENTIAL IPR for a STANDARD or TECHNICAL SPECIFICATION being unavailable.

ETSI Intellectual Property Rights Policy, *supra* note 20, at 35.

58. See, e.g., Anne Layne-Farrar, *Business Models and the Standard Setting Process*, in *THE PROS AND CONS OF STANDARD SETTING* 34, 49 (2010). Layne-Farrar states:

[O]nce upstream patent holders have no option of seeking injunctive relief, they will have no bargaining power at all in licensing negotiations. Especially within standard setting contexts, where the parties typically commit to license via a FRAND promise, such a rule would amount to compulsory licensing, leaving up-stream patent holders at the mercy of licensees.

Indeed, the fashionable “efficient infringement” term is itself a sign of the weakness of the common position, for it evokes the oft-used contract notion of “efficient breach” by which it is said that each and every promise should be regarded as an option by the promisor to either perform or pay damages.<sup>59</sup> Under this view, injunctions against doing business with third persons should always be off the table. But the objections to the theory of efficient breach are numerous.<sup>60</sup> The most obvious is that oftentimes the calculation of damages is sufficiently complex that important items are too difficult to evaluate. This means promisees are thus left systematically undercompensated. In addition, in dealing with complex supply chains, nonperformance of one contract has ripple effects down the supply chain as more and more people are dislocated. In these downstream disputes, it is not clear whether the promisor who has not performed has a defense based on its inability to obtain the necessary inputs for its performance from his promisors. In all supply chain operations, the focus is on making sure that performance levels are high through the entire system. On this view of the world, any deliberate breach of contract, made in order to secure a high price from another customer, is a fatal offense. The use of damages becomes acceptable only as a backstop remedy, chiefly in cases where timely performance is rendered impossible, say because of a seller’s accidental destruction of the goods made for sale.

In patent law as in ordinary contract law, the goal is performance, not damages. Efficient infringement, like efficient breach, is a dangerous misnomer. In response to the risks of efficient infringement, the parties develop institutional arrangements to overcome all obstacles to high-levels of performance.

Yet an influential body of literature, led by Mark Lemley and Carl Shapiro, has instead focused primarily on the risk of “patent holdup” by

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59. An early version of this thesis is found in Oliver Wendell Holmes, Jr.’s *The Common Law*, which stated: “[T]he only universal consequence of a legally binding promise is, that the law makes the promisor pay damages if the promised event does not come to pass.” OLIVER WENDELL HOLMES, JR., *THE COMMON LAW* 301 (1881). Holmes was aware that in some cases the other remedies are allowable but regarded those only as exceptional. *Id.* at 300–01. For a later version see, for example, Charles J. Goetz & Robert E. Scott, *Liquidated Damages, Penalties and the Just Compensation Principle: Some Notes on an Enforcement Model and a Theory of Efficient Breach*, 77 COLUM. L. REV. 554 (1977). For critiques, see Daniel Friedmann, *The Efficient Breach Fallacy*, 18 J. LEGAL STUD. 1. (1989), and Richard Craswell, *Contract Remedies, Renegotiation, and the Theory of Efficient Breach*, 61 S. CAL. L. REV. 629 (1988).

60. For discussion, see generally Richard A. Epstein & David Kappos, *Legal Remedies for Patent Infringement: From General Principles to FRAND Obligations for Standard Essential Patents*, 9 COMPETITION POLICY INT’L 69 (2013).

innovators while paying short shrift to the correlative risk of “patent holdout” by implementers.<sup>61</sup> While their more recent work has passingly acknowledged the possibility that the injunctive threat may prod implementers into good-faith FRAND licensing negotiations,<sup>62</sup> the principal focus of Lemley and Shapiro’s work has been to discourage the availability of injunctions in the context of products that practice multiple patents, such as mobile handsets that practice numerous SEPs.<sup>63</sup> Lemley and Shapiro advise courts to deny injunctions “when the product that would be enjoined contains multiple components, of which only one is the subject of the patent in suit”—a factual description that applies to nearly every product in the modern marketplace, including many pharmaceutical products.<sup>64</sup> That “relatively simple step,” according to Lemley and Shapiro, “will help to rebalance the patent system and ensure that it enhances rather than impedes innovation in component industries.”<sup>65</sup>

Lemley and Shapiro’s writings should be read against the backdrop of the Supreme Court’s then-recent decision in *eBay, Inc. v. MercExchange, L.L.C.*,<sup>66</sup> in which the Supreme Court reversed the traditional rule that a patentee is presumptively entitled to some form of injunctive relief for infringement of a valid patent. In its stead, the Court adopted a now familiar four-part test:

According to well-established principles of equity, a plaintiff seeking a permanent injunction must satisfy a four-factor test before a court may grant such relief. A plaintiff must demonstrate: (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity

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61. See, e.g., Colleen V. Chien & Mark A. Lemley, *Patent Holdup, the ITC, and the Public Interest*, 98 CORNELL L. REV. 1, 41 (2012) (conflating the risk of patent holdout with explicit “copying” and observing that copying “isn’t much of a problem”); Mark A. Lemley & Carl Shapiro, *A Simple Approach To Setting Reasonable Royalties for Standard-Essential Patents*, 28 BERKELEY TECH. L. J. 1135, 1144 n.23 (2013) (observing that courts may rightly find it inappropriate to grant injunctions even against unwilling FRAND licensees); Lemley & Shapiro, *supra* note 4, at 1991–92; Carl Shapiro, *Injunctions, Hold-Up, and Patent Royalties*, 12 AM. L. & ECON. REV. 280, 280–82 (2010).

62. Lemley & Shapiro, *supra* note 49, at 1144 n.23, 1153 (acknowledging that the injunction remedy should be available to innovators faced with an implementer who refuses to negotiate a FRAND license in good faith).

63. Lemley & Shapiro, *supra* note 4, at 2036.

64. *Id.*

65. *Id.* at 2045.

66. 547 U.S. 388 (2006).

is warranted; and (4) that the public interest would not be disserved by a permanent injunction.<sup>67</sup>

This “well-established” test mentioned in *eBay* bears little relationship to the historical practices that courts, particularly courts of equity, applied in ordinary nuisance cases.<sup>68</sup> In these situations, the difficulty of calculating present and future damages attributable to ongoing activities persuaded courts that the first line of defense should be the injunction, which could then be, and often was, supplemented by various forms of interim and cleanup damages. The *eBay* decision jettisoned that subtle and flexible mixed remedial approach and instead reverted to a stark and simplistic opposition between “property rules” and “liability rules,” as those terms were used by Calabresi and Melamed in their seminal article on the subject,<sup>69</sup> which only considered the pure form of both types of remedy. That mistake magnified the errors of both kinds of rules,<sup>70</sup> as error and implementation costs always increase in exponential fashion as the law moves to either corner. The holdout problem created under an injunction—only regime has far greater disruptive power than it does in a world in which a small payment of damages may relax some particularly onerous terms of the categorical injunction. And the risk of abuse can be reduced still further by attaching various conditions and limitations to injunctive relief that were not the focus of the Calabresi and Melamed article. Conversely, the valuation problems of a damage system are reduced if the injunction is able to reduce the extent and uncertainty of the loss.

The misunderstanding of the remedial permutations used in standard nuisance cases are only magnified when the battleground shifts from ordinary nuisance disputes to patent litigation. Even in the two-party cases, the great defect of the damages-first approach is that it gives the potential infringer every incentive to refuse to negotiate, knowing that the patent holder will have to endure expensive litigation to obtain damages down the road at a time when either the holder, the infringer, or both may be insolvent. The patentee’s situation is further compromised because imitation is the most serious form of flattery. Any firm that is normally willing to purchase a license from a patentee may well refuse to do so if noncompliant firms gain a competitive advantage over compliant firms. Therefore, it becomes

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67. *Id.* at 391.

68. See generally Mark P. Gergen et al., *The Supreme Court’s Accidental Revolution? The Test for Permanent Injunctions*, 112 COLUM. L. REV. 203 (2012) (reviewing traditional equitable remedies, which shows the dominance of injunctive relief, contrary to *eBay*’s four-part test).

69. Calabresi & Melamed, *supra* note 5.

70. For discussion, see Richard A. Epstein, *Intellectual Property and the Law of Contract: The Case Against “Efficient Breach”*, 9 EUR. REV. CONT. L. 345 (2013).

exceedingly dangerous to adopt remedial structures that presuppose that one side, the putative licensee, necessarily acts in good faith regardless of its behavior, while the other side, the putative licensor, does not. The use of the injunction, suitably restrained in cases of bad faith assertion by the patentee, is an essential component of an overall systematic strategy designed to prevent the disintegration of the voluntary market. A tool that is essential in simple two-party patent disputes does not lose its appeal in the context of SEPs.

The flawed remedial structure announced in *eBay* is further aggravated in the interpretation and enforcement of patent remedies in multiparty situations, most notably in connection with SEPs that are licensed under FRAND principles. The transaction costs in this context are even higher than in the ordinary patent context, and the correct allocation of rights and default rules is thus even more critical.<sup>71</sup> “Correct” rules are those that (i) move the parties toward the Pareto-optimal outcome they would otherwise reach through negotiation in the absence of transaction costs, (ii) adopt practices that reduce transaction costs in order to promote negotiated solutions over litigation, and (iii) uphold and enforce the results of parties’ preexisting contractual solutions. “Incorrect” rules create the opposite effects, and their distortionary impacts are difficult to bargain around precisely because of high uncertainty and high transaction costs.

In the FRAND context, a mixed remedial system that begins with the presumption of an injunction in cases of refusals to deal and bad faith negotiations by the putative licensee is the correct approach in that it serves each of the above objectives. It is the very threat of the injunction right—and its associated high transaction costs—that brings the parties to the negotiating table and motivates them to draw upon the full scope of their knowledge and creativity in forming contractual and institutional solutions to the perceived holdup problem.<sup>72</sup> Indeed the FRAND architecture—and all of its attendant benefits and positive externalities—has arisen *because of* the presumption of injunctive relief, not despite it.

Patent pools for standard-essential patents present another important illustration of the merits of an injunction-first remedial approach. These

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71. R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960). For the enduring viability of this notion, see also Pierre Schlag, *The Problem of Transaction Costs*, 62 S. CAL. L. REV. 1661, 1663 n.9 (1989) (citing RICHARD POSNER, *ECONOMIC ANALYSIS OF LAW* 38, 46–47, 68–69, 81, 82–83, 90, 93–94, 104, 113–14, 122–23 (3d ed. 1986)); *Merges*, *supra* note 8, at 2655–62.

72. See *Merges*, *supra* note 8, at 2655 (“[I]n the presence of high transaction costs, industry participants have an incentive to invest in institutions that lower the costs of IPR exchange.”).



pools do not form *before* the standard is selected, largely because at that juncture no one knows the standard, and thus cannot determine which patents read onto the standards and which do not. Indeed, any effort to bargain for inclusion of a predetermined portfolio of patents before the deliberations are concluded makes it much more likely that an inferior standard will be selected. “The actual creation of pools typically occurs late in the standard life cycle.”<sup>73</sup>

At this juncture, the standard tends to reduce transaction costs in two ways. First, it makes it easier for various firms that hold patents that read onto the standard to negotiate with each other. Oftentimes, a two-stage negotiation works better than a single negotiation with a large number of parties. Thus, if twenty-four persons hold patents that read onto the standard, it could be easier to find solutions if some separate pools, not necessarily of equal size or value, are created. Some patents may be in groups of six, others in groups of four. Indeed, there is nothing about this process that requires that all patents be placed into pools once the standard is set. It could well be that parties that hold especially strong patents will prefer to negotiate separately. When patents are placed into pools, there is always the risk that the agreement among pool members on royalty rates will include, often by error, implicit cross subsidies. But that risk is in turn reduced if all the patents appear at the *ex ante* stage to have roughly equal value, which makes the first level of bargaining more efficient.

The use of these pools thus increases the returns on investment of all patent holders from the *ex ante* perspective.<sup>74</sup> They also make it easier to allow for cross-licensing among multiple patent owners in ways that reduce the potential of infringement suits that exist when a given portion of the patent terrain is covered by multiple patents. Just as having small plots of real estate in separate hands increases the likelihood of trespass, so too holding patents of small terrain does the same in the IP space. The pooling solutions thus provide benefits not only in dealing with the outside world, but in dealing with other FRAND members, and the negotiations in these cases can then serve as useful benchmarks for the negotiations with external parties.

Even holders of patents that ultimately *do not* read onto standards are left better off *ex ante*, given that the anticipated returns from success are higher with a viable pooling option available after the standard is set. And

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73. Justus Baron & Tim Pohlmann, The Effect of Patent Pools on Patenting and Innovation—Evidence from Contemporary Patent Standards 12 (Feb. 2, 2015) (unpublished manuscript), [http://www.law.northwestern.edu/research-faculty/searlecenter/innovationeconomics/documents/Baron\\_Pohlmann\\_effect\\_of\\_patents.pdf](http://www.law.northwestern.edu/research-faculty/searlecenter/innovationeconomics/documents/Baron_Pohlmann_effect_of_patents.pdf).

74. *Id.*



in many cases, firms may come with portfolios of patents, some of which read onto a particular standard even if others do not. Accordingly, some measure of diversification reduces the size of the downside. Hence, the expectation is that patent pools should increase returns to the members of the pool. The logic runs as follows: once one part of the standard is clarified, non-pool parties know that their negotiation costs will be reduced because they need to deal with fewer parties in a less complex legal environment. The conflicts of interest which typically crop up in labor-management negotiations are thus muted because of the very different bargaining structures, which are, at all stages, calculated to achieve maximum gain.

The formation of these pools also has its impact on the second stage of negotiations, which occurs between holders of patents subject to FRAND obligations and outside parties. The standard in this context is, of course, necessarily vague when it is stated in the abstract, but the high rate at which these negotiations have historically concluded suggests that this vagueness leads to fewer breakdowns than one might expect a priori. One reason is that the formation of pools will *reduce* the number of separate negotiations that take place. Another is that these negotiations all take place in a fishbowl, meaning that an intransigent stand by any one holder of a SEP will place pressure not only on the prospective licensees but also on those FRAND licensors for the same standard who hold the complementary patents whose value will be reduced if any inefficiencies in the final standard lead to its rejection in the marketplace. In addition, it is likely that there is some overlap between the group of innovators and implementers, for some technology players will hold dual roles of licensor and licensee. This close interdependence extends not only to any single pool but also to other similar pools, creating an environment in which repeat players have to weigh the loss of future opportunities against the possible gains of an aggressive stance in the immediate transaction.

All of these soft pressures typically push parties to make deals so that the FRAND patents do not sit idle while the underlying negotiations take place. These pressures tend to speed up the process of coordination. The effort to impose various independent substantive rules on the operation of this process is highly costly because it involves the examination of the rate of patent utilization in alternative states of the world which are both unobservable and difficult to infer from existing practices. Words like “reasonable royalties” and “incremental damages” may roll easily off the page in government reports, such as the 2011 FTC report entitled “*The Evolving IP Marketplace: Aligning Patent Notice and Remedies with*

*Competition*,”<sup>75</sup> where it is sometimes stated that sound practice requires, “when it can be determined, [for] the incremental value of the patented invention over the next-best alternative [to] establish[] the maximum amount that a willing licensee would pay in a hypothetical negotiation,” and for “[c]ourts [to] not award reasonable royalty damages higher than this amount.”<sup>76</sup> But it is never clear which the next best alternative is when there are two or more, or how that reasonable royalty rate should be determined.<sup>77</sup> Note that the voluntary practice, when goaded by the injunction, does not need any independent body to both define and apply these slippery definitions in complex cases. It is also worth noting that the administrative costs needed to work out either of these rates will necessarily result in the decline in value of all standards going forward; after all, once the law imposes any external standard, the parties will perforce bargain to that background norm, even if it conflicts with prior industry norms and practices, which may of course vary from industry to industry. Calculating marginal benefits and costs is extraordinarily difficult, and often unnecessary given that parties need not know what these are.

The courts neither have the information nor the institutional capacity of replicating, much less improving upon, contractual and institutional arrangements such as FRAND and SEP patent pools, which have arisen *because of* the presumption of injunctive relief.<sup>78</sup> Thus, at least in the SEPs context, it would seem logical for the courts to push the parties toward negotiated and coordinated solutions through a strong recognition of property rights backed by a principled preference for injunction relief.

That is particularly true given that the theoretical boogeyman of “royalty stacking”—a principal justification for subverting injunctive relief—has been empirically debunked. In industries subject to innovation-driven standardization, such as mobile handsets, the consistent evidence points to a combination of sharp price decreases and massive technological progress, as well as low aggregate patent royalty payments and increasing market penetration.<sup>79</sup> The notion that implementers in such innovation-driven industries are being suffocated by an insurmountable patent royalty stack has turned out to be nothing more than horror fiction. This reality is perhaps

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75. FED. TRADE COMM’N, THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION 147 (2011).

76. *Id.* at 189.

77. For a longer critique of the 2011 report, see Epstein et al., *supra* note 43.

78. See Merges, *supra* note 24, at 1346 (“Without property rights—backed by the threat of production-choking injunctions—the advantages conveyed by the [patent] pool[s] would never have been realized.”).

79. See *supra* note 17.

best demonstrated by the fact that Google has chosen to enter the mobile handset business,<sup>80</sup> and Nokia has also elected to reenter that business after several years of seeking to monetize its innovations exclusively through FRAND licensing agreements.<sup>81</sup> If the FRAND licensing business were as lucrative as stacking theory predicts, Nokia would have remained a patent licensing company, rather than reentering the product space. And, if royalty stacking were true, an entity as sophisticated (and opportunity-rich) as Google would not have waded into making and selling mobile handsets.<sup>82</sup>

Yet as the following Part describes, courts in the United States have largely taken the opposite approach by defaulting to liability rules without due regard for property rights, even in the face of evidence of patent holdout by implementers,<sup>83</sup> which is facilitated by misinterpreting and thus redefining FRAND as a wholly one-sided agreement that only serves implementers' interests. These efforts have yielded "incorrect" results in that they have not moved the parties toward the Pareto-optimal outcome they would achieve absent transaction costs, upheld the results of their contractual agreements, or incited them toward negotiated solutions. Instead, they have merely encouraged even greater litigation.

#### **IV. THE EROSION OF THE FRAND FRAMEWORK IN RECENT JUDICIAL DECISIONS AND SDO INTELLECTUAL PROPERTY RIGHTS POLICY REVISIONS**

As noted in Part II, the FRAND framework is deliberately vague in order to provide critical flexibility for parties to shape its contours to the

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80. Tim Higgins & Nathan Olivarez-Giles, *Google Announces New Pixel Smartphones, Amazon Echo Rival*, WALL ST. J. (Oct. 5, 2016, 9:23 AM), [www.wsj.com/articles/google-to-detail-amazon-echo-fighter-called-home-new-phones-1475592365](http://www.wsj.com/articles/google-to-detail-amazon-echo-fighter-called-home-new-phones-1475592365).

81. Rory Cellan-Jones, *Nokia Dials Back Time to Sell Mobile Phones Again*, BBC (Dec. 1, 2016), <http://www.bbc.com/news/technology-38167451>.

82. Of course, Google may see profit opportunities in the handset space that go beyond per unit profits from device sales. But it is ultimately irrelevant how Google expects to capture value from entering the mobile handset market. The point is simply that Google's decision to enter the market necessarily reveals that Google sees a significant opportunity for large supra-competitive profits. That fact directly contradicts the gloomy prediction of royalty-stacking theory that aggregate patent royalties will cause firms to "not find it worth incurring the costs necessary to develop, manufacture, and sell" products like mobile handsets. See Lemley, *supra* note 7, at 2012.

83. See Merges, *supra* note 8, at 2662 (observing that a strong property rights rule for patents facilitates contractual solutions to patents' high transaction costs, whereas liability rules "work against the flexible, voluntary institutions that are formed to overcome the costs faced by transactors").

particular circumstances of their negotiations. Notwithstanding its virtues, that amorphousness will, from time to time, bring the parties to litigation.<sup>84</sup> In response, courts have too often ignored the contractual and mutual exchange that underlies the FRAND bargain, as well as the criticality of enforcing the obligation of good faith and fair dealing on *both* sides. In its place they have instead attempted to “clarify” FRAND itself, beginning with the false premise that FRAND was principally created to promote “widespread” standardization and to avoid “patent holdup,” *i.e.*, that FRAND was created for the benefit of implementers alone and should thus be interpreted with a presumptive preference toward those interests.<sup>85</sup> Working from this incorrect premise, courts have largely ignored the injunctive remedy even in the face of evidence that the implementer refused to negotiate at all, or at least in good faith, and have also concluded that innovators should take no share of the commercial benefits accruing from standardization of their innovations.

As we illustrate in this Part, the choice between the two strategies—a principal preference for liability rules or a mixed approach that begins with the injunction remedy—is not just a zero-sum game. Indeed, in the face of high transaction costs, pure liability rules tend both to encourage “patent holdout” by implementers and to shortchange innovators in *ex post* allocations of the cooperative surplus created by FRAND negotiations. Taken together, these two forces reduce the rate of return to innovation overall and to FRAND commitments in particular. Innovators are acutely responsive to such incentive changes in this context, and *ex post* devaluations of their returns from the FRAND game in a given round necessarily have feedback effects on their willingness to participate in subsequent rounds. In practice, they might then refuse to license their innovations to the industry as a whole, preferring to develop them internally or form limited strategic innovation-development partnerships with only a select set of industry participants. And if neither of the former alternatives

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84. *See, e.g.*, *Microsoft v. Motorola*, 2013 WL 2111217, at \*10 (W.D. Wash. April 25, 2013); *In re Innovatio IP Ventures, LLC Patent Litig.*, No. 11 C 9308, 2013 WL 5593609, at \*5 (N.D. Ill. Oct. 3, 2013); *Apple v. Motorola*, 757 F.3d 1286, 1332 (Fed. Cir. 2014); *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1233 (Fed. Cir. 2014); *Commonwealth Sci. & Indus. Research Org. (“CSIRO”) v. Cisco Sys.*, 809 F.3d 1295, 1304–05 (Fed. Cir. 2015); *Microsoft v. Motorola*, 795 F.3d 1024, 1052 (9th Cir. 2015).

85. *See, e.g.*, *Microsoft*, 2013 WL 2111217, at \*10 (“The purpose of the RAND commitment is to encourage widespread adoption of the standard.”); *id.* at \*20 (“In trying to reach an agreement, the SEP owner would have been obligated to license its SEPs on RAND terms which necessarily must abide by the purpose of the RAND commitment of widespread adoption of the standard through avoidance of holdup and stacking.”).

is appealing, they might instead reduce their research and development allocations across the board. Moreover, if these same parties function as innovators in different markets, they should get the benefit of the robust protection of FRAND-committed patents advanced by the rule defended in this essay: the willingness to participate in a FRAND regime should not foreclose the issuance of an injunction against parties that seek to avoid the negotiation process, *i.e.*, unwilling licensees.

The decisions of the Federal Circuit in *Apple v. Motorola*<sup>86</sup> and the Ninth Circuit in *Microsoft v. Motorola*<sup>87</sup> are illustrative of the prevailing hostility toward injunctions in the FRAND context—even where there is evidence of an unwilling licensee—and the dangers of that bias.

In *Apple v. Motorola*, Motorola had sought an injunction on the grounds that Apple had negotiated in bad faith by refusing Motorola's licensing offers, which Motorola contended were on FRAND terms, and by stalling negotiations.<sup>88</sup> Judge Richard Posner, sitting by designation on the district court, denied that request on summary judgment.<sup>89</sup> On appeal, a majority of the Federal Circuit panel applied the four-part balancing test set forth in *eBay*, holding that the combination of Motorola's FRAND commitment and its willingness to license its patent effectively foreclosed a finding of either irreparable harm or that monetary damages alone would be inadequate.<sup>90</sup> And while the majority opinion, authored by Judge Jimmie Reyna, nominally acknowledged that "an injunction may be justified where an infringer unilaterally refuses a FRAND royalty or unreasonably delays negotiations to the same effect," it nonetheless concluded that Apple should not be enjoined because "negotiations have been ongoing, and there is no evidence that Apple has been, for example, unilaterally refusing to agree to a deal."<sup>91</sup>

The inconsistency between the court's legal statement and its holding was not lost on Judge Randall Rader, who wrote separately to concur and dissent in part. He concurred that a unilateral refusal to take a FRAND license should trigger an injunction. But he dissented from the majority's affirmance of the denial of Motorola's injunction request. Judge Rader instead found "evidence that Apple may have been a holdout" and criticized the majority's unwillingness to analyze whether Apple's refusal to license

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86. 757 F.3d 1286 (Fed. Cir. 2014).

87. 795 F.3d 1024 (9th Cir. 2015).

88. *Apple*, 757 F.3d at 1332.

89. *Id.* at 1331.

90. *Id.* at 1332.

91. *Id.*

on Motorola’s offered terms was a refusal of a “FRAND royalty.”<sup>92</sup> He further cited evidence that Apple had refused for years to even discuss a license while nonetheless infringing the patent in suit.<sup>93</sup>

Judge Sharon Prost, on the other hand, also wrote separately to express the opposite opinion. While she agreed with the majority opinion that Motorola did not qualify for an injunction, she disagreed with both Judge Reyna and Judge Rader “that an alleged infringer’s refusal to enter into a licensing agreement justifies entering an injunction against its conduct.”<sup>94</sup> Instead, she took the view that an implementer’s negotiation conduct—no matter how intransigent—should never justify granting an injunction to the holder of the SEP.<sup>95</sup>

These fractured views appear to explain the internal inconsistency between the statement of the law in *Apple* and its holding. Yet whatever the reasons, the ensuing decision appears to stand for the troubling proposition that a proven infringer of FRAND-encumbered patents may avoid an injunction so long as it maintains the semblance of ongoing negotiations, regardless of whether it has refused to accept FRAND licensing terms. Stated otherwise, *Apple* conflates a unilateral refusal to accept a FRAND deal (which is the relevant inquiry) with a unilateral refusal to engage in discussions regarding *any* deal (which is a toothless standard).

By suggesting that an implementer acts in good faith by simply maintaining a negotiation dialogue, without also considering whether the implementer has refused to accept a proper FRAND licensing offer, the *Apple* majority opinion encourages two erroneous outcomes. First, it suggests that innovators should continue to negotiate even after they have offered a license on FRAND terms, thus necessarily eroding their bargaining power and the value of FRAND-encumbered patents. Second, it suggests that an injunction may not be available unless an implementer refuses to engage in any licensing discussions at all, even if it has rejected FRAND terms, magnifying the same effect.

Subsequently, in *Microsoft v. Motorola*, the Ninth Circuit made a similar error. The case arose out of two letters in which Motorola made opening offers to license its standard-essential patents covering certain Wi-Fi and video encoding standards at a rate of 2.25% of the sales price of the end products—offers that Motorola represented were consistent with its

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92. *Id.* at 1332–34 (Rader, J., dissenting in part).

93. *Id.* at 1333–34 (Rader, J., dissenting in part).

94. *Id.* at 1342–43 (Prost, J., dissenting in part).

95. *Id.*



FRAND obligations.<sup>96</sup> The letters stated the offers were available for twenty days. Microsoft did not make a counteroffer or engage in any negotiations. Instead, before the end of that twenty-day period, Microsoft sued Motorola, asserting Motorola's initial offer was a breach of its FRAND commitments.<sup>97</sup> The next day, Motorola responded with a countersuit seeking an injunction from the district court, and also filed for an injunction with the International Trade Commission ("ITC").<sup>98</sup> Microsoft, in turn, amended its complaint to assert that Motorola had further breached its FRAND commitments by pursuing injunctions.<sup>99</sup>

The district court set out to determine a FRAND range for the Motorola portfolios in order to determine whether Motorola's opening licensing offer was a breach of its FRAND commitment. In a 207-page opinion, the court concluded that the top end of the FRAND range was approximately 16 cents per unit for the video encoding portfolio and 19 cents per unit for the Wi-Fi portfolio—figures that were notably lower than Motorola's opening offer.<sup>100</sup> Those rates were then presented to a jury, which was asked whether Motorola violated its duty of good faith and fair dealing by seeking an injunction. The jury found against Motorola and awarded Microsoft damages that included the attorneys' fees Microsoft incurred in defending the injunction actions.<sup>101</sup>

On appeal, the Ninth Circuit reviewed the sufficiency of the evidence underlying that verdict. The appellate court accepted the jury's finding that Motorola had breached its duty of good faith and fair dealing by pursuing injunctions, citing four categories of evidence.<sup>102</sup> Notably, the Ninth Circuit reasoned that because Motorola could have ultimately obtained a FRAND award from the district court, it lacked a legitimate fear of irreparable harm. From there, the appellate court made the leap that, "[i]n the absence of a fear of irreparable harm as a motive for seeking an injunction, the jury could have inferred that the real motivation was to induce Microsoft to agree to a license at a higher-than-[F]RAND rate."<sup>103</sup> In conclusion, the Ninth Circuit embraced the theory that a FRAND-encumbered patentee may violate its duty of good faith and fair dealing and breach its FRAND commitment by seeking injunctive relief, at least where it has not first offered a license on

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96. Microsoft v. Motorola, 795 F.3d 1024, 1032 (9th Cir. 2015).

97. *Id.*

98. *Id.*

99. *Id.*

100. *Id.* at 1033.

101. *Id.* at 1034.

102. *Id.* at 1047.

103. *Id.* at 1046.



FRAND terms.<sup>104</sup> With respect to damages, the Ninth Circuit held that Microsoft was entitled to the attorneys’ fees it incurred in defending against the injunctions because such fees were “consequential contract damages” arising out of Motorola’s breach of its FRAND obligations.<sup>105</sup>

In a similar vein, in March 2015 the IEEE adopted a set of IPR policy revisions in which it stated that a FRAND commitment to the IEEE “precludes seeking, or seeking to enforce” an injunction except in two narrow circumstances: (1) where “the implementer fails to participate in, or to comply with the outcome of, an adjudication, including an affirming first-level appellate review,” or (2) “[i]n jurisdictions where the failure to request a Prohibitive Order in a pleading waives the right to seek a Prohibitive Order at a later time.”<sup>106</sup> Notably, the IEEE’s policy does not even permit patentees to pursue an injunction where an implementer has categorically refused to take a license on FRAND terms or to negotiate in good faith, and is thus even more restrictive than *Apple* and *Microsoft*.

The critical flaw with the combined result of the Ninth Circuit and Federal Circuit decisions (and the IEEE’s policy revision) is that it gives implementers a “heads I win, tails you lose” litigation alternative to pursuing good-faith negotiations, with the dual negative effects of categorically lowering the value of FRAND-encumbered patents and discouraging negotiated resolutions. Recall that in *Microsoft*, the dispute arose out of Motorola’s opening offer, to which Microsoft only responded by immediately filing a lawsuit—an approach the district court and Ninth Circuit ultimately embraced and rewarded. Motorola’s injunction request only came after Microsoft’s lawsuit and was not the genesis of the parties’ litigation proceedings. Yet the Ninth Circuit held that an innovator’s opening offer in a FRAND negotiation is subject to such a stringent duty of good faith that an innovator may not seek injunctive relief even where an implementer refuses to make any good faith counteroffer in the negotiations.

Thus, under *Microsoft*, an implementer of FRAND-encumbered SEPs has numerous motivations and few disincentives to respond to an opening licensing offer with a lawsuit. If the innovator’s opening offer is later determined to have been FRAND, the implementer can accept the offer at

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104. *Id.* at 1048–49, n.19 (citing *Realtek Semiconductor Corp. v. LSI Corp.*, 946 F. Supp. 2d 998, 1006 (N.D. Cal. 2013), for the proposition that seeking injunctive relief “before offering a license on [F]RAND terms” is inherently inconsistent with the FRAND commitment) (emphasis added).

105. *Microsoft v. Motorola*, 795 F.3d 1024, 1049 (9th Cir. 2015).

106. IEEE, *supra* note 10, § 6.2 at 16–18.

that time, several years down the road. While the implementer would be aware of the nominal risk of an injunction under such facts,<sup>107</sup> it would be willing to take that risk since, under *Microsoft* and *Apple*, mere participation in court-ordered mediation sessions and a post-litigation agreement to pay the judicially determined FRAND rate would appear to obviate both “irreparable harm” and bad faith, and thus the ability to obtain an injunction.<sup>108</sup> If, on the other hand, the opening offer is later determined to have been above FRAND, the implementer will pay the lower FRAND rate and may also obtain its attorneys’ fees if, for instance, the opening offer is deemed to have erred from FRAND beyond the zone of good faith. Either way, by filing suit the implementer will also force the innovator to incur many millions of dollars in litigation costs, the value of which will not be reflected in the court’s FRAND determination.<sup>109</sup>

Innovators, in turn, must take these realities into account in making their opening offers. Under the specter of *Microsoft*, the correct opening offer is no longer one that positions the parties to conclude a license on FRAND terms, but rather one that is likely to be FRAND from the outset. Perhaps the implementer will make a counteroffer, but under prevailing law that offer will not be tested against the same good faith standard that is applied to innovators. Hence, availing itself of that option is likely to only generate further delay, which could work to the implementer’s advantage. If the innovator rejects, the implementer can sue and, at worst, can later accept the innovator’s initial offer. Meanwhile, the implementer can argue that any untested counteroffer conclusively demonstrates good faith under *Apple*.

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107. See *Microsoft*, 795 F.3d at 1048, n.19 (agreeing with the Federal Circuit in *Apple* that “if an infringer refused to accept an offer on [F]RAND terms, seeking injunctive relief could be consistent with the [F]RAND agreement, even where the commitment limits recourse to litigation”).

108. See *id.* at 1046 (holding that Microsoft’s payment of a judicially determined FRAND rate would have “fully compensated for Microsoft’s infringing use” and that the potential availability of such an award precluded the possibility of irreparable harm). *Apple v. Motorola* also states:

Motorola’s FRAND commitments . . . strongly suggest that money damages are adequate to compensate Motorola for any infringement. Similarly, Motorola has not demonstrated that Apple’s infringement caused it irreparable harm. . . . Motorola argues that Apple has refused to accept its initial licensing offer and stalled negotiations. However, the record reflects that negotiations are ongoing, and there is no evidence Apple has been, for example, unilaterally refusing to agree to a deal.

757 F.3d 1286, 1332 (Fed. Cir. 2014).

109. See *Apple*, 757 F.3d at 1342 (Rader, J., dissenting in part) (“In the absence of the threat of an injunction, an infringer would have no incentive to negotiate a license because the worst-case scenario from a patent infringement lawsuit is that it would have to pay the same amount it would have paid earlier for a license.”).

Accordingly, under *Microsoft* and *Apple*, innovators are pressured to begin at FRAND, and only go lower. Even more troubling, this effect will compound itself as innovators pursue further licenses. Once the first implementer has taken a license, the next implementer will point to the “nondiscriminatory” aspect of FRAND to argue that its licensing rate should not be higher but should certainly be lower. The innovator must either acquiesce or, again, enter litigation in which it can essentially do no better and only do worse. The only way out of this downward spiral is, paradoxically, for the innovator to make an initial offer that it feels is safely FRAND (or at least sufficiently close to be in good faith) and then to embrace litigation (and its attended costs and delays) if the implementer does not accept the initial offer. Accordingly, the end result of this sequential game theory is a mutual motivation toward litigation and away from negotiated resolutions, as well an overall devaluation of FRAND–encumbered patents. This in turn undermines the FRAND–enabled innovation marketplace.

These difficulties arise out of a misallocation of rights among the bargaining parties. Under *Microsoft* and *Apple*, implementers face no credible injunction risk from pushing FRAND negotiations into the courts in search of a lower rate and greater leverage. On the other hand, innovators face the risk of a breach of contract and breach of duty of good faith claim merely based on their opening offers alone. This allocation of rights and risks is particularly misguided since innovators have every reason to avoid litigation costs and secure immediate revenues by engaging in licensing negotiations in good faith, whereas implementers inherently gain from delay, with the gains from reducing the ultimate royalty rate often far exceeding the typical costs of litigation. The entire situation would be radically altered by one key change in the rule: the innovator should be allowed to attack the counteroffer by the implementer because it is below the permissible range of a FRAND offer and is thus not in good faith. Only if both sides are at risk is there pressure for mutual good faith negotiations.

The recent case of *Core Wireless v. LG Electronics* illustrates the dangers of a one–sided legal regime. In 2011, Microsoft and Nokia jointly formed Core Wireless to hold approximately 2,000 Nokia patents covering both standard–essential technologies and nonessential implementation technologies.<sup>110</sup> The portfolio was then assigned to Conversant Intellectual Property Management, an experienced patent licensing specialist, who assumed responsibility for licensing the portfolio, as well as all associated

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110. See Ben Dummett, *Nokia Sells 2,000 Patents*, WALL ST. J. (Sept. 2, 2011).

patent litigation and patent prosecution legal costs, in exchange for a revenue sharing agreement with Nokia and Microsoft.<sup>111</sup> Conversant initiated negotiations with LG Electronics, among others. As the district court observed in awarding enhanced infringement damages against LG five years later:

After a long series of meetings between the parties, including seven meetings in Seoul, Korea, LG invited Core Wireless representatives to Korea one last time and indicated that it would be making a monetary offer for a license. Rather than make an offer or engage in serious, good faith negotiations, LG delivered a terse one-page presentation stating that a lawsuit was “preferable” to a license, and that LG would prefer to wait until another major cell phone manufacturer licensed the portfolio, at which point LG intended to be “a follower” in the established royalty scheme.<sup>112</sup>

In other words, LG appears to have pursued a path of “patent holdout” and “efficient infringement.” And while Core Wireless ultimately prevailed in litigation, it was forced to expend nearly \$6.8 million in legal fees and expert fees,<sup>113</sup> and incur many years of delay, in order to obtain an award of \$2.736 million.<sup>114</sup> Thus, as *Core Wireless* illustrates, the dangers of an initial misallocation of legal rights and obligations in the FRAND context are not merely theoretical or academic, but are real and powerful. Absent a credible injunction threat, LG appears to have faced no compelling reason to bargain in good faith, and instead *invited* litigation, driven—according to the district court—“not by the merits or strength of its non-infringement and invalidity defenses,” but rather “by its resistance to being the first in the industry to take a license,”<sup>115</sup> and its apparent calculation that the potential benefits from the litigation game, from its standpoint, were more than worth the candle.

Correcting the pervasive effects of these misguided incentives requires changing the incentives themselves. Thus, the better approach is to hold, as noted above, that an implementer has a concrete and reciprocal duty to

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111. *Id.*

112. *See* Core Wireless Licensing S.a.r.l. v. LG Elecs., Inc., No. 2:14-CV-912-JRG, 2016 WL 10749825, at \*1 (E.D. Tex. Nov. 2, 2016).

113. *See* Core Wireless’s Motion for Attorneys’ Fees and Expert Witness Fees at \*1 n.1, Core Wireless Licensing S.a.r.l. v. LG Elecs., Inc., No. 2:14-CV-912-JRG (E.D. Tex. Nov. 30, 2016), 2016 WL 10749825.

114. *See* Core Wireless, 2016 WL 10749825, at \*2. Core Wireless also moved for an award of attorneys’ fees and expert fees. These motions are pending as of this writing.

115. *See id.*

negotiate a FRAND license in good faith, and that a breach of that duty automatically and necessarily gives rise to an injunction, which an innovator may pursue at the outset of the litigation. To the extent such an approach must be tied to the *eBay* four-factor test, it would be supported under factor three—“that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted”—which should be the only relevant consideration under such circumstances.<sup>116</sup> Under that approach, an implementer may not respond to an innovator’s first offer with a lawsuit, but instead must make a good faith offer in furtherance of a FRAND agreement and must have that offer rejected before it can sue the innovator for breach of the FRAND duties.<sup>117</sup> In other words, the implementer has no cause of action for breach of the FRAND commitment until it has made a good faith offer of its own. Moreover, if an implementer rejects a good-faith FRAND offer from an innovator, the implementer is automatically subject to an injunction if the patents at issue are adjudicated to be valid and infringed. The injunction would not apply if the innovator’s offer is found to be outside the good-faith range of FRAND, and an injunction would also not be available if the implementer is found to have made a good-faith pre-suit FRAND offer. Finally, an implementer that has made a good-faith offer and either received no counteroffer or a bad-faith counteroffer may sue the innovator. If the claim prevails, the innovator must grant a license in accordance with the implementer’s good-faith pre-suit offer and must also pay the implementers reasonable attorneys’ fees.

The above approach moves the parties away from the courtroom and toward the negotiating table, where they can craft mutually agreeable solutions to their licensing disputes against the backdrop of balanced legal rights and remedies for bad-faith conduct on either side.

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116. *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 391 (2006).

117. Judge Leonard Davis made similar observations in *Ericsson v. D-Link Systems*, where he noted:

RAND licensing also includes an obligation to negotiate in good faith. This obligation is a two-way street. As potential licensees in a RAND negotiation, Defendants possessed an obligation to negotiate in good faith and earnestly seek an amicable royalty rate. They failed to do so. Defendants’ entire argument boils down to the fact that they believed Ericsson’s initial RAND offer was too high. However, Ericsson’s \$0.50 offer was only the starting point in the negotiations. Defendants never meaningfully engaged Ericsson in RAND licensing negotiations after the initial offer. Further, the fact that the RAND rate was ultimately litigated in court does not make Ericsson’s initial offer unreasonable.

*Ericsson Inc. v. D-Link Sys., Inc.*, No. 6:10-CV-473, 2013 WL 4046225, at \*25 (E.D. Tex. Aug. 6, 2013), *aff’d in part, vacated in part, rev’d in part*, 773 F.3d 1201 (Fed. Cir. 2014).

Indeed, in July 2015, the European Union Court of Justice (“CJEU”) adopted a similar approach in *Huawei v. ZTE*, in which it stated that a FRAND-encumbered patent holder may seek and obtain an injunction if: (1) it first gives the alleged infringer notice of its claims and the basis for its infringement allegations, including identifying the relevant standards provisions to which its patents are alleged to be essential, as well as a specific written offer on FRAND terms that identifies the royalty amount and how it is calculated; and (2) the implementer does not “diligently” respond with a good-faith response, *i.e.*, neither accepts the innovator’s offer nor makes a specific FRAND counteroffer.<sup>118</sup>

Like the approach proposed above, and unlike in *Microsoft*, the CJEU’s approach in *Huawei* does not allow an implementer to pursue claims against the innovator for breach of the FRAND agreement unless the implementer has at least provided a good-faith FRAND counteroffer, and thus promotes negotiation and cooperative solutions between implementers and innovators.<sup>119</sup>

The United Kingdom’s High Court of Justice (Patents) further advanced these principles in its recent decision in *Unwired Planet v. Huawei*.<sup>120</sup> *Unwired Planet* correctly recognized that “eliminating holdup value is not the only consideration to take into account” when seeking to apply FRAND.<sup>121</sup> Rather, “[i]n order to arrive at fair, reasonable and non-discriminatory license terms the patentee must not engage in hold up nor must the licensee engage in hold out.”<sup>122</sup> In order to create the proper incentives for such mutual good-faith conduct by licensors and licensees, *Unwired Planet* put forth the following two significant holdings.

First, *Unwired Planet* made clear that a licensee will not have a meritorious cause of action for anticompetitive conduct against a licensor who has simply sought a royalty rate that is “higher than the true FRAND rate.”<sup>123</sup> Rather, “for a royalty to amount to excessive pricing it would have to be *substantially* more than FRAND,” *i.e.*, “a royalty rate can be at least somewhat higher than the true FRAND rate and still not be contrary to competition law.”<sup>124</sup> Thus, an innovator’s licensing offers that are made “as a step in negotiation” should not give rise to a cause of action by the

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118. Case C-170/13, *Huawei Tech. Co. v. ZTE Corp.*, 2015 E.C.R. 477, 60–71.

119. *See also Ericsson*, 2013 WL 4046225, at \*16 (“Intel cannot rely on its failure to negotiate to prove Ericsson’s failure to make a legitimate license offer.”).

120. *Unwired Planet v. Huawei* [2017] EWHC (Pat) 711 (U.K.).

121. *Id.* ¶ 95.

122. *Id.* ¶ 96.

123. *Id.* ¶ 153.

124. *Id.* (emphasis added).



implementer, even if the offers are ultimately determined to be “a number of times higher” than an adjudicated FRAND rate, so long as the offers were not intended to “prejudice or disrupt the negotiation,” *i.e.*, were made in good faith.<sup>125</sup> Relatedly, an innovator should not be deprived of the injunctive remedy simply because its pre-suit offers were above the ultimately adjudicated FRAND rate, and does not engage in “premature litigation” by commencing an infringement suit before first making an offer that is later determined to be truly FRAND.<sup>126</sup>

Second, *Unwired Planet* held that an injunction should apply to an implementer found to infringe a valid patent and who “refuses to take a license on terms found by the court to be FRAND.”<sup>127</sup> In such circumstances, the implementer should “not be entitled to the protection from injunctions provided for by the patentee’s FRAND undertaking” and instead would be properly “coerced” into taking a license on FRAND terms.<sup>128</sup>

In stark contrast to the correct incentives and policies advanced by the *Huawei v. ZTE* and *Unwired Planet v. Huawei* decisions, the IEEE’s 2015 policy revisions have only sown discord and undermined the FRAND framework’s basic purpose of bringing innovators and implementers into an innovation-driven standardization marketplace. For instance, since the IEEE adopted its highly one-sided injunction policy, key innovation contributors including Qualcomm, Nokia, Ericsson, and InterDigital have refused to abide by the policy revision and have also refused to make further FRAND commitments to the IEEE on those terms.<sup>129</sup>

Similarly, the Federal Circuit and IEEE’s “clarification” efforts with respect to the damages remedy in the FRAND context, *i.e.*, “reasonable royalties,” have also heavily skewed the playing field in implementers’ favor and thus created further distortionary effects and inefficiencies that undermine the FRAND regime.

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125. *Id.* ¶¶ 783–84.

126. *Id.* ¶ 755.

127. *Id.* ¶ 806(5).

128. *Id.* ¶ 167.

129. See, e.g., Richard Lloyd, *The IEEE’s New Patent Policy One Year on—the Battle That’s Part of a Bigger Licensing War*, IAM (May 6, 2016), <http://www.iam-media.com/blog/detail.aspx?g=e8f72d6e-a3f8-45d8-882f-3ebdd3a1d69e>; Susan Decker & Ian King, *Qualcomm Says It Won’t Follow New Wi-Fi Rules on Patents*, BLOOMBERG TECH. (Feb. 11, 2015, 2:29 PM), <https://www.bloomberg.com/news/articles/2015-02-11/qualcomm-says-new-wi-fi-standard-rules-unfair-may-not-take-part>.



As previously noted, a central purpose of the FRAND structure is to ensure that innovators are “adequately and fairly rewarded”<sup>130</sup> for the use of their technologies and are “motivated to contribute their patented technologies to the standards-development process.”<sup>131</sup> As SDOs like ETSI and ITU have long recognized and witnessed firsthand, patented innovations contribute enormous value to the standardization process and to the success of the standards and the products that implement them. Given innovators’ contributions to the success of innovation-driven standardization efforts like Wi-Fi and 4G, a “reasonable royalty” approach intended to “adequately and fairly” compensate innovators and to “motivate” their continued contributions to the standards development process should allocate some portion of the gains from standardization back to innovators.

Yet the courts have repeatedly held otherwise.<sup>132</sup> Most notably in *Ericsson v. D-Link Systems, Inc.*,<sup>133</sup> the Federal Circuit held that the calculation of a reasonable royalty award for SEPs “should reflect the approximate value of [the patent’s] technological contribution, not the value of its widespread adoption due to standardization.”<sup>134</sup> In other words, *Ericsson* held that “any royalty award must be based on the incremental value of the invention, not the value of the standard as a whole or any increased value the patented feature gains from its inclusion in the standard.”<sup>135</sup>

The Federal Circuit reached that holding through heavy reliance on the Supreme Court’s decision in *Garretson v. Clark*,<sup>136</sup> which the *Ericsson* court concluded “requires apportionment of the value of the patented technology from the value of its standardization.”<sup>137</sup> The court’s reasoning began with the correct legal premise that a “patent holder should only be compensated for the approximate incremental benefit derived from his invention,”<sup>138</sup> but then veered off course by assuming, without any evidence

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130. ETSI Intellectual Property Rights Policy, *supra* note 20, at 35.

131. INT’L TELECOMM. UNION, *supra* note 30.

132. By missing the basic point of FRAND, courts demonstrate a continuing lack of understanding and appreciation for organizational innovations. See OLIVER E. WILLIAMSON, MARKETS AND HIERARCHIES: ANALYSIS AND ANTITRUST IMPLICATIONS 192–93 (1975).

133. 773 F.3d 1201 (Fed. Cir. 2014).

134. *Id.* at 1233.

135. *Id.* at 1235.

136. 111 U.S. 120 (1884).

137. *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1233 (Fed. Cir. 2014) (emphasis added).

138. *Id.* (citing *Garretson v. Clark*, 111 U.S. 120, 121 (1884)).

or meaningful analysis, that “widespread adoption due to standardization” is not an inherent benefit contributed by standard essential patents, and on that basis concluded that a SEP holder should derive no value from the gains associated with the standardization of its patented technology.<sup>139</sup>

The Federal Circuit subsequently reiterated *Ericsson*’s holding in *Commonwealth Scientific and Industrial Research Organisation (“CSIRO”) v. Cisco Systems*,<sup>140</sup> where it perpetuated the misguided notion that innovators are not rightly entitled to share in the “benefit created by standardization—benefit that would otherwise flow to consumers and businesses practicing the standard.”<sup>141</sup> Applying *Ericsson*, the court vacated the district court’s reasonable-royalty determination, which was based on actual licensing offers and discussions between the parties themselves, and instructed the lower court on remand to both “consider[ ] the standard’s role in causing commercial success” of the adjudicated infringing products and to consider an adjustment, *i.e.*, a decrease, to its royalty determination “for standardization.”<sup>142</sup>

And in March 2015, the IEEE incorporated this aspect of *Ericsson* into its IPR Policy, stating that a “Reasonable Rate” must exclude “the value, if any, resulting from inclusion of that [SEP] in the IEEE Standard.”<sup>143</sup>

The error underlying the above aspects of *Ericsson* and *CSIRO* is, as noted earlier, a failure to distinguish between two very different types of standards-creation processes: those that merely pick one uniform approach from a range of essentially equivalent alternatives, and those that *develop* technological advancements by evaluating and bringing together next-generation innovations for the widest impact and dissemination through standardization. These development standards seek to identify next-generation innovations and to promote the widespread dissemination of those cutting-edge innovations through standardization. The 802.11 Wi-Fi standards, which were at issue in *Ericsson* and *CSIRO*, fall into that latter category, as do the successive generations of cellular telecommunications standards, from 2G through 5G.<sup>144</sup>

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139. *Ericsson*, 773 F.3d at 1233.

140. 809 F.3d 1295 (Fed. Cir. 2015).

141. *Id.* at 1305.

142. *Id.* at 1305–06.

143. IEEE, *supra* note 10, § 6.1 at 16.

144. For an example, *see* the ETSI’s explanation of “What We Do,” which states: We facilitate the early exchange of information between the research and standardization communities. Researchers benefit from early exposure to the issues they face in industrial take-up of their ideas. Industry benefits from faster exploitation of research results. Research input is

The apportionment requirement of *Ericsson* and *CSIRO* makes sense in the former context, i.e., technology-agnostic “standard setting,” which, by definition, derives no particular benefit from selecting one approach over another.

But *Ericsson* and *CSIRO*’s apportionment requirement (and the IEEE’s adoption of that requirement) is wholly misguided when applied to the latter context of innovation-driven standards development. In this scenario, it would be virtually impossible to achieve meaningful technological advances across generations of standards without the close participation and extensive technological contributions of innovators like Qualcomm, Nokia, and Ericsson. And those innovative contributions are the result of significant risk and investment<sup>145</sup>—exceeding billions of dollars per year<sup>146</sup>—which innovators undertook with the full expectation of “adequate and fair” returns as set forth in their FRAND contractual agreements. Properly understood, the standards-development process is a collaborative joint venture between innovators and implementers in which both parties seek to maximize the commercial success of their respective contributions, including through widespread adoption of the standards and thus the creation of a widespread market for their innovations and products. Having achieved that goal, both parties to the venture should share in the benefits of their mutual standardization efforts.

By requiring apportionment of the value of standardization in *all* cases, *Ericsson* and *CSIRO* appear to conflate innovation-driven standards development (which was relevant to those cases) with technology-agnostic

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very relevant in early study phases, when alternative technical solutions have to be evaluated.

ETSI, *What We Do: From Research to Standards*, <http://www.etsi.org/about/what-we-do/research> [<https://perma.cc/4QH7-LWAL>]

145. David J. Teece, *The “Tragedy of the Anticommons” Fallacy: A Law and Economics Analysis of Patent Thickets and FRAND Licensing*, 32 BERKELEY TECH. L.J. 1489 (2017).

146. See, e.g., Brief of Amicus Curiae Qualcomm Incorporated In Support of Neither Party at \*2, *Microsoft v. Motorola*, 795 F.3d 1024 (9th Cir. 2015) (No. 14-35393), 2014 WL 4802385 (noting that Qualcomm invests \$5 billion per year in research and development, amounting to 20% of its annual revenues).

standards setting (which was not),<sup>147</sup> <sup>148</sup> thereby depriving innovators of rightfully earned returns on their extensive R&D investments and contributions to successful standardization. This, in turn, further depresses the value of standard-essential patents and further rewrites the FRAND bargain to the detriment of innovators and, ultimately, innovation.<sup>149</sup>

*Garretson*—which was decided in 1884 and neither faced nor addressed any of the above standards-related considerations—should not be literally applied to cases like *Ericsson* and *CSIRO*. Rather, consistent with *Garretson* and *Georgia-Pacific Corp. v. U.S. Plywood Corp.*,<sup>150</sup> SEP infringement damages should reflect the value of the patentee’s contribution to the product’s commercial success, including through innovation-driven standards development.

Indeed, the vast majority of innovation-driven SDOs appear to disagree with *Ericsson*, *CSIRO*, and the IEEE on this issue, as no major SDO other than the IEEE has incorporated such an apportionment requirement into its IPR policy. Moreover, the IEEE’s incorporation of the *Ericsson*

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147. See *Ericsson v. D-Link Systems, Inc.*, 773 F.3d 1201, 1233 (Fed. Cir. 2014).

When a technology is incorporated into a standard, it is typically chosen from among different options. Once incorporated and widely adopted, that technology is not always used because it is the best or the only option; it is used because its use is necessary to comply with the standard. In other words, widespread adoption of standard essential technology is not entirely indicative of the added usefulness of an innovation over the prior art.

*Id.*; see also *Commonwealth Sci. & Indus. Res. Org. v. Cisco Sys.*, 809 F.3d 1295, 1305 (Fed. Cir. 2015) (“[T]he value of the technology . . . is distinct from any value that artificially accrues to the patent due to the standard’s adoption. Without this rule, patentees would receive all of the benefit created by standardization—benefit that would otherwise flow to consumers and businesses practicing the standard.”).

148. See *supra* Part II (distinguishing between technology-agnostic standard setting such as picking a side of the road to drive on and innovation-driven standards development).

149. See J. Gregory Sidak, *Apportionment, FRAND Royalties, and Comparable Licenses After Ericsson v. D-Link*, 2016 U. ILL. L. REV. 1809, 1867 (2016). Professor Sidak explains:

No economic or normative justification supports the assumption that all of the seller surplus from the standard should accrue to the implementers. Without the SEP holder’s contribution to the value of the standard, the implementer’s profit from the sale of the end product that practices the standard would not exist. There is no economically sound reason to deny an SEP holder any portion of the value of the standard that it helped to create.

*Id.*; see also *id.* at 1862–67.

150. 318 F. Supp. 1116 (S.D.N.Y. 1970) (developing an influential set of factors that courts consider when calculating reasonable royalties).

apportionment rule has led to the aforementioned mutiny by numerous members, including Qualcomm, InterDigital, Ericsson, and Nokia, who have refused to make FRAND assurances under the March 2015 policy.<sup>151</sup> And an analysis of the IEEE's response to members' opposition to that revision has identified "a statistically significant bias against the firms that opposed the bylaw amendments—primarily large SEP holders—and in favor of revisions designed to devalue SEPs."<sup>152</sup>

In sum, what is wholly lacking from this one-sided approach is an awareness that opportunism and holdups are a two-way street. A firm that invests heavily in a patent that reads onto a standard may be met by a refusal to deal from a potential FRAND licensee, who claims that the rate is above some supposed competitive rate of return. But beneath the objection lies the simple point that the refusal to accept terms may well deprive that patentee of the rate of return needed to make its investment worthwhile, just as can happen with common carriers and public utilities if faced with confiscatory rates. Therefore, in the abstract, the risks are far from symmetrical. Indeed, the greater the hue and cry about exploitation by the patentee, the more likely it is that the potential licensee can reduce the terms, knowing that injunctions will only be issued in rare cases that are not relevant to routine business transactions. Therefore, at this point, whenever the specter of bilateral opportunism arises, where does the greater peril lie? In many instances, the most likely source of abuse lies with the putative licensee, who already has what it wanted (use of the innovator's valuable technology as part of its products and the standard) and who (absent a court order) can profit from that technology through its product sales without paying anything to the innovator at all. And the prospective licensee's incentives for such opportunism only increase once it has little or no SEPs of its own to license out. The same situation arises when its counterparty is purely an innovator or patent holder, rather than an innovator-implementer. In such circumstances, the putative licensee in this round has little concern for maintaining good will with the putative licensor, as their roles will not be reversed in future rounds, thereby further weakening the elaborate set of soft institutional and social constraints that bind parties who both contribute patents to the SDO standard and practice that standard.

Refreshingly, the UK's High Court of Justice has recently pushed back against the implementer-centric tendencies of American courts and the IEEE. In *Unwired Planet*, the High Court held that FRAND does not compel that "the patentee could not appropriate some of the value that is

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151. See *supra* note 94 and accompanying text.

152. See Sidak, *supra* note 9, at 333.

associated with the inclusion of his technology into the standard and the value of the products that are using those standards,” and that it is “not necessary to deprive the patentee of its fair share of those two sources of value in order to eliminate hold up and fulfill the purpose of FRAND.”<sup>153</sup> Indeed, that point was undisputed by both sides in the *Unwired Planet* matter notwithstanding the Federal Circuit’s decisions in *Ericsson* and *CSIRO*.<sup>154</sup>

## V. IMPLEMENTER-CENTRICISM IN ITS LARGER LEGAL AND ECONOMIC CONTEXT

As we have shown, the misguided judicial and policy approaches we discuss in this Article appear driven by a presumptive and pervasive prejudice in favor of implementers and against innovators. The central thrust of that view is to minimize returns to innovation inputs via attractive but false theories like royalty stacking, all in order to augment returns to commercial embodiments and thus ensure (so the theory goes) that the production of commercial embodiments can continue.<sup>155</sup> These same philosophical foundations underlie the *eBay* decision, in which Justice Kennedy’s concurrence appeared to sound an alarm by 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,”<sup>156</sup> and which courts (particularly in America) have subsequently applied in a manner that effectively precludes the injunction remedy to companies that do not produce their own commercial embodiments of their inventions.<sup>157</sup>

Although we demonstrate and explore that object-centric bias through a focus on FRAND and the mobile handset marketplace, the sources of that bias run much deeper, and its troubling implications reach far beyond standard-reliant industries.

This bias arises because our commercial society is fundamentally built to value, protect, and reward “things” or “objects” rather than “ideas”—objects that embody innovations, but not necessarily the underlying innovations themselves. The ultimate consequence of our current “objects

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153. *Unwired Planet v. Huawei* [2017] EWHC (Pat) 711 [¶ 97] (U.K.).

154. *Id.*

155. See Barnett, *supra* note 9; Alexander Galetovic, Stephen Haber & Lew Zaretzki, *Is There an Anticommons Tragedy in the World Smartphone Industry?*, 32 BERKELEY TECH. L. J. 1527 (2017).

156. *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 396 (2006) (Kennedy, J. concurring).

157. See Barnett, *supra* note 9.



over ideas” framework is that it impedes the development and growth of the “ideas economy” at its seminal moment. The confused logic of Justice Kennedy’s position represents a rejection of the basic principle, as old as Adam Smith, that gains from trade derive from socially productive specialization in the marketplace, and that free-market actors will allocate resources where they can secure the highest value. There is thus no reason to lament, as Justice Kennedy did, that patents have increasingly emerged as a distinct asset class. Rather, that is precisely the trend that should be encouraged. As the costs and barriers to manufacturing and implementation continue to plummet—whether through globalization, robotics, 3D printing, advances in computing hardware and software, or otherwise—it is increasingly the ideas themselves, not their implementation, that hold the greatest value. And it is in this realm of ideas and innovation that human beings will continue to hold a productive role for the foreseeable future.

If we are to move into this next phase of our economic existence, ideas must be protectable, transactable, and monetizable. Our legal rules and social norms must recognize and allocate value and primacy to innovation, while also embracing a new economic order in which the development of commercial embodiments becomes a low-margin industry. Most notably, an efficient marketplace for innovation necessarily allows specialization between innovators and implementers, rather than forcing an increasingly inefficient vertical integration between the two. Thus, in Silicon Valley 2.0, brilliant young entrepreneurs should not be distracted by developing and selling their innovations as products, but rather should be able to develop firms that occupy the far more impactful (and lucrative) role of generating and transacting ideas alone.

This Article thus focuses on the treatment of FRAND-encumbered standard-essential patents because that subject is at the forefront of these far broader issues. By and large, FRAND-encumbered SEPs are not vague, abstract, infinitely broad, whimsical, or practically irrelevant. They encompass and protect precise, narrow, and concrete engineering innovations that are the results of billions of dollars in research and development and millions of hours of grinding labor,<sup>158</sup> trial and error, and occasional genius by engineers who know their field of art and continually work to advance it. These mere ideas yield real benefits and real results. It is these ideas that have moved us from 2G to 3G to 4G and now on to 5G, enabling billions and even trillions of dollars in economic gains. It is these

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158. See Alexander Galetovic & Kirti Gupta, *Royalty Stacking and Standard Essential Patents: Theory and Evidence from the World Mobile Wireless Industry* 19–20 (Hoover Inst. Working Grp. on Intellectual Prop., Innovation, & Prosperity, Working Paper No. 15012, 2016), <https://hooverip2.org/wp-content/uploads/ip2-wp15012-paper.pdf>.



ideas that have led to the magic of Wi-Fi. We have all enjoyed their massive benefits, and it is only logical that our commercial legal regime should enable the protection, transaction, and monetization of such innovations as standalone assets.

The patent system is currently our most sophisticated mechanism for achieving that aim. Thus, the anti–patent, anti–licensing, and anti–innovator trends we identify here represent precisely the wrong approach at exactly the wrong time. Rather than working from the premise that the FRAND marketplace is inherently flawed and that one side of the bargain requires continuous and significant judicial protection against systematic abuse from the other, courts, legislators, regulators, and academics should recognize that it is the very combination of strong property rights for innovation and strong enforcement of voluntary contractual arrangements that has brought us this far—and that this approach is the only one that can take us further.



# THE SMALLEST SALABLE PATENT-PRACTICING UNIT: OBSERVATIONS ON ITS ORIGINS, DEVELOPMENT, AND FUTURE

*David Kappos<sup>†</sup> & Paul R. Michel<sup>††</sup>*

## ABSTRACT

The concept of basing patent infringement damages on the sale of the smallest salable patent-practicing unit (“SSPPU”) has garnered support from a significant portion of the U.S. innovation community. Some supporters contend that the SSPPU is a substantive rule for defining the appropriate royalty base for all purposes and in all contexts. In this Article, we challenge this view and conclude that the SSPPU is merely a tool used to implement the apportionment requirement created in *Garretson v. Clark*, 111 U.S. 120 (1884), in the context of patent infringement jury trials. This Article further clarifies the SSPPU’s role and limits in U.S. patent damage determinations. Some of these limits include its (a) inability to estimate the value of licenses in large portfolios, (b) irrelevance to standard-essential patents in FRAND licensing situations, and (c) inability to override actual market value. We believe an understanding of these limitations is necessary to avoid erroneously applying the SSPPU in contexts for which it is not intended and in which application could lead to a reduction of incentives for innovation and R&D, particularly in standards-dependent fields.

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### **I. INTRODUCTION**

The assessment of damages for patent infringement has become a thorny and contentious undertaking. One controversial thread in this evolving body of law is the notion of the smallest salable patent–practicing unit (“SSPPU”). It has become fashionable to refer to SSPPU as a substantive rule defining the appropriate royalty base for all purposes and in all contexts. Some have gone so far as to suggest that SSPPU constitutes a

limitation on how patent holders may value their patents and a constraint on how private parties may conduct commercial negotiations.<sup>1</sup> It is even argued that in an infringement case against a multi-component product, the SSPPU concept implies that the royalty base must be derived not from the *value* the invention contributes to the end product, but from the *cost* to the infringer of one or more components it purchased from its suppliers.<sup>2</sup>

All these suggestions are incorrect. Judge Randall Rader, while sitting as a district court judge, coined the term “smallest saleable patent-practicing unit” in the context of an evidentiary ruling on the admissibility of certain damages testimony in a jury trial.<sup>3</sup> The determination of admissibility lies in the discretion of the trial judge, and in the damages context, identifying an SSPPU can be one useful guidepost.<sup>4</sup> But the SSPPU concept was never intended to be, and is not, a rigid rule prescribing how patent damages and royalties must be calculated in all contexts. Notably in the 2015 case of *Commonwealth Scientific & Industrial Research Organization v. Cisco Systems, Inc.* (“CSIRO”), the Federal Circuit rejected the argument that all damages models must be based on SSPPU and instead affirmed a district court’s use of a damages analysis that made no reference to SSPPU.<sup>5</sup>

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1. For example, in 2017 the IEEE revised its IPR policy to include consideration of SSPPUs in setting RAND royalties for patents declared essential to IEEE standards, such as the 802.11 WiFi standards. See IEEE, IEEE-SA STANDARDS BOARD BYLAWS 16, [http://standards.ieee.org/develop/policies/bylaws/sb\\_bylaws.pdf](http://standards.ieee.org/develop/policies/bylaws/sb_bylaws.pdf); Jorge L. Contreras, *IEEE Amends Its Patent (FRAND) Policy*, PATENTLY-O (Feb. 9, 2015), <http://patentlyo.com/patent/2015/02/amends-patent-policy.html>. In China, the Electronic Intellectual Property Center (“EIPC”), a research center under the auspices of the Chinese Ministry of Industry and Information Technology, released a draft IPR Policy “Template” for Chinese SSOs, which would require FRAND royalties to be based on SSPPUs; EIPC ultimately decided to drop this requirement. See *Comments of the American Bar Association’s Sections of Antitrust Law, Intellectual Property Law, Science & Technology Law, and International Law on the Draft Template for IPR Policies in Industry Standards Organizations Issued by the Electronic Intellectual Property Center of the Ministry of Industry and Information Technology*, AM. BAR ASS’N (Jan. 29, 2015), <http://chinaipr2.files.wordpress.com/2015/02/aba-comments.ndf>.

2. See, e.g., *Commonwealth Sci. & Indus. Research Org. v. Cisco Sys., Inc.*, No. 6:11-CV-343, 2014 WL 3805817, at \*9 (E.D. Tex. July 23, 2014), *vacated and remanded*, 809 F.3d 1295 (Fed. Cir. 2015).

3. *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 283 (N.D.N.Y. 2009).

4. *Id.* at 286 (“The methodology of assessing and computing damages under 35 U.S.C. § 284 is within the sound discretion of the district court.” (quoting *TWM Mfg. Co. v. Dura Corp.*, 789 F.2d 895, 898 (Fed. Cir. 1986))).

5. *Commonwealth Sci. & Indus. Research Org. v. Cisco Sys., Inc.*, 809 F.3d 1295, 1303–04 (Fed. Cir. 2015).

The notion of an SSPPU does not restrict how patent holders may value their patents, nor does it dictate how negotiating parties may arrive at mutually agreeable licensing terms. It certainly does not require that the prices of inputs to the manufacture of an infringing product determine the proper royalty base.

To take a simple example, suppose chemist C invents and patents a new and useful drug compound. C offers to license the patent to pharmaceutical company P. P will have to invest considerable resources to develop the drug, test it, manufacture it, and bring it to market. But when all is said and done, P anticipates making a handsome profit on selling the drug for years to come. Obviously, without the license, P will have no right to the drug and no profits from it. Basic principles of economics, as well as logic and common sense, tell us that P will be willing to pay a substantial license fee, up to something less than its total profit, in exchange for the right to make and sell the drug. The amount P will ultimately pay to C as a licensing fee bears no relationship to the cost of the ingredients (likely a few pennies per pill) of the medication. There is simply no connection between an infringer's *costs* and the *value* it obtains from using an invention.

Consider a second example. Suppose manufacturer M of multicomponent electronic devices makes a product using chips it acquires for \$10 each. The product incorporates a variety of patented technologies, implemented in large part in the \$10 chips. M sells its product to end-users for \$1,000 each in 2015. In 2016, M's chip supplier reduces its chip price from \$10 to \$5. M continues to sell its product for \$1,000, now making even more profit. No one would contend that in 2015 the patented technologies incorporated into M's product were worth a fraction of \$10, and in 2016 those same technologies were worth fifty percent less. The only change was that M's component cost went down, perhaps because its supplier's cost declined, or new models of chips were released, or chip competition increased. Nothing changed about the technology used in M's product. Indeed, the right to sell that product became *more* valuable—more profitable to M. Obviously, the infringer's cost of materials does not determine the value of the technology it uses.

This Article seeks to dispel confusion about the role of SSPPU in U.S. patent damages law, to prevent misapplication of the SSPPU concept, and to avoid policy missteps that may occur from misunderstanding these topics. Part II begins with background on U.S. law regarding the calculation of patent damages, and then Part II examines the origin, development, and limitations of SSPPU in U.S. patent infringement case law. Part III debunks

some popular myths, with a view to maintaining the SSPPU concept in its proper context going forward. Part IV briefly concludes.

## II. THE LAW OF PATENT DAMAGES, BRIEFLY

The U.S. patent code provides that “the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer . . . .”<sup>6</sup> Damages may be fixed on the basis of lost profits, reasonable royalty, or a combination of the two.<sup>7</sup> The reasonable royalty thus acts as a damages floor.<sup>8</sup> When assessing the reasonable royalty measure of damages, the Federal Circuit recognizes that market evidence, in the form of actual licenses to the patent-in-suit, can be the best evidence.<sup>9</sup> But such evidence is not always available, and courts have developed other methods for determining a reasonable royalty, including the often-employed hypothetical negotiation framework of *Georgia-Pacific Corp. v. U.S. Plywood Corp.*<sup>10</sup>

The U.S. Supreme Court has held that for any patent infringement damages award the patent holder must:

[G]ive evidence tending to separate or apportion the defendant’s profits and the patentee’s damages between the patented feature and the unpatented features, and such evidence must be reliable and tangible, and not conjectural or speculative; or he must show, by equally reliable and satisfactory evidence, that the profits and damages are to be calculated on the whole machine, for the reason that the entire value of the whole machine, as a marketable article, is properly and legally attributable to the patented feature.<sup>11</sup>

From this, patent damages jurisprudence has developed what are now known as the principle of “apportionment” and the “entire market value rule” (“EMVR”).<sup>12</sup>

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6. 35 U.S.C. § 284 (2012).

7. *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1324 (Fed. Cir. 2009).

8. *See Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1544 (Fed. Cir. 1995) (en banc) (“[T]he purpose of [the reasonable royalty] alternative is not to direct the form of compensation, but to set a floor below which damage awards may not fall.”).

9. *See, e.g., Versata Software, Inc. v. SAP Am., Inc.*, 717 F.3d 1255, 1267 (Fed. Cir. 2013).

10. 318 F. Supp. 1116, 1120–21 (S.D.N.Y. 1970).

11. *Garretson v. Clark*, 111 U.S. 120, 121 (1884).

12. Zelin Yang, *Damaging Royalties: An Overview of Reasonable Royalty Damages*, 29 BERKELEY TECH. L.J. 647, 654–56 (2014) (describing the origins and modern



These principles apply when determining a royalty base to be used, along with an appropriate rate, in calculating a per-unit reasonable royalty. The EMVR provides that the patent holder may use the entire market value of the defendant's multicomponent product as the base only if the patented invention drives demand for the end product.<sup>13</sup> If the patent holder cannot establish that the invention drives demand for the product—and thus is not entitled to use the entire market value of the product as the base—then the patent holder must, in some fashion, apportion the value contributed by the invention to the final product.<sup>14</sup>

### III. THE “SMALLEST SALABLE PATENT-PRACTICING UNIT”: ORIGINS AND DEVELOPMENT

This Part examines both the origin of the SSPPU in patent jurisprudence as well as the modern application of the SSPPU in the Federal Circuit. In so doing, it outlines principles that form the basis for correcting emerging scholarly and jurisprudential mistakes with respect to the SSPPU.

#### A. GENESIS OF THE SSPPU: *CORNELL UNIVERSITY V. HEWLETT-PACKARD CO.*

The term “smallest salable patent-practicing unit” first appeared in 2009, in an opinion by Judge Rader sitting as a district court judge by designation in Northern District of New York.<sup>15</sup> *Cornell* involved a single patent that, “[b]y achieving multiple and out-of-order processing . . . enhances the throughput of [computer] processors with multiple functional units.”<sup>16</sup> The parties agreed that the patent applied solely to a component of a computer processor: “the claimed invention is a small part of the IRB, which is a part of a processor, which is part of a CPU module, which is part of a ‘brick,’ which is itself only part of the larger server.”<sup>17</sup>

Cornell's damages expert “sought to testify that the jury should compute damages using a royalty base encompassing Hewlett-Packard's earnings from its sales revenue from its entire servers and workstations.”<sup>18</sup> Judge

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application of the EMVR); Alan Devlin, *Patent Law's Parsimony Principle*, 25 BERKELEY TECH. L.J. 1693, 1744 (2010) (noting controversy over the EMVR).

13. See *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1227 (Fed. Cir. 2014).

14. *Id.* at 1226.

15. *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 283 (N.D.N.Y. 2009).

16. *Id.*

17. *Id.*

18. *Id.* at 284.

Rader interrupted the trial to hold a *Daubert* hearing on the testimony and ruled that neither Cornell nor its damages expert had adequately shown that the entire market value rule applied.<sup>19</sup> Judge Rader did not invoke SSPPU in the *Daubert* opinion, but found that the expert's testimony failed to properly apportion between the claimed invention and the accused products.<sup>20</sup> This failure was particularly problematic in light of HP's "ordering 'menus' provid[ing] price breakdowns for individual 'processor modules' independent of the server systems they may be incorporated with."<sup>21</sup> Cornell's damages expert offered no reason why those processor module prices could not be used to determine a royalty base.<sup>22</sup>

After Judge Rader excluded the testimony based on server prices, Cornell's expert testified at trial that the proper royalty base was the CPU brick—a component of the server that included multiple processors and other components.<sup>23</sup> Based on the CPU brick testimony, the jury awarded damages of over \$184 million.<sup>24</sup> HP moved for judgment as a matter of law, and Judge Rader reduced the royalty base to the processors and reduced the damages award accordingly.<sup>25</sup> Once again, Judge Rader held that Cornell's expert had not provided any evidence that the invention drove demand for the CPU bricks such that the entire market value rule applied:

[Cornell] exceeded again this court's direction and proceeded to attempt to show economic entitlement to damages based on technology beyond the scope of the claimed invention. . . . Notably, Cornell chose this hypothetical royalty base in favor of another alternative more clearly relevant to the value of the patented invention—the revenue Hewlett-Packard would have earned had it sold each infringing processor as just that, a processor, without any additional non-infringing components.<sup>26</sup>

Judge Rader's opinion made clear that the concern was with "evidence that would mislead the jury to award damages far in excess of their compensatory purpose."<sup>27</sup> The focus was on the belief that juries may be

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19. Cornell Univ. v. Hewlett-Packard Co., No. 01-CV-1974, 2008 WL 2222189, at \*2 (N.D.N.Y. May 27, 2008).

20. *Id.*

21. *Id.*

22. *Id.* at \*3.

23. Cornell Univ. v. Hewlett-Packard Co., 609 F. Supp. 2d 279, 284 (N.D.N.Y. 2009).

24. *Id.* at 282.

25. *Id.* at 292.

26. *Id.* at 284–85.

27. *Id.* at 284.

unduly swayed by large revenue figures that have not first been shown to relate to the invention.<sup>28</sup> That risk can be mitigated by selecting a royalty base more closely related to the invention.<sup>29</sup>

While the court in *Cornell* criticized the plaintiff's expert for not choosing the "smallest salable patent-practicing unit" as the royalty base, the opinion did not claim to be announcing a new substantive rule.<sup>30</sup> Nor did the court hold that the royalty base in all cases and all contexts must be a component of a multicomponent product. Rather, the SSPPU concept was used in *Cornell* to underscore the point that the expert failed to adhere to the Supreme Court's prior guidance regarding apportionment of value under *Garretson*.<sup>31</sup> Rather than choosing as his royalty base the smallest unit that HP offered for sale and that incorporated the invention (i.e., an individual processor), the expert focused on the "processor brick," which included multiple processors together with other elements.<sup>32</sup> In an exercise of its discretionary authority in matters pertaining to the admissibility of evidence and, in particular, to the assessment of patent infringement damages, the court ruled that the expert's testimony was not well-grounded economically, was likely misleading to the jury, and resulted in an excessive damages award.<sup>33</sup>

In sum, the court in *Cornell* merely applied the apportionment principle of *Garretson*. No sweeping new rule was established. Rather, the court's determination was tied to the particular facts of the case, the particular choice made by Cornell and its expert to ignore the court's prior guidance, and the risk of misleading lay jurors.

#### B. SSPPU IN THE FEDERAL CIRCUIT

Subsequent to *Cornell*, the Federal Circuit applied the SSPPU concept in three cases—all of them involving jury trials.<sup>34</sup> All of these cases arose during an upwelling of concern about the perceived risk of runaway jury

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28. *Id.*

29. *Id.*

30. *See id.* at 285–87 (explaining that the court was applying settled damages law).

31. *Id.* at 286–87 (applying the entire market value rule).

32. *Id.*

33. *Id.* at 284.

34. The one exception is *Astrazeneca AB v. Apotex Corp.*, 782 F.3d 1324, 1339–40 (Fed. Cir. 2015), a case in which the court mentions the "smallest salable unit," but finds the concept inapplicable to the facts of the case. *Id.* (holding that basing the damages calculation on the omeprazole product as a whole was proper because the patented formulation "substantially created the value of the entire omeprazole product").

verdicts, and every one of them addresses that concern, reinforcing the point that SSPPU is an evidentiary consideration used to implement the apportionment principle in situations where there is risk of juror confusion.

In a recent case, the Federal Circuit provided important guidance on the law of patent infringement damages, making clear that SSPPU is not a mandatory, substantive requirement of damages law. Rather it is an “evidentiary principle . . . assisting in reliably implementing the [apportionment] rule when—in a case involving a per-unit royalty—the jury is asked to choose a royalty base as the starting point for calculating a reasonable royalty award.”<sup>35</sup> The court stated that “[t]he point of the evidentiary principle is to help our jury system reliably implement the substantive statutory requirement of apportionment of royalty damages to the invention’s value.”<sup>36</sup> And further:

It is not that an appropriately apportioned royalty award could never be fashioned by starting with the entire market value of a multi-component product—by, for instance, dramatically reducing the royalty rate to be applied in those cases—it is that reliance on the entire market value might mislead the jury, who may be less equipped to understand the extent to which the royalty rate would need to do the work in such instances.<sup>37</sup>

The court’s specific holding regarding the application of SSPPU in *Ericsson* is also illuminating. The defendant had asked the trial court to exclude testimony by the patentee’s damages expert that relied on comparable licenses using a whole-device royalty base.<sup>38</sup> The trial court allowed the testimony.<sup>39</sup> On appeal, the defendant invoked the SSPPU concept to argue that the district court’s decision was incorrect.<sup>40</sup> The Federal Circuit upheld the decision below, finding that it was appropriate for the district court to allow the testimony, despite the fact that it relied on licenses using a whole-device royalty base while the patents at issue read only on a component of the device.<sup>41</sup> The Federal Circuit explained:

As the testimony at trial established, licenses are generally negotiated without consideration of the EMVR, and this was

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35. *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014).

36. *Id.*

37. *Id.* at 1227.

38. *Id.* at 1225.

39. *Id.*

40. *Id.* at 1213.

41. *Id.* at 1226.

specifically true with respect to the Ericsson licenses relating to the technology at issue. Making real world, relevant licenses inadmissible on the grounds D-Link urges would often make it impossible for a patentee to resort to license-based evidence.<sup>42</sup>

*Ericsson* thus confirms that SSPPU is a flexible evidentiary tool, not an unyielding substantive requirement of patent damages law.

In two other Federal Circuit cases, the court likewise focused on the risk of juror confusion, using the SSPPU concept as a guideline in evaluating damages theories presented to juries. In *VirnetX, Inc. v. Cisco Systems, Inc.*, the patentee claimed that Apple iOS products (such as iPhones) were the smallest salable unit, and therefore the proper royalty base.<sup>43</sup> The Federal Circuit held that the fact of a multicomponent product being the SSPPU did not compel the conclusion that that product was the appropriate royalty base to be presented to a jury.<sup>44</sup> As the court explained, “the smallest salable unit approach was intended to produce a royalty base much more closely tied to the claimed invention than the entire market value of the accused products” and was:

[S]imply a step toward meeting the requirement of apportionment. Where the smallest salable unit is, in fact, a multi-component product containing several non-infringing features with no relation to the patented feature (as *VirnetX* claims it was here), the patentee must do more to estimate what portion of the value of that product is attributable to the patented technology.<sup>45</sup>

Similarly, in *LaserDynamics, Inc. v. Quanta Computer, Inc.*, the Federal Circuit construed the SSPPU as an evidentiary principle focused on jury confusion.<sup>46</sup> *LaserDynamics* involved a patent on optical disc drives included in laptop computers.<sup>47</sup> The patentee had granted numerous licenses to the patent-in-suit for lump-sum royalties.<sup>48</sup> At trial, the patentee’s damages expert testified that those licenses should be disregarded in determining damages and instead calculated a running royalty using the

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42. *Id.* at 1228.

43. 767 F.3d 1308, 1327–28 (Fed. Cir. 2014).

44. See *id.* at 1327 (“[R]eliance on the entire market value of the accused products . . . ‘cannot help but skew the damages horizon for the jury.’” (quoting *Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1320 (Fed. Cir. 2011))).

45. *Id.*

46. *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51 (Fed. Cir. 2012).

47. *Id.* at 56.

48. *Id.* at 57–58.

price of laptops as the royalty base.<sup>49</sup> The Federal Circuit held that there was no evidence the patented feature drove demand for laptops, and again raised concerns about jury confusion.<sup>50</sup>

Most recently, the Federal Circuit addressed the SSPPU concept in *CSIRO v. Cisco Systems, Inc.*<sup>51</sup> After a bench trial on damages, the district court applied a per-unit royalty based on the parties' pre-suit negotiations.<sup>52</sup> On appeal, Cisco argued that the district court erred by failing to use the SSPPU (the Wi-Fi chip) as the base for the reasonable royalty.<sup>53</sup> The Federal Circuit flatly rejected Cisco's argument, holding that "[t]he rule Cisco advances—which would require all damages models to begin with the smallest salable patent-practicing unit—is untenable. It conflicts with our prior approvals of a methodology that values the asserted patent based on comparable licenses."<sup>54</sup> The Federal Circuit held that the district court correctly "did not apportion from a royalty base at all. Instead, the district court began with the parties' negotiations."<sup>55</sup> And the Federal Circuit reaffirmed its prior holdings that actual market valuation is a reliable method of apportionment, regardless of the royalty base employed:

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49. *Id.* at 68.

50. *Id.* ("Admission of such overall revenues, which have no demonstrated correlation to the value of the patented feature alone, only serve to make a patentee's proffered damages amount appear modest by comparison, and to artificially inflate the jury's damages calculation beyond that which is 'adequate to compensate for the infringement.'" (quoting *Uniloc*, 632 F.3d at 1320)). Both *VirnetX* and *LaserDynamics* rely heavily on *Uniloc*, which—while not using the term SSPPU—makes clear that the concern is with juror confusion. In *Uniloc*, it was undisputed that the patented feature did not drive demand for the accused products (Microsoft's Word and Windows software), but the patentee's expert nonetheless used the entire market value of the software as a "check" on his royalty calculation. *Id.* at 1318–19. The Federal Circuit found that this reference to the entire market value of the accused products was not linked to the value contributed by the patented invention, and therefore ran a significant risk of misleading the jury. *Id.* at 1320 ("This case provides a good example of the danger of admitting consideration of the entire market value of the accused product where the patented component does not create the basis for customer demand. As the district court aptly noted, 'the \$19 billion cat was never put back into the bag even by Microsoft's cross-examination of [Uniloc's damages expert], and in spite of a final instruction that the jury may not award damages based on Microsoft's entire revenue from all the accused products in the case.'").

51. *Commonwealth Sci. & Indus. Research Org. v. Cisco Sys., Inc.*, 809 F.3d 1295 (Fed. Cir. 2015).

52. *Id.* at 1300–01.

53. *Id.*

54. *Id.* at 1303.

55. *Id.* at 1302.

Where the licenses employed are sufficiently comparable, this method is typically reliable because the parties are constrained by the market's actual valuation of the patent. . . . Moreover . . . otherwise comparable licenses are not inadmissible solely because they express the royalty rate as a percentage of total revenues, rather than in terms of the smallest salable unit. Therefore, adopting Cisco's position would necessitate exclusion of comparable license valuations that . . . may be the most effective method of estimating the asserted patent's value.<sup>56</sup>

*CSIRO* effectively lays to rest any contention that SSPPU is a fixed, substantive rule of patent law. Rather, it is an evidentiary tool designed primarily for jury cases (as again reaffirmed in *CSIRO*<sup>57</sup>) and aimed at apportioning the value of a patented invention before the damages question is put to a jury, to prevent jurors from being misled by large revenue or profit numbers, thereby addressing a perceived risk of runaway jury verdicts.

#### IV. CORRECTING MISUNDERSTANDINGS ABOUT THE SSPPU CONCEPT

Despite the purpose and application of SSPPU as explained in the case law above, some seek to export SSPPU to other contexts and deploy it for purposes for which it was not intended.<sup>58</sup> Some may even claim that SSPPU is the definitive rule for determining a royalty base and applies in all cases and all contexts (i.e. not only in U.S. jury cases). These claims are incorrect.

##### A. THE SSPPU CONCEPT APPLIES NEARLY EXCLUSIVELY IN JURY TRIALS

The case law makes clear that the SSPPU concept is limited in application. In over seventy-five district court decisions that have

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56. *Id.* at 1303–04.

57. *Id.* at 1302.

58. See, e.g., Douglas G. Smith, *The Increasing Use of Challenges to Expert Evidence Under Daubert and Rule 702 in Patent Litigation*, 22 J. INTELL. PROP. L. 345, 354 (2015) (incorrectly claiming that the Federal Circuit made the SSPPU mandatory substantive damages law); David J. Teece, *Are the IEEE Proposed Changes to IPR Policy Innovation Friendly?* 11 (Tusher Cent. for Mgmt. of Intellectual Capital, Working Paper No. 2, 2015), <https://pdfs.semanticscholar.org/d374/b8d689319de1c7c69e30021ffac4f40f4d45.pdf> (criticizing the IEEE's transition toward use of the SSPPU); Alexander L. Clemons, *Beyond the Smallest Salable Unit*, 6 LANDSLIDE 36, 36–38 (2014) (collecting and criticizing district court applications of the SSPPU).



considered the SSPPU concept, all but one have been in jury trials.<sup>59</sup> Cases applying the SSPPU concept make clear that the motivating concern is jury confusion.<sup>60</sup>

The concern animating the SSPPU approach does not exist, or at least has much less force, outside the jury context. For example, there is no similar concern in a bench trial. There is no reason to believe that district court judges would fail to understand the rule of apportionment and the mathematical interactions between royalty base and royalty rate when performing a reasonable royalty analysis. On the contrary, the law accords broad discretion to district court judges to determine damages methodologies, because they are able to, and do, carefully analyze the reliability of proffered damages models.<sup>61</sup> And where those models fail to properly apportion between patented and unpatented values, judges do not hesitate to reject them.<sup>62</sup>

Additionally, it would be neither appropriate, nor practical, to screen judges from revenue or profit information. Justice requires judges to be aware of all the pertinent facts of a case, and we rely on judges to render fair decisions in view of all the facts, not in ignorance of them. It would be impractical to put blinders on judges, for the simple reason that judges are the gatekeepers who determine what evidence is admissible. Thus, if one party sought to exclude evidence relating to a royalty base beyond the SSPPU, the judge would necessarily become acquainted with the evidence through ruling on its admissibility. Courts are clear that prophylactic rules designed to protect against basic misunderstandings or miscalculations are

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59. The one exception is *In re Innovatio IP Ventures*, No. 11 C 9308, 2013 WL 5593609, at \*2 (N.D. Ill. Oct. 3, 2013), where the court in a bench trial applied the SSPPU to determine the royalty base for damages calculation; the court used market information, such as the average price and profit of a Wi-Fi chip, to serve as the royalty base.

60. District courts continue to consider the SSPPU framework in limited circumstances (i.e., cases involving jury trials and a small number of patents). *See, e.g.*, *TVIIM, LLC v. McAfee, Inc.*, No. 13-CV-04545-HSG, 2015 WL 4448022, at \*3 (N.D. Cal. July 19, 2015); *Wonderland Nurserygoods Co. v. Thorley Indus. LLC*, No. 2:13-CV-00387, 2015 WL 5021416, at \*17 (W.D. Pa. 2015); *Better Mouse Co. v. SteelSeries ApS*, No. 2:14-CV-198-RSP, 2016 WL 3611528, at \*1 (E.D. Tex. Jan. 5, 2016); *ART+COM Innovationpool GmbH v. Google Inc.*, 155 F. Supp. 3d 489, 513 (D. Del. 2016).

61. *See infra* Section IV.H (describing the importance of district court discretion in fashioning damages awards).

62. *See, e.g.*, *Commonwealth Sci. & Indus. Research Org. v. Cisco Sys., Inc.*, No. 6:11-CV-343, 2014 WL 3805817, at \*7 (E.D. Tex. July 23, 2014) (rejecting patentee's damages model that failed to "carefully tie proof of damages to the claimed invention's footprint in the market place").

not required in bench trials: “[I]n a bench trial, the . . . judge can also exclude those improper inferences from his mind in reaching a decision.”<sup>63</sup>

B. THE SSPPU CONCEPT DOES NOT LIMIT THE FREEDOM OF PRIVATE PARTIES NEGOTIATING A LICENSE AGREEMENT

Some advocates contend that the SSPPU concept determines the royalty base that must be used in patent licenses. Nothing could be farther from the truth. No case has ever so held, and it would be bad policy.

Parties negotiating license agreements are free to negotiate whatever mutually agreeable terms make commercial sense for them.<sup>64</sup> There is no requirement that private parties negotiating license agreements first go through all the patents in question and identify the SSPPU for each one. In fact, to do so would be incredibly inefficient. Instead, parties tend to negotiate licenses that cover whole products, or classes of products, and whole portfolios of patents potentially applicable to those products.<sup>65</sup> As a result, parties tend to use whole products as the royalty base for license agreements. This approach is sensible and efficient in terms of reduced transaction costs, and highly preferred for all parties, particularly when significant numbers of patents are involved.

The business people on both sides of these transactions are familiar with the revenues and profits (or potential revenues and profits where new products are concerned) associated with the products in question. They cannot be screened from this information as a practical matter, nor could anyone seriously suggest they should be. Thus, in the context of private license negotiations, even more than in bench trials, while the SSPPU approach is available to negotiators who wish to refer to it, it has no necessary bearing on how parties negotiate or upon what terms they agree.

Indeed, an attempt to dictate that business people must negotiate patent licenses on the basis of the SSPPU for each licensed patent and each licensed product would be highly counterproductive. Such a rule would

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63. *Gulf States Utils. Co. v. Ecodyne Corp.*, 635 F.2d 517, 519 (5th Cir. 1981).

64. Such license terms are subject, of course, to the rules of antitrust and competition laws. *See generally*, e.g., Maureen A. O'Rourke, *Striking a Delicate Balance: Intellectual Property, Antitrust, Contract, and Standardization in the Computer Industry*, 12 HARV. J.L. & TECH. 1 (1998) (describing the interplay of contract, intellectual property, and antitrust law).

65. *See, e.g.*, David J. Teece, *The “Tragedy of the Anticommons” Fallacy: A Law and Economics Analysis of Patent Thickets and FRAND Licensing*, 32 BERKELEY TECH. L.J. (forthcoming 2017) (explaining that parties often make “blanket” commitments of their entire portfolios in FRAND agreements because of the inefficiency of individually examining patents).

require parties to engage in patent-by-patent and component-by-component negotiations, greatly magnifying transaction costs. Instead, parties should remain free to use all the valuation and efficiency tools available to them, without limitation. This leads to effective negotiations and equitable agreements for all, as it has for generations.

C. THE SSPPU CONCEPT IS NOT USEFUL IN ESTIMATING THE VALUE OF A LICENSE TO A LARGE AND DIVERSE PORTFOLIO

Some parties have advocated that the SSPPU approach should apply to licenses of large and diverse portfolios of patents. Again, no court has so held. Rather, the cases referencing the SSPPU concept have in nearly all cases involved small numbers of patents.<sup>66</sup> SSPPU has never been applied to determine a reasonable royalty base for a large, diverse portfolio of patents.

As suggested above, attempting to apply the SSPPU concept to a large portfolio of patents would be impractical. The SSPPU would almost certainly be different for different patents, and it could be different for different claims within a single patent. The task of identifying and valuing the SSPPU within each affected product and for each patent or claim, then applying an appropriate royalty rate to each patent-and-component combination to calculate the total amount owed would be overwhelming.

It is far more efficient, particularly in private license negotiations, to start with the proposition that all of the licensee's products (or its products within a certain class, such as cellular telephones) will be licensed under all of the patent holder's patents. And this, unsurprisingly, is precisely where typical license negotiations start, allowing the licensee to obtain what licensees want: freedom of operation.<sup>67</sup> And the patent holder obtains an easy-to-administer license. The natural base to use for each product in such

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66. See *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 282 (N.D.N.Y. 2009) (single patent); *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1209–11 (Fed. Cir. 2014) (three patents); *VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1315 (Fed. Cir. 2014) (two patents); *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 56 (Fed. Cir. 2012) (single patent). In over seventy-five district court cases that have considered the SSPPU, all but one involved fewer than eight patents, with over eighty percent of the cases entailing three or fewer patents. The one exception is *In re Innovatio IP Ventures*, No. 11 C 9308, 2013 WL 5593609, at \*3 (N.D. Ill. Oct. 3, 2013), a case involving nineteen patents.

67. See, e.g., Stuart J.H. Graham et al., *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L.J. 1255, 1317 (2009) (noting that thirty percent of surveyed firms sought patents for “freedom-to-operate considerations”); Stuart J.H. Graham & Ted Sichelman, *Why Do Start-Ups Patent?*, 23 BERKELEY TECH. L.J. 1063, 1065 (2008) (noting that many firms explicitly claim “defensive” purposes for seeking patents or patent licenses).

a license is the product itself, so that all aspects or components of the product that could infringe any of the licensor's patents will be licensed. Also, where a large and diverse portfolio is concerned, the patents likely cover a number of aspects or components of the products in question, and some may cover entire products. Where the basic all-products and all-patents framework is agreed, the parties can proceed efficiently to set a royalty rate (and ancillary terms).

In the litigation context, if a case arose requiring a judge or a jury to determine a royalty for a large portfolio of patents, it would be unworkable, for the reasons stated above, to require that determination to be made patent-by-patent for thousands of patents. The sensible approach would be to proceed as knowledgeable business people do, using accused products as the royalty bases, and assessing an appropriate royalty rate. The concern that jurors might be misled by large revenue or profit figures would have considerably less force in a case involving hundreds or thousands of patents covering different aspects of the accused products. It would be quite rational in that circumstance for a court to use its discretion in damages matters to adopt the simplifying assumption that the royalty base is the entire product, and let the parties litigate over the royalty rate.

D. THE SSPPU CONCEPT HAS NO AUTOMATIC RELEVANCE TO  
STANDARD-ESSENTIAL PATENTS OF FRAND

There is also no support for the contention that SSPPU is a requirement of fair, reasonable and nondiscriminatory ("FRAND") terms and conditions under which holders of standard-essential patents ("SEPs") often agree to grant licenses. No case has imposed such a requirement.

There are both policy and practical reasons why it would be inappropriate to engraft SSPPU onto FRAND. A FRAND licensing commitment is a contractual arrangement designed to ensure implementers will have access to standardized technologies while also giving innovators a sufficient return on their investment in R&D, so that they will continue to offer technologies to standards development organizations ("SDOs") for standardization.<sup>68</sup> In almost all cases where innovators make technical contributions to SDOs and enter into licensing commitments, they do so against the background of a decades-long tradition of bilaterally negotiated

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68. See Clark D. Asay, *The Informational Value of Patents*, 31 BERKELEY TECH. L.J. 259, 261–62 (2016) (explaining how FRAND commitments function and why such agreements offer economic value). See also generally Jorge L. Contreras, *A Market Reliance Theory for FRAND Commitments and Other Patent Pledges*, 2015 UTAH L. REV. 479 (2015) (surveying, collecting, and analyzing the literature on FRAND commitments).

license agreements employing the intentionally broad FRAND requirement. Changing those ground rules now would undermine the basis of the FRAND bargain, and could seriously reduce incentives to innovators. This would be fundamentally unfair to those who have relied on the FRAND bargain, and also undercut incentives for innovators to participate in standards development going forward, a highly undesirable policy outcome.

Importing SSPPU into the standards context is also problematic for a number of practical reasons. First, FRAND negotiations are bilateral contract negotiations between private parties. As noted above, SSPPU does not necessarily apply in that context. Second, FRAND negotiations often involve large and diverse portfolios of patents, and, again, the SSPPU concept cannot be applied in such cases. Third, a FRAND commitment is a contract between an innovator and an SDO, with implementer–licensees as third–party beneficiaries. The meaning of FRAND is dependent on the IPR policy of the applicable SDO. The contractual documents do not generally refer to the SSPPU concept, and it is inappropriate to impose SSPPU retroactively. Fourth, only one SDO, the IEEE, has recently adopted an explicit SSPPU reference in its IPR policy, and that decision was hotly contested.<sup>69</sup> The IEEE controversy demonstrates that there is no consensus on the advisability of incorporating SSPPU into FRAND negotiations. What is clear is that SSPPU is neither inherent in FRAND nor traditionally understood as part of FRAND. Thus, reading SSPPU into FRAND is untenable as a matter of contract law.

E. THE SSPPU CONCEPT CANNOT BE USED TO OVERRIDE ACTUAL MARKET VALUE

Case law in the realm of patent infringement damages has long recognized that direct, market–based information in the form of actual licenses is very potent evidence of the value of patented technology. As the Federal Circuit emphasized in *Versata Software*, where there is “an established royalty,” that market–based rate should be used as the basis for calculating the reasonable royalty in preference to other inherently more speculative calculations.<sup>70</sup> Relatedly, the Federal Circuit in *Ericsson* and *CSIRO* reaffirmed use of actual licenses as evidence of a market–based

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69. See Teece, *supra* note 58, at 11 (noting criticism of the IEEE’s decision).

70. *Versata Software, Inc. v. SAP Am., Inc.*, 717 F.3d 1255, 1267–68 (Fed. Cir. 2013).

royalty, regardless of whether those licenses were negotiated under the SSPPU approach.<sup>71</sup>

These cases belie any suggestion that the SSPPU approach should somehow trump market evidence. Indeed it would be absurd to conclude that SSPPU should prevail over market-based evidence. Consider for a moment that proponents of SSPPU would never advocate its use unless they expected it to result in *lower* royalty awards than might otherwise be obtained. But this amounts to a suggestion that an adjudged infringer should pay less in damages than willing licensees paid in the open market and without putting the patent holder to the trouble and expense of litigation. That would fly in the face of the statutory requirement of § 284 that courts award damages sufficient to compensate the patent holder.

Further, imposing the SSPPU in lieu of actual market evidence would turn the patent law's system of incentives on its head. Instead of rewarding innovators for creating new technologies, the system would reward infringers for misappropriating them. Infringers would have no reason to avoid infringement, let alone seek or take a license, until forced to do so through litigation.

F. THE SSPPU CONCEPT DOES NOT COMPEL USING THE COST OF A COMPONENT AS THE ROYALTY BASE FOR CALCULATING DAMAGES

Some argue that the SSPPU concept requires the cost of one component of a multicomponent product to operate as a cap on the royalty base when assessing patent infringement damages. Effectively, they argue that the royalty should be capped at the price of the component. Certainly there may be cases, like *Cornell*, where the value of an invention subsists in a component of a component of a component of an end product, and the reasonable royalty on that invention arguably should be limited to some fraction of the value of an appropriate component. But this is not always or even generally the case. Frequently, a patent claims an invention operationalized in a multicomponent device—such as a computer or a smartphone—and the true value of the invention lies in the functionality it

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71. *Ericsson*, 773 F.3d at 1226–28; *Commonwealth Sci. & Indus. Research Org. v. Cisco Sys., Inc.*, 809 F.3d 1295, 1303 (Fed. Cir. 2015). In a more recent decision, a district court held that the average sales price of an infringing product can serve as the SSPPU, thus collapsing the smallest salable unit into a market-based valuation of the rights appropriated. *See TVIIM, LLC v. McAfee, Inc.*, No. 13-CV-04545-HSG, 2015 WL 4448022, at \*2 (N.D. Cal. July 19, 2015) (holding that the average sales price information, which the damages expert used as the SSPPU, is “plainly relevant for the limited purpose for . . . serving as the starting point for the ‘apportioning down’ of the royalty base to a reasonable estimate of the value of the accused feature”).



enables, not in a disembodied chip that might serve as part of the invention's implementation. To paraphrase the district judge in *CSIRO*, the value of a book is not measured by the cost of the ink, paper, and binding used to make it. Likewise, the value of a functioning device, such as a smartphone, is greater than the sum of the costs of its components. No reason exists to conclude that the value of a technology or a collection of technologies enabling a product to function must necessarily be limited to the cost of the product's constituent parts rather than the value of the whole.

A key principle of the hypothetical negotiation analysis is that the use of an invention has value to the person using it. The negotiation between the patent holder and the technology user (the putative infringer) is, in its essence, a process to arrive at a number between the maximum amount of that value that the user would pay for the right to use the technology and the minimum amount the patent holder would accept.<sup>72</sup>

This principle is well illustrated by the hypothetical scenarios presented in Part I. The licensing fee a chemist receives from a pharmaceutical company will depend not on the cost of the ingredients for a drug, but on the value of the invention to the company. Similarly, the value an electronics manufacturer derives from an invention is not tied to the cost of components implementing that invention, which can vary depending on independent market forces. Rather, the value depends on the profit the manufacturer is able to make from the invention.

G. THE SSPPU CONCEPT NEITHER COMPELS NOR SUPPORTS USING THE COST OF A COMPONENT AS THE ROYALTY BASE

Some advocates of SSPPU declare that it is a definitive rule for determining a royalty base, in any context. This would be inconsistent with *CSIRO*, where the Federal Circuit squarely rejected the argument that SSPPU must be employed in all damages models and affirmed the district court's use of a non-SSPPU-based damages analysis. Moreover, as discussed above, SSPPU does not apply and is inappropriate in most circumstances—including any situation other than a U.S. patent

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72. See Cristina Caffarra & Pierre Régibeau, *Patent Explosion and Patent Wars: Hold-Up, Royalties and Misunderstandings over 'Market Value'*, in EUROPEAN COMPETITION LAW ANNUAL 2012 at 307, 326–27 (Philip Lowe & Mel Marquis eds., 2014); see also *Trans-World Mfg. Corp. v. Al Nyman & Sons, Inc.*, 750 F. 2d 1552, 1568 (Fed. Cir. 1984) (“A reasonable royalty is the amount that a person, desiring to manufacture, use, or sell a patented article, as a business proposition, would be willing to pay as a royalty and yet be able to make, use, or sell the patented article, in the market, at a reasonable [sic] profit.”) (alteration omitted) (internal quotation marks omitted).



infringement jury trial. And, even where it does apply, SSPPU is a guide to—not a definition of—the proper royalty base.

The case law referencing SSPPU does not hold or imply that SSPPU definitively sets the royalty base for a reasonable royalty calculation. In *VirnetX*, the Federal Circuit held that the proper royalty base to be presented to a jury may be *less* than the SSPPU.<sup>73</sup> In *Ericsson*, the court held that licenses using a royalty base *greater* than the SSPPU could be presented to the jury.<sup>74</sup> In *Cornell* itself, the court did not hold that the only acceptable royalty base was the SSPPU, but rather that the expert's testimony did not provide a sound economic basis for focusing his damages analysis on a larger unit.<sup>75</sup> In *CSIRO*, the Federal Circuit held that courts need not apply SSPPU at all.<sup>76</sup>

All these cases rely on the Supreme Court's decision in *Garretson* for the guiding principle of apportionment. *Garretson* itself did not refer to the SSPPU concept. It did not even hold that the *royalty base* must be apportioned. The Supreme Court ruled only that the patent holder's *damages* must be commensurate with the value contributed by the patented invention to the defendant's product. How that should be accomplished was not specified, and federal patent statutes reaffirm flexibility by explicitly reserving the damages decision to a district court's sound discretion.<sup>77</sup> The value of adaptability can be demonstrated arithmetically; if an appropriate royalty on a \$1,000 product would be \$10, that result can be obtained just as well by applying a 1% royalty rate to a \$1,000 royalty base or by reducing the base to \$100 and applying a 10% rate.

#### H. APPLYING THE SSPPU CONCEPT AS A MANDATORY SUBSTANTIVE RULE WOULD DEFEAT THE GOAL OF DAMAGES LAW

The broader body of case law covering patent infringement damages makes clear that a definitive SSPPU rule would be inappropriate. The Federal Circuit has repeatedly rejected rigid approaches to patent damages and has emphasized that the trial court has broad discretion to fashion a damages methodology appropriate to the particular case before it.<sup>78</sup>

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73. *VirnetX*, 767 F.3d at 1326–28.

74. *Ericsson*, 773 F.3d at 1225–29.

75. *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 284–85 (N.D.N.Y. 2009).

76. *Commonwealth Sci. & Indus. Research Org.*, 809 F.3d at 1300–01.

77. 35 U.S.C. § 284 (2012); *see also infra* Section IV.H.

78. *See, e.g., Mars, Inc. v. Coin Acceptors, Inc.*, 527 F.3d 1359, 1366 (Fed. Cir. 2008) (“The correct measure of damages is a highly case-specific and fact-specific analysis.”),

Similarly, the Supreme Court has “more than once cautioned that courts should not read into the patent laws limitations and conditions which the legislature has not expressed.”<sup>79</sup> In *Ericsson* the Federal Circuit invoked this spirit of flexibility to accommodate diverse, case-specific facts, observing “that an appropriately apportioned royalty award could . . . be fashioned by starting with the entire market value of a multi-component product—by, for instance, dramatically reducing the royalty rate to be applied in those cases . . . .”<sup>80</sup> All of this shows that, as a matter of law, SSPPU cannot be viewed as a rigid definition of royalty base. As the jurisprudence around patent damages continues to evolve, courts are questioning SSPPU’s broad relevance and applicability in damage calculations.<sup>81</sup>

The overarching purpose of the patent laws is to incentivize innovation by creating enforceable property rights and facilitating transactions involving those rights.<sup>82</sup> Patent infringement damages awards serve that

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*amended on other grounds*, 557 F.3d 1377 (Fed. Cir. 2009); *Hebert v. Lisle Corp.*, 99 F.3d 1109, 1119 (Fed. Cir. 1996) (“The adequacy of the damages measure depends on the circumstances of each case.”); *Minco, Inc. v. Combustion Eng’g, Inc.*, 95 F.3d 1109, 1118 (Fed. Cir. 1996) (“Because fashioning an adequate damages award depends on the unique economic circumstances of each case, the trial court has discretion to make important subsidiary determinations in the damages trial, such as choosing a methodology to calculate damages.”); *Cornell Univ.*, 609 F. Supp. 2d at 286 (“The methodology of assessing and computing damages under 35 U.S.C. § 284 is within the sound discretion of the district court.”) (quoting *TWM Mfg. Co. v. Dura Corp.*, 789 F.2d 895, 898 (Fed. Cir. 1986))).

79. *Bilski v. Kappos*, 561 U.S. 594, 602 (2010) (quoting *Diamond v. Diehr*, 450 U.S. 175, 182 (1981)) (internal quotation marks omitted); *see also* *Octane Fitness, LLC v. ICON Health & Fitness, Inc.*, 134 S. Ct. 1749, 1756 (2014) (courts should not “superimpose[] an inflexible framework onto statutory text that is inherently flexible”); *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 419 (2007) (“Helpful insights . . . need not become rigid and mandatory formulas . . .”).

80. *Ericsson*, 773 F.3d at 1227.

81. *See, e.g.*, *Genband US LLC v. Metaswitch Networks Corp.*, No. 2:14-CV-33-JRG-RSP, 2016 WL 125503, at \*5 (E.D. Tex. Jan. 9, 2016) (holding that when an expert’s damages analysis attempts to directly apportion the royalty base to the precise value of the patented features, “it is not necessary . . . to identify or rely upon the SSPPU”); *Better Mouse Co., LLC v. Steelseries Aps*, No. 2:14-CV-198-RSP, 2016 WL 115686, at \*3 (E.D. Tex. Jan. 9, 2016) (holding that a damages expert “does not always need to identify the smallest saleable unit to satisfy apportionment”); *ART+COM Innovationpool GmbH v. Google Inc.*, 155 F. Supp. 3d 489, 513 (D. Del. 2016) (questioning “whether there is a ‘smallest salable unit’ at all” when a patent is used in a service that is not sold, but rather monetized through various interrelated and intermingled sources of revenue that “do not break down nicely for purposes of proving damages in patent litigation”).

82. U.S. CONST. art. I, § 8, cl. 8; *see also* Colleen V. Chien, *Software Patents as a Currency, Not Tax, On Innovation*, 31 BERKELEY TECH. L.J. 1669, 1675 (2016) (“Patent transactions can enhance the patent system’s incentive-inducing role by supporting

purpose by compensating the patent holder for the use the infringer made of the invention. Section 284 of the Patent Act provides flexibility to assure the patent holder receives *full* compensation.<sup>83</sup> And, consistent with the objective of maintaining enforceable intellectual property rights and orderly exchanges based on those rights, damages awards should incentivize lawful behavior. That is, they should discourage infringement and encourage users of patented technologies to seek licenses. Inflexible rules that interfere with these objectives can only serve to depress innovation incentives and should be avoided.

The debate around the reach—or overextension—of the SSPPU concept is at its core not about interpretation of the law or particular legal decisions; it is about business models, and about using the law as a tool to express a preference for the business model pursued by implementers of others' technological innovation over the business model of creators of innovative new technologies. Make no mistake—applying the SSPPU concept as some advocates suggest would unquestionably represent a strong statement of preference, and would confer major competitive advantage in favor of implementers over innovators, unquestionably devaluing innovation in the process. Courts and Congress both have historically declined to express such a preference, striving instead to maintain a system that over time has worked a balance between the interests of innovators and implementers. Indeed, there is no indication whatever that the historical balance has shifted in a manner calling for major destabilization as sought by interests pushing for general applicability of SSPPU.

A major national policy change governing innovation incentives, especially one quite affirmatively designed to depress innovation incentives, is simply irresponsible absent careful study and clear data mandating such a change. The authors are aware of none. Such a change simply makes it easier for free-riders to cheaply take others' property. The impact is troubling across the board, invariably leading to lower levels of innovation investment, and causing less standardization of innovative technologies.<sup>84</sup> Hardest hit will be the bone-grinding innovation involved in creating and standardizing highly complex technologies such as those pervading smart phones, where many development and standardization

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specialization and extending the reach of the patent system to those who invent regardless of their position in the marketplace, helping to overcome the advantages of incumbents.”).

83. 35 U.S.C. § 284 (2012).

84. Teece, *supra* note 65 (noting that free-riding depresses innovation in R&D for crucial technologies below socially-optimal levels).

efforts fail, costs soar, and licensing is frequently the only mechanism available to recoup investment.<sup>85</sup> Given what we know, a move to intentionally discourage innovation in key technological areas would constitute very bad policy indeed.

## V. CONCLUSION

An understanding of the origins and boundaries of the SSPPU concept is crucial to avoid erroneously applying it in contexts for which it was not intended. The concept exists as a tool to implement the *Garretson* apportionment requirement in the context of patent infringement jury trials. All opinions referring to SSPPU have recognized that the motivating concerns are damages apportionment and the potential for jury confusion. No court has ever held that SSPPU is a hard-and-fast substantive requirement of patent law, and indeed the Federal Circuit has held just the opposite in *CSIRO*.

Efforts by some technology implementers to broaden the scope and applicability of the SSPPU concept are legally unfounded and unsound as a matter of patent law policy. It is to be expected that implementers will claim they pay “too much” in royalties; undoubtedly they would prefer to pay nothing for the technologies they use. But such claims have no legal merit and do nothing to encourage innovation. Instead they devalue innovation, relegating the future to a static status quo in favor of an “I’ll get mine now” attitude.

The urged expansion and misapplication of the SSPPU concept is dangerous. If successful, it will reduce incentives for innovation and stifle R&D investments, particularly in standards-dependent fields. Courts and other governmental authorities should be wary and take care to confine SSPPU to its proper scope and context.

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85. *Id.*



# LITIGATION OF STANDARDS-ESSENTIAL PATENTS IN EUROPE: A COMPARATIVE ANALYSIS

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## ABSTRACT

Despite the significance of patent litigation in the EU and the looming structural overhaul of the European patent litigation system, there has been comparatively little empirical or statistical analysis of European patent cases across member states. This absence has largely been due to the lack of harmonized case-level data across European jurisdictions. Over the past few years, however, researchers in Europe have developed patent litigation databases that have enabled robust quantitative analysis. As a result, comparative empirical studies have recently been published concerning European patent litigation overall, as well as litigation by so-called non-practicing entities (NPEs). The present study extends this work to the important area of litigation relating to standards-essential patents (SEPs) in the EU. We find that SEPs has been asserted in Europe at significant levels, and that PAEs play a large role in this activity.

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### I. INTRODUCTION

The European Union (EU) is among the world's largest markets and technology development regions. As such, patent litigation has emerged as a significant market phenomenon across the EU. Currently, each European state maintains its own judiciary, and patent cases are adjudicated at the national level with recourse to the European Court of Justice (CJEU) only on questions pertaining to EU-wide directives.<sup>1</sup> This will all change soon, however, with the pending introduction of the EU Unified Patent Court (UPC), which will provide a coordinated adjudicatory framework for patent disputes.<sup>2</sup>

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1. See generally LUKE McDONAGH, EUROPEAN PATENT LITIGATION IN THE SHADOW OF THE UNIFIED PATENT COURT 88–90 (2016).

2. The Rules of Procedure of the UPC were adopted in October 2015. See *Rules of Procedure* (“Rules”) of the Unified Patent Court, UNIFIED PATENT COURT (Oct. 19, 2015)



Despite the significance of patent litigation in the EU and the looming structural overhaul of the European patent litigation system, there has been comparatively little empirical or statistical analysis of European patent cases across member states.<sup>3</sup> This absence has largely been due to the lack of harmonized case-level data across European jurisdictions.<sup>4</sup> Over the past few years, however, researchers in Europe have developed patent litigation databases that have enabled robust quantitative analysis.<sup>5</sup> As a result, comparative empirical studies have recently been published concerning European patent litigation overall,<sup>6</sup> as well as litigation by so-called nonpracticing entities (NPEs).<sup>7</sup> The present study extends this work to the important area of litigation relating to standards-essential patents (SEPs) in the EU.

## II. BACKGROUND: SEPs AND NPEs

Technical interoperability standards enable telecommunications, computing, and other devices produced by different firms to interoperate without significant user intervention. Many interoperability standards are developed by private firms that collaborate in standards-development organizations (SDOs) such as ITU, ISO and ETSI.<sup>8</sup>

Because successful standards embody numerous technological advances, firms that develop standards may obtain patents covering the technical contributions that they make to a standard. Many patents cover important interoperability standards in fields such as wireless communications, computer networking, and semiconductor design.

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<https://www.unified-patent-court.org/sites/default/files/UPC-Rules-of-Procedure.pdf>. See generally EUROPEAN PATENT OFFICE, PATENT LITIGATION IN EUROPE: AN OVERVIEW OF NATIONAL LAW AND PRACTICE IN THE EPC CONTRACTING STATES 135–38 (4th ed. 2016), [http://documents.epo.org/projects/babylon/eponot.nsf/0/05B84848CBCF7338C1257833003C2531/\\$File/patent\\_litigation\\_in\\_europe\\_2016\\_en.pdf](http://documents.epo.org/projects/babylon/eponot.nsf/0/05B84848CBCF7338C1257833003C2531/$File/patent_litigation_in_europe_2016_en.pdf).

3. See Katrin Cremers et al., *Patent Litigation in Europe*, 44 EUR. J.L. & ECON. 1, 3–4 (2016) (noting the lack of previous empirical research in this area).

4. *Id.*

5. *Id.* at 4.

6. *Id.* See also generally Stuart J.H. Graham & Nicolas van Zeebroeck, *Comparing Patent Litigation Across Europe: A First Look*, 17 STAN. TECH. L. REV. 655 (2014).

7. See generally Brian J. Love et al., *Patent Assertion Entities in Europe*, in PATENT ASSERTION ENTITIES AND COMPETITION POLICY 104 (D. Daniel Sokol ed., 2017).

8. See Knut Blind & Brian Kahin, *Standards and the Global Economy*, in CAMBRIDGE HANDBOOK OF TECHNICAL STANDARDIZATION LAW: COMPETITION, ANTITRUST AND PATENTS, CH. 1 (Jorge L. Contreras ed., 2017).

A. STANDARDS AND STANDARDS-ESSENTIAL PATENTS (SEPs)

In order to promote broad adoption of their standards, many SDOs require that their participants disclose and license SEPs. Ideally, participants license SEPs to manufacturers of standardized products either royalty-free (RF) or subject to “fair, reasonable and nondiscriminatory” (FRAND) royalties.<sup>9</sup> These commitments are intended to assure manufacturers that they will be able to obtain licenses to SEPs on terms that are, at a minimum, reasonable, and also that they will not be prevented from manufacturing products incorporating a standard due to the disclosed patents.

B. SEP LITIGATION

Despite these assurances, over the past decade significant litigation involving SEPs has arisen in the United States, Europe, and Asia. This litigation occurs in several contexts. For example, the holder of a SEP and its potential licensee may disagree whether an offered royalty rate is, indeed, FRAND. Several well-known cases in the United States, including *Microsoft Corp. v. Motorola Inc.*<sup>10</sup> and *Ericsson Inc. v. D-Link Sys.*,<sup>11</sup> involved such disagreements. In these cases, the manufacturer often concedes that a license under the asserted SEPs is required but claims that the SEP holder’s royalty demand is unreasonably high.<sup>12</sup> That is, the manufacturer brings a breach of contract, estoppel, or similar claim against the SEP holder, asserting that the SEP holder’s breach of its FRAND commitment has damaged the manufacturer in some way.<sup>13</sup> Such arguments may also be made by a manufacturer as affirmative defenses to a claim of infringement by the SEP holder (i.e., the manufacturer may argue that it is

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9. See RUDI BEKKERS & ANDREW UPDEGROVE, A STUDY OF IPR POLICIES AND PRACTICES OF A REPRESENTATIVE GROUP OF STANDARDS SETTING ORGANIZATIONS WORLDWIDE 89 tbl. 13 (2012), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2333445](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2333445) (examining ten SDOs and finding that eight required FRAND licensing); Brad Biddle et al., *How Many Standards in a Laptop? (And Other Empirical Questions)*, in PROCEEDINGS OF THE 2010 ITU-T KALEIDOSCOPE ACADEMIC CONFERENCE 125 fig. 2 (2010), [www.itu.int/dms\\_pub/itu-t/opb/proc/T-PROC-KALEI-2010-PDF-E.pdf](http://www.itu.int/dms_pub/itu-t/opb/proc/T-PROC-KALEI-2010-PDF-E.pdf) (finding that 75% of the standards incorporated in a typical laptop computer were subject to a RAND commitment and 22% were royalty-free); Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CALIF. L. REV. 1889, 1906 (2002) (examining thirty-six SDO policies, and finding that twenty-nine required FRAND licensing and three encouraged it).

10. 795 F.3d 1024 (9th Cir. 2015).

11. 773 F.3d 1201 (Fed. Cir. 2014).

12. See *Microsoft Corp.*, 795 F.3d at 1032; see also *Ericsson Inc.*, 773 F.3d at 1229.

13. See *id.*

entitled to a license on FRAND terms, thereby nullifying the SEP holder's infringement claims).<sup>14</sup>

### C. NPES, PAES, AND SEP LITIGATION

As a result of the recent surge of litigation concerning SEPs and their enforcement, an extensive literature has emerged in this field.<sup>15</sup> However, much of this literature focuses on firms that participated in the standard-setting process and have themselves made FRAND and other licensing commitments with respect to their SEPs.<sup>16</sup> These firms are typically product manufacturers, service providers, and technology developers that are repeat players in the SDO that developed a particular standard.

Yet an increasing number of these firms are transferring patents to NPES, including patent assertion entities (PAEs),<sup>17</sup> for a variety of financial and strategic reasons (a practice sometimes referred to as "privateering").<sup>18</sup> In both the United States and Europe, the majority of patents held by PAEs were obtained from operating technology companies.<sup>19</sup> Thus, it stands to

14. *See id.*

15. *See, e.g.,* Jorge L. Contreras, *Patents, Technical Standards and Standard-Setting Organizations: A Survey of the Empirical, Legal and Economics Literature*, in RESEARCH HANDBOOK ON THE ECONOMICS OF INTELLECTUAL PROPERTY LAW, VOL. II – ANALYTICAL METHODS (Peter S. Menell & David Schwartz eds., 2017).

16. *Id.*

17. Numerous definitions have been proposed for the terms "non-practicing entity" and "patent assertion entity." *See, e.g.,* John R. Allison et al., *How Often Do Non-Practicing Entities Win Patent Suits?*, 32 BERKELEY TECH. L.J. 235, 240–42 (2017) (collecting and discussing the literature on NPE and PAE nomenclature).

18. *See generally* Daniel L. Rubinfeld, *Privateering in the Markets for Desktop and Mobile Operating Systems*, 33 BERKELEY TECH. L.J. (forthcoming 2018) (describing the origins and modern development of "IP privateering"); D. Daniel Sokol, *Patent Privateering: The Rise of Hybrid Patent Assertion Entities*, in PATENT ASSERTION ENTITIES AND COMPETITION POLICY, Ch. 5 (D. Daniel Sokol, ed. 2017); Erik Hovenkamp & Thomas F. Cotter, *Anticompetitive Patent Injunctions*, 100 MINN. L. REV. 871 (2016).

19. *See* Brian J. Love et al., *An Empirical Look at the "Brokered" Market for Patents*, 83 MO. L. REV. (forthcoming 2018) (manuscript at 31 tbl. 12) (finding that approximately sixty-one percent of brokered patent packages acquired by PAEs between 2012 and 2017 were purchased from operating companies); Colleen V. Chien, *Software Patents as a Currency, Not Tax, On Innovation*, 31 BERKELEY TECH. L.J. 1669, 1676 (2016) ("[T]he majority of the patents held by NPES were bought in the marketplace from operating companies . . . ."); EUROPEAN COMM'N JOINT RESEARCH CTR., PATENT ASSERTION ENTITIES IN EUROPE: THEIR IMPACT ON INNOVATION AND KNOWLEDGE TRANSFER IN ICT MARKETS 19 (Nikolaus Thumm & Garry Gabison eds., 2016) [hereinafter JRC Report], <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC103321/lfna28145enn.pdf> (reporting that "[t]he consensus among our interviewed stakeholders was that in Europe, patents asserted by PAEs are acquired from third parties and, primarily, large practicing firms," with one interviewed expert estimating that eighty percent of PAE patents were purchased from operating companies).

reason that some portion of the patents that PAEs acquire and assert will be SEPs. There are already a number of well-known cases involving SEP assertions by PAEs and other NPEs,<sup>20</sup> including *In re Negotiated Data Solutions LLC (N-Data)*,<sup>21</sup> *In re Innovatio IP Ventures*,<sup>22</sup> *Rembrandt v. Samsung*,<sup>23</sup> and *CSIRO v. Cisco*.<sup>24</sup> Moreover, there is increasing evidence that operating firms, often participants in SDOs, have transferred significant numbers of SEPs to PAEs for enforcement purposes in privateering transactions.<sup>25</sup> In one recent case, Apple alleged that Nokia conspired with a number of PAEs, including Acacia Research and Conversant Intellectual Property Management, to divide Nokia's portfolio of SEPs amongst themselves in order to collect excessive licensing fees in violation of Nokia's FRAND commitments and U.S. antitrust laws.<sup>26</sup>

PAE activity is significant in Europe as well. Love and coauthors found that PAEs accounted for approximately nineteen percent of patent assertions between 2000 and 2008 in Germany and nine percent of patent assertions between 2000 and 2013 in England and Wales.<sup>27</sup> Several individual cases of SEP assertion by PAEs in Europe have also attracted attention, particularly in Germany and the UK.<sup>28</sup> General fears regarding SEP assertion by PAEs have been expressed by market participants, particularly in view of the potential for PAEs to utilize the new UPC

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20. Each of the following cases is discussed in greater detail in Contreras, *infra* note 48.

21. Decision and Order, *In re Negotiated Data Solutions LLC*, FTC File No. 051-0094, Docket No. C-4234 (Sept. 22, 2008).

22. *In re Innovatio IP Ventures, LLC Patent Litig.*, 921 F. Supp. 2d 903, 907 (N.D. Ill. 2013).

23. *Rembrandt Wireless Techs. LP v. Samsung Elecs. Co.*, No. 2:13-CV-213-JRG, 2014 WL 3385125 (E.D. Tex. July 10, 2014).

24. *Commonwealth Sci. & Indus. Research Org. v. Cisco Sys., Inc.*, No. 6:11-CV-343, 2014 WL 3805817 (E.D. Tex. July 23, 2014), *rev'd and remanded*, 809 F.3d 1295 (Fed. Cir. 2015).

25. See BJÖRN LUNDQVIST, STANDARDIZATION UNDER EU COMPETITION RULES AND US ANTITRUST LAWS: THE RISE AND LIMITS OF SELF-REGULATION 412 (2014) (discussing Microsoft's and Nokia's patent transfers to Mosaid, Philips's transfer to Sisvel, and Ericsson's transfer to Unwired Planet).

26. Complaint ¶ 4, *Apple Inc. v. Acacia Research Corp.*, No. 16-CV-7266 (N.D. Cal. Dec. 20, 2016), 2016 WL 7403907.

27. See Love et al., *supra* note 7, at 109 (presenting data on German and United Kingdom PAE litigation).

28. See, e.g., *Unwired Planet v. Huawei* [2017] EWHC (Pat) 711 (UK) (involving PAE assertion of patent essential to ETSI's 4G LTE standard in UK); Landgericht Mannheim [LG] [Mannheim Regional Court] Judgement of Nov. 17, 2015 - Case No. 2 O 106/14 (involving PAE assertion of patent essential to AMR-WB standard relevant for wideband audio coding used in HD-Voice transmission in Germany).

framework to obtain EU-wide injunctive relief in the near future.<sup>29</sup> Finally, a pattern of aggregation and enforcement of SEPs by European PAEs has been confirmed by at least one recent qualitative study by the European Commission's Joint Research Centre (JRC).<sup>30</sup> The JRC conducted eighteen in-depth interviews with industry participants, finding that PAEs in Europe are acquiring significant numbers of SEPs, particularly in the telecommunications sector.<sup>31</sup>

This trend raises several questions, as well as several concerns. First, will the acquisition of SEPs by PAEs increase the overall rate of SEP litigation, thereby increasing costs of standardization and financial burdens on standardized products? PAEs, by their nature, are litigious, and the assertion of patents by NPEs has become increasingly prevalent both in the United States<sup>32</sup> and Europe.<sup>33</sup> Unlike operating firms, the principal reason that many PAEs obtain patents is to assert them for the purpose of generating revenue, either through licensing or litigation settlements and awards.<sup>34</sup> As such, PAEs that assert SEPs would likely prioritize short term financial returns over the success of an ongoing standardization effort—which is unlike SDO participants, whether they are technology developers or product manufacturers. SEPs, in fact, may be particularly attractive to PAEs, as the purported essentiality of a SEP to a particular standard could make proof of infringement less difficult for the enforcer.

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29. See, e.g., Letter from Adidas AG et al. to Member States of the European Union et al. (Sept. 26, 2013) <https://graphics8.nytimes.com/packages/pdf/business/26trolls-letter.pdf>; Joff Wild, *Why Europe's New Patent Regime Could be an Exciting One for NPEs*, IAM (Oct. 14, 2014), <http://www.iam-media.com/Blog/Detail.aspx?g=d1f4ed0a-23c3-47b5-998c-a35b5d710440>.

30. JRC Report, *supra* note 19, at 121.

31. *Id.* at 6 (“Large portions of the Telecoms portfolios that have been passed to PAEs comprise SEPs which can be asserted against a wide range of products.”).

32. See, e.g., RPX CORP., 2015 REPORT: NPE LITIGATION, PATENT MARKETPLACE, AND NPE COST (2016), [www.rpxcorp.com/wp-content/uploads/sites/2/2016/07/RPX-2015-Report-072616.FinalZ.pdf](http://www.rpxcorp.com/wp-content/uploads/sites/2/2016/07/RPX-2015-Report-072616.FinalZ.pdf); David L. Schwartz & Jay P. Kesan, *Analyzing the Role of Non-Practicing Entities in the Patent System*, 99 CORNELL L. REV. 425 (2014); John R. Allison et al., *Understanding the Realities of Modern Patent Litigation*, 92 TEX. L. REV. 1769 (2014); Christopher A. Cotropia et al., *Unpacking Patent Assertion Entities (PAEs)*, 99 MINN. L. REV. 649, 669–70 (2014); Sara Jeruss et al., *The America Invents Act 500: Effects of Patent Monetization Entities on US Litigation*, 11 DUKE L. & TECH. REV. 357 (2012); Mark A. Lemley & A. Douglas Melamed, *Missing the Forest for the Trolls*, 113 COLUM. L. REV. 2117 (2013).

33. See Love et al., *supra* note 7.

34. See JRC Report, *supra* note 19, at 5 (“[L]icensing fees collected from alleged infringers represent the primary source of revenue for PAEs.”).

Second, to what degree are PAEs bound by the licensing commitments made by SDO participants with respect to their SEPs? In most cases, the typical PAE likely played no role in the development of a standard covered by a given SEP, nor made any affirmative commitment, FRAND or otherwise, to the relevant SDO. As such, the PAE is an “outsider” to the standards process and cannot rightly be bound by the SDO’s rules and policies.<sup>35</sup> Is the SEP still encumbered by the commitments made by its prior owners?<sup>36</sup> While at least one U.S. FTC enforcement action suggests that FRAND commitments should bind subsequent owners of SEPs,<sup>37</sup> this theory has not yet been validated by the courts. And while, in recent years, an increasing number of SDOs have required that transferors of SEPs contractually bind transferees to abide by prior licensing commitments,<sup>38</sup> the effect of such requirements also remains untested in the courts, both in the United States and Europe. Accordingly, PAEs may not be bound by FRAND and other commitments previously made with respect to the SEPs that they are asserting. As such, assumptions made by industry participants regarding the level of royalties that a SEP holder may claim could be inaccurate.<sup>39</sup>

Third, to the extent that PAEs and other SDO outsiders are *not* bound by the FRAND and other commitments made with respect to the SEPs that they enforce, is injunctive relief available to a greater degree than generally

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35. See Jorge L. Contreras, *When a Stranger Calls: Standards Outsiders and Unencumbered Patents*, 12 J. COMPETITION L. & ECON. 507, 507–10 (2016) (introducing the concept of SDO “outsiders” and their assertion of SEPs); Michael Mattioli, *Patent Pool Outsiders*, 33 BERKELEY TECH. L.J. (forthcoming 2018) (exploring “outsiders” to patent pools and related legal regimes).

36. See NAT’L RESEARCH COUNCIL, *Transfers of Patents with Licensing Commitments*, in PATENT CHALLENGES FOR STANDARD-SETTING IN THE GLOBAL ECONOMY 81, 81–88 (Keith Maskus & Stephen A. Merrill eds., 2013) (discussing issues arising from transfer of SEPs); see also Contreras, *supra* note 35, at 514–15.

37. This issue first gained prominence in a 2008 action brought by the U.S. Federal Trade Commission against Negotiated Data Solutions LLC (N-Data). Decision and Order, *In re Negotiated Data Solutions LLC*, FTC File No. 051-0094, Docket No. C-4234 (Sept. 22, 2008). In 2003, N-Data acquired a patent from National Semiconductor that covered IEEE’s 802.3 Fast Ethernet standard. *Id.* National was an IEEE participant and committed to license the patent to all manufacturers of standard-compliant products at a flat rate of \$1,000. *Id.* When N-Data acquired the patent, it announced that it would seek higher royalties. *Id.* The FTC brought an action against N-Data, arguing, among other things, that N-Data’s disavowal of National’s earlier \$1,000 licensing commitment constituted an unfair method of competition in violation of Section 5 of the FTC Act. *Id.* The matter settled with N-Data agreeing to honor National’s prior commitment. *Id.*

38. See, e.g., IEEE, IEEE-SA STANDARDS BOARD BYLAWS § 6.1 at 16 (2017), [https://standards.ieee.org/develop/policies/bylaws/sb\\_bylaws.pdf](https://standards.ieee.org/develop/policies/bylaws/sb_bylaws.pdf).

39. See Contreras, *supra* note 35, at 537.



believed in SEP cases? Courts in both the United States (*Apple Inc. v. Motorola Inc.*<sup>40</sup>) and Europe (*Huawei v. ZTE*<sup>41</sup>) have limited the ability of SEP holders to seek injunctive relief if they have previously made commitments to licensee their SEPs on FRAND terms. Similarly, competition enforcement agencies in the United States<sup>42</sup> and Europe<sup>43</sup> have initiated investigations and enforcement actions against holders of FRAND-encumbered SEPs who have sought or threatened to seek injunctions against implementers of a standard. Recently, one major SDO incorporated such a limitation on injunctive relief into its internal policies, making this prohibition binding on all of its participants.<sup>44</sup> Thus, it is commonly asserted that injunctive relief is seldom available in SEP enforcement cases.<sup>45</sup> This common assumption, however, may not hold if PAEs are not bound by applicable FRAND commitments.<sup>46</sup>

And finally, policymakers around the world are considering whether, and to what degree, to intervene in cases involving SEP assertions.<sup>47</sup> To a large degree, the dialog surrounding these potential interventions assumes that SEP holders have been participants in the standard-setting process and are bound by relevant FRAND and other licensing commitments. If these assumptions do not hold, then the basis for potential regulatory or legislative action may need to be reconsidered.

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40. 757 F.3d 1286 (Fed. Cir. 2014). This limitation stems from the fact that the patent holder has committed to grant licenses to all implementers of a standardized technology, a commitment that is increasingly seen as inconsistent with enjoining the implementer from using the technology unless the implementer is itself unwilling or unable to take a license.

41. Case C-170/13, *Huawei Tech. Co. v. ZTE Corp.*, 2015 E.C.R. 477.

42. Decision and Order, *In re Motorola Mobility LLC & Google Inc.*, FTC File No. 1210120, Docket No. C-4410 (July 23, 2013) (imposing procedural requirements before patent holder is permitted to seek injunctive relief); Decision and Order, *In re Robert Bosch GmbH*, FTC File No. 1210081, Docket No. C-4377, at 3 (Apr. 23, 2013).

43. See Summary of Commission Decision of 29 April 2014 (Case AT.39939 — Samsung — Enforcement of UMTS standard essential patents), 2014 OJ (C 350).

44. IEEE, *supra* note 38, § 6.1 at 16.

45. See, e.g., JRC Report, *supra* note 19, at 7 (“[I]n Europe . . . under FRAND terms one cannot obtain an injunction for SEPs unless the alleged infringer is unwilling to take out a license.”).

46. See Contreras, *supra* note 35, at 520.

47. Makan Delrahim, Assistant Att’y Gen., U.S. Dep’t. of Justice, Assistant Attorney General Makan Delrahim Delivers Remarks at the USC Gould School of Law’s Center for Transnational Law and Business Conference (Nov. 10, 2017), [www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-usc-gould-school-laws-center](http://www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-usc-gould-school-laws-center).



#### D. QUANTIFYING PAE SEP LITIGATION

In order for market actors and policymakers to assess the potential impact of SEP assertion by outsiders, it is necessary to develop a more accurate understanding of the degree to which SDO outsiders, and PAEs in particular, have acquired and asserted SEPs. In 2015, Contreras conducted the first empirical study of SEP assertion by SDO outsiders.<sup>48</sup> This study reviewed the assertion of patents covering seven widely-adopted ICT standards (GSM, USB, 802.11, Bluetooth, UMTS, H.264 and LTE) in U.S. district courts over a sixteen-year period. The standards covered included five that were subject to FRAND licensing commitments and two subject to royalty-free (RF) licensing commitments. The study found that NPEs were responsible for 446 of 577 total defendant-assertion events involving these standards (77%).<sup>49</sup> With respect to IEEE's 802.11 family of standards, 89% of all defendant-assertion events were initiated by NPEs; and with respect to ETSI's wireless telecommunications standards, NPEs initiated 79% of GSM assertions, 89% of LTE assertions, and 93% of UMTS assertions.<sup>50</sup>

These findings are consistent with those of the JRC's recent interview-based study.<sup>51</sup> The JRC found that PAEs in Europe, particularly in the telecommunications sector, have acquired large quantities of SEPs<sup>52</sup> and regularly enforce them.<sup>53</sup> As observed by the JRC: "A common strategy that has been observed in Germany in relation to the assertion of SEPs against telecom operators involves PAEs presenting the standard, providing evidence of how technology infringes the standard, and then demanding the relief sought from the alleged infringements."<sup>54</sup>

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48. Contreras, *supra* note 35, at 520 (updating 2015 study data); Jorge L. Contreras, *Assertion of Standards-Essential Patents by Non-Practicing Entities*, in *PATENT ASSERTION ENTITIES AND COMPETITION POLICY* 50 (D. Daniel Sokol, ed., 2017) (original 2015 study).

49. A "defendant-assertion event" is a claim of infringement brought by a plaintiff against a single defendant under one or more patents. In cases in which multiple unrelated defendants are named, the number of defendant-assertion events is equal to the number of individual defendants (aggregated with their corporate affiliates). *See* Contreras, *supra* note 35, at 525 n.76.

50. JRC Report, *supra* note 19.

51. *Id.*

50. *Id.*

53. *Id.* at 21 ("Our interviews confirmed that PAEs enforce SEPs.")

54. *Id.* at 26.

### III. METHODOLOGY

A gap exists, however, between prior empirical studies of U.S. litigation and the JRC's qualitative study of EU litigation. This Article fills that gap by providing the first empirical data regarding the assertion of SEPs by NPEs in two major European jurisdictions: Germany and the UK. It then compares trends and modalities on both sides of the Atlantic.

#### A. JURISDICTIONS

We selected Germany and the UK as the jurisdictions for this study for several reasons. First, Germany is widely recognized as the most important European jurisdiction for patent litigation, both in terms of the quantity of cases adjudicated and the size of the German market.<sup>55</sup> One unique feature of the German litigation system that has made it particularly attractive for patent assertion is its bifurcated system for obtaining injunctions and monetary relief.<sup>56</sup> In this system, a patent holder's entitlement to injunctive relief is adjudicated in a proceeding separate from the adjudication of infringement and validity, a feature that allows plaintiffs to obtain interim injunctive relief quickly and more readily.<sup>57</sup>

The UK<sup>58</sup> offers an important contrast to Germany. Although the volume of patent litigation in the UK is substantially less than in Germany, the UK is still viewed as one of the major centers for patent litigation in Europe.<sup>59</sup> It is also the principal common law jurisdiction in the EU, in contrast to the civil law systems of Germany and most other continental European states. Prior to the "Brexit" vote, London was scheduled to be the site of one of the three centralized European patent courts and, according to

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55. See *id.* at 5 ("The majority of [PAE] assertions in Europe have been initiated in Germany."); Cremers et al., *supra* note 3, at 23 tbl. 3 (finding 8,424 German patent cases filed between 2000 and 2008).

56. See generally JRC Report, *supra* note 19, at 25–26; Cremers et al., *supra* note 3, § 2.5.1 (presenting an overview of bifurcation in German patent litigation).

57. See Katrin Cremers et al., *Invalid but Infringed? An Analysis of the Bifurcated Patent Litigation System*, 131 J. ECON. BEHAV. & ORG. 218 (2016).

58. Technically, the United Kingdom of Great Britain and Northern Ireland (UK) consists of England, Wales, Scotland, and Northern Ireland. As discussed below, we utilize case data only from the courts of England and Wales. However, for convenience, we refer to England and Wales, by far the most commercially significant components of the UK, as well as the site of virtually all patent suits filed in the UK, as "the UK." This usage is consistent with other empirical studies of UK patent litigation. See, e.g., Cremers et al., *supra* note 3, at 4 n.6; Love et al., *supra* note 7, at 107 n.2.

59. See Christian Helmers & Luke McDonagh, *Patent Litigation in the UK: An Empirical Survey 2000-2008*, 8 J. INTELL. PROP. L. & PRAC. 846 (2013) (finding that over 100 patent suits are filed each year in England and Wales); see also Cremers, *supra* note 3, at 23 tbl. 3.

subsequent reports, may continue in this role even after a UK withdrawal from the EU.<sup>60</sup>

#### B. CASE-LEVEL DATA

To identify lawsuits enforcing SEPs in Germany and the UK, we analyzed case-level data on patent litigation in both jurisdictions.<sup>61</sup> Unlike in the United States, case-level data is not readily accessible online in these jurisdictions; we therefore accessed and digitized paper records for over 5,800 cases at five different courts in the two jurisdictions combined, as described in greater detail below.

For Germany, we obtained data on all infringement actions brought in Germany's three busiest regional courts—Mannheim, Düsseldorf, and Munich—between 2000 and 2008.<sup>62</sup> We estimate that this data comprises roughly eighty percent of all patent litigation undertaken in the country during this nine year period.<sup>63</sup> Though we lack more recent data, litigation activities in Germany seem to have remained quite stable between now and then.<sup>64</sup> The Patent Law Modernization Act of 2009 amended several aspects of German patent law; however, rules concerning patent enforcement in the civil courts remain untouched.<sup>65</sup> To our knowledge, this data is also the best collection of patent litigation in Germany presently in existence.<sup>66</sup> For each case in our German database, we collected information related to each case's filing date, the outcome, the identities of the litigating parties, and the litigated patent(s).

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60. See Clive Cookson, *Britain to Ratify Single European Patent System*, FIN. TIMES (Nov. 28, 2016), <https://www.ft.com/content/6a07fdbb-b56f-11e6-ba85-95d1533d9a62>.

61. Love et al., *supra* note 7.

62. For a detailed discussion of the data construction, see Cremers et al., *supra* note 3, § 3.1.

63. *Id.*

64. For example, the annual total of validity challenges litigated in Germany's Federal Patent Court remained between 217 and 297 each year from 2009 to 2015. *The Annual Reports of the Federal Patent Court*, BUNDESPATENTGERICHT, [www.bundespatentgericht.de/cms/index.php?option=com\\_content&view=article&id=29&Itemid=18&lang=en](http://www.bundespatentgericht.de/cms/index.php?option=com_content&view=article&id=29&Itemid=18&lang=en) (last visited Mar. 15, 2018) (listing reports for each year).

65. Note that several cases with (appellate) decisions up to 2013 are part of our data, because the timeframe restriction applies to the initial filing date at entry court level. See generally Cremers et al., *supra* note 3, § 2.1 (providing an overview of German patent litigation).

66. Collecting litigation data in Germany entails considerable effort. Regional courts do not systematically list cases and types of cases, so an update of the data would require the manual identification of relevant patent cases. Furthermore, with digital case files still being optional these days, a thorough data collection is only possible by physically accessing the court dockets.

For the UK, we have data on patent litigation in the Patents Division of the High Court of England and Wales—often referred to simply as the “Patents High Court” or PHC—from 2000 to 2013.<sup>67</sup> The PHC is the UK’s most popular venue for patent litigation, as well as the sole venue in England and Wales for patent suits with more than GBP 500,000 at stake.<sup>68</sup> We estimate that the PHC heard slightly more than eighty percent of all patent suits filed in the UK during the period covered.<sup>69</sup> Smaller and less complex patent suits can also be brought in the Intellectual Property Enterprise Court (IPEC), previously referred to as the “Patents County Court.”<sup>70</sup>

As with the German data, we collected case-level information related to each UK case’s filing, outcome, litigants, and patent(s)-in-suit. For the IPEC, however, we lack data on the identity of litigants for cases filed prior to 2007 because this information was not publicly available until then. Thus, the patentee-related statistics for the UK that we present below include data for cases filed in the IPEC only during the years 2007 to 2013.

The unit of case measurement was a single action brought against a single defendant or group of related defendants, irrespective of the number of patents asserted in the action.<sup>71</sup> This measurement methodology corresponds with the “defendant-assertion” measure contained in Contreras’s U.S. litigation data.<sup>72</sup>

Finally, for all suits in our data, we categorized the party or parties enforcing patent rights as either operating companies or NPEs. In addition, we further categorized NPEs using the classification system of Love et al. to distinguish among PAEs, individuals, universities, and IP-holding subsidiaries of operating companies.<sup>73</sup>

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67. For a detailed discussion of this data, see Love et al., *supra* note 7, at 107; Cremers et al., *supra* note 3, § 3.1 (discussing the scope of coverage of this German data).

68. For a detailed discussion of the distinction between the PHC and IPEC as well as the reforms that have transformed the PCC into the IPEC between 2010 and 2013, see generally ANGELA FOX, INTELLECTUAL PROPERTY ENTERPRISE COURT: PRACTICE AND PROCEDURE (2014); see also Cremers et al., *supra* note 3, § 2.2 (providing an overview of UK patent litigation).

69. See Cremers et al., *supra* note 3, § 3.2 (discussing the scope of coverage of this UK data).

70. See FOX, *supra* note 68.

71. For a detailed discussion of our case counting methodology, see Cremers et al., *supra* note 3, § 3.6.

72. See Contreras, *supra* note 35, at 525–26 (describing case counting methodology).

73. See Love et al., *supra* note 7, at 108 tbl. 1 (describing the NPE classification system used). This classification system is similar to that utilized in Allison et al., *supra*

### C. SEP DATA

Next, we identified which of these NPE-asserted patents were declared essential to a technology standard.<sup>74</sup> To do this, we relied on the publicly available dataset dSEP.<sup>75</sup> This dataset includes information on publicly available intellectual property disclosure records collected from the archives of thirteen major SDOs through March 2011. The declarations also include information on the date of disclosure, the standard and/or committee the declaration refers to, and the licensing commitment with respect to the disclosed patent.<sup>76</sup> Table 1 below lists the principal standards and corresponding SDOs that were studied.<sup>77</sup>

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note 17, at 249. *See also* Cotropia et al., *supra* note 32, at 669–70 (describing a slightly different NPE classification system).

74. Several major SDOs, including IEEE, ITU and ETSI, require participants to self-declare whether they hold any patents that are “essential” to implement a standard under development or consideration. *See* Bekkers & Updegrove, *supra* note 9, at ch. 4. There is generally no external verification of this determination. As a result, over-declaration of SEPs is a well-known phenomenon. Recent studies have found that only 28%, 29%, and 50% of patent families declared “essential” to ETSI’s 2G, 3G, and 4G wireless telecommunications standards, respectively, were actually essential to implementation of those standards. ROBERT A. MYERS, FAIRFIELD RES. INT’L, REVIEW OF PATENTS DECLARED AS ESSENTIAL TO LTE AND SAE (4G WIRELESS STANDARDS) THROUGH JUNE 30, 2009, at 2 (2010), <http://www.frlicense.com/LTE%20Final%20Report.pdf>; FAIRFIELD RES. INT’L, ANALYSIS OF PATENTS DECLARED AS ESSENTIAL TO GSM AS OF JUNE 6, 2007, at 7 (2007), [http://frlicense.com/GSM\\_FINAL.pdf](http://frlicense.com/GSM_FINAL.pdf); ROBERT A. MYERS, FAIRFIELD RES. INT’L, REVIEW OF PATENTS DECLARED AS ESSENTIAL TO WDCMA THROUGH DECEMBER, 2008, at 1 (2009), <http://www.frlicense.com/wcdma1.pdf>.

75. The dSEP dataset is freely accessible. Rudi Bekkers et al., *Disclosed Standard Essential Patents (dSEP) Database*, SSOPATENTS.ORG, <http://ssopatents.org> (last visited Mar. 15, 2018) [hereinafter Bekkers et al., *dSEP Database*]; *see also* Rudi Bekkers et al., *Declared Essential Patents* (Hoover Inst. Working Grp. on Intellectual Prop., Innovation, & Prosperity, Working Paper No. 16003, 2016), <https://hooverip2.org/wp-content/uploads/ip2-wp16003-paper.pdf> (describing this data set); Rudi Bekkers et al., *Intellectual Property Disclosure in Standards Development*, in PROCEEDINGS FROM THE NBER CONFERENCE ON STANDARDS, PATENTS & INNOVATION 1 (2012).

76. *See* Bekkers, et. al., *dSEP Database*, *supra* note 75.

77. The dSEP database contains records for more standards than are represented in Table 1. We omit standards for which there was no match between UK or German NPE assertions and patents declared essential to the standard. One such omission that is notable is IEEE’s popular 802.11 series of wireless networking standards, which is included in dSEP but for which we found no UK or German NPE assertions. Notably, Contreras’s study of U.S. SEP litigation identified 209 separate actions involving IEEE 802.11 from 2000–2015. Contreras, *supra* note 35, at 527.

Table 1: Principal Standards Studied

<u>Standard</u>	<u>SDO</u>	<u>First Version Released</u>
802.3 (Ethernet)	IEEE	1983
GSM (2G)	ETSI	1992
GSM / TDMA (2G)	ETSI	1992
DVB	ETSI	1994
13818 (MPEG-2)	ISO/IEC	1996
G.729	ITU	1996
H.222 (MPEG-2)	ITU	1996
H.262 (MPEG-2 Part 2)	ITU	1996
DAB (digital audio broadcast)	ETSI	1997 <sup>78</sup>
Smart Card	ETSI	1997
UMTS (3G)	ETSI	2000
UMTS / CDMA (3G)	ETSI	2000
OMA [not specified]	OMA	2002
UICC	ETSI	2003
H.264	ITU	2003
LTE (4G)	ETSI	2008

Because many SEP disclosures reference application numbers, rather than issued patents, we performed our search across patent families, as well as individual patent numbers. For all patents asserted in our data set, as well as all patents included in the dSEP database, we identified the DOCDB family members using the European Patent Office's Patstat database.<sup>79</sup>

#### D. U.S. DATA FOR COMPARISON

Finally, for comparative purposes, we reference Contreras's data on U.S. SEP assertions.<sup>80</sup> Contreras collected this data by searching the text of all patent litigation documents for cases filed in U.S. federal district courts between 2000 and 2015 available on Lex Machina for references to one of

78. The DAB (digital audio broadcast) specification was finalized in 1993 by the EU's EUREKA project. It was adopted by ITU-T in 1994 and by ETSI in 1997. Because dSEP records relate to the ETSI standard, we use 1997 as the release date.

79. The DOCDB family follows the definition of Espacenet and includes all patents that share the same set of priorities. For more information, see EUROPEAN PATENT OFFICE, *DOCDB Simple Patent Family*, <https://www.epo.org/searching-for-patents/helpful-resources/first-time-here/patent-families/docdb.html> (last visited Mar. 15, 2018).

80. See Contreras, *supra* note 48; see also Contreras, *supra* note 35 (updating 2015 data).

seven widely-adopted standards. Four of these standards (GSM, UMTS, LTE and H.264) correspond with the standards studied here, and thereby constitute the basis for comparison of the German/UK and U.S. results. It is also worth noting that Contreras's U.S. study examined standards subject to both FRAND and royalty-free licensing commitments. Because none of the SDOs in the German or UK studies required royalty-free licensing, the comparisons in this Article focus solely on standards subject to FRAND licensing commitments.

#### IV. FINDINGS

Combining the data described above, we were able to identify suits filed by NPEs in Germany and the UK to enforce patents declared essential to one of the standards cataloged in dSEP. Below we summarize our findings.

##### A. OVERALL SEP LITIGATION PICTURE

We identified 422 German and 36 UK cases involving the assertion of patents declared essential to a total of twenty-nine different standards. These figures correspond to roughly 8% and 6% of all patent cases in our German and UK datasets, respectively. Of these totals, PAEs initiated 330 (78%) German cases and 8 (22%) UK cases. There is a striking difference in the overall number of SEP suits brought per country. This result is consistent with the view, as reported by the JRC, that Germany is, by far, the most important European jurisdiction for PAE litigation.<sup>81</sup>

Figure 1 shows the number of cases involving SEPs over time. As shown in the figure, there is a large increase in case filings in Germany starting in 2004; Sisvel, a single NPE, filed a significant number of these cases (discussed in Section III.B). In the UK, the share of cases involving SEPs brought by NPEs is consistently smaller over time than in Germany. Also, there is no similar increase in SEP enforcement by Sisvel in the UK during the 2004 to 2008 period.

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81. See JRC Report, *supra* note 19, at 5 ("The majority of [PAE] assertions in Europe have been initiated in Germany."); Cremers et al., *supra* note 3, at 43 (reporting that Germany has over half the patent assertion suits filed in Europe).



**Figure 1: SEP Assertions by NPEs and non-NPEs in Germany (2000–2008) and the UK (2000–2013) Over Time**

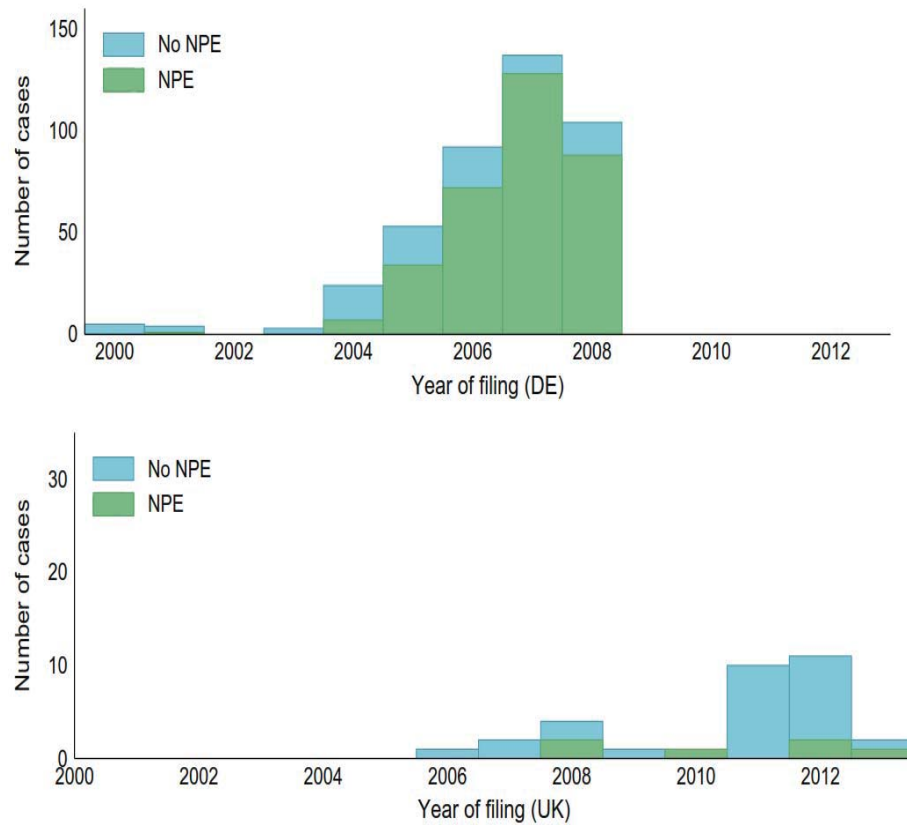


Table 2 breaks down aggregate SEP assertions according to the 29 standards covered by our data. Consequently, the unit of observation is now the number of assertions by standard. Because a single patent can cover multiple standards, a single case can involve multiple standards. Therefore, the total standard-differentiated case count in Table 2 exceeds the total number of unique cases identified.

**Table 2: SEP Assertions in Germany (2000–2008) and UK (2000–2013)**

<u>Standard</u>	<u>SEP Patent Families</u>	<u>Germany PAE Cases</u>	<u>Germany All Cases</u>	<u>UK PAE Cases</u>	<u>UK All Cases</u>	<u>Total Cases</u>
ISO/IEC 13818 (MPEG-2)	3	316	322	0	3	325
ETSI DAB	2	312	313	0	3	316
OMA [not specified]	3	225	225	0	2	227
ITU H.262 (MPEG-2)	3	1	32	0	2	34
ETSI GSM	22	2	18	6	11	29
ITU H.222 (MPEG- 2)	1	1	16	0	2	18
ETSI UMTS	12	0	12	3	6	18
ETSI GPRS	6	0	14	0	2	16
ETSI 3GPP <sup>82</sup>	9	0	10	0	2	12
OMA WAP	6	0	2	0	7	9
IEEE 802.3	2	8	8	0	0	8
ETSI DCS 1800	3	0	8	0	0	8
ITU H.264	1	0	2	0	0	2
ETSI DVB	2	0	0	0	2	2
ETSI LTE	1	0	2	0	0	2
ETSI UMTS / CDMA	1	0	0	1	1	1
ETSI UICC	2	0	0	0	1	1
ITU G.729	1	0	0	1	1	1
ETSI GSM / TDMA	2	0	0	1	1	1
ETSI Smart Card	1	1	1	0	0	1
Other <sup>83</sup>	11	0	13	0	7	20
Total	92	866	998	12	53	1051

The most active standards from a German litigation standpoint are ETSI's DAB standard (digital audio broadcasting) (313 cases), ISO/IEC's 13818 MPEG-2 standard (322 cases), and unspecified standards developed

82. This classification refers to unspecified standards projects conducted at the 3rd Generation Platform Partnership (3GPP).

83. Includes ANSI UL 464, ISO/IEC 24727, ISO/IEC 7816, ITU G.992, ITU H.261, ITU H.263, OMA DRM, ETSI TETRA, ISO/IEC 14496.

at the Open Mobile Alliance (OMA) (225 cases). However, as discussed below, the vast majority of assertions of SEPs covering these standards was by a single PAE, Sisvel.

The widely-adopted wireless telecommunications standards developed at ETSI (e.g., GSM, GPRS, UMTS, LTE) were moderately litigated (84 assertions), but the large majority (98%) were brought by operating companies. As noted in Section III.C, this result differs substantially from that observed in the United States, where the large majority of assertions of SEPs covering these standards were by NPEs.

#### B. NPE CHARACTERISTICS

Table 3 below offers a more detailed picture of NPE assertions in Germany and the UK by individual NPE.

**Table 3: SEP Assertions by NPEs in Germany (2000–2008) and the UK (2000–2013)**

<u>Rank</u>	<u>NPE</u>	<u>NPE Type</u>	<u>Jurisdiction</u>	<u>Total Cases</u>	<u>SSO(s)</u>	<u>Unique SEPs Asserted</u>	<u>Prior (or Current) SEP<sup>84</sup> Owner<sup>85</sup></u>
1	SISVEL INT'L	PAE (pool)	Germany	316	ETSI, IEC-JTC1, ISO-JTC1, OMA	2	France Telecom, TDF, Philips
2	CIF LICENSING	PAE	Germany	9	IEEE, ITU	3	JVC, Motorola
3	IPCOM	PAE	Germany + UK	6	ETSI, ITU	3	Robert Bosch
4	INTERDIGITAL TECH.	Tech dev.	UK	2	ETSI	5	-
5	VRINGO INFATRUC.	PAE	UK	2	ETSI	3	Nokia
6	GEMPLUS	Tech dev.	Germany	1	ETSI	1	-
7	PEARL AGENCY	PAE	Germany	1	OMA	1	Bayerische Rundfunkwerbung
8	THOMSON LICENSING	Tech dev.	Germany	1	ITU	1	Panasonic

84. Data on patent assignees/owners was obtained from the German Patent Office (Deutsche Patent- und Markenamt (DPMA)) and European Patent Office (EPO) registers.

85. In some cases, especially those involving Sisvel, the asserting entity does not own the patents in question and instead has a contractual right to assert.

As shown in Table 3, Sisvel International is the most active NPE asserting SEPs in Germany and the UK during the time periods studied. Sisvel obtained SEPs covering a number of standards (MPEG-2, DAB and OMA) from large patent holders including France Telecom and Philips. Sisvel and its subsidiaries manage patent pools in a number of technology areas including wireless communications, audio and video coding and decoding (CODEC), broadband and digital displays.<sup>86</sup>

As a patent pool administrator, Sisvel is not a typical PAE. Rather than asserting patents against an entire industry, a pool administrator only targets infringing firms that are not currently pool members.<sup>87</sup> While this enforcement pattern is somewhat different from that of the typical PAE, analytically speaking there is little difference between a PAE that asserts patents in order to raise revenue, and a pool administrator that asserts patents to obtain revenue for the pool or to encourage membership in the pool. For this reason, patent pools are classified as PAEs under our framework.<sup>88</sup>

Despite its active enforcement in Germany, Sisvel did not file a single case in the UK over the 2000 to 2013 period. The German firm IPCom is the only NPE actively enforcing SEPs (GSM) in both Germany and the UK. Other than Sisvel and IPCom, only 12 NPE assertions were brought in Germany by other NPEs including CIF (transferee from Motorola as to IEEE 802.3), and three single-suit NPEs (Gemplus, Thomson, and Pearl). Compared to the United States, this is a relatively small number of NPEs/PAEs. By way of comparison, Contreras found that 26 different NPEs initiated SEP enforcement suits in the United States from 2000 to 2015, led

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86. *Licensing Programs Background*, SISVEL INT'L S.A., <http://www.sisvel.com/licensing-programs/background> (last visited Mar. 15, 2018).

87. *See, e.g., 3G Licensing S.A. Enforces its 3G Patents at IFA 2016*, 3G LICENSING S.A., <http://3g-licensing.com/news-events/56-3g-licensing-s-a-enforces-its-3g-patents-at-ifa-2016> (last visited Mar. 15, 2018). This article states:

We are a negotiation first licensing administrator . . . however, to secure FRAND conditions and a level playing field for all the users of the patented technology, in these two cases we were left with no other choice than enforcing the 3G SEPs which are owned by [Sisvel subsidiary] 3G Licensing S.A.

*Id.* (internal quotation marks omitted). In an email communication, Roberto Dini, the founder of Sisvel, explains that the large number of patent assertions by Sisvel is attributable, at least in part, to a requirement under EU law that civil litigation be initiated in order to bring a border seizure action against counterfeit goods per Regulation (EU) No. 608/2013 of the European Parliament and of the Council of 12 June 2013 Concerning Customs Enforcement of Intellectual Property Rights and Repealing Council Regulation (EC) No. 1383/2003. *See* Email from Roberto Dini, Founder, Sisvel, to author (Mar. 8, 2018) (on file with BTLJ).

88. *See* LUNDQVIST, *supra* note 25, at 412 (referring to Sisvel as a “privateer”).

by U.S.-based PAE firms such as Acacia Research, Wi-LAN, and Golden Bridge. None of these entities appear in the German or UK assertion data; nor does Sisvel, the principal European enforcement PAE, appear in the United States. This data suggests that PAEs may tend to litigate in their “home” jurisdictions, perhaps for administrative convenience, to benefit from home court advantage, or to minimize their litigation costs. One exception to this hypothesis arises in the UK, where Interdigital and Vringo, both large U.S.-based PAEs, have asserted a total of eight SEPs. But in both cases, these assertions, which also have counterparts in the United States, appear to be part of global patent litigation campaigns that span multiple jurisdictions.

Table 4 shows the types of NPEs that enforced SEPs versus non-SEPs in Germany and the UK during the periods studied.

**Table 4: Comparison of NPE Types with SEPs and without SEPs (Germany & UK)**

<u>NPEs</u>	<u>Non-SEP</u>	<u>SEP</u>
PAE: IP licensing (acquired patents)	26	5
PAE: IP licensing (owned by inventor)	31	1
University or Research Inst.	8	1
Startup (pre-product)	1	0
Individual	241	0
Industry consortium	3	0
IP subsidiary (producing comp)	35	3
<b>N</b>	<b>345</b>	<b>10</b>

As Table 4 shows, of the ten total NPEs asserting SEPs, six were PAEs (60%), three were IP subsidiaries of operating companies (30%), and one was a university (10%). In the U.S. study, of 26 identified NPEs that asserted SEPs, twenty (77%) were PAEs, three (11%) were technology development firms, and one each were an academic/governmental institution, IP subsidiary, or an individual.<sup>89</sup>

The profile of NPEs asserting non-SEPs is strikingly different. As shown in Table 4, the most significant type of NPE observed in German and UK cases over the period studied were individuals (69.9%). PAEs represented 16.5% of the total number of NPEs, followed by IP subsidiaries of operating companies (10.1%), and universities (2.3%).<sup>90</sup> Individuals

89. Contreras, *supra* note 48, at fig.4, app.2.

90. Allison, Lemley, and Schwartz studied all U.S. patent assertions in 2008 and 2009 and found that, among NPE assertions (27.9% of the total), the breakdown of NPEs by

represent the lion's share of all NPE plaintiffs in Germany and the UK, but asserted no SEPs. Meanwhile, PAEs and IP subsidiaries represented 60% and 30% of the NPEs asserting SEPs, but only 16.5% and 10.1% of the NPEs asserting other patents in Germany and the UK. This data suggests that the assertion of SEPs may require a greater degree of expertise than the assertion of other patents and is thus pursued primarily by firms with deep technological expertise and ties to industry.

### C. COMPARISON TO U.S. DATA

Table 5 compares German, UK, and U.S.<sup>91</sup> assertions of SEPs covering the four standards common to both studies: GSM, UMTS, LTE and H.264. In order to form an accurate comparison, only cases filed between 2000 and 2008 were considered for all three jurisdictions.

**Table 5: Comparison of German, UK, and U.S. SEP Litigation (2000–2008)**

	DE PAE Cases	DE All Cases	UK PAE Cases	UK All Cases	U.S. PAE Cases <sup>92</sup>	U.S. All Cases <sup>65</sup>
2G GSM <sup>93</sup>	2	18	2	2	1	3
3G UMTS <sup>94</sup>	0	12	1	3	10	12
4G LTE	0	2	0	0	0	1
H.264	0	2	0	0	0	1

Table 5 gives rise to several observations. First, the level of litigation surrounding GSM, ETSI's 2G wireless standard, is significantly higher in Europe than the United States (eighteen and twelve assertions, respectively, versus three). This result is not entirely surprising, as the 2G GSM standard was deployed primarily in Europe, while competing 2G CDMA standards were prevalent in the United States.<sup>95</sup> Moreover, the major holders of patents covering GSM were European firms.<sup>96</sup> It thus stands to reason that,

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category was: Individual (11.8%), PAE (11.0%), Failed Startup (3.8%) and University (1.4%). Allison et al., *supra* note 17, at 293 tbl. A1.

91. See Contreras, *supra* note 35, at 528 tbl. 3.

92. Jorge L. Contreras, *Dataset of U.S. SEP Assertions 2000-2015* (on file with author), GSM, UMTS, LTE, H.264.

93. Includes patents declared both as to ETSI GSM and ETSI GSM/TDMA.

94. Includes patents declared both as to ETSI UMTS and ETSI UMTS/CDMA.

95. See generally RUDI BEKKERS & JAN SMITS, *MOBILE TELECOMMUNICATIONS: STANDARDS, REGULATION, AND APPLICATIONS* (Artech House trans., 1999) (1997).

96. By the time that GSM was approved by ETSI in 1990, four European firms (Ericsson, Nokia, Siemens, and Alcatel), together with U.S.-based Motorola, held most

at least in the early years, GSM patents and products were concentrated in Europe, as was GSM litigation.<sup>97</sup> Further confirming this theory, the single U.S. NPE assertion of GSM SEPs (in which three different SEPs were asserted) was initiated by IPCom, a Munich-based PAE,<sup>98</sup> against HTC, a Chinese handset manufacturer.<sup>99</sup> The U.S. operating company-initiated GSM suits were brought by Research in Motion (RIM, now Blackberry) and Broadcom—a handset manufacturer and wireless chip vendor, respectively.<sup>100</sup> In Germany, IPCom was also responsible for the GSM suits identified. However, IPCom was the only NPE active in Germany with respect to GSM during this period. The remainder of German GSM suits were brought by operating companies active in the telecommunications market (Ericsson, Philips, and Motorola).

The level of assertions relating to UMTS, ETSI's 3G standard that replaced GSM, are comparable in Germany and the United States (twelve assertions each), and half that level in the UK. Again, this result is consistent with the development of the global mobile industry, which sought a uniform 3G solution to replace the geographically fragmented and incompatible 2G protocols.<sup>101</sup> As a result, UMTS was adopted at similar rates in the United States and Europe and U.S. firms—including Qualcomm and Motorola—held significant patent positions. One significant difference between German and U.S. assertions covering UMTS, however, is the degree to which NPE suits dominate U.S. litigation (eighty-three of UMTS assertions) but play no role in German litigation. With respect to U.S. UMTS suits during this period, four different PAEs were active: U.S.-based Golden Bridge, SPH, and MSTG, as well as the German PAE IPCom.<sup>102</sup> The two UMTS suits brought in the United States by operating companies were initiated by RIM and Broadcom in the same actions in which they also asserted GSM-related patents (discussed above).<sup>103</sup> In Germany, in

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patents covering the standard. Rudi Bekkers et al., *Intellectual Property Rights and Standardization: The Case of GSM*, 26 TELECOMM. POL'Y 171, 175–76 (2002).

97. Despite this slow start, GSM litigation did pick up in the United States after 2008, fueled primarily by NPE assertions. By 2015, there had been twenty-nine GSM cases in the United States, with twenty-three (79%) initiated by NPEs. Contreras, *supra* note 35, at 528 tbl. 3.

98. IPCom was formed in 2007 to monetize SEPs in the mobile communications field. *See About Us*, IPCom, [http://www.ipcom-munich.com/home\\_en.html](http://www.ipcom-munich.com/home_en.html) (last visited Mar. 15, 2018).

99. Contreras, *supra* note 92, at GSM.

100. *Id.*

101. *See* BEKKERS & SMITS, *supra* note 95.

102. Contreras, *supra* note 92, at UMTS.

103. *Id.*



contrast, all suits concerning UMTS were brought by operating companies based in Europe (i.e., Ericsson, France Telecom, and Siemens) or the United States (Motorola and Qualcomm).<sup>104</sup> When U.S. litigation data is extended through 2015, the number of assertions rises dramatically to 123 cases, but the proportion of NPE suits (115 or 93%) remains consistent.<sup>105</sup>

Data relating to LTE, ETSI's 4G mobile standard that replaced UMTS, is difficult to compare during this period, as LTE was not publicly released until 2008, at the tail end of our German dataset. Nevertheless, it is significant that two German actions asserting LTE patents were brought even in this very early stage. In the United States, a single LTE suit was brought in 2008 by RIM. Projecting outward, U.S. data through 2015 shows that 95 LTE suits were brought, including 85 (89%) by PAEs.<sup>106</sup> Interestingly, however, UK data through 2013 shows no LTE suits at all.

#### D. LITIGATION OUTCOMES

Tables 6 and 7 present data regarding the outcomes of the cases studied: a final decision that the asserted patent was valid and infringed, a final decision of noninfringement, or a settlement.<sup>107</sup> Table 6 compares the outcomes of cases involving SEP assertion by NPEs and operating firms. Table 7 compares the outcomes of all NPE-initiated cases, whether SEPs or non-SEPs were asserted. Both tables aggregate German and UK data for the periods studied.

**Table 6: Comparison of Outcomes of SEP cases: Operating Companies vs. NPEs (German and UK)**

<u>Outcome</u>	<u>Operating Co.</u>		<u>NPE</u>		<u>Difference</u>	<u>p-value</u>
All SEPs	N	Share	N	Share		
Infringed	21	0.186	85	0.253	-0.067	0.147

104. It is curious that IPCo, a German PAE, did not assert UMTS SEPs in Germany during the same period that it asserted them in the United States (in the same case in which it also asserted its GSM SEPs). This may be an artifact of timing, as IPCo's U.S. case (a counterclaim against HTC) was initiated in November 2008, and a corresponding German filing may have come shortly after the U.S. filing, but after the cutoff for our 2008 dataset.

105. We can draw no firm conclusion regarding the growth of German UMTS suits after 2008. However, qualitative studies such as the JRC Report suggest that PAE litigation concerning telecom technologies has grown significantly in Germany in recent years. See JRC Report, *supra* note 19, at 27 (“[B]y 2013 almost all of the [telecommunications patent] claims were made by entities that do not have any practicing activities.”).

106. See Contreras, *supra* note 35, at 528 tbl. 3.

107. This table only considers cases that have, as of the time of collection, reached a final adjudication. Cases still in progress are not represented.

<b>Not infringed</b>	4	0.035	4	0.011	0.023	0.103
<b>Settled</b>	88	0.779	247	0.735	0.044	0.358
<b>N</b>	113		336			

As shown in Table 6, settlement rates of SEP assertion cases in Germany and the UK do not vary substantially based on whether they were initiated by NPEs or operating companies. NPE-initiated cases settled 77.9% of the time, while 73.5% of operating company cases settled: a difference of only 4.4% that is not statistically significant ( $p=0.358$ ). A similar level of consistency was found by Contreras in U.S. SEP cases (71% and 68% of operating company-initiated and NPE-initiated SEP assertions settled, respectively).<sup>108</sup> Both sets of results are consistent with broader studies of patent litigation, which find that actions initiated by operating companies and NPEs settle at roughly the same rates.<sup>109</sup>

However, when decisions on the merits are considered, differences emerge. In the cases studied, NPEs had higher success rates proving infringement (25.3%) than operating companies (18.6%). That said, the difference is still not statistically significant ( $p=0.147$ ).<sup>110</sup> This result is somewhat contrary to the results of Contreras's study of U.S. SEP litigation, which found that operating companies asserting SEPs were five times more likely to prove infringement than NPEs (10% versus 2% of cases resulting in substantive judgments in favor of the plaintiff).<sup>111</sup> More general studies of U.S. patent litigation also find that operating company plaintiffs are much more likely to prevail on the merits of infringement claims than NPEs.<sup>112</sup> Given these statistics, it is difficult to explain European NPEs' higher rates of success with SEP infringement claims relative to operating companies. One possibility is simply that in the cases studied, which are heavily represented by Sisvel's patent pool assertions, the patents are particularly strong, making it more likely that judgments of infringement will be reached.

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108. See Contreras, *supra* note 48, at 60.

109. See, e.g., Jeruss et al., *supra* note 32, at 385.

110. This pattern was also observed by Love et al., *supra* note 7, at 115 ("PAEs were reasonably successful in proving infringement. This is especially true in Germany, where infringement was found in eighty of the ninety-seven PAE cases decided on the merits.").

111. Contreras, *supra* note 48, at 60.

112. This result is shown most strikingly by Allison et al., *supra* note 17, at 268 tbl. 6a, which shows that in U.S. patent litigation from 2008 to 2009, operating companies obtained judgments of infringement more than four times as often as NPEs (160 versus 37 instances). See also John R. Allison et al., *Patent Quality and Settlement Among Repeat Patent Litigants*, 99 GEO. L.J. 677, 693 (2011); Jeruss et al., *supra* note 32, at 387.

In a different vein, Love et al. have hypothesized that higher rates of infringement may generally be found in German cases due to the bifurcated nature of the German litigation system.<sup>113</sup> That is, in Germany, invalidity challenges are not made until after infringement is found and, in many instances, cases settle.<sup>114</sup> In the United States, on the other hand, a verdict of infringement would not be reached if the relevant patents were found to be invalid. This hypothesis does little, however, to explain the difference between success rates of NPEs and operating companies within Germany.

**Table 7: Comparison of Outcomes of NPE cases with SEPs and without SEPs**

<u>Outcome</u>	<u>Non-SEP</u>		<u>SEP</u>		<u>Difference</u>	<u>p-value</u>
<b>All NPEs</b>	N	Share	N	Share		
<b>Infringed</b>	82	0.170	85	0.254	-0.084	0.003
<b>Not infringed</b>	96	0.199	4	0.011	0.188	0.000
<b>Settled</b>	305	0.631	247	0.735	-0.103	0.002
<b>N</b>	483		336			

Table 7 compares the outcomes of NPE cases that enforce SEPs with the outcomes of NPE cases that do not. In his U.S. study, Contreras found that outcomes of SEP-related NPE cases were generally consistent with published reports describing outcomes of general patent cases brought by NPEs.<sup>115</sup> The data in Table 6, however, shows distinct differences in terms of settlement likelihood (63.1% for non-SEP cases versus 73.5% for SEP cases) and findings of infringement (17.0% for non-SEP cases versus 25.4% for SEP cases). Thus, in the European cases studied, NPE cases involving SEPs were both more likely to settle (difference being 10.3%) and more likely to result in a finding of infringement if they did not settle (difference being 8.4%).

One explanation for this difference may lie in the nature of SEPs. If a patent is declared as essential to a standard, and if that declaration is accurate, then, by definition, any product implementing the standard must infringe the patent. As such, one might expect that SEP cases would, in general, be more likely to result in findings of infringement than non-SEP cases. However, there is no external validation of patent holders'

113. See Love et al., *supra* note 7, at 115 n.18 (discussing the potential impact that Germany's bifurcated system has on infringement outcomes); see also Cremers et al., *supra* note 57.

114. See *id.*

115. Contreras, *supra* note 48, at 60. The Contreras U.S. SEP study did not collect or analyze data regarding non-SEP cases.

declarations of essentiality. Thus, in U.S. cases, a SEP holder must prove infringement as a factual matter to a jury, as in any other patent case.<sup>116</sup> It is possible that European courts, which do not rely on jury determinations of infringement, may give greater deference to the patent holders' declarations of essentiality, thus making it easier to prove infringement when a SEP is involved.

Another potential factor at work, at least in the sample of cases studied, is the significant number of repeat assertions by Sisvel of the same few patents.<sup>117</sup> It is possible that, while the patent holder may have been required to prove infringement in the normal course, after it did so once, it may have been easier to do so in cases against similarly situated accused products. If so, then the higher rate of success for SEPs may simply be attributable to repeat litigation by the SEP holder, rather than any particular attribute of the SEPs themselves.

## V. LIMITATIONS AND OPPORTUNITIES FOR FURTHER STUDY

This study is the first to attempt to quantify the level of SEP assertion by NPEs in Europe. Because we largely relied on existing data sets and publicly-available data, there are limitations inherent in our findings, as well as numerous opportunities for further study.

First, this study's temporal coverage could be expanded. As noted above, comprehensive litigation data for Germany is currently only available for the years 2000 to 2008. Yet it appears that a significant amount of SEP litigation has arisen after 2008.<sup>118</sup> Thus, extending the temporal scope of our study in Germany through a more recent date would likely reveal further interesting data. In particular, it would be informative to compare rates of SEP assertion before and after the CJEU's 2015 decision in *Huawei v. ZTE*.<sup>119</sup> Likewise, it is not clear whether the introduction of the UPC in Europe will have an impact on jurisdictions in which litigants, and PAEs in particular, elect to file suit. This being said, our analysis through 2008 encompasses the adoption and deployment of several

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116. See, e.g., *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1213 (Fed. Cir. 2014) (noting that, while the district court held a bench trial on FRAND issues, a jury trial was held to determine infringement).

117. See Table 3, *supra*.

118. See Jorge L. Contreras, *Fixing FRAND: A Pseudo-Pool Approach to Standards-Based Patent Licensing*, 79 ANTITRUST L.J. 47, 95–97 (2013) (cataloging all U.S. FRAND-related litigation by year, through 2012).

119. Case C-170/13, *supra* note 41, ¶ 37 (judgment).

significant and heavily-litigated standards, particularly ETSI's 2G GSM and 3G UMTS wireless telecommunications standards. This end date also fits well with the most recent and comprehensive studies of NPEs and patent litigation both in Europe and in the United States.<sup>120</sup>

Likewise, expanding the geographic scope of this study could yield informative results. The JRC has observed that PAE activity in Europe is concentrated in the UK, Germany, France, Sweden, Italy, Switzerland, Finland, the Netherlands, Norway, and Spain.<sup>121</sup> The recent empirical study of EU patent litigation by Cremers et al. covered Germany, the UK, France, and the Netherlands.<sup>122</sup> Given that major SEP holders in the wireless telecommunications space are based in Sweden (Ericsson) and Finland (Nokia), expanding our study to one or more of these additional countries could shed additional light on the extent of PAE activity in Europe. Moreover, expanding our research to the major Asian jurisdictions (China, Korea, Japan, and India) could offer illuminating comparisons worth considering, though the inability to identify and search cases in these jurisdictions still presents significant practical hurdles.

From a methodological standpoint, this study is limited by its dependence on patents that are publicly declared as being essential to particular standards and which are cataloged in dSEP. As a result, we had no ability to identify litigation involving other SEPs, even those relating to widely adopted standards that are not included in dSEP. For this reason, the scope of our study did not overlap precisely with the seven standards studied by Contreras with respect to U.S. SEP litigation, nor did our study include any standards subject to RF licensing policies (i.e., all were FRAND-based policies). In future work, we could use a combination of overlapping case harvesting methodologies, including the dSEP correlation utilized in the present study together with text-based searching of litigation records, as performed by Contreras for U.S. cases.<sup>123</sup>

## VI. CONCLUSIONS

By matching case-level data from two major patent litigation jurisdictions, Germany (2000 to 2008) and the UK (2000 to 2013), with

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120. See Cremers et al., *supra* note 3 (analyzing German patent litigation data through 2008); Love et al., *supra* note 7 (analyzing German NPE litigation data through 2008); Allison et al., *supra* note 17 (analyzing U.S. NPE litigation data for 2008 and 2009).

121. JRC Report, *supra* note 19, at 41.

122. Cremers et al., *supra* note 3.

123. The ability to perform text-based searching on European cases does not yet exist in a convenient form. Though some commercial legal databases have recently emerged, their coverage for Europe falls short compared to the United States.

declared patents in the dSEP database, we have collected all assertions of SEPs by NPEs over the selected jurisdictions and timeframes. We analyzed these results in terms of frequency of assertion by standard, plaintiff, timing of assertion, plaintiff characteristics, and litigation outcome. We also compare our results with a recent study of NPE SEP assertion in the United States. These analyses suggest the following conclusions.

First, Germany surpasses the UK in terms of the frequency with which SEP cases are filed (422 versus 36 SEP assertions initiated). This observation is consistent with general patent litigation trends in these two jurisdictions and the view that Germany is the most important patent litigation venue in Europe.<sup>124</sup> However, it is significant that the vast majority of German SEP assertions that we observed were initiated by a single PAE, Sisvel. In addition, viewed as a percentage of all patent litigation, SEP assertions in Germany and the UK are actually comparable. German SEP assertions represented approximately 8% of all German patent cases filed during the period studied, and UK SEP assertions represented approximately 6% of all UK patent cases filed during the period.<sup>125</sup> Thus, when taking into account the lower overall rates of patent litigation in the UK, Germany and the UK appear to have similar rates of SEP assertion. In fact, were we to exclude Sisvel, the number of SEP assertions as a percentage of overall German patent assertions would fall well below that of the UK. Thus, it does not appear that Germany presents any compelling benefits to SEP plaintiffs over holders of non-SEPs.

This said, Sisvel's selection of Germany as its preferred litigation venue can hardly be ascribed to chance. Sisvel is based in Italy, and the principal owners of the SEPs asserted by Sisvel are also based outside of Germany (Philips in the Netherlands and France Telecom in France). Thus, Germany presents no "home court advantage" for Sisvel and was likely selected due to its perception as a plaintiff-friendly jurisdiction. It may also have been selected because of its bifurcated system in which injunctions can be readily obtained before adjudication on the merits. It is unclear whether these advantages will continue following the implementation of the UPC.

Our observations also confirm that the large majority of NPE SEP assertions in Europe during the periods studied have been by Europe-based NPEs, and not by U.S. entities. Thus, while large numbers of NPEs operate

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124. See JRC Report, *supra* note 19, at 5 ("[T]he majority of [PAE] assertions in Europe have been initiated in Germany . . ."); Cremers et al., *supra* note 3, at 23 tbl. 3 (identifying 8,424 German patent cases from 2000 to 2008 and 326 UK patent cases from 2000 to 2013).

125. See *supra* Section IV.A.



in the United States,<sup>126</sup> our results show that few of them availed themselves of the European courts during the periods studied. One possible explanation for the avoidance of European courts by U.S. PAEs has been suggested by the JRC, which speculates that U.S. NPEs may simply lack the “know how” to litigate effectively in Europe.<sup>127</sup> U.S. PAEs may also find that lower average damages awards in Europe<sup>128</sup> coupled with the risk of the loser paying the winner’s litigation costs,<sup>129</sup> and the necessity to engage European counsel may make European litigation less profitable than litigation in favorable jurisdictions in the United States.<sup>130</sup> As such, at least for the periods studied, European NPE SEP litigation has largely been dominated by Europe-based entities.<sup>131</sup>

The observed characteristics of NPEs asserting SEPs versus non-SEPs are also informative. As described in Section III.B, the large majority of patent assertions by NPEs in Germany and the UK were by individuals (69.9%). PAEs and IP subsidiaries of operating companies represented a total of only 26.6% of non-SEP assertions. For SEPs, the results were strikingly different, with PAEs and IP subsidiaries collectively representing 90% of assertions, and no individuals represented at all. These results, which are consistent with those in the United States,<sup>132</sup> suggest that the assertion (and acquisition) of SEPs may require a greater degree of expertise than the average patent assertion and is thus pursued primarily by firms with deep technological expertise and ties to industry.

Finally, a direct comparison of German, UK, and U.S. assertion of SEPs covering the GSM and UMTS standards over the period 2000 to 2008 reveals that even in a globalized economy, litigation over SEPs has numerous localized tendencies. For example, as illustrated in Table 5, the

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126. *See, e.g.,* Cotropia et al., *supra* note 32, at 676 (finding that more than 1,500 unique NPEs filed suit between 2010 and 2012).

127. JRC Report, *supra* note 19, at 55.

128. *See id.*

129. *See id.* at 54.

130. European patent litigation costs are estimated in more detail in Cremers et al., *supra* note 57.

131. One exception to this rule is litigation brought in Germany and the UK by large U.S.-based PAEs such as Interdigital and Vringo as part of global patent litigation campaigns. *See supra* Section IV.B.

132. Allison, Lemley, and Schwartz observed that of all U.S. NPE patent assertions in 2008 and 2009, Individuals brought 11.8%, PAEs 11.0%, Failed Startups 3.8%, and Universities 1.4%. Allison et al., *supra* note 17, at 293 tbl. A1. In Contreras’s U.S. SEP-assertion study, of 26 identified NPEs that asserted SEPs, 20 (77%) were PAEs, 3 (11%) were technology development firms, and one each were an academic/governmental institution, IP subsidiary and an individual.



assertion of SEPs covering GSM—the 3G wireless telecommunications standard deployed primarily in Europe—was largely focused in Germany (eighteen cases) with relatively few cases in the United States (two cases). And of the two U.S. NPE GSM cases brought during this period, both were initiated by a German PAE, IPCom. But with ETSI's 3G UMTS standard, which was adopted worldwide, SEP assertion rates in the United States and Germany became equivalent. NPE suits dominate U.S. litigation but play no role in German litigation.<sup>133</sup> This finding suggests, again, that while PAE activity is meaningful in Europe, it is still surpassed by U.S. PAE litigation, particularly with respect to standardized technologies not included in Sisvel's patent pools.<sup>134</sup>

In summary, these results indicate that the assertion of SEPs has occurred in Europe at significant levels, and that PAEs played a large role in this activity. Further research is encouraged to illuminate more recent trends, particularly in view of the implementation of the UPC and the CJEU's decision in *Huawei v. ZTE*.<sup>135</sup>

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133. See *supra* Table 5 and accompanying text.

134. Today, Sisvel administers a patent pool covering 3G technology through its subsidiary 3G Licensing S.A. See 3G LICENSING S.A., *supra* note 86.

135. Case C-170/13, *supra* note 41, ¶ 37 (judgment).



# **THE “TRAGEDY OF THE ANTICOMMONS” FALLACY: A LAW AND ECONOMICS ANALYSIS OF PATENT THICKETS AND FRAND LICENSING**

*David J. Teece<sup>†</sup>*

## **ABSTRACT**

Heller introduced the “anticommons” concept in the late 1990s, based on Hardin’s earlier “commons” concept, to refer to the situation in which numerous entities control the rights to use some asset or related cluster of assets. Heller and Rosenberg argued that, in such situations, users would need permission from multiple rights holders in order to use the asset(s), and that the difficulties of coordination would lead to inefficient underuse, leading to what they termed the “tragedy of the anticommons.” This Article addresses the limitations of the “tragedy of the anticommons” arguments in the context of licensing of patents related to some industry standard for which the patent holders have committed to license their patents on “fair, reasonable and nondiscriminatory” (“FRAND”) licensing terms. This Article identifies several real-world examples where Heller and Eisenberg’s prediction of underuse are not borne out in practice, and explain why real-world institutions that have emerged have largely solved the problem.

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### I. INTRODUCTION

The idea of the “anticommons” was introduced to the law and economics literature by Heller (1998)<sup>1</sup> and Heller and Eisenberg (1998)<sup>2</sup> using an analogy with Hardin’s “tragedy of the commons.”<sup>3</sup> They suggested that, when ownership of complementary assets (whether tangible or intangible) is fragmented, firms may not be able to negotiate for all of the

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1. Michael A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621 (1998).

2. Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698, 698–701 (1998).

3. Garrett Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243 (1968).

permissions needed to use the fragmented rights in socially desirable ways.<sup>4</sup> The claim is that, when ownership of rights is fragmented, the difficulties associated with negotiating the necessary permissions lead to inefficient underuse.<sup>5</sup> Heller and Eisenberg point to the situation in biomedical research, where many firms have different patents on complementary research tools whose coordinated use is needed to discover, develop, and market new drugs.<sup>6</sup>

Heller defined the anticommons as a situation on which “multiple owners are each endowed with the right to exclude others from a scarce resource, and no one has an effective privilege of use.”<sup>7</sup> He gave as his example the situation in post-Soviet Russia in which storefronts sat idle while vendors set up kiosks on the sidewalk in front of the empty storefront, because the rights to control the use of the building were held by a group of different entities and negotiating the necessary permissions to use the building was difficult.<sup>8</sup> In that situation, the “scarce resource” is the building, and the tragedy is that a valuable asset can be underused, not used, or possibly even abandoned.

As noted, Heller and Eisenberg applied the anticommons label to a quite different situation in which multiple patent holders each have separate patents on various complementary biotechnology research tools, a number of which need to be used together in order to develop new products legally.<sup>9</sup> However, in such a situation, it is doubtful whether there is a single “scarce resource” over which “multiple owners” each have the right to exclude. Instead, there are multiple complementary patents; each patent holder has the right to exclude others from using its own patented technology (but not

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4. Heller, *supra* note 1, at 624 (“When there are too many owners holding rights of exclusion, the resource is prone to underuse—a tragedy of the anticommons”); Heller & Eisenberg, *supra* note 2, at 698 (“[A]voiding tragedy requires overcoming transaction costs, strategic behaviors, and cognitive biases of participants . . . Once an anticommons emerges, collecting rights into usable private property is often brutal and slow.”) (citations omitted).

5. See *supra* note 4 and accompanying text.

6. Heller & Eisenberg, *supra* note 2, at 698 (“The result has been a spiral of overlapping patent claims in the hands of different owners, reaching ever further upstream in the course of biomedical research.”).

7. Heller, *supra* note 1, at 624.

8. *Id.* (“This Article proposes empty Moscow storefronts as a canonical example of the tragedy of underuse.”). In reality, one expects that it may have been either a plethora of regulations or difficulty in pricing the various permissions rather than fragmentation of property rights that stood in the way of easy use.

9. Heller & Eisenberg, *supra* note 2.

the others' patents), and users need to use multiple complementary patented technologies in order to develop and legally market new products.<sup>10</sup>

In what follows, I will use the latter interpretation (i.e., that market activity is complicated by the challenges associated with what I call elsewhere the "multi-invention" situation).<sup>11</sup> Given this interpretation, I believe that the presence of "patent thickets"—where multiple patents held by different firms are often required for completion of a single product—would be an example of the anticommons "problem," as Heller and Eisenberg framed it in their discussion of the anticommons in biomedical research.<sup>12</sup>

Experience does not bear out Heller and Eisenberg's anticommons thesis in the patent context. In many situations where multiple patents covering many products in many contexts, there are extraordinary rates of innovation despite the fact that barriers supposedly exist.<sup>13</sup> This should give immediate pause to anyone trying to understand whether or not there is a policy issue of the kind Heller and Eisenberg suggest with respect to the so-called "anticommons." As discussed below, one can seriously question whether the "anticommons tragedy" arises all that frequently. Every day, many firms face the challenge of assembling thousands of inputs to make complex systems. The existence of products that require licenses from multiple patent owners supposedly leading to what Heller and Eisenberg characterize as a "tragedy of the anticommons" does not, in practice, seem to lead to serious problems.

Empirical work appears to confirm this commonsense intuition. For example, one study by Walsh, Arora, and Cohen did not show support the anticommons tragedy thesis for biotech.<sup>14</sup> Instead, they found that patents

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10. Deepak Somaya, David Teece & Simon Wakeman, *Innovation in Multi-Invention Contexts: Mapping Solutions to Technological and Multi-Invention Complexity*, 53 CAL. MGMT. REV. 47 (2011).

11. Somaya et al., *supra* note 10.

12. Edward J. Egan & David J. Teece, *Untangling the Patent Thicket Literature* (Tusher Cent. for Mgmt. of Intellectual Capital, Working Paper No. 7, 2015), <http://innovation-archives.berkeley.edu/businessinnovation/documents/Tusher-Center-Working-Paper-7.pdf>.

13. One well-known example includes cellular telecommunications, where there are thousands of patents held by hundreds of firms that have been declared as essential to various cellular standards, but the pace of technological progress is extremely rapid. *See infra* Section II.F.

14. 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, 285 (Wesley M. Cohen & Stephen A. Merrill eds., 2003) ("[T]here has in fact been an increase in patents on the inputs to drug discovery ('research tools'). However,

only posed a relatively small number of obstacles.<sup>15</sup> Further, the “solutions” to these obstacles included licensing, doing the research beyond the reach of patents, and outright infringement.<sup>16</sup> In addition to the Walsh et al. study, Fiona Murray and Scott Stern (2007) see little evidence of harmful effects created by patent thickets.<sup>17</sup> Their test examines knowledge difference rates associated with the publication of a patent.<sup>18</sup> Anticommons theory predicts a drop-off in citations to the research once patents are granted; they find at most only a modest drop off.<sup>19</sup>

There is a problem of a different kind lurking about that is highlighted in this Article. The systematic problem identified here is undercompensation, and possibly overuse, not underuse. The goal of this Article is to explore in more detail the reasons why underutilization of technology might arise in particular contexts. Indeed, as discussed below, even Eisenberg has subsequently conceded that important qualifications need to be made to the anticommons thesis, noting that unauthorized use likely mitigates the risk of anticommons problems.<sup>20</sup> However, she still worries that in the case of “practically excludable” materials and data, high transaction costs makes technology use less likely.<sup>21</sup>

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we find that drug discovery has not been substantially impeded by these changes. We also find little evidence that university research has been impeded by concerns about patents on research tools.”).

15. *Id.* at 285–86 (“Restrictions on the use of patented genetic diagnostics, where we see some evidence of patents interfering with university research, are an important exception. There is, also, some evidence of delays associated with negotiating access to patented research tools, and there are areas in which patents over targets limit access and where access to foundational discoveries can be restricted.”).

16. *Id.* at 286 (“[F]irms and universities have been able to develop ‘working solutions’ that allow their research to proceed.”).

17. Fiona Murray & Scott Stern, *Do Formal Intellectual Property Rights Hinder the Free Flow of Scientific Knowledge? An Empirical Test of the Anti-Commons Hypothesis*, 63 J. ECON. BEHAV. & ORG. 648 (2007).

18. *Id.* at 650.

19. *Id.* at 651 (“[T]here is robust evidence for a quantitatively modest but statistically significant anti-commons effect; across different specifications, the article citation rate declines by approximately 10 to 20 percent after a patent grant.”).

20. Rebecca S. Eisenberg, *Noncompliance, Nonconformist, Nonproblem? Rethinking the Anticommons in Biomedical Research*, 45 HOUS. L. REV. 1059, 1098 (2008).

21. *Id.* at 1098–99.



## II. EMPIRICAL AND THEORETICAL CHALLENGES TO THE ANTICOMMONS

Heller and Eisenberg have described a potential concern; but in their original article they did not identify a single verifiable instance of underuse. Instead, their article was replete with examples of what “could” or “may” happen. If research is presented as policy relevant, vague innuendo or occasional examples of allegedly deterred behavior are not an adequate substitute for broader empirical studies.

Accordingly, this Part outlines various empirical and theoretical challenges to the anticommons thesis as articulated by Heller and Eisenberg. It first notes when anticommons scholars claim that an anticommons situation should arise. Then, it identifies five arguments demonstrating that anticommons situations do not inherently give rise to inefficiency or other harmful consequences, and then even when potential anticommons problems may exist, private ordering can effectively solve them.

### A. IDENTIFYING “ANTICOMMONS” SITUATIONS

This Section briefly examines the anticommons literature to identify what factors are supposed to give rise to anticommons situations, in order to frame the empirical inquiries in the remainder of this Part. As noted in Part I, the anticommons literature is thought to have started with Heller and Eisenberg. Since their papers, a number of other authors have expanded on their work, notably Buchanan and Yoon<sup>22</sup> and Fennell.<sup>23</sup> Buchanan and Yoon purport to show that the anticommons and commons problems are symmetric, though I disagree for the reasons laid out below.<sup>24</sup> Fennell contrasts both the commons and the anticommons with what she refers to as the “semicommons,” following Henry Smith’s work.<sup>25</sup>

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22. James M. Buchanan & Yong J. Yoon, *Symmetric Tragedies: Commons and Anticommons*, 43 J.L. ECON. 1 (2004).

23. Lee Anne Fennell, *Commons, Anticommons, Semicommons*, in RESEARCH HANDBOOK ON THE ECONOMICS OF PROPERTY LAW 35 (Kenneth Ayotte & Henry E. Smith eds., 2009) (citing Henry E. Smith, *Semicommon Property Rights and Scattering in the Open Fields*, 29 J. LEGAL STUD. 131 (2000)).

24. The core problem with their argument is that even though, on paper, multiple permissions are needed in order to make use of complementary assets, this “requirement” often does not hold true in practice once the limitations of defining and enforcing rights are recognized. See *infra* Section II.C.

25. Henry E. Smith, *Semicommon Property Rights and Scattering in the Open Fields*, 23 J. LEGAL STUD. 131 (2000).

In what follows, I will concentrate on Heller and Heller and Eisenberg. As noted above, one particularly important example of a situation where there are fragmented property rights involves so-called “patent thickets,” where numerous firms have a large number of patents that relate to some product. I have written critically about patent thickets at length elsewhere and will not repeat that discussion here.<sup>26</sup> The presence of patent thickets has led to concerns about “royalty stacking,” a situation in which the potential for having to pay multiple patent holders for licenses is claimed to raise the cost of making products, potentially to unsustainable levels.<sup>27</sup> The issue of “royalty stacking” is a complex one, but a discussion of the issues involved would take us too far afield from the thrust of the present Article.

Finally, in some contexts, patent holders have voluntarily given pledges not to enforce their patents.<sup>28</sup> One recent example involves Tesla’s pledge not to assert its patents against those that want to use its technology in good faith.<sup>29</sup> Such pledges may serve to reduce problems associated with the potential enforcement of patent rights. However, because there is a dearth of aggregated empirical data to analyze, this Article does not engage with them.<sup>30</sup>

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26. See, e.g., Edward F. Sherry & David J. Teece, *Patent Thickets: An Economic Appraisal* (Tusher Cent. for Mgmt. of Intellectual Capital, Working Paper No. 1, 2015), <http://innovation-archives.berkeley.edu/businessinnovation/documents/Patent-Thickets232015.pdf>; Egan & Teece, *supra* note 12.

27. Benjamin C. Li, *The Global Convergence of FRAND Licensing Practices: Towards “Interoperable” Legal Standards*, 31 BERKELEY TECH. L.J. 429, 432 (2016) (“A royalty rate that may have seemed reasonable on its own is not reasonable when a company developing a particular technology must pay several thousand separate royalties to account for all of the patents implicated by its technology. Stacking all of these royalties on top of each other can make a product too expensive to bring to market.”); Zelin Yang, *Damaging Royalties: An Overview of Reasonable Royalty Damages*, 29 BERKELEY TECH. L.J. 647, 652 (2014) (“The cumulative effect of potentially overcompensating thousands of patentees represents a crushing cost for producers and stifles innovation.”); Mark A. Lemley & Carl Shapiro, *A Simple Approach to Setting Reasonable Royalties for Standard-Essential Patents*, 28 BERKELEY TECH. L.J. 1135, 1149 (2013) (“Royalty stacking arises when implementers must pay royalties to multiple patent owners, so those royalties cumulate or ‘stack’ on top of each other from the perspective of the implementer.”).

28. See generally Clark D. Asay, *The Informational Value of Patents*, 31 BERKELEY TECH. L.J. 259 (2016) (describing the legal implications of the growing trend of patent nonenforcement pledges).

29. See *id.* at 280 (noting that it is an open question whether such pledges would be enforceable in a lawsuit); Tyrone Berger, *Where’s the Real Value in Tesla’s Patent Pledge*, PHYS.ORG (Aug. 20, 2014), <http://phys.org/news/2014-08-real-tesla-patent-pledge.html>.

30. Unfortunately, I do not know of any data source that collects information about the extent of such pledges in different industries, nor of any data source that would enable me to trace the empirical effect of such pledges.

B. COMPLEX PRODUCTS WITH MANY TANGIBLE INPUTS SUPPLIED BY DIFFERENT SUPPLIERS

There are readily observable situations where an anticommons problem should arise under Heller and Eisenberg's theory, but does not arise in practice. To better understand the nature of a possible anticommons problem, I believe it is worth drawing an analogy to the situation in which multiple tangible complementary inputs supplied by a large and "fragmented" number of different suppliers are needed to make and sell a complex product.

By way of illustration, Boeing says that that "the 787 [Dreamliner] is made up of 2.3 million parts, which are flown in from 135 sites across the globe"<sup>31</sup> presumably sold by hundreds if not thousands of suppliers. One source says that an "A380 [Airbus] has about 4 million parts, with 2.5 million part numbers produced by 1,500 companies from 30 countries around the world."<sup>32</sup>

To my knowledge, no one complains about an "anticommons" in the supply of airplane parts, but the situation certainly qualifies as an "anticommons" in the Heller and Heller and Eisenberg sense. The aircraft manufacturers need to assemble numerous (in this case, millions of) complementary inputs (in this case, tangible components), supplied by a large and "fragmented" group of suppliers, in order to make and sell its product. Boeing and Airbus have to negotiate with hundreds if not thousands of vendors to acquire the necessary millions of parts.<sup>33</sup> Once production commences, if any key input from a key supplier is unavailable, the production process grinds to a halt, even if all of the other inputs are available. Yet airplane production and innovation proceeds apace.<sup>34</sup> Neither the fact that there are multiple suppliers of needed complementary components or the potential for "input cost stacking" acts as a deterrent to making and selling complex products. This is also true despite the fact that some components are proprietary and do not enter general commerce.

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31. Lucy Tobin, *Dreaming Big in Boeing's Jumbo Factory*, INDEPENDENT (Apr. 16, 2014, 11:00 PM), <http://www.independent.co.uk/news/business/analysis-and-features/dreaming-big-in-boeings-jumbo-factory-9265916.html>; Randy Tinseth, *Our Supply Chain*, BOEING BLOGS (Feb. 21, 2013), [http://www.boeingblogs.com/randy/archives/2013/02/supply\\_chain.html](http://www.boeingblogs.com/randy/archives/2013/02/supply_chain.html) (offering a visual breakdown of suppliers for the Boeing 787).

32. James Wallace, *A380 Ride & Factoids*, SEATTLE POST-INTELLIGENCER (Mar. 29, 2007, 5:03 PM), <http://blog.seattlepi.com/aerospace/2007/03/29/a380-ride-and-factoids/>.

33. See *id.*; Tobin, *supra* note 31; Tinseth, *supra* note 31.

34. William Cook, *The Best Innovation in Aviation*, BBC FUTURE (Dec. 19, 2017), [www.bbc.com/future/story/20171219-subtle-and-surprising-innovations-in-aviation](http://www.bbc.com/future/story/20171219-subtle-and-surprising-innovations-in-aviation).

In fairness, the lack of concern may be because of competition among vendors of parts to supply parts to Boeing or Airbus; if one hydraulic pump supplier tries to charge an excessive price, Boeing or Airbus can turn to an alternative pump supplier. That is often not the case with patented technology, as each patent holder has a “monopoly” over its own patented technology (though there may be just-as-good substitute technologies available from others; so the “patent monopoly” over a particular patented technology may not imply any market power in a relevant technology market).<sup>35</sup> The lack of concern is also in part because tangible input suppliers can physically withhold their inputs unless assured of payment, unlike patent holders who have to resort to costly and risky patent litigation to enforce their rights. Finally, the lack of concern may also be because tangible inputs are often priced differently from intangible patented inputs; patent royalties calling for the licensee to pay a percentage-based royalty on its sales are common,<sup>36</sup> but I have never seen such a pricing structure for tangible inputs used to make a complex product.

Despite these caveats, the point is that the mere presence of an “anticommons” does not always lead to “underuse,” contrary to the suggestion of Heller and Eisenberg. Airplane production is a situation in which supply of complementary inputs needed for a complex product is fragmented, so that an implementer needs to deal with hundreds if not thousands of suppliers of complementary inputs—yet there is no resultant failure to provide air travel, as the robust and innovative airline industry demonstrates. Further, it obviously costs more to buy the millions of parts needed for an airliner than the dozens of parts needed for, say, a bicycle, and transaction costs are higher when there are more input suppliers. But in my experience, the “input cost stacking” in the case of multiple tangible inputs does not raise the hackles of commentators to anywhere near the

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35. See Justin R. Orr, *Patent Aggregation: Models, Harms, and the Limited Role of Antitrust*, 28 BERKELEY TECH. L.J. 525, 557 (2013) (“A patent alone does not convey market power for the purposes of antitrust law, and courts generally assume that because any inventor can innovate and receive a patent, firms rarely possess market power in a market for patents themselves.”); Stuart J.H. Graham & Ted Sichelman, *Why Do Start-Ups Patent?*, 23 BERKELEY TECH. L.J. 1063, 1085 n.99 (2008) (calculating that only “about 10% of all patents confer significant market power”); but cf. Thomas H. Chia, *Fighting the Smartphone Patent War with RAND-Encumbered Patents*, 27 BERKELEY TECH. L.J. 209, 211 (2012) (“Entities that implement a closed standard are ‘locked in’ to the patents that are essential to the standard. As a result, these ‘essential patent[s]’ automatically confer market power onto the patent holder.”).

36. Yang, *supra* note 27, at 648 (noting that such royalties “are the most common form of damages, accounting for eighty-one percent of the damages awards” in patent cases).

same degree that the somewhat-analogous “royalty stacking” does in the case of multiple patented inputs. In short, the process of production for an airline shows that an “anticommons” can exist without limiting innovation and development.

C. INFRINGEMENT, ACCESS, AND SELF-ENFORCEMENT

Anticommons situations may not give rise to inefficiencies when parties have access to patented goods and strategically choose to infringe. The tacit assumption underlying much of the Heller and Eisenberg anticommons argument is that firms need to negotiate in advance for the permissions needed to make and sell products.<sup>37</sup> That may be the case in the context of physical inputs, where all of the complementary inputs to a complex product are needed in order to assemble the product and the suppliers of the physical inputs will not deliver those inputs unless they are assured of getting paid.

But the situation with patents is different. This is because patent holders cannot physically withhold their patented technology from implementers who have not paid for the right to use it; instead, patent holders have to resort to costly and risky litigation in order to protect their rights.<sup>38</sup> As noted earlier, patents are not self-enforcing—they never have been. Accordingly, firms can and routinely do use patented technology without permission,<sup>39</sup> though of course they run the risk that they may be sued for doing so, may have to pay the (not inconsiderable) costs of defending against such suits, and may (if, but only if, the patent is found valid and infringed) be required to pay damages for their infringement and may be enjoined from future infringement if the court decides to grant an injunction.

Patent injunctions have also grown more difficult to obtain over time. In the days prior to the landmark *eBay* decision,<sup>40</sup> post-verdict prospective injunctions were routinely granted; now, the courts apply a four-factor test in deciding whether to grant such injunctions.<sup>41</sup> Accordingly, injunctions

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37. See *supra* note 4 and accompanying text (noting where Heller and Eisenberg make those assumptions).

38. Walsh et al., *supra* note 14, at 324 (noting that some actors, like universities, “simply to ignore some or all” of the “restrictive patents on upstream inventions” in hopes that an infringement suit will not follow); Tina Saladino, *Seeing the Forest Through the Trees: Gene Patents & the Reality of the Commons*, 26 BERKELEY TECH. L.J. 301, 321 (2011) (“Generally, for-profit firms do not threaten infringement action for unlicensed use largely due to the high costs and limited damages available through litigation.”).

39. See *id.*

40. *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006)

41. *Id.* at 390; Joshua D. Sarnoff & Christopher M. Holman, *Recent Developments Affecting the Enforcement, Procurement, and Licensing of Research Tool Patents*, 23 BERKELEY TECH. L.J. 1299, 1347 (2008) (“*eBay* rejected this strong presumption in favor

are much harder for patent owners to secure. Thus, unlicensed use and infringement is likely more frequent.<sup>42</sup> This is a quite different kind of tragedy from what Heller and Eisenberg had identified, and it may well be the more serious one.

Even Professor Eisenberg is having second thoughts. In a 2008 article, she revisited the anticommons issue in the context of biomedical research, drawing on empirical research (in the form of surveys and interviews) of problems faced by practitioners, both academic and industrial, in the field of biomedical research.<sup>43</sup> She largely retracted many of the “underuse” claims she and Heller had expressed ten years earlier.<sup>44</sup> She drew the distinction between “upstream” research, largely conducted by academics, and “downstream” research, largely conducted by firms, finding more concerns at the “downstream” level than at the “upstream” level.<sup>45</sup> Her conclusion was that:

[O]verall, intellectual property has presented fewer impediments than policymakers may have projected on the basis of early salient controversies. Most scientists report no difficulties in attempting to acquire IP-protected technologies, and only a small percentage report significant delays in research or having to abandon a project because of IP issues.<sup>46</sup>

She noted that many researchers (especially academics) ignore patents entirely. “Even in fields characterized by extensive patenting, many academic researchers seem to be either oblivious to the patents they might be infringing or unconcerned about potential infringement liability.”<sup>47</sup> This may be in part because patent holders often do not learn about such infringement (taking place as it does in research labs largely away from public scrutiny), and in part because patent holders are generally not willing to incur the cost of litigating their patents when there is little prospect of

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of granting injunctions in patent cases, holding that nothing in the Patent Act suggested that patent law should depart from traditional principles of equity law . . .”).

42. Saladino, *supra* note 38, at 321 (“Patent law, itself, may encourage this practice of unlicensed use.”).

43. Eisenberg, *supra* note 20.

44. *Id.* at 1098.

45. *Id.* at 1077 (“In the United States, difficulties in attempting to acquire IP-protected technologies were more common among industry respondents (40%) than among academic respondents (25%).”). It is worth noting that the patent situation is the same in both areas.

46. *Id.* at 1061.

47. *Id.*



recovering significant damages (which would be unlikely against academic researchers).<sup>48</sup>

Eisenberg went on to note that other considerations, such as the need to negotiate material transfer agreements (MTAs), proved more problematic for researchers than did patent rights, largely because researchers needed physical access to such raw materials and could not obtain them without negotiating with their suppliers, who (unlike patent holders) can generally physically withhold them unless compensated.<sup>49</sup> She noted the importance of what she called the “burden of inertia”<sup>50</sup> and the distinction between patent rights and what Cohen and Walsh had termed “practical excludability.”<sup>51</sup> In these regards, her 2008 paper mirrored those of other scholars, notably Caulfield, Cook-Deegan, Kieff, and Walsh.<sup>52</sup>

The leitmotif of Heller and Eisenberg is that the problem was underuse of technology, not overuse or underpayment. However, if one paid attention to the fact that property rights are not self-enforcing, the fact that (on paper) an implementer needs permissions from a fragmented set of multiple rights holders need not be controlling, as it is costly and difficult to enforce rights, and many implementers will simply ignore the need to obtain all of the necessary permissions. Even putting evidence to one side, the problem with the use of intellectual property knowledge more generally is free riding, imitation, and misappropriation—appropriability is a major challenge, and (in my view) a much more compelling problem than underuse.<sup>53</sup> Poor appropriability denies inventive and creative entities a sufficient return on their activity, and suffocates incentives to engage in inventive activity.<sup>54</sup>

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48. *Id.* at 1062.

49. *Id.*

50. *Id.* at 1086.

51. *Id.* at 1085.

52. Timothy Caulfield, Robert M. Cook-Deegan, F. Scott Kieff & John P. Walsh, *Evidence and Anecdotes: An Analysis of Human Gene Patenting Controversies*, 24 NATURE BIOTECHNOLOGY 1091 (2006).

53. Peter S. Menell & Ben Depoorter, *Using Fee Shifting to Promote Fair Use and Fair Licensing*, 102 CALIF. L. REV. 53, 60 n.27 (2014); Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L.J. 1477, 1484 n.18 (2005) (describing the importance of appropriability for generating innovation); Arti K. Rai, *Fostering Cumulative Innovation in the Biopharmaceutical Industry: The Role of Patents and Antitrust*, 16 BERKELEY TECH. L.J. 813, 829 & n.64 (2001); Thomas M. Jorde & David J. Teece, *Innovation, Cooperation and Antitrust*, 4 BERKELEY TECH. L.J. 1, 6 (1989) (explaining the differences between—and significance of—weak appropriability versus strong appropriability).

54. *See supra* note 53.



## D. PATENTS, THE ANTICOMMONS, AND THE COASE THEOREM

It is also important to note the anticommons thesis runs somewhat counter to the Coase Theorem.<sup>55</sup> (Heller and Eisenberg were silent with respect to its existence or applicability to the predicament they were postulating.) The Coase Theorem claims that at least when (a) property rights are well defined and their ownership is agreed upon and (b) transactions costs are zero, parties will negotiate to an efficient outcome.<sup>56</sup> When these conditions hold, the theorem indicates that private ordering should solve any anticommons predicament without the need for government intervention.<sup>57</sup> Put another way, if the Coase conditions hold, the fact that the ownership of relevant rights is fragmented and that multiple permissions are (at least on paper) needed does not lead to inefficiencies; there is no “tragedy.”<sup>58</sup> However, even if the Coase conditions are not satisfied, there are yet other ways in which private ordering (i.e., voluntary private contractual arrangements) may be able to lead to the resolution of issues that might arise.<sup>59</sup> These are discussed below.

In the context of patents, the dual assumptions that (1) rights are well defined and (2) assignment of rights to particular parties are agreed upon by all interested parties are seriously questionable and sometimes inapplicable. While the *existence* of patents is generally agreed to (though many firms are not aware of others’ patent rights), there is often significant disagreement as to the parties’ respective rights and obligations.<sup>60</sup> The patent holder may

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55. R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

56. *Id.* at 19; see also Merges, *supra* note 53, at 1480–81 (describing the refinement of Coase’s work, including the Coase Theorem, over time).

57. See *supra* note 56.

58. Heller and Eisenberg themselves seem to implicitly recognize the implications of the Coase conditions holding. See Heller & Eisenberg, *supra* note 2, at 698 (“In theory, in a world of costless transactions, people could always avoid commons or anticommons tragedies by trading their rights.”) (citation omitted).

59. The Coase Theorem does not imply that parties will always negotiate to a successful agreement. If the potential seller values the item being negotiated over more than the potential buyer does, there is no mutually acceptable deal; the “no deal” outcome is economically efficient. Most “potential” transactions never occur because the potential buyer is unwilling to meet or exceed the potential seller’s reservation price. Only when there are gains from trade would one expect to see a transaction.

60. That said, many implementers intentionally choose not to look for potentially relevant patents related to their activities, often out of concerns that, if they have identified a potentially relevant patent, they may be required to pay up to treble damages for unlicensed “willful infringement” should the patent be found valid and infringed. J. Jonas Anderson, *Secret Inventions*, 26 BERKELEY TECH. L.J. 917, 941 (2011) (describing the disclosure-based “teaching function” of patents as “ineffective” because of “the risk of willful infringement faced by those that do examine prior patents”); Mark A. Lemley &

believe that its patent is valid and infringed by another's product; the other party may dispute the patent's validity, infringement, or both. Infringement often turns on how the claims of the patent are construed and interpreted (which involves an often-disputed process called "claim construction").<sup>61</sup> Resolving these disagreements is costly and time consuming.

Several empirical studies of patent litigation outcomes show that only about half of litigated patents are found valid and infringed.<sup>62</sup> Indeed, economists acknowledge that patents are only "probabilistic,"<sup>63</sup> in the sense that, in any given context, there is only some probability that the patent will (if litigated) be found valid and infringed by some product. The situation is complicated even if the parties *agree* on these probabilities, but the parties often *disagree* on the probabilities of validity and infringement. Theory suggests that, if the patent holder is more optimistic that the accused infringer about the probability that the patent, if litigated, would be found valid and infringed, then the patent holder will (holding other factors constant) want to be paid more for a license than the accused infringer is willing to pay, so that no mutually agreeable deal can be reached. Conversely, if the situation is reversed and the patent holder is less optimistic than the accused infringer, it is more likely that a mutually agreeable deal can be reached. The fact that patents are probabilistic, and that the parties often disagree on the probability that a court would find the patent valid and infringed, makes relying on the Coase Theorem suspect.

The Coase Theorem identifies sufficient, not necessary, conditions for negotiations to lead to efficient outcomes. As noted above, if property rights are well defined and their assignments are agreed to, and if transactions costs are zero, then private negotiations will lead to efficient outcomes. But private negotiations can lead to efficient outcomes even if property rights are not well defined or their assignments are not agreed to, and even if transactions costs are positive.

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Ragesh K. Tangri, *Ending Patent Law's Willfulness Game*, 18 BERKELEY TECH. L.J. 1085, 1102 (2003) ("All of these rules presuppose that potential infringers actually read the patent disclosure. If they don't, and instead take their lawyers' advice and avoid patents in order to escape the taint of willfulness, the patent system's goal of disclosure is frustrated."). In such situations, the implementers are not even aware of the existence of relevant patents.

61. See *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 388 (1996) (establishing claim construction as a matter for judges and giving birth to now-common "Markman hearings"); Peter S. Menell, Matthew D. Powers & Steven C. Carlson, *Patent Claim Construction: A Modern Synthesis and Structured Framework*, 25 BERKELEY TECH. L.J. 711, 814–18 (2010) (describing the conduct of Markman hearings).

62. See Edward F. Sherry & David J. Teece, *Royalties, Evolving Patent Rights, and the Value of Innovation*, 33 RES. POL'Y 179 (2004).

63. Mark A. Lemley & Carl Shapiro, *Probabilistic Patents*, 19 J. ECON. PERSP. 75 (2005).

By way of illustration, suppose that there is uncertainty about whether a given patent is valid and infringed by some product; suppose that the parties agree that, if the issue were litigated, there is only a 50% chance that the patent would be found valid and infringed. Suppose further that the parties would negotiate a 10% royalty if the patent were known to be valid and infringed. Given the uncertainty, a rational licensee would not pay the full 10% royalty given that there is only a 50% chance that the patent would be found valid and infringed if challenged. But the parties may be able to negotiate a license for the “untested” patent calling for a 5% royalty. In such a situation, both parties are better off than they would be without such a license; the result is efficient. That is true even though the patent is only “probabilistic.”

As noted, a patent holder cannot as a practical matter unilaterally refuse to supply its technology to others who do not pay for it. This is because patents are published, exposing key elements of the invention to competitors, imitators, and implementers.<sup>64</sup> Accordingly, the patent holder must resort to costly and risky litigation to persuade a court or some other enforcement or regulatory agency to enforce its rights. This is unlike the supplier of a tangible input, which can refuse to deliver it unless and until paid. The essence of the situation is that patents are not self-enforcing. In the United States, only the federal courts (plus the International Trade Commission or imports) have the authority to block the sale of infringing products.<sup>65</sup>

The above observation implies that firms often take the calculated risk of being sued for infringement. In some case, they may knowingly infringe taking a “catch me if you can” attitude. In other cases, validity may be questionable and boundaries may be fuzzy. The proper moral, ethical, and legal approaches are to (a) negotiate all potentially necessary licenses in advance or (b) choose not to proceed with infringement of the patent. Both sides need to be reasonable and admit to some amount of ambiguity.

However, instead of widespread *underuse* as predicted in the anticommons literature, in many industries (notably the mobile phone industry), it is quite common for firms to take a “catch me if you can”

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64. Patent rights apply even to “independent inventors” who developed the technology without reading the published patent. *See, e.g.*, Robert P. Merges, *A Few Kind Words for Absolute Infringement Liability in Patent Law*, 31 BERKELEY TECH. L.J. 1, 3–4 (2016) (explaining that patent law currently does not recognize an “independent invention” defense and thus may be characterized as imposing “absolute liability”).

65. 19 U.S.C. § 1337 (2012) (granting the ITC authority to block importation of goods that infringe patents); *Suprema, Inc. v. Int’l Trade Comm’n*, 796 F.3d 1338, 1340 (Fed. Cir. 2015) (affirming broad ITC discretion to block infringing goods).

approach and launch and market products without negotiating licenses in advance.<sup>66</sup> Such “widespread infringement” or *overuse* means that patent holders, far from being adequately compensated or overcompensated for their innovations, run the risk of being undercompensated.<sup>67</sup> If an accused infringer merely has to pay what it would have paid had it negotiated for a license to untested patents if and when it is sued and found liable, then the infringer has an incentive to play “heads I win, tails I break even” game. This in turn implies that a damages award following a verdict of validity and infringement should reflect not the rates that would have been negotiated *ex ante* for an *untested* patent, but the rates appropriate for a proven-valid-and-infringed patent.

Unfortunately, courts too often award their estimates of “reasonable royalties,” sometimes interpreted (conceptually incorrectly) as the rate that would have been agreed to *ex ante* for *untested* patents,<sup>68</sup> even after the patent holder has been forced to incur the risk and expense of litigation to prove validity and infringement.

Since the preconditions of the Coase Theorem (and in particular, the assumptions that transaction costs are zero and the requirement that property rights are well defined and their assignment agreed upon) frequently do not hold (in particular, patents are probabilistic), it is perhaps remarkable that technology development is not arrested. However, as a practical matter there are at least five reasons that Coasian type (private ordering) solutions nevertheless emerge. Quite simply, patent owners have reasons to go ahead and use and/or enter voluntary agreements that result in the licensed use of patents even when the Coasian conditions are not satisfied. They are: (i) as a practical matter, infringement is an option, in the sense that court injunctions are difficult to get post *eBay*,<sup>69</sup> and so

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66. See Michael P. Akemann, John A. Blair & David J. Teece, *Patent Enforcement in an Uncertain World: Widespread Infringement and the Paradox of Value for Patented Technologies* (Tusher Ctr. for Mgmt. of Intellectual Capital, Working Paper No. 6, 2014), <http://innovation-archives.berkeley.edu/businessinnovation/documents/Tusher-Center-Working-Paper-6.pdf>.

67. See *id.*

68. The clearest example is when a court determines that there is an “established royalty” and awards that royalty as damages, when the licenses that serve as the basis for the “established royalty” were negotiated in the context where patent validity and infringement were not established (and may well have been disputed).

69. This applies with less force to the ITC’s powers to enjoin infringing imports. See Daniel E. Valencia, *Appeals From the International Trade Commission: What Standing Requirement?*, 27 BERKELEY TECH. L.J. 1171, 1171 (2012) (describing the ITC’s broad powers). These powers have not been impaired by the *eBay* decision, though some have suggested that the ITC’s ability to exclude products should be limited along the lines of the

infringement often is not deterred. Moreover, unlicensed use is tempting if there is some chance that the patent owner will not find out or has other reasons not to sue; in such situations, the patent holder may acquiesce to the situation and enter into a license; (ii) major players often all have relevant patent portfolios, opening up the possibility of cross licensing;<sup>70</sup> (iii) in other cases, patent pools exist or can be created;<sup>71</sup> (iv) in yet other circumstances, “Mexican standoff” situations emerge where the parties tacitly agree that mutual unlicensed use of each other’s patented technology is better than patent warfare;<sup>72</sup> finally, (v) there may be other points of contact, such as supply agreements or purchase agreements between the very parties that need licenses. If so, such factors can also facilitate licensing, or a “Mexican standoff” resolution, for fear that pursuing a patents infringement would sour the overall business relationship between the firms.

Hence, even if the assumptions of the Coase Theorem do not hold, private ordering arrangements frequently emerge, and government and judicial action is not required. Indeed, recent scholarly work around “patent thickets” in sewing machines,<sup>73</sup> automobiles,<sup>74</sup> and aircraft<sup>75</sup> have shown that early beliefs about mutually blocking patent situations were in fact

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*eBay* four-factor test. See, e.g., Natalie Flechsig, *Trade Secret Enforcement After TianRui: Fighting Misappropriation Through the ITC*, 28 BERKELEY TECH. L.J. 449, 479 (2013) (calling for the application of *eBay* to limit the ITC’s exclusionary powers).

70. See Peter C. Grindley & David J. Teece, *Managing Intellectual Capital: Licensing and Cross-Licensing in Semiconductors and Electronics*, 39 CAL. MGMT. REV. 8, 9 (1997) (“Many managers now understand the use of licensing and cross-licensing as part of business strategy as well as the importance of a valuable patent portfolio.”).

71. For a rigorous treatment of patent pools from leading scholars on the subject, see Robert P. Merges & Michael Mattioli, *Measuring the Costs and Benefits of Patent Pools*, 78 OHIO ST. L.J. 281 (2017).

72. See Egan & Teece, *supra* note 12, at 20; David Teece, Edward Sherry & Peter Grindley, *Patents and “Patent Wars” in Wireless Communications: An Economic Assessment*, 95 DIGIWORLD ECON. J. 85, 88 (2014).

73. Adam Mossoff, *The Rise and Fall of the First American Patent Thicket: The Sewing Machine War of the 1850s*, 53 ARIZ. L. REV. 165, 206 (2011) (“[T]he underlying assumption is that patent thickets are a relatively modern problem to which a public-ordering regulatory model is the best, if not only, solution. . . . [T]he Sewing Machine Combination confirms that voluntary, privately formed patent pools are not just theoretically possible, but have long occurred in the real world.”).

74. John Howells & Ron Katznelson, *The Patent Troll Fables of the Automobile Industry*, IPWATCHDOG (June 30, 2016), <http://www.ipwatchdog.com/2016/06/30/patent-troll-fables-automobile-industry/id=70468/>.

75. John Howells & Ron Katznelson, *The Myth of Early Aviation Patent Holdup—How a Government Monopsony Commandeered Pioneer Airplane Patents*, 24 INDUS. & CORP. CHANGE 1, 2 (2015) (arguing that “many secondary sources that repeat the aircraft patent hold-up allegation” but claiming that primary sources show “there was . . . no patent hold-up or development suppression” as a matter of historical fact).

erroneous (or seriously overstated) fables. Put differently, Coasian solutions to the problems of social costs exist even when the Coasian assumptions do not hold.

The inevitable conclusion is that despite ambiguity around property rights, and despite transaction costs that are often nontrivial, private ordering still frequently works reasonably well. While a narrow reading of the prerequisites for the Coase Theorem would suggest that the conditions for eliminating the problem of social cost are unlikely to exist, other institutional and organizational factors and arrangements serve to render private ordering solutions robust enough to almost entirely resolve the anticommons problem.

The next Part discusses yet another mechanism that serves to soften, if not eliminate, anticommons fears in certain contexts that have received much attention in recent years—namely, the development of compatibility standards.

E. STANDARDS, STANDARD ESSENTIAL PATENTS, FRAND, AND THE “ANTICOMMONS”

There are other situations and associated arrangements, not discussed by Heller and Eisenberg and not listed above, that structurally serve to “solve” Heller and Eisenberg anticommons “problems” in relevant (though obviously not all) contexts. The situation in question involves standards setting and standards development activities that implicate complex products. These incorporate cutting-edge technologies, many of which are patented or patent-pending.

These situations appear to fit Heller and Eisenberg’s “anticommons” dilemma situations. The standards development situation involves (a) fragmented ownership of numerous complementary inputs (in this case, patented technologies needed to practice a standard) and (b) implementers that need access to numerous, diversely owned inputs (standards essential patents or “SEPs”) in order to make and sell commercially viable standards-compliant products.<sup>76</sup> As such, the situation is directly analogous to the Heller and Eisenberg biotechnology situation. However, there are well-recognized “solutions” not discussed by Heller and Eisenberg (or by Coase) that have evolved to help surmount the potential for a so-called “tragedy of the anticommons” in these situations.

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76. Li, *supra* note 27; Jorge L. Contreras & Richard J. Gilbert, *A Unified Framework for RAND and Other Reasonable Royalties*, 30 BERKELEY TECH. L.J. 1451, 1454 (2015).



The situation can be illustrated by cellular phone development and manufacturing, for which there are hundreds of thousands of patents held by thousands of firms.<sup>77</sup> In many standards development contexts, including telecommunications standards, multiple firms own patents that can read on the proposed standards-compliant products.<sup>78</sup> In these situations, standards development organizations (SDOs) (such as the IEEE and ETSI) typically adopt policies specifying that they will not incorporate patented technology into a proposed standard unless owners of patents that are “essential” to practice the proposed standard commit to making licenses available to an unlimited number of implementers of the proposed standard on “reasonable and non-discriminatory” (RAND) or “fair, reasonable and non-discriminatory” (FRAND) terms and conditions.<sup>79</sup>

For many modern standards, there are tens of thousands of such SEPs and thus thousands of such FRAND commitments that are made, often quite routinely.<sup>80</sup> Indeed, many SEP holders make “blanket” commitments to making licenses available to whichever of their patents turn out to be essential to practice the standard on FRAND terms.<sup>81</sup>

FRAND licensing largely sweeps away the anticommons problem. Patent owners agree to make an unlimited number of licenses available (i.e., licensing is nonexclusive). They agree to do so on FRAND terms. This allows widespread use of SEPs. To be sure, the FRAND commitment system is not a panacea. In particular, rancorous disputes can and do arise

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77. Mike Masnick, *There Are 250,000 Active Patents That Impact Smartphones; Representing One in Six Active Patents Today*, TECHDIRT (Oct 18, 2012, 8:28 AM), [www.techdirt.com/articles/20121017/10480520734/there-are-250000-active-patents-that-impact-smartphones-representing-one-six-active-patents-today.shtml](http://www.techdirt.com/articles/20121017/10480520734/there-are-250000-active-patents-that-impact-smartphones-representing-one-six-active-patents-today.shtml); Evan Engstrom, *So How Many Patents Are There in a Smartphone?*, ENGINE (Jan. 17, 2017), [www.engine.is/news/category/so-how-many-patents-are-in-a-smartphone](http://www.engine.is/news/category/so-how-many-patents-are-in-a-smartphone) (noting that Bluetooth alone incorporates patents from 30,000 firms).

78. See Chia, *supra* note 35, at 210–12 (explaining the standard-setting process).

79. Contreras & Gilbert, *supra* note 76, at 1453–54.

80. Knut Blind & Tim Pohlmann, *Trends in the Interplay of IPR and Standards, FRAND Commitments and SEP Litigation*, LES NOUVELLES 177, 177 (Sept. 2013), [http://www.iplytics.com/download/docs/articles/Blind\\_Pohlmann\\_2013\\_Trends%20In%20The%20Interplay%20Of%20IPR%20And%20Standards.pdf](http://www.iplytics.com/download/docs/articles/Blind_Pohlmann_2013_Trends%20In%20The%20Interplay%20Of%20IPR%20And%20Standards.pdf) (“Not only the number of SEPs, currently approximately 10,000 active patents . . . but also the number of SEP holders, approximately 800 entities, has been increasing.”).

81. Jay P. Kesan & Carol M. Hayes, *FRAND’s Forever: Standards, Patent Transfers, and Licensing Commitments*, 89 IND. L.J. 231, 245 (2014) (“Thus, companies may have an incentive to not undertake expensive investigations of their own patent portfolios for the purpose of disclosing specific patents as potential SEPs. However, such companies may be more willing to make a blanket commitment to the SSO to license any SEPs on FRAND terms without identifying the SEPs individually.”)



about whether proposed licensing terms are or are not consistent with a FRAND commitment.<sup>82</sup> Many of the recent major patent lawsuits over smartphones involve such disputes. But the courts are able to deal with such disputes, although how efficient they are at doing so is open to question. The fact that the system works reasonably well (even though not perfectly) suggests that the Heller and Eisenberg “underuse” conclusion is seriously flawed. And it seems somewhat incongruous to label disagreements over prices (royalty rates) as leading to a “tragedy.”

#### F. EVIDENCE FROM BIOTECH AND MOBILE PHONES

Both the biotechnology and mobile phone industries are commonly held up as paradigm—examples of anticommons that produce underuse. Heller and Eisenberg’s original article, for example, took biotechnology as its case study.<sup>83</sup> Similarly, “[a]n influential literature claims that standard setting in the smartphone industry creates monopoly power” that produces underuse.<sup>84</sup> This Section addresses both examples directly and shows that they do not support Heller and Eisenberg’s anticommons thesis.

##### 1. *Biotechnology*

As noted earlier, one can seriously question the conclusion by Heller and Eisenberg that there is a substantial amount of “underuse” of patented technology even in the biomedical research field. In many fields, firms are intentionally deciding not to conduct inquiries into patents potentially relevant to what they intend to do, for fear that, if they discover relevant patents but choose not to take licenses, they may be found liable for up-to-trebled damages for “willful infringement.”<sup>85</sup> Many researchers can and do use technology without securing the potentially necessary licenses beforehand, often taking the position that they will deal with potential infringement lawsuits if and when they are sued, gambling that (1) the patent holder may not detect the claimed infringement, (2) the patent holder will not sue unless the researcher is successful in developing and marketing

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82. Jorge L. Contreras, *Fixing FRAND: A Pseudo-Pool Approach to Standards-Based Patent Licensing*, 79 ANTITRUST L.J. 47, 62 (“[B]ecause FRAND commitments by themselves have proven to be vague and indeterminate, this protection can be largely illusory.”); Jorge L. Contreras, *Why FRAND Commitments are Not (Usually) Contracts*, PATENTLY-O (Sept. 14, 2014), <https://patentlyo.com/patent/2014/09/commitments-usually-contracts.html> (discussing lawsuits over the requirements of FRAND agreements).

83. Though, as noted *supra* Part II, Heller and Eisenberg’s article amounted to little more than anecdotal analysis and lacked rigorous empirical support.

84. Alexander Galetovic, Stephen Haber & Lew Zaretzki, *Is There an Anticommons Tragedy in the Smartphone Industry?*, 32 BERKELEY TECH. L.J. 1527, 1529 (2017).

85. See *supra* note 60.

a product, (3) patent holders will not incur the (substantial) cost and risk of litigation unless they believe that the expected damages award will exceed the cost of litigation, and (4) the asserted patents may be found invalid and/or not infringed.<sup>86</sup>

Empirical scholarship since the publication of Heller and Eisenberg's article challenges the notion of a pervasive "underuse" in biotech. For example, in a 2005 article in *Nature Biotechnology*, Ebersole, Guthrie, and Goldstein examine standards and patent pools in the field of "diagnostic genetics" and find that patent pools can significantly mitigate the risk of underuse while spurring innovation.<sup>87</sup> Similarly, in a chapter in a 2008 handbook on "Patent Law and Theory," Goldstein discusses how the patent pools and standards setting in the biotechnology field has enabled broad industry access to patented technologies.<sup>88</sup> Thus, at a minimum, the Heller–Eisenberg hypothesis of "underuse" arising from fragmented ownership of patent rights in the biotechnology field needs to be reconsidered in the light of this evidence, the Walsh et al. evidence cited earlier,<sup>89</sup> as well as evidence of the formation of functioning patent pools and other potential patent pools, in at least one major biotechnology field.

The strongest possible case for underuse is that the small size of many startup biotech firms, plus the importance of intellectual property rights in the biotech field and risk aversion by venture capitalists, may potentially lead to a situation in which venture capitalists are unwilling to invest money in a new firm. However, this reluctance to invest can be overcome if the startup can demonstrate (a) a reasonable likelihood of success, (b) a

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86. See *supra* Section II.C.

87. Ted J. Ebersole, Marvin C. Guthrie & Jorge A. Goldstein, *Patent Pools and Standard Setting in Diagnostic Genetics*, 23 *NATURE BIOTECHNOLOGY* 937 (2005). They conclude: "Properly structured and implemented, diagnostic patent pools could integrate complementary technologies, reduce transaction costs and spur innovation." *Id.* at 937; see also Jeanne Clark et al., *Patent Pools: A Solution to the Problem of Access to Biotechnology Patents?*, 20 *BIOTECHNOLOGY L. REP.* 607, 615–18 & n.34 (2001) (describing how patent pools can produce biotech innovation and overcome anticommons problems).

88. Jorge A. Goldstein, *Biotechnology Patent Pools and Standards Setting*, in *PATENT LAW AND THEORY: A HANDBOOK OF CONTEMPORARY RESEARCH* 712, 714 (Toshiko Takenaka ed., 2005) ("[T]he use of carefully crafted patent pools is reasonably likely to make patents pertaining to the diagnosis of polymutationally correlated diseases available to the industry at reasonable royalties.").

89. Even Mark Lemley, a strong proponent of various strains of the anticommons theory, appears to recognize the significance of the Walsh et al. study for university research. See Mark A. Lemley, *Ignoring Patents*, 2008 *MICH. ST. L. REV.* 19, 21 (2008). ("John Walsh's study suggests that threats of patent infringement are not in fact responsible for deterring much, if any, research.").

thought-out plan to protect the firm's output from competition by patent protection or otherwise, and (c) a low likelihood of credible threats that the firm will be sued (successfully or not) by others for patent infringement and have to incur the cost and distraction of defending itself against such threats.

## 2. *Mobile Phones*

Similar evidence exists with respect to mobile phones, and electronics more generally. Despite the fact that implementers need access to all valid—and—infringed SEPs<sup>90</sup> in order to make and sell standards-compliant products, it is widely recognized that implementers benefit when SEP holders have made FRAND commitments. In the digital electronics industry, this requirement is common among standards setting and standards development organizations. Partly as a result, there is no obvious problem of impaired innovation. Indeed, studies by Keith Mallinson<sup>91</sup> and Galetovic, Haber, and Levine<sup>92</sup> speak to rapid innovation. FRAND commitments reduce if not eliminate the prospect that implementers will not be able to obtain the necessary licenses, at least as long as they are willing to pay the FRAND royalties.

That is, the “tragedy of the anticommons”—underuse of potentially relevant IP—is virtually eliminated with respect to SEPs by the presence of FRAND commitments. As noted in Section II.E, there are still sometimes disagreements between parties as to whether particular royalty rates are or are not “reasonable.” The courts have to resolve such disputes, and in a manner that helps sustain innovation and prosperity.

The mobile telecommunications sector of the economy is heavily dependent on standards. The thesis of “underuse” of patented technology due to fragmented ownership of patents is difficult to credit in this sector, given its explosive growth and the entry of scores of newcomers. If anything, the problem is that widespread infringement is common, and innovators are not being adequately compensated for the use by others of their patented technology.

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90. Not all patents that have been “declared” as essential to some standard are in fact essential. A patent that is invalid and/or not infringed cannot block others' use of the claimed technology (though of course it may be expensive for both parties to determine whether an asserted patent is or is not valid and infringed).

91. 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 (2016).

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

### III. THE “TRAGEDY OF THE ANTICOMMONS” FALLACY

In this Part, the various threads discussed above are pulled together to deliver a major indictment of the anticommons thesis on “underuse”; it all but turns the Heller and Eisenberg thesis on its head and argues that patent holders are systematically *undercompensated* for their innovations.

The analysis above summarizes theory and evidence surrounding Heller and Eisenberg’s tacit (but false) conclusion that, without judicial or policy interventions, there is inefficient underuse of patented technology. Their paradigm is wrong with respect not only to biotech (as Eisenberg now seems to recognize), but also to standards essential patents where patent owners make FRAND commitments. Their tacit assumption was that, without agreement in advance, risk-averse potential implementers will err on the side of caution and avoid using technology claimed by others without first coming to an agreement. That assumption is often not true in the context of patented technology.

Unlike suppliers of tangible goods who will refuse to deliver unless they are assured they will get paid, patent holders cannot physically withhold their technology from others. Instead, they must resort to costly and risky legal proceedings to enforce their rights. Put another way, patent rights are not self-enforcing; patent holders cannot resort to the sorts of “self-help” mechanisms available to suppliers of tangible goods (like withholding delivery). Firms can (and routinely do) use patented technology whose ownership is claimed (rightly or wrongly) by others without paying for it. Many firms routinely ignore (and are often entirely unaware of the existence of) relevant patents.<sup>93</sup>

In my view, the real “tragedy” to be concerned about is not that business enterprises are being deterred from using patented technology, but that innovators are not getting paid sufficiently because of unlicensed use. This is troubling from a public policy and social welfare perspective. There are many contexts (e.g., mobile phones) where some firms use intellectual property owned by others without paying for it (indeed, in some contexts widespread infringement routinely occurs). Even Eisenberg subsequently recognized this in the biotechnology field but did not see this as a problem, let alone a “tragedy.”<sup>94</sup> The knock-on consequence is that firms will

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93. Lemley, *supra* note 89, at 21 (“[B]oth researchers and companies in component industries simply ignore patents. Virtually everyone does it. They do it at all stages of endeavor. Companies and lawyers tell engineers not to read patents in starting their research, lest their knowledge of the patent disadvantage the company by making it a willful infringer.”).

94. See Eisenberg, *supra* note 20.

underinvest in inventive activities because of underpayment that occurs.<sup>95</sup> This denies society access to new technology that would result from higher levels of investment in creative activities.

It is certainly true that risk-averse firms can be deterred from using technology (research tool or otherwise) claimed by others because of the fear of being falsely accused of infringement when there is no actual infringement. But if the implementer goes ahead and uses it without paying (the more common circumstance), then it is not so much that society's problem is not so underused as it is uncompensated overuse. In short, there is usually underpayment, not overpayment; uncompensated overuse, not underuse.

As noted, Heller and Eisenberg's fear of economic inefficiency arising from underuse does not appear to be significant either in biotech or in mobile phones. I am not aware of any evidence of "holdup."<sup>96</sup> This should not be surprising when one realizes patent owners cannot unilaterally deny others access to its technology; only a court can do that.

In the telecommunications field, firms often make and sell standards-compliant products without taking licenses under all of the claimed SEPs and without paying royalties (at least immediately) to many, and perhaps most, patent holders. Thus, contrary to the Heller and Eisenberg "underuse" theory, what one frequently sees is a situation of contemporaneously uncompensated use, often amounting to a situation of widespread infringement, implying that patent holders whose patented technology is being used are being currently undercompensated. The fact that firms are using others' patented technology without (currently) paying for it suggests that, if anything, there is overuse, not the underuse predicted by the proponents of anticommons theory.

The above reasoning is correct as far as it goes. But it disregards the fact that the infringer may be ordered to pay damages for its unlicensed use at some point in the future, should the patent holder prevail on the issues of liability and damages. If the court sets the damages level correctly and also requires infringers to pay prejudgment interest at the economically appropriate rate (a dubious assumption, to be discussed further below), the

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95. Vincenzo Denicolò, *Do Patents Over-Compensate Innovators?*, 22 ECON. POL'Y 679, 703 (2007) (conducting empirical analysis of R&D return rates to conclude that insufficient patent protection for innovations will result in "under-compensation" that decreases initial investment)

96 Alexander Galetovic, Stephen Haber & Ross Levine, *No Empirical Evidence that Standard Essential Patents Hold-Up Innovation*, IPWATCHDOG (May 4, 2015), <http://www.ipwatchdog.com/2015/05/04/no-empirical-evidence-that-standard-essential-patents-hold-up-innovation/id=57424/>; Galetovic, Haber & Levine, *supra* note 92.

result is that compensation will not be eliminated entirely, but only delayed during the pendency of the litigation. Of course, should the patent holder not prevail on both validity and infringement, the court will award nothing in the way of damages. Whether the overall level will be over- or underuse, and whether patent holders are over- or undercompensated for others' use of their patented technologies, depends on the expected level of damages and prejudgment interest the infringer expects to ultimately be required to pay. There is simply no reason to expect that Heller and Eisenberg's conclusion that the mere existence of fragmented patent rights, the existence of an anticommons, will result in "underuse" holds once these factors are considered.

Whether undercompensation will persist in the face of finding an infringement depends on how the court sets damages following a verdict of validity and infringement. If the infringer is only ordered to pay the same level of royalties that it could have negotiated *ex ante*, prior to a finding of validity and infringement, then the infringer gets to play a "heads I win, tails I break even" game, which encourages infringement and results in overuse and undercompensation. If, however, following a verdict in the patent holder's favor, the infringer is required to pay a royalty rate appropriate for a proven-valid-and-infringed patent, rather than the (discounted) rate that it could have negotiated *ex ante* for what might be termed an "untested" patent—one for which the issues of validity and infringement have not been litigated, and which may be seriously disputed—then appropriate compensation is at most delayed, rather than being eliminated entirely.

A simple numerical example might help to illustrate the point. Suppose that everyone agreed that the rate for a patent, should it be shown valid and infringed, would be 10%. Suppose further that the patent holder and the potential licensee agree that there is only a 50% chance that the patent, if litigated, would be found valid and infringed. Faced with that uncertainty, a rational licensee would not be willing to pay the full 10% royalty appropriate for a valid-and-infringed patent for a license *ex ante*, before the patent is litigated. The parties might agree to a license calling for the licensee to pay royalties of 5%, the 10% rate for a proven-valid-and-infringed patent times the 50% probability that the patent, if litigated, would be found valid and infringed. The patent holder may well enter into a significant number of such *ex ante* licenses for an untested patent with numerous potential licensees. Indeed, the negotiated rate of 5% may come to be an "established" royalty.

If the patent holder is forced to litigate its patent, and it prevails, then it should be awarded the 10% royalty rate, which (by our assumption) is



appropriate for a proven-valid-and-infringed patent, not the lower “established” rate of 5% negotiated for the “untested” patent.

If the court were to mistakenly award damages at the discounted 5% established rate instead of the economically appropriate 10% rate as damages following a verdict in the patent holder’s favor, then the infringer would have little or no economic incentive (other than avoiding litigation costs) by taking a license; litigating is a “heads I win, tails I break even” strategy. Unfortunately, in our experience some courts argue that the accused infringer should be entitled to test the patent holder’s claims of validity and infringement without suffering a “penalty” for unsuccessfully doing so. Other courts take existing licenses of 5% as evidence that court-awarded damages should likewise be 5%, because of the claim that the existence of numerous licenses demonstrates an “established royalty” that purportedly serves as a cap on damages.

The issue of the award of prejudgment interest was flagged earlier. If the defendant is only ordered to pay back royalties without interest (or at an inappropriately low rate of interest), it would again have an economic incentive to avoid taking a license, as it could avoid paying royalties now and only have to pay them in the future, gaining from the ability to use the royalties in the meantime. An award of prejudgment interest at the economically correct amount will eliminate this incentive.

Patent courts typically award prejudgment interest, but they have a significant degree of discretion in selecting the interest rate used. The economically appropriate rate would reflect both the opportunity cost faced by the patent holder by not having the money available earlier<sup>97</sup> and the fact that the patent holder was in effect compelled to make what can be thought of as something akin to a “forced loan” of the unpaid royalties to the infringer.<sup>98</sup> Unfortunately, many courts exercise their discretion to award prejudgment interest at a much lower rate, often the risk-free rate (the T-bill rate), the inflation rate, the prime rate, the federal rate on *post*-judgment interest (which is set by statute at the T-bill rate), or some rate tied to the rate awarded by some selected state court (often set statutorily, and sometimes calculated as simple interest rather than using the economically correct compound interest approach), such as the patent holder’s state of

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97. This opportunity cost should generally be measured by the patent holder’s weighted average cost of capital (WACC).

98. The opportunity cost of this forced loan should be measured by the defendant’s adjusted debt rate (adjusted for the differences between an ordinary loan and a litigation claim, which are substantial).



incorporation or the state in which the trial is held.<sup>99</sup> If an economically inappropriately low rate of prejudgment interest is expected to be awarded, again the infringer has an incentive to delay payment by not taking a license, but paying damages—plus—prejudgment—interest instead.

One potential limitation on the above discussion is the real possibility that the courts may make either what statisticians call a “Type I” or “false positive” error on liability and/or damages—finding the accused infringer liable when it should not be found liable, and/or awarding excessive damages—or what statisticians call a “Type II” or “false negative” error—finding the accused infringer not liable when it should have been found liable, and/or awarding insufficient damages. Unfortunately, I know of no data source available to measure the likelihood of either Type I or Type II errors for either liability and damages issues,<sup>100</sup> though I expect that the error rates are not inconsiderable, especially for damages, as courts are notoriously bad at setting prices.

#### IV. PATENT DAMAGES AND THE AMPLIFIED SOCIAL WELFARE LOSSES WITH GENERAL-PURPOSE TECHNOLOGIES

In the discussion above, this Article showed that in invention-rich environments, unpaid use was likely the bigger problem, and that as a consequence of the reduced rewards for innovation from free riding, society would not receive the level of invention that it would otherwise enjoy. Interestingly—and especially in the patent-rich environment Heller and Eisenberg were examining—under-compensation is likely to be amplified further when the environment is not only patent rich, but when those patents cover enabling or general-purpose technologies (GPTs) because of the uncaptured social value generated by such technologies.<sup>101</sup> Accordingly, this Part reviews the literature on social returns to innovation and then discuss the special circumstance of GPTs.

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99. See, e.g., *Brunswick Corp. v. United States*, 36 Fed. Cl. 204, 219 (1996), *aff’d*, 152 F.3d 946 (Fed. Cir. 1998) (rejecting WACC as a measure based on the “strong judicial policy in just compensation cases favoring the establishment of uniform interest rates in order to avoid discrimination among litigants”); *Hynix Semiconductor Inc. v. Rambus Inc.*, No. CV-00-20905 RMW, 2006 WL 2522506, at \*1 (N.D. Cal. Aug. 30, 2006) (rejecting WACC as “too speculative” a measure for damages).

100. There are numerous studies of win rate data, but they do not measure the probability of either Type I or Type II errors.

101. For consistency and simplicity, this Article uses the moniker “general-purpose technologies,” though such innovations are also sometimes termed “enabling” technologies.

A. SOCIAL RETURN TO INVESTMENT IN R&D COMPARED TO PRIVATE RETURNS

It is well recognized in the economics literature that society underinvests in R&D and innovation because of positive externalities (spillovers) that go unrewarded. There is often a sizable gap between the private return to successful innovators and the return of such innovations to society as a whole, after accounting for spillovers. Spillovers occur because (1) an innovating firm is not able to charge the full value to consumers of its goods due to imperfect price discrimination, weak appropriability, or competition; and (2) some of the knowledge generated by the implementation of an innovation (e.g., the appearance and function set of the iPhone) leaks to rivals without adequate—or any—intellectual property protection.<sup>102</sup>

A number of efforts have been made to quantify the gap between social returns and private returns. Statistical studies by different researchers using different methods over several decades have identified a consistent disparity between social returns to investment in innovation and the private return to the innovator. While the different estimates vary, they are all fairly large, suggesting that the innovators are underpaid to a significant degree for the use that occurs.

One common approach is to analyze the returns to single innovations, typically using estimates of consumer surplus as a measure of social benefit. The earliest study of this type was done by Zvi Griliches, who estimated the annualized social rate of return to public and private R&D on hybrid corn since 1910 as lying between 35% and 40%.<sup>103</sup> The literature reviewed by Hall, Mairesse, and Mohnen found social returns to agricultural innovation as high as 100%.<sup>104</sup> Mansfield et al. computed the private and social rates of return for seventeen industrial product and process innovations.<sup>105</sup> Across the seventeen innovations, they obtained a median social return of 56%

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102. Zvi Griliches, *The Search for R&D Spillovers*, in *R&D AND PRODUCTIVITY: THE ECONOMETRIC EVIDENCE* 251 (Zvi Griliches ed., 1998).

103. Zvi Griliches, *Research Costs and Social Returns: Hybrid Corn and Related Innovations*, 66 J. POL. ECON. 419, 425 (1958) (“The internal rate of return on hybrid-corn research expenditures is between 35 and 40 per cent.”).

104. Bronwyn H. Hall, Jacques Mairesse, & Pierre Mohnen, *Measuring the Returns of R&D*, in 2 HANDBOOK OF THE ECONOMICS OF INNOVATION 1033, 1071 (Bronwyn H. Hall & Nathan Rosenberg eds., 2010) (“[W]hen the estimates are obtained separately for each industry, they range from close to zero to a full 100% (or even larger in a few cases).”).

105. Edwin Mansfield et al., *Social and Private Returns from Industrial Innovation*, 91 Q.J. ECON. 221, 234 (1977) (“The median estimated social rate of return is about 56 percent. . . . The median private rate of return (before taxes) was about 25 percent.”).

against a median private (firm-level) rate of about 25%.<sup>106</sup> A similar study by Tewksbury et al. derived a median social rate of return of 99% against a private rate of return of 27%.<sup>107</sup> Manuel Trajtenberg estimated the benefits of CT scanners during their first decade in use and found that they were 270% greater than the R&D that had been spent on them.<sup>108</sup> Teece et al. analyzed Pilkington PLC's 1952 invention of the float process that revolutionized glass making, which Pilkington chose to license to other firms in markets outside the United Kingdom.<sup>109</sup> The private rate of return to Pilkington for its portfolio of patents and trade secrets was estimated at about 21%, versus a global social rate of return from 29% to 62%, depending on the measure used.<sup>110</sup>

A different type of study uses industry-level data on R&D and productivity, comparing the within-industry return on R&D to the nationwide increase in output that is found to be statistically attributable to it. Table 1 summarizes some of these studies. The private (within-industry) return to R&D includes spillovers that accrue to non-innovating firms within the same industry as the innovator, so the net spillover (social minus private return) in these estimates is lower than its true value.<sup>111</sup>

A more recent study by Bloom et al. estimated firm-level private and social returns to R&D using data from 1980 to 2001 for more than 700 publicly listed companies that had been granted at least one patent. They constructed a model that accounts for (1) the likelihood that a given firm benefits from spillovers of R&D performed by other firms and (2) the likelihood that some of the firm's business will be taken away by other firms

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106. *Id.*

107. J. G. Tewksbury, M.S. Crandall & W.E. Crane, *Measuring the Societal Benefits of Innovation*, 209 SCIENCE 658, 659 tbl. 1 (1980).

108. Manuel Trajtenberg, *The Welfare Analysis of Product Innovations, with an Application to Computed Tomography Scanners*, 97 J. POL. ECON. 444, 472 (1989) ("I obtain a capitalized benefit/cost ratio of 270 percent (this is the average between two alternative specifications, one using R & D by U.S. firms only, the other including R & D by foreign firms as well).").

109. David J. Teece, Peter C. Grindley & Edward F. Sherry, *The Glass Industry and the Pilkington Float Process*, in *MANAGING INTELLECTUAL CAPITAL: ORGANIZATIONAL, STRATEGIC, AND POLICY DIMENSIONS* 225 (David J. Teece ed., 2002).

110. *Id.* at 244.

111. There are contradictory factors that would make the estimates both larger and smaller than the actual underlying value. On the one hand, they are partial equilibrium estimates that probably overstate the difference that would be found if a comparison were made to a counterfactual in which the innovating firms had actually charged more for the use of their innovations. On the other hand, they use industry-level data that mixes all types of R&D together, which might understate the value of the private-social difference that exists for the subset of licensable innovations.

innovating in similar product markets. Using multiple measures, they found that social returns, which ranged from 55% to 74%, were about twice as large as private returns, estimated to be from 21% to 40%.<sup>112</sup> For the half of the sample with the largest firms, they found that spillover social benefits were as much as three times larger than private returns.

While all net social return estimates are based on imperfect data, the general pattern is consistent across industries, years, and geographies: an innovator will receive only a tiny fraction of the social returns from innovation, and the gap is likely to be greater the more widely applicable the innovation. For instance, in the case of the float glass process, Teece et al. estimated that Pilkington (the innovator and owner of the pioneering patents and trade secrets) received only 4.2% of the benefits measured in terms of consumer surplus.<sup>113</sup> The well-documented presence of social returns greater than private returns—whatever the actual gap may be in a particular case—leads to the conclusion that private firms, absent other incentives, will make insufficient investment in innovation when considered from the perspective of society as a whole.

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112. Nicholas Bloom, Mark Schankerman & John Van Reenen, *Identifying Technology Spillovers and Product Market Rivalry*, 81 *ECONOMETRICA* 1347, 1384 (2013).

113. Teece, Grindley & Sherry, *supra* note 109.

**Table 1: Selected Industry–Level Estimates of Private and Social Rates to Return to Investment in R&D**

Study	Sample (Location, Size, Time Period)	Within–Industry Return	Return in Other Industries
Griliches and Lichtenberg (1984) <sup>114</sup>	United States 193 industries 1959–78	11% to 31%	50% to 90%
Goto and Suzuki (1989) <sup>115</sup>	Japan 50 industries 1978–83	26%	80%
Bernstein and Nadiri (1989) <sup>116</sup>	United States 4 industries 1965–78	7 %	9% to 13%
Bernstein (1998) <sup>117</sup>	Canada 11 industries 1962–89	12.8%	19% to 145%
Bernstein (1998) <sup>118</sup>	United States 11 industries 1962–89	16.4%	28% to 167%
Griffith, Redding, and Van Reenen (2004) <sup>119</sup>	12 OECD countries 12 industries 1974–90	47% to 67%	57% to 105%

114. Zvi Griliches & Frank Lichtenberg, *Interindustry Technology Flows and Productivity Growth: A Reexamination*, 66 REV. ECON. & STAT. 324 (1984).

115. Akira Goto & Kazuyuki Suzuki, *R&D Capital, Rate of Return on R&D Investment and Spillover of R&D in Japanese Manufacturing Industries*, 71 REV. ECON. & STAT. 555 (1989).

116. Jeffrey I. Bernstein & M. Ishaq Nadiri, *Research and Development and Intra-Industry Spillovers: An Empirical Application of Dynamic Duality*, 56 REV. ECON. STUD. 249 (1989).

117. Jeffrey I. Bernstein, *Factor Intensities, Rates of Return, and International Spillovers: The Case of Canadian and U.S. Industries*, 49/50 ANNALES D'ÉCONOMIE ET DE STATISTIQUE 541 (1998).

118. *Id.*

119. Rachel Griffith, Stephen Redding & John Van Reenen, *Mapping the Two Faces of R&D: Productivity Growth in a Panel of OECD Manufacturing Industries*, 86 REV. ECON. & STAT. 883 (2004).

B. SOCIAL RETURNS TO GPT<sup>120</sup>

General Purpose Technologies (GPTs) are those technologies which (a) are widely used, (b) are capable of ongoing technical improvement, and (c) enable complementary innovation in application sectors.<sup>121</sup> Such technologies not only have impacts on many sectors of the economy but also improve rapidly and spawn further downstream innovations. Upstream GPT innovation benefits downstream complementary innovation. For example, the introduction of electric motors allowed the redesign of factories.<sup>122</sup> According to Bresnahan and Trajtenberg, semiconductors are the dominant GPTs of our time.<sup>123</sup> Other examples are nanotechnology, lasers, and 2G, 3G, 4G, and 5G wireless communications standards technologies. These technologies have had (or will have) economy-wide effects and end up reshaping the economy and supporting (if not spawning) downstream innovation.

Although anticommons situations—the presence of fragmented rights owned by multiple entities—arise in many different contexts, concerns are especially significant in the context of GPTs, which today are seldom “invented” by a single innovator but rather developed and contributed to standards organizations or other alliances.

The business model (appropriability) problems alluded to above are amplified in the presence of GPTs because they are, by definition, relevant to multiple (downstream) applications. In consequence of their wide-ranging downstream applicability, the positive externalities of GPTs will likely be far larger than for single-industry innovations. With private returns so much lower than the society-wide benefit, firms are less likely

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120. For definitions and further elaborations of these concepts, see David J. Teece, *Enabling Technologies*, in THE PALGRAVE ENCYCLOPEDIA OF STRATEGIC MANAGEMENT (Mie Augier & David J. Teece eds., 2016 ed.), and Alfonso Gambardella & Marco Giarratana, *General-Purpose Technology*, in THE PALGRAVE ENCYCLOPEDIA OF STRATEGIC MANAGEMENT (Mie Augier & David J. Teece eds., 2016 ed.).

121. Timothy F. Bresnahan, *Generality, Recombination, and Reuse*, in THE ROLE AND DIRECTION OF INVENTIVE ACTIVITY REVISED 611 (Josh Lerner & Scott Stern eds., 2012).

122. NATHAN ROSENBERG, *INSIDE THE BLACK BOX TECHNOLOGY & ECONOMICS* 77 (1982) (“Consider the case of electricity. . . . The social payoff to electricity would have to include . . . the benefits flowing from the new-found freedom to redesign factories with a far more flexible power source than was previously available under the regime of the steam engine.”).

123. Timothy F. Bresnahan & M. Trajtenberg, *General Purpose Technologies: “Engines of Growth”?*, 65 J. ECONOMETRICS 83, 84 (1995) (comparing semiconductors to other “key technologies in the process of growth, such as the steam engine, the factory system, [and] electricity . . .”).

(than is socially optimal) to pursue investment in this type of generally applicable R&D, despite its potentially large impact on economic growth.

Furthermore, the commercialization of GPTs depends on the coordination of multiple entities. Because one cannot identify the recombinant possibilities of GPTs *ex ante*, firms cannot solve the bargaining problem early (i.e., downstream implementers will not pay the GPT innovators ahead of time).<sup>124</sup> They pay later, if at all. This is another reason why the level of investment in GPT will tend to be too low.

Social rates of return will be much greater than private rates of return for GPTs because of (a) complementarities and externalities due to the GPT triggering and enabling downstream innovation and also (b) horizontal complementarities and externalities.<sup>125</sup> Such vertical externalities magnify and help propagate the effects of GPT innovation. The downstream sectors are the application sectors. The rents earned downstream increase with the “quality” of the GPT.<sup>126</sup>

GPTs create the need for cooperation and coordination. As Bresnahan and Trajtenberg note, if the relationship between the GPT and its users is limited to arm’s length market transaction, innovation will be “too little, too late” in both the GPT and the application sector.<sup>127</sup> The GPT and various applications can be thought of as strategic complements. These innovation complementarities help explain why social returns are greater than private returns. There are two fundamental externalities at work: (1) vertical, linking the upstream and downstream innovators, and (2) horizontal, linking the interests of companies in different areas. Firms upstream and downstream have linked payoffs: the upstream firm will only innovate efficiently if a mechanism allows it to appropriate an efficient fraction of the downstream returns.<sup>128</sup>

The rate of improvement in GPT depends on the number of applications and implementations. An externality therefore arises horizontally, since more applications and implementations should hasten the advance of the

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124. See Benjamin Jones, *Comment on Generality, Recombination, and Reuse*, in *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY REVISITED* 656, 658 (Josh Lerner & Scott Stern eds., 2012).

125. RICHARD G. LIPSEY, KENNETH I. CARLAW & CLIFFORT BEKAR, *ECONOMIC TRANSFORMATIONS: GENERAL PURPOSE TECHNOLOGIES AND LONG-TERM ECONOMIC GROWTH* 442 & n.7 (2005).

126. Jones, *supra* note 124, at 658–59.

127. Bresnahan & Trajtenberg, *supra* note 123, at 86.

128. Bresnahan and Trajtenberg call this the “bilateral moral hazard problem.” *Id.* at 94.



GPT, assuming that each application/implementation is contributing to the profit stream of the GPT developer.

With GPT and with implementers, there is benefit from increasing cooperation. Each implementer would like to see other implementers advancing their technology and paying the GPT to advance the upstream technology. Imperfect technological forecasting makes this difficult.<sup>129</sup> However, it is clear that horizontal and vertical interdependencies exist with GPTs; the viability of one level depends on the viability of the other, and vice versa.

One must consider, of course, that downstream technology licensees (implementers) might also be innovators. The higher royalties they might pay for (upstream) technology could conceivably dampen their own incentives to innovate. However, downstream implementers often have a plethora of business models to extract rents from their product (feature) innovation. The upstream firms, particularly if their technology is incorporated into a standard, often have no such luxury because of their FRAND commitments. If one is contractually committed to non-exclusive licensing, the ability to extract profits is generally weak, as explained below.

## **V. THE LIMITATIONS OF LICENSING AS A VALUE CAPTURE (BUSINESS) MODEL FOR GPT TECHNOLOGIES**

The Heller and Eisenberg fable and concomitant concern about “royalty stacking” are factors that have led some scholars and some courts to proceed to gut royalties for SEPs for fear that they might be too high and might slow or otherwise impair technological adoption. However, the more worrisome and far more serious problem is the prospect of undercompensation to the patent owner. This is especially serious when technologies exhibit GPT characteristics.

As a general rule, undercompensation in the market is likely when economic realities are such that inventors are confined for one reason or using licensing as the principal tools (or business model) to capture value. As Nobel Laureate economist Kenneth Arrow remarked a half a century ago:

Patent royalties are generally so low that the profits from exploiting one's own invention are not appreciably greater than

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129. See David J. Teece, *Foreward to the Second Edition* of GEORGE RICHARDSON, INFORMATION AND INVESTMENT: A STUDY IN THE WORKING OF THE COMPETITIVE ECONOMY v, vii (1997).

those derived from the use of others' knowledge. It really calls for some explanation, why the firm that has developed the knowledge cannot demand a greater share of the resulting profits.<sup>130</sup>

Fifty years later, it seems he had the same quandary, noting that:

It is generally accepted that the main source of profits to the innovator are those derived from temporary monopoly. Why is it that royalties are not an equivalent source of revenues? In simple theory, the two should be equivalent.<sup>131</sup>

The enigma Arrow is grappling with is due in large measure to the fact that patents are not self-enforcing and licensing is not a high-powered instrument for capturing value from innovation, particularly when a technology is so general that it impacts scores of application areas, and possibly even industries. However, it may be the only model certain companies are able to implement. As noted above, GPTs generate positive "spillovers," vertically and horizontally. The obverse of spillovers is that the patent owner is yielding most of the value created with the license. As noted above, Pilkington's licensing program for float glass, considered a great success by most analysts, captured only a single-digit percentage of the social surplus. Implementers (in the Pilkington case, manufacturers) and consumers captured the lions share.

The business model that would in theory likely yield a higher return for the patent owner is vertical integration (i.e., own use of the technology and the sale of products in which the technology is embedded, not just the sale (licensing) of naked patent rights). This logic has been laid out in some of my earlier articles.<sup>132</sup> When licensing is required, strategic alternatives for the inventor are denied, and the owners of complementary assets and/or implementers usually capture most of the available profits.

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130. Kenneth J. Arrow, *Comment on The Origins of the Basic Inventions Underlying Du Pont's Major Product and Process Innovations, 1920 to 1950*, in *THE RATE AND THE DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS* 353, 355 (Richard R. Nelson ed., 1962).

131. Kenneth J. Arrow, *The Economics of Inventive Activity Over Fifty Years*, in *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY REVISITED* 43, 47 (Josh Lerner & Scott Stern eds., 2012).

132. See, e.g., David J. Teece, *Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, 15 RES. POL'Y 285 (1986); David J. Teece, *Reflections on "Profiting from Innovation"*, 35 RES. POL'Y 1131 (2006); David J. Teece, *Profiting from Innovation in the Digital Economy* (Tusher Cent. for Mgmt. of Intellectual Capital, Working Paper No. 16, 2016), <http://businessinnovation.berkeley.edu/wp-content/uploads/2014/07/Tusher-Center-Working-Paper-No.-16.pdf>.

As a practical matter, not all externalities in a market can be corrected. Notwithstanding, public policy shouldn't amplify distortions but should try to correct them. Accordingly, it is especially important that the courts, in adjudicating royalty rates and reasonable royalty damages, do what is possible within the law to award damages that err on the side of being privately generous, recognizing that being privately generous almost always implies being socially generous because of the positive externalities (spillovers) that innovation delivers, especially when GPTs are implicated.<sup>133</sup> Such awards will still likely be insufficient to correct the undercompensation and underinvestment problem, but go in the right direction. Courts should not be tricked by fallacious anticommons arguments into thinking that patents should be devalued because there are too many patents that the downstream use of the implementer might have to pay for. This is true for all technology, and is especially true for GPTs.

## VI. CONCLUSION

Heller and Eisenberg focused on how patent thickets might block downstream innovation, not through "hold up" but through the sheer complexity of assembling the required (intellectual) property rights when they are diffusively owned. In this Article, the fact that this predicament might occur very occasionally is not disputed; but the notion that there is a systematic bias toward underuse (and concomitant overpayment) is rejected. The real property context situation fails to take into account several aspects of the manner in which patent rights differ from (real) property rights. The one most relevant here is that patents do not self-enforce (i.e., there is no private mechanism to exclude). Put simply, patent owners cannot take the problem of infringement into their own hands. They need courts to issue injunctions, which courts are reluctant to do, especially after *eBay*. Moreover, courts seem reluctant to grant damages that recognize the concept of the "infringer's royalty."

The absence of the ability to easily or credibly threaten to exclude infringers (especially difficult today when FRAND commitments have been made) renders Heller and Eisenberg's anticommons thesis barren if not misleading with respect to its ability to yield useful policy or judicial insights. Public policy problems are compounded when the courts don't appreciate the infringer's royalty concept and related issues (such as setting prejudgment interest at economically correct levels). When the legal

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133. This is especially significant because licensees treat royalty payments as a private cost, whereas from a societal perspective they are largely a transfer payment from the licensee to the licensor.

standards do not reflect economic realities, infringement—rather than licensing—becomes the “solution” to the anticommons issues. Clearly, it is a very poor solution because it guts the incentive to invest in R&D and to innovate, compounding existing underinvestment problems.

Eisenberg seem to have subsequently recognized “unauthorized use” as a “solution.” She did not seem to be troubled by that outcome and the investment distortions it generates. Unauthorized use (coupled with inadequate enforcement and damages that are too low) diminishes the chance that society will get the level of innovation it actually wants. It also undermines the whole intellectual property system.

Put differently, the real problem is likely precisely the opposite of the one that Heller and Eisenberg initially identified. The tragedy, if there is one, is underpayment for technologies that have high social returns, resulting in underinvestment in R&D and lower innovation and growth than society desires. Such undercompensation and underinvestment is a near certainty in circumstances where the patent owners have developed general-purpose technologies. The nature of the real “tragedy” is that society does not get what it is in fact willing to fund. The tragedy of widespread infringement and concomitant underinvestment in the generation of social beneficial technologies was not flagged by either Heller and Eisenberg or subsequent scholars, leaving multiple tragedies for the reader to ponder.



# IS THERE AN ANTICOMMONS TRAGEDY IN THE WORLD SMARTPHONE INDUSTRY?

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## ABSTRACT

An influential literature claims that standard setting for high-technology interoperable products potentially creates monopoly power for the owners of standard-essential patents. Moreover, because there are many owners of standard-essential patents, and each may independently exercise monopoly power (a phenomenon called royalty stacking), an anticommons tragedy may ensue. With actual data from the canonical case of the smartphone industry, this Article shows that royalty stacking theory predicts a cumulative royalty yield of nearly eighty percent. That is, it predicts that four-fifths of the price of a smartphone will accrue to patent holders. Even if all patent holders would combine to eliminate the tragedy of the anticommons and behave as a single monopolist, theory predicts a cumulative royalty yield of nearly sixty-seven percent. That is, it predicts that two-thirds of the price of a smartphone will accrue to patent holders.

This Article then uses actual data from licensors in the smartphone value chain to estimate the actual cumulative royalty yield. It finds that in 2016, the cumulative royalty yield in the world smartphone value chain was only 3.4 percent of the average selling price of a smartphone. This suggests that patent holders do not exercise any meaningful monopoly power to increase prices in the world smartphone market, much less that there is an anticommons tragedy in the smartphone industry.

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It is generally accepted that the main source of profits to the innovator are those derived from temporary monopoly. Why is it that royalties are not an equivalent source of revenues? In simple theory, the two should be equivalent. Indeed, . . . it should generally be more profitable to the innovator to grant a license to a more efficient producer . . . but I have the impression that licensing is a minor source of revenues.

– Kenneth J. Arrow (2012)<sup>1</sup>

## I. INTRODUCTION

An influential literature claims that standard setting in high technology, compatible and interoperable products, creates an opportunity for the exercise of monopoly power by the owners of standard-essential patents. The core of this claim is that there are “too many” owners of the intellectual property rights necessary to make interoperable and compatible products, each of whom is able earn “excessive royalties” from the monopoly power conferred upon them through the process of standards development. These claims can be found not only in the academic literature, but also in court cases, published reports by competition authorities, and in the declarations of the officials that head those authorities, both in the United States and Western Europe.<sup>2</sup>

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1. Kenneth J. Arrow, *The Economics of Inventive Activity Over Fifty Years*, in THE RATE AND DIRECTION OF INVENTIVE ACTIVITY REVISITED 43, 47 (Josh Lerner & Scott Stern eds., 2012).

2. See, e.g., FED. TRADE COMM’N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY ch. 2 at 3 (2003), [www.ftc.gov/sites/default/files/documents/reports/promote-innovation-proper-balance-competition-and-patent-law-and-policy/innovationrpt.pdf](http://www.ftc.gov/sites/default/files/documents/reports/promote-innovation-proper-balance-competition-and-patent-law-and-policy/innovationrpt.pdf); (“[R]esearchers who require access not just to a single patent but to *multiple* patents may find their work impeded by high transaction costs, royalty stacking, hold up in patent thickets, and oligopolists seeking to bar new entry. . . . [T]hese are not merely hypothetical concerns.”); FED. TRADE COMM’N, THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION 147 (2011) [hereinafter FTC, EVOLVING IP MARKETPLACE], [www.ftc.gov/sites/default/files/documents/reports/evolving-ip-marketplace-aligning-patent-notice-and-remedies-competition-report-federal-trade/110307patentreport.pdf](http://www.ftc.gov/sites/default/files/documents/reports/evolving-ip-marketplace-aligning-patent-notice-and-remedies-competition-report-federal-trade/110307patentreport.pdf) (“Large numbers of patents can create ‘patent thickets’ and increase transaction costs for manufacturers that seek to clear the rights needed to produce a product.”); FED. TRADE COMM’N & U.S. DEP’T OF JUSTICE, ANTITRUST ENFORCEMENT AND INTELLECTUAL PROPERTY RIGHTS: PROMOTING INNOVATION AND COMPETITION (2007), [www.justice.gov/sites/default/files/atr/legacy/2007/07/11/222655.pdf](http://www.justice.gov/sites/default/files/atr/legacy/2007/07/11/222655.pdf) (“Royalty stacking occurs when access to multiple patents is required to produce an end product, forcing the manufacturer’s products ‘to bear multiple patent burdens’ . . . .”); Bill Baer, Assistant Att’y Gen., U.S. Dep’t of Justice, Reflections on the Role of Competition Agencies When Patents

The reasoning behind the tragedy of the anticommons claim is that the owners of the patented technologies that allow products to be interoperable obtain monopoly power because their technologies have been accepted as part of an industry standard. On the supply side, manufacturers are locked into particular technologies by their own standard-specific investments. On the demand side, consumers would not switch unilaterally to products that use an alternative technology because their devices would no longer be compatible with those owned by other consumers.<sup>3</sup> Alternative technologies are therefore knocked out of the market. The firms whose patented

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Become Essential (Sept. 11, 2015), <https://www.justice.gov/opa/speech/assistant-attorney-general-bill-baer-delivers-remarks-19th-annual-international-bar> (“In recent years it has become well understood that the competitive process can suffer when the value of a patent is enhanced by becoming essential to a standard and patent holders seek to exploit that added value by failing to keep the commitments they voluntarily make about how they will license these patents.”); Renata B. Hesse, Assistant Att’y Gen., U.S. Dep’t of Justice, IP, Antitrust and Looking Back on the Last Four Years 16 (Feb. 8, 2013), <https://www.justice.gov/atr/file/518361/download> [hereinafter *Hesse 2013 Speech*] (arguing that standard setting confers market power on standard essential patent holders); Renata B. Hesse, Assistant Att’y Gen., U.S. Dep’t of Justice, At the Intersection of Antitrust & High-Tech: Opportunities for Constructive Engagement 9 (Jan. 22, 2014), [www.justice.gov/atr/file/517776/download](http://www.justice.gov/atr/file/517776/download) (describing the continuing vigilance of antitrust authorities to prevent that standards are used to restrict competition); Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in 1 INNOVATION POLICY AND THE ECONOMY 119, 125 (Adam Jaffe, Josh Lerner, Scott Stern eds., 2001) (describing the danger of paying royalties to multiple patent holders); Fiona Scott Morton & Carl Shapiro, *Patent Assertions: Are We Any Closer to Aligning Reward to Contribution?*, in 16 INNOVATION POLICY AND THE ECONOMY 89, 124 (Josh Lerner, Scott Stern eds., 2016) (“For example, the ‘Internet of Things’ is a new and growing area where royalty stacking and patent holdup appear to be very real dangers.”); Margrethe Vestager, European Commissioner for Competition, European Commission, Speech on Protecting Consumers from Exploitation (Nov. 21, 2016) (claiming that smartphone manufacturers pay very high royalties). For court cases, see the recent comprehensive survey by Jonathan M. Barnett, *Has the Academy Led Patent Law Astray*, 32 BERKELEY TECH. L.J. 1313 (2017) (arguing that royalty stacking, patent thickets, and patent holdup theories have influenced policy makers and judges).

3. See, e.g., Suzanne Michel, *Bargaining for RAND Royalties in the Shadow of Patent Remedies Law*, 77 ANTITRUST L.J. 889, 891–92 (2011) (“Accused infringers will pay royalties based on the costs of switching to another technology, but switching costs may be prohibitively high due to the expense of retooling a manufacturing facility or ensuring interoperability with related products.”); Jorge Contreras & Richard Gilbert, *A Unified Framework for RAND and Other Reasonable Royalties*, 30 BERKELEY TECH. L.J. 1451, 1468 (2015) (“[T]he patent owner may be able to charge a very high royalty for that patent because . . . [that] standard (and its modifications) are embedded in millions of devices and switching to an alternative technology would be enormously expensive and perhaps infeasible”); Hesse, *2013 Speech*, *supra* note 2, at 16 (“Once a standard becomes established, firms implementing the standard may find switching away more difficult and expensive. This lock-in confers market power on the owners of the incorporated patents.”).

technologies have been chosen are free, at least according to the theory, to exploit monopoly power.<sup>4</sup> The dangers of monopoly power are then, according to the theory, multiplied by the number of patent holders who can each assert monopoly power over their standardized patent. Monopoly power is therefore piled on top of monopoly power in a process called “royalty stacking.”<sup>5</sup> According to the theory, the resulting high cumulative royalty yield raises the price of products, reduces output, and thereby harms consumers.<sup>6</sup>

This theory of the anticommons has seldom been tested against systematic evidence.<sup>7</sup> This Article therefore a canonical case of a

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4. See, e.g., Shapiro, *supra* note 2, at 128; Robert A. Skitol, *Concerted Buying Power: Its Potential for Addressing the Patent Holdup Problem in Standard Setting*, 72 ANTITRUST L.J. 727, 728 (2005) (“The owner [of the patent] can then unilaterally impose onerous license terms . . . an anticompetitive exercise of artificially created seller market power . . .”); Cary et al., *The Case for Antitrust Law to Police the Patent Holdup Problem in Standard Setting*, 77 ANTITRUST L.J. 913, 921 (2011) (“[T]he opportunistic conduct resulting in patent holdup specifically ‘concerns the inefficient acquisition of market power’ . . .”); FTC, *EVOLVING IP MARKETPLACE*, *supra* note 2, at 192 (“[A] firm with a patent reading on the standard may have market power in the relevant technology market.”). Further, Joseph Farrell et al. have explained:

Ex ante, before an industry standard is chosen, there are various attractive technologies, but ex post, after industry participants choose a standard and take steps to implement it, alternative technologies become less attractive. Thus, a patent covering a standard may confer market power ex post that was much weaker ex ante.

Joseph Farrell et al., *Standard Setting, Patents, and Hold-Up*, 74 ANTITRUST L.J. 603, 607 (2007).

5. Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991, 2015 (2007) (“The theory of Cournot complements warns us that royalty stacking causes harm based on reduced output, higher prices, and thus deadweight loss.”).

6. Here, we use the term “monopoly power” as is standard in the economics literature since Lerner introduced his famous index in 1934. See generally A. P. Lerner, *The Concept of Monopoly and the Measurement of Monopoly Power*, 1 REV. ECON. STUD. 157 (1934). We do so because, as we explain below, royalty stacking is explicitly defined as patent holders simultaneously exercising monopoly power as economists understand it. See *infra* Section III.C. For a brief history of the role of the Lerner index in antitrust enforcement, see generally Kenneth G. Elzinga & David E. Mills, *The Lerner Index of Monopoly Power: Origins and Uses*, 101 AM. ECON. REV. 558 (2011). Fisher points out that courts have defined monopoly power as “the power to set prices and exclude competitors.” Franklin M. Fisher, *Diagnosing Monopoly*, 19 Q. REV. ECON. & BUS. 7, 14 (1979). This definition is broader and may include conduct in which a monopoly price is not the issue.

7. An exception is Alexander Galetovic & Kirti Gupta, *Royalty Stacking and Standard Essential Patents: Theory and Evidence from the World Mobile Wireless Industry* 18–24 (Hoover Inst. Working Grp. on Intellectual Prop., Innovation, & Prosperity, Working Paper No. 15012, 2016), <https://hooverip2.org/wp-content/uploads/ip2->

compatible, interoperable product—smartphones—and asks three questions. First, what is the approximate magnitude of the cumulative royalty yield in the world smartphone value chain predicted by the theory of royalty stacking?<sup>8</sup> This Article parameterizes a standard royalty stacking model with actual data on prices, output, and the number of major patent holders in the world smartphone value chain. In 2016 there were twenty-nine identified patent licensors who received royalty revenue, and the predicted cumulative royalty yield is 79.5 percent.<sup>9</sup> That is, almost four out of every five dollars paid for a smartphone should be transferred to the patent holders.

Second, this Article asks what the royalty yield would be if there were no anticommons tragedy and patent holders were allowed to coordinate as a single profit maximizing monopolist. The model indicates that the royalty yield would be approximately sixty-seven percent. That is, two out of every three dollars paid for a smartphone would be transferred to the monopoly patent holder.

Third, this Article asks how much is the actual, observed average cumulative royalty yield from the twenty-nine identified patent licensors. We find that it is 3.4 percent.<sup>10</sup> That is to say, the actual yield is more than

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wp15012–paper.pdf (testing the observable implications of the theory of royalty stacking with data from the smartphone industry).

8. Following Keith Mallinson, we use the term royalty “yield” rather than royalty “rate.” See generally Keith Mallinson, *Cumulative Mobile–SEP Royalty Payments No More Than Around 5% of Mobile Handset Revenues*, WISEHARBOR (Aug. 19, 2015), [www.wisearbor.com/pdfs/Mallinson%20on%20cumulative%20mobile%20SEP%20royalties%20for%20IP%20Finance%202015Aug19.pdf](http://www.wisearbor.com/pdfs/Mallinson%20on%20cumulative%20mobile%20SEP%20royalties%20for%20IP%20Finance%202015Aug19.pdf). As used herein, “rate” refers to the actual royalty paid by a licensee to a licensor as a percentage of the licensee’s sales. “Yield” is the sum total of patent royalty payments divided by the total value of mobile phones shipped, the latter of which might include the production of those who evade patent licenses.

9. Note that each pool may be considered a licensor or licensing entity but represents a multiplicity of patent holders. The pools do not typically own the patents but rather only a right to sublicense them under particular terms and conditions. The natural assumption is that if the patents in the pool would confer monopoly power, each pool would act as a single monopoly when setting pool royalties.

10. See Alexander Galetovic et al., *An Estimate of the Average Cumulative Royalty Yield in the World Mobile Phone Industry: Theory, Measurement and Results*, TELECOMM. POL’Y (forthcoming 2018). The August 2017 update of the database, *A New Dataset on Mobile Phone Patent License Royalties* is available in an Excel workbook that we have posted online. See Alexander Galetovic et al., *A New Dataset on Mobile Phone Patent License Royalties: August 2017 Update* (Hoover Inst. Working Grp. on Intellectual Prop., Innovation, & Prosperity, Working Paper No. 18005, 2018), <https://hooverip2.org/working-paper/wp18005> [<https://perma.cc/QF4E-LJW5>].

twenty times lower than either the yield predicted by the anticommons royalty stacking model or the predicted royalty that would be charged by a single profit-maximizing monopolist. The implication is straightforward: patent holders in the world smartphone value chain do not exercise any meaningful monopoly power to raise prices to the levels that monopoly and royalty stacking theory predict.<sup>11</sup>

Could it be the case that patent holders earn monopoly rents through some other mechanism beyond patent licenses themselves, thereby biasing our estimates of actual royalties downwards?<sup>12</sup> The scope of the businesses of most major patent holders in the smartphone value chain is very narrow. In fact, there are only two significant patent holders in our dataset who either manufacture a smartphone (Huawei) or a physical input to a smartphone (Qualcomm).

It is unlikely that Huawei earns significant rents on its intellectual property through phone sales. The smartphone handset business is competitive and, with the exceptions of Apple and Samsung, the operating profits of manufacturers are very small.

The situation is similar for Qualcomm, which produces baseband processors. Not only is this a competitive market, but it is possible for handset manufacturers to license Qualcomm's patents without purchasing its baseband processor. In addition, in 2016 gross revenues from baseband processors across all manufacturers, accounted for only 5.1 percent of the value of the average phone, not two-thirds or more, as would be the case if patent holders were exploiting monopoly power in the world smartphone market through the sale of baseband processors. The implication is that monopoly power is not being exercised in this segment of the industry. In short, the evidence indicates that patent holders do not exploit significant monopoly power in the world smartphone market through the sale of another input or final product.

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11. That said, there may be geographic, product, or technology-based segments and niches within the world smartphone market where conditions may differ from those in the broader market. Any such segment would require focused research and analysis to determine whether and to what extent it resembles the world smartphone market. Here, we confine our analysis and conclusions to the world smartphone market.

12. An economic rent is the excess of total revenues over total long-run costs. See Roger G. Noll, "Buyer Power" and *Economic Policy*, 72 ANTITRUST L.J. 589, 593 (2005) (offering this definition). In this Article, we use the term "total rent of the smartphone value chain" to denote the difference between consumers' willingness to pay for a smartphone and the total long-run cost of manufacturing a smartphone excluding patent royalties and R&D costs.

Could it be the case that, even if patent holders do not exercise any meaningful monopoly power, the 3.4 percent royalty yield is still “excessive” because of the way that courts tend to compensate patent holders in cases of infringement or for another reason? That is, do the royalties earned by patent holders through the process of negotiation in the shadow of litigation, on average, tend to overcompensate patent holders? This Article briefly explores this issue and observes that making such an argument across the entire market, including all licensors, patent portfolios, licensable products, and licensees would be very challenging.

Part II briefly summarizes the sources and methods used to arrive at the estimate of the observed average cumulative royalty yield. Part III presents the theory of monopoly and royalty stacking. Part IV estimates the magnitude of the royalty yield that would be observed if a tragedy of the anticommons affected the industry and shows that it is much larger than the observed average cumulative royalty yield by a factor of more than twenty. Having shown that patent holders do not exercise monopoly power, Part V asks what facts would need to be convincingly demonstrated to draw the inference that the observed royalty yields are “excessive.” In Part VI we offer a partial explanation why patent holders do not exploit monopoly power. Part VII concludes.

## II. AN ESTIMATE OF THE AVERAGE CUMULATIVE ROYALTY YIELD IN THE SMARTPHONE INDUSTRY

In their 2018 work, Galetovic, Haber and Zaretzki estimated the average cumulative royalty yield in the smartphone value chain.<sup>13</sup> This estimate is the benchmark that we use below to compare the actual royalties charged by licensors in the smartphone industry against the cumulative royalty predicted by theory when there are multiple patent holders exploiting monopoly power. We now briefly describe how we obtained our estimate.

### A. METHODS

Estimating the average cumulative royalty yield is not easy because neither the manufacturers of smartphone inputs (e.g., baseband processors) nor smartphone original equipment manufacturers (OEMs) report their royalty payments. Nevertheless, every dollar spent by a smartphone OEM or its suppliers on a patent license must show up as a dollar earned by a technology company, a patent assertion entity (PAE), or a patent pool on

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13. Galetovic et al., *supra* note 10, at 9–10.



their revenue statements.<sup>14</sup> We therefore “followed the money” and identified, with varying degrees of accuracy, thirty–nine potential licensors in the smartphone value chain.<sup>15</sup>

We estimate that, as a group, the thirty–nine licensors had cumulative royalties in 2016 of almost \$14.2 billion. Of these thirty–nine potential licensors, ten had licensing revenues of effectively zero or otherwise had royalty income which we could not quantify. The licensing revenue of the remaining twenty–nine licensors ranged from a low of \$1.6 million to a high of \$7.7 billion.<sup>16</sup>

Our estimates most likely overstate smartphone patent royalty revenues. One reason for the overstatement is that, when we were in doubt, we biased approximations upwards.<sup>17</sup> A second reason is that we assumed that all royalties earned by licensors came from licenses on smartphones, but in actuality some of it came from feature phones, tablets, and even other industries entirely. A third reason is that our estimates probably include some double counting, because in some cases we may have included both the royalty revenues declared by a licensor and the royalty revenues earned by a pool where the licensor is a member.

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14. We built on work by Mallinson, who estimated an upper bound of the royalty yield. Mallinson, *supra* note 8, at 1. Sidak built on Mallinson as well, but took a somewhat different theoretical approach, including payments in kind and estimates of the value of cross–licenses. J. Gregory Sidak, *What Aggregate Royalty Do Manufacturers of Mobile Phones Pay to License Standard–Essential Patents?*, 1 CRITERION J. ON INNOVATION 701, 716–19 (2016).

15. This is appropriate, because economic theory suggests that per–unit royalties will affect decisions of manufacturers at the margin no matter where they are charged in the vertical chain. Input manufacturers will pass through per–unit royalties, which will affect manufacturers’ marginal costs.

16. The twenty–nine licensors are Qualcomm, Nokia, Philips, Ericsson, Huawei, Interdigital, Rambus, Microsoft, Acacia, Unwired Planet/Panoptis, IBM, Quarterhill, Xperi, AT&T (by virtue of its 802.11 and MPEG4 programs), VirnetX, Tivo, Technicolor, Blackberry, Parker Vision, Broadcom, ICom, Intellectual Ventures, Conversant, the MPEGLA MPEG4 patent pool, the MPEGLA AVC/H.264 patent pool, the MPEGLA HEVC patent pool, the Via Licensing AAC patent pool, the Via Licensing WCDMA patent pool, and the HEVC Advance patent pool. *See generally* Galetovic et al., *supra* note 10, at Table A1.

17. For example, in the case of Huawei, which is a relatively new licensor whose legal status as a privately owned collective means that it is not subject to the same kind of reporting requirements as a U.S. or European firm, we liberally assumed that its mobile phone royalty revenues were the same as that of a well–established, U.S.–based technology company, Interdigital. In doing so, we assumed that Huawei was earning, on its mobile phone patents alone, roughly 20 percent of all patent revenues earned by all Chinese companies in any line of economic activity.



At the same time, the scope of our dataset is broad. It captures the Standard Essential Patents (SEPs) that enable mobility, the revenues earned from licenses on patents that enable video, imaging, audio, and other functions and the revenues of a major software company who earns royalty revenue from the most popular mobile phone operating system.

B. THE ESTIMATE OF THE AVERAGE CUMULATIVE ROYALTY YIELD

There are three numbers that one needs to know to estimate the average cumulative royalty yield: (i) the mobile phone patent licensing revenue earned by each licensor; (ii) the number of mobile phones sold; (iii) the average selling price of a mobile phone (ASP).

On the basis of publicly available sources, we estimated the total number of smartphones sold in 2016 as 1.474 billion,<sup>18</sup> the total value of smartphone shipments at \$415 billion,<sup>19</sup> and total royalty revenues of the twenty-nine major licensors at \$14.2 billion.<sup>20</sup> Therefore, if the average wholesale selling price of a smartphone was roughly \$281.5 and if the average cumulative royalty paid on each smartphone was \$9.60, it follows that in 2016 the average cumulative royalty yield on a smartphone was 3.4 percent.<sup>21</sup>

We performed several robustness checks. Each increased the average cumulative royalty yield somewhat, but none changed the order of magnitude of the estimate. For example, if we assume that thirty percent of all smartphones evade paying any royalties at all, the average cumulative royalty yield of the remaining seventy percent increases to 4.9 percent (from 3.4 percent). If we assume that the eleven licensors for which we could find only limited patent licensing revenue information—or for that matter, other unidentified licensors—earned an additional \$2 billion in patent royalties (a very generous, if perhaps fanciful, estimate) and we maintain the thirty percent evasion rate then the cumulative royalty yield would increase to 5.6 percent.<sup>22</sup> Even if we assume that only Apple and Samsung pay royalties to licensors, and that they pay an additional \$2 billion in licensing revenues

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18. Galetovic et al., *supra* note 10, § 1.8 [“Device Sales”].

19. *Id.*

20. *Id.* § 1.7.1 [“Summary by Licensor”].

21. *Id.* § 1.3 [“Royalty Yield Summary 2016”].

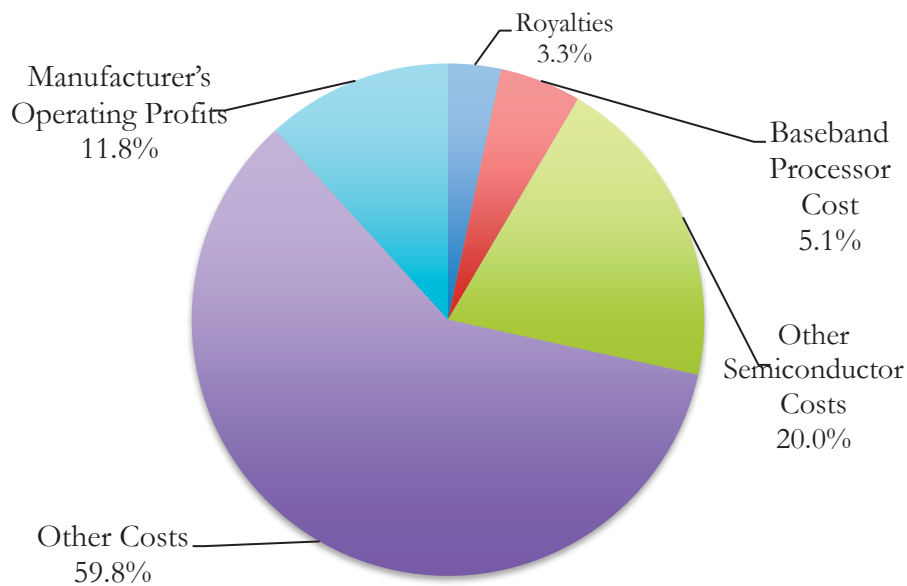
22. Note that the magnitude of our estimates is similar to Mallinson’s upper bound of about 5.5% and Sidak’s upper bound between 4 and 5%. Mallinson, *supra* note 8, at 1; Sidak, *supra* note 14, at 701–02.

beyond our estimate of \$14.2 billion, the average cumulative royalty yield would only be 7.2 percent.<sup>23</sup>

### C. PUTTING THE ESTIMATE INTO PERSPECTIVE

To put our average cumulative estimate into perspective, Figure 1 decomposes the average selling price of a mobile phone. We estimate the costs of the baseband processor, other semiconductor costs, patent license royalty payments, and operating profits.<sup>24</sup>

**Figure 1: Breakdown of the Average Selling Price of a Mobile Phone (2016)**



Note that royalty payments are roughly the same magnitude as baseband processor costs, about one-fifth of other semiconductor costs, and less than one-twentieth of other costs.<sup>25</sup> Perhaps more interesting, the average

23. In 2016 Apple and Samsung sold 35.8 percent of all smartphones. Galetovic et al., *supra* note 10, § 1.9 [“OEM Sales”].

24. See generally *id.* § 1 [“Introduction”]. The estimates include both smartphones and feature phones because we could not disaggregate costs and margins. In 2016 smartphones accounted for 97% of all mobile phone wholesale revenues. *Id.* § 1.9 [“OEM Sales”].

25. We included all expenses, both the cost of the goods sold (COGS) and operating costs, such as R&D, and selling, general and administrative costs (SG&A).

cumulative royalty yield is about one-third of the operating profit made by an average mobile phone.<sup>26</sup>

### III. MONOPOLY POWER, ROYALTY STACKING AND THE TRAGEDY OF THE ANTICOMMONS

#### A. THE MARKET FOR SMARTPHONES

How does a 3.4 percent average cumulative royalty yield compare with the yield that would be predicted if all twenty-nine patent holders in our dataset exploited monopoly power independently? How does it compare with the yield that would be predicted if all twenty-nine patent holders joined together into a single, profit-maximizing monopoly?

To answer this question, we develop a simple model based on a seminal paper in the royalty stacking literature by Lemley and Shapiro.<sup>27</sup> Let  $q$  be the number of smartphones,  $p$  their price and assume that the derived demand for smartphones is a straight line:

$$(1) \quad q = S \cdot (v - p)$$

In this demand curve, which is shown in Figure 2,  $v$  is the maximum amount that any consumer is willing to pay for a smartphone and  $S > 0$  parameterizes the size of the market.<sup>28</sup> We further assume that a smartphone costs  $c$  to produce and sell to customers, and that manufacturers compete.

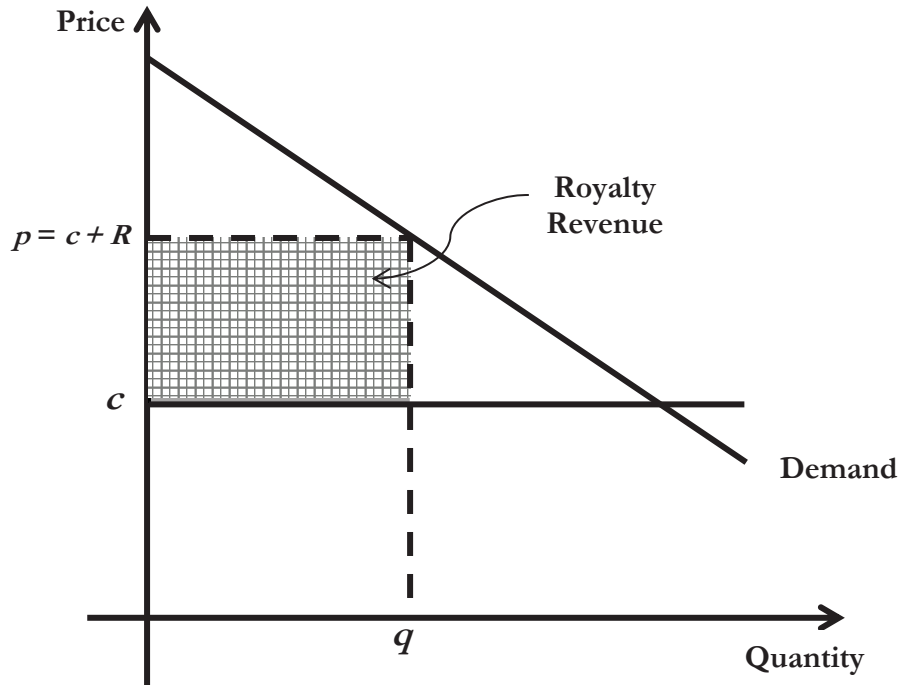
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26. According to industry analysts, in 2016 about 79 percent of all profits made by selling smartphones accrued to Apple and the rest to Samsung. *See, e.g.,* Husain Sumra, *Apple Captured 79% of Global Smartphone Profits in 2016*, MACRUMORS (Mar. 7, 2017), <https://www.macrumors.com/2017/03/07/apple-global-smartphone-profit-2016-79/>.

27. Lemley, *supra* note 5.

28. We use a linear demand curve because it is simple, and because Lemley and Shapiro use it. *See id.* at 2046. All results carry through with a far more general, log-concave demand curve. In particular, the magnitude of the predicted royalty yield is the same. *See* Galetovic & Gupta, *supra* note 7, at 3–5.

Figure 2: Royalties and the Derived Demand for Smartphones



Note that the demand for smartphones confronted by manufacturers is a derived demand as it is indirectly created by the demand for mobile communications by users.<sup>29</sup> Thus, the source and limit of all surplus in the smartphone value chain is that users value what they can do with a smartphone. Because of this, neither patents nor components are valuable by themselves. On the contrary, they have value only in as much as they contribute to producing smartphones for which consumers are willing to pay.

We denote the cumulative royalty charged by all patent holders as  $R$ , and other manufacturing costs, including normal industry profits, as  $c$ . Thus, the marginal cost of providing a smartphone to a customer is:  $c + R$ , which

29. The rules governing derived demand have been known since Alfred Marshall's *Principles*. For a formal treatment see generally M. Bronfenbrenner, *Notes on the Elasticity of Derived Demand*, 13 OXFORD ECON. PAPERS 254 (1961) (which formally derives the properties of derived demand). See also GEORGE STIGLER, *THE THEORY OF PRICE* 252 (4th ed. 1987) (defining derived demand); J.K. Whitaker, *Derived Demand*, in 2 THE NEW PALGRAVE DICTIONARY OF ECONOMICS 1345–46 (Steven N. Durlauf & Lawrence E. Blume eds., 2d ed. 2008) (tracing the history of the concept).

is also equal to the equilibrium price,  $p$ , of a smartphone, because this is a competitive market.<sup>30</sup> Therefore, as can be seen in Figure 2, when fixing royalty  $R$ , patent holders determine the downstream equilibrium price of a smartphone. Because downstream manufacturers compete, the cumulative royalty  $R$  is equal to the price–cost margin ( $p - c$ ) of the entire value chain. It follows that, in this model, all rent generated by the smartphone value chain is captured by patent owners through royalty  $R$ . This rent is the gridded rectangle in Figure 2.<sup>31</sup>

We cannot stress strongly enough that, as Figure 2 shows, the rent that patent holders can capture is bounded by the difference between the price paid by consumers and the cost of making a smartphone. Regardless of how patent holders capture this rent, be it as a royalty or embedded in the price of an input, the total amount they can extract is constrained by the difference between willingness to pay and the producer's costs.<sup>32</sup>

#### B. THE ROYALTY SET BY A PATENT MONOPOLY

The tragedy of the anticommons occurs when many monopolists simultaneously exploit their monopoly power. For purposes of exposition, let us begin by explaining what happens to a market if there would be a single firm which owns all relevant patents and charges for them as a profit–maximizing monopolist. As can be seen in Figure 3, standard textbook theory implies that the monopolist will charge a royalty such that the market's marginal revenue equals marginal cost  $c$ .

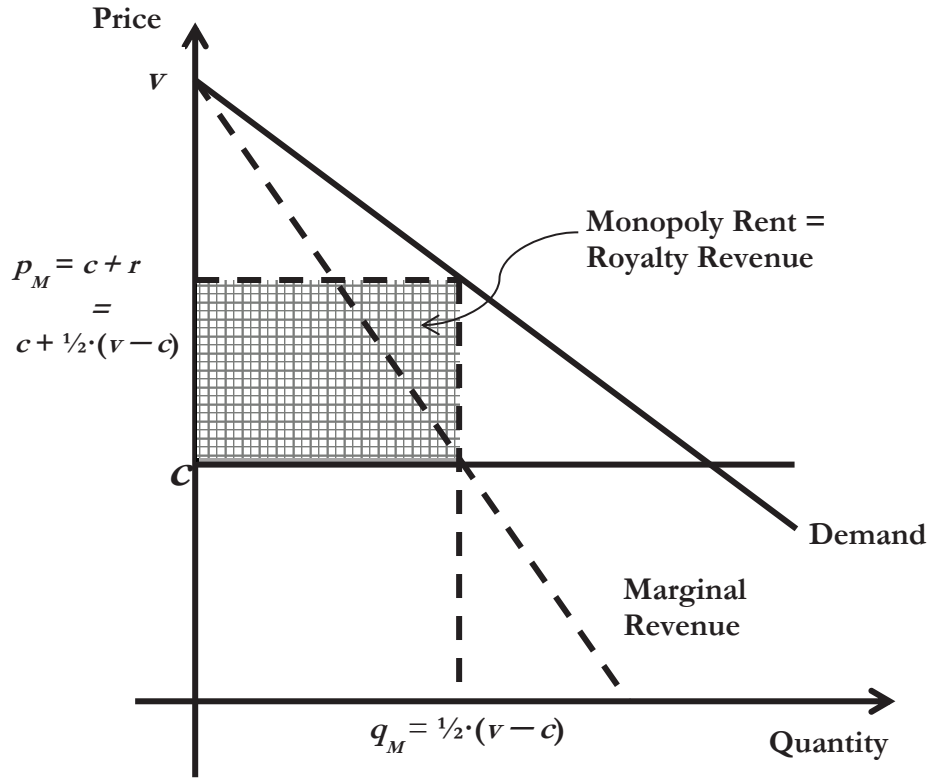
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30. This is a simplifying assumption. Results do not change if we assume imperfect competition among smartphone manufacturers. *See* Galetovic & Gupta, *supra* note 7, at 9.

31. The mechanics is that consumers pay for the phones and manufacturers pass through royalties to patent owners.

32. The insight can be traced back at least to Joseph J. Spengler, *Vertical Integration and Antitrust Policy*, 58 J. POL. ECON. 347, 348–49 (1950). When manufacturers use an input in fixed proportions to produce a final good and the downstream segment of the industry is competitive, the equilibrium price is equal to the unit marginal cost of production plus all charges made by the producers of intermediate goods.

Figure 3: A Single Patent Holder Exploits Market Power



Furthermore, it can be shown that with a linear demand curve like (1) the profit-maximizing royalty of an individual patent holder acting as a monopolist ( $r_m$ ) is:

$$r_m = \frac{1}{2} \cdot (v - c)$$

The equation says that a profit-maximizing single patent holder would charge a royalty equal to half the difference between the maximum willingness to pay for a smartphone ( $v$ ) and the cost of manufacturing that smartphone ( $c$ ). Therefore:

$$p_m = c + \frac{1}{2} \cdot (v - c)$$

Standard monopoly theory thus shows that a monopolist chooses price so that:

$$\frac{p_m - c}{p_m} = \frac{1}{\eta}$$

where,  $\eta$  is the price elasticity of demand and the left-hand side is the famous Lerner margin. Because  $r_m = p_m - c$ , it follows that the royalty yield is equal to:

$$(2) \quad \frac{r_m}{p_m} = \frac{p_m - c}{p_m} = \frac{v - c}{v + c}$$

Therefore, it is apparent from the first equality in (2) that the royalty yield set by a monopolist patent holder (the ratio of the royalty to the price) equals the Lerner margin.

The second equality in (2) shows that the royalty yield depends on the ratio of the unit cost of production to the maximum amount that a consumer is willing to pay for a unit of the good,  $v$ . For example, if the maximum amount that a consumer is willing to pay for a unit of the good is twice as much as the cost of manufacturing it ( $v = 2c$ ), then the royalty yield will be  $\frac{1}{3}$  or 33.3 percent. If the maximum willingness to pay is five times the cost of manufacturing the good ( $v = 5c$ ), then the royalty yield will be  $\frac{2}{3}$  or 66.6 percent. Therefore, if one firm owns all patents, and that firm operates as a profit-maximizing monopolist, it will appropriate a substantial fraction of the final price paid by consumers for a smartphone, with that fraction determined by the ratio of the maximum willingness to pay divided by the marginal cost of manufacturing a smartphone.

A profit-maximizing monopolist will, of course, drive up the final price of a phone. As the price increases, the output of phones will fall, because consumers will purchase fewer of them. If there were no royalties being earned, smartphone manufacturers would charge  $c$  and their unit sales would be given by  $v - c$ . With a monopoly controlling all patents, the effect on output is given by:

$$q_M = S \cdot \frac{v - c}{2}$$

Therefore, compared with a hypothetical situation with no royalty, a monopoly patent holder would reduce output by half, assuming a linear



demand curve. This effect of a monopoly in the smartphone value chain would therefore be quite large.

#### C. ROYALTY STACKING AND THE TRAGEDY OF THE ANTICOMMONS

To this point, we have assumed that there is a single patent holder, but what would happen if there were many patent holders, each of which is independently exercising monopoly power? In 1838, Augustin Cournot asked a similar question: what if two upstream monopolists, each producing a different input for a downstream firm, post unit prices independently of the other?<sup>33</sup> He found that they would post higher prices and sell less than if they collude and choose a single, profit-maximizing price for both inputs. Consequently, the downstream firm would charge consumers a higher price than with a single monopoly supplier, and sell less. This is known as the Cournot Complement problem, and it can be summarized by the aphorism “two monopolists are worse than one.”<sup>34</sup>

Royalty stacking theory is an application of Cournot’s Complements problem to industries with multiple patent holders. The question that motivates the theory is: what happens if multiple patent holders simultaneously and independently exercise monopoly power?<sup>35</sup>

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33. See AUGUSTIN COURNOT, RESEARCHES INTO THE MATHEMATICAL PRINCIPLES OF THE THEORY OF WEALTH ch. 9 (Nathaniel T. Bacon trans., Macmillan Co. 1897) (1838).

34. Spulber shows that the Cournot Complements problem emerges only if input monopolists independently post linear unit prices (a “linear price” is a unit price that does not vary with the quantity purchased). See Daniel F. Spulber, *Complementary Monopolies and Bargaining*, 60 J.L. & ECON. 29, 57 (2017). It disappears, for example, if manufacturers and input providers bargain bilaterally. See Daniel F. Spulber, *Patent Licensing and Bargaining with Innovative Complements and Substitutes*, 70 RES. ECON. 693, 710 (2016) [hereinafter Spulber, *Patent Licensing*].

35. The original statement of the problem is by Carl Shapiro. See Shapiro, *supra* note 2, at 120–23. Lemley and Shapiro use the term “royalty stacking.” See Lemley & Shapiro, *supra* note 5, at 1992; see also Contreras & Gilbert, *supra* note 3, at 1468; Vincenzo Denicolò et al., *Revisiting Injunctive Relief: Interpreting eBay in High-Tech Industries with Non-Practicing Patent Holders*, 4 J. COMPETITION L. & ECON. 571 (2008); Einer Elhauge, *Do Patent Holdup and Royalty Stacking Lead to Systematically Excessive Royalties?*, 4 J. COMPETITION L. & ECON. 535 (2008); Galetovic & Gupta, *supra* note 7, at 18–24; Galetovic et al., *supra* note 10; Damien Geradin et al., *The Complements Problem Within Standard Setting: Assessing the Evidence on Royalty Stacking*, 14 B.U. J. SCI. & TECH. L. 144 (2008). For a comprehensive survey of the literature, see Edward J. Egan & David J. Teece, *Untangling the Patent Thicket Literature* (Tusher Cent. for Mgmt. of Intellectual Capital, Working Paper No. 7, 2015), <http://innovation-archives.berkeley.edu/businessinnovation/documents/Tusher-Center-Working-Paper-7.pdf>. Spulber shows that royalty stacking emerges only if patent holders post linear royalties and disappears if parties bargain for royalties. See Spulber, *Patent Licensing*, *supra* note 34, at 710–11.

To see what happens if there are multiple patent holders, each exercising monopoly power, let  $N$  be the number of patent holders. Each patent holder now sets a profit-maximizing royalty equal to:

$$r_N = \frac{1}{1+N} \cdot (v - c)$$

Note that with  $N \geq 2$  the individual, profit maximizing royalty is smaller than the royalty charged by a single monopoly patent holder by a factor of  $(2/(1+N))$ . But because there are  $N$  patent holders, the cumulative royalty is:

$$N * r_N = R_N = \frac{N}{1+N} \cdot (v - c)$$

The implications are straightforward. As the number of patent holders increases, individual royalties earned fall. Each patent holder is effectively applying a tax on all other patent holders, as well as on the downstream firm. The cumulative royalty, however, grows with each patent holder, such that it exceeds the royalty that would be charged by a single monopolist by a factor of  $(2N/(1+N))$ . It follows that if there are more than a few patent holders, the cumulative royalty will be close to  $v - c$  (the difference between the maximum amount that a consumer is willing to pay for a smartphone and the cost of providing the device). That is, if  $N$  is large, the patent holders will extract nearly all surplus created in the smartphone value chain.

What is the magnitude of this effect? A little algebra shows that with  $N$  patent holders the equilibrium downstream price is:

$$p_N = c + \frac{N}{1+N} \cdot (v - c)$$

Therefore, with  $N$  patent holders the price-cost margin is:

$$(3) \quad \frac{p_N - c}{p_N} = \frac{R_N}{p_N} = \frac{v - c}{v + \frac{c}{N}}$$

For example, if  $N = 3$  and the maximum amount that a consumer is willing to pay for a smartphone is five times the cost of manufacturing it ( $v = 5c$ ), then the royalty yield would be 75 percent. If  $N = 29$  (the number of licensors that we estimate charge royalties in the smartphone value chain in Part II), then the royalty yield would be 79.4 percent. That is, the theory of royalty stacking predicts that if there are twenty-one patent holders almost 80 percent of the price of a smartphone will be appropriated by them.

It is useful to relate equation (3) to the theory of monopoly and Cournot Complements. Shapiro<sup>36</sup> showed that with royalty stacking the equilibrium price–cost margin in (3) is equal to:

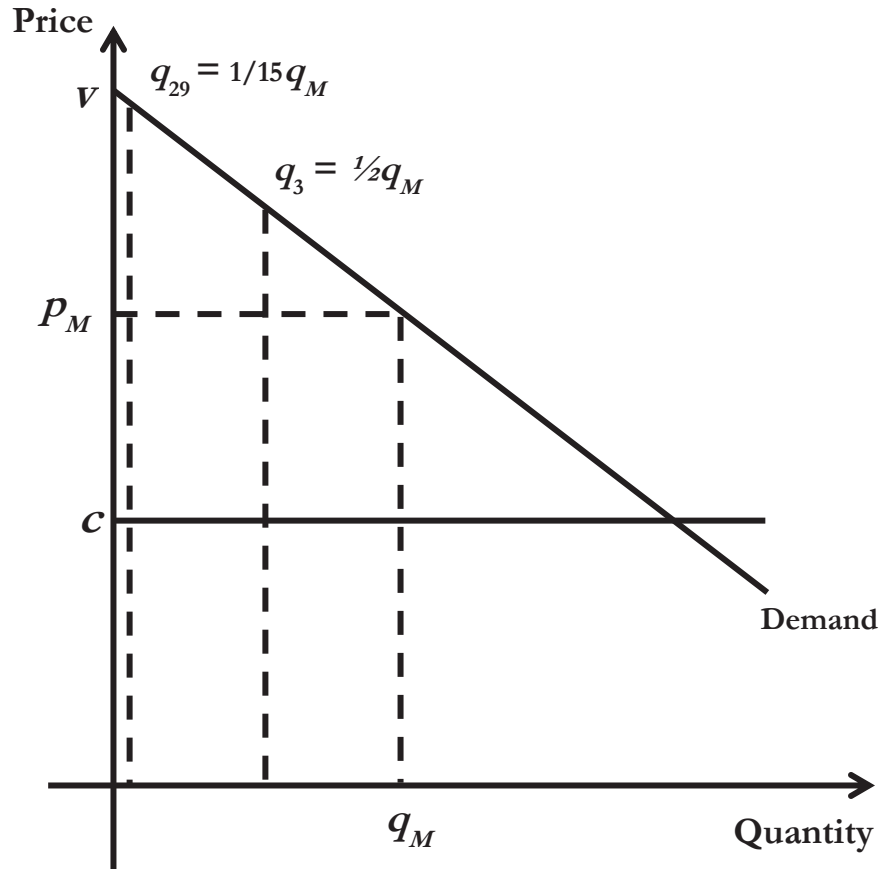
$$\frac{p_N - c}{p_N} = \frac{N}{\eta}$$

Therefore, royalty stacking multiplies the Lerner margin by the number of patent holders charging royalties,  $N$ .

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36. Shapiro, *supra* note 2, at 149–50.

Figure 4: Royalty Stacking and the Tragedy of the Anticommons



The consequences of this tragedy of the anticommons are perhaps best appreciated by examining the effect that an estimated 79 percent royalty would have on the output of smartphones. Because the downstream equilibrium price of a smartphone rises with the number of patent holders, output is a decreasing function of  $N$ :

$$q_N = \frac{1}{1+N} \cdot S \cdot (v - c)$$

The implications can be seen in Figure 4. For example, with  $N = 3$  output is one-half of the level with a single patent holder. With  $N = 29$  output is

one fifteenth of the output level with a single patent holder,  $q_M$ . Therefore, it takes only a few patent owners to drastically reduce output.<sup>37</sup>

It is crucial to note that patent holders are hurt by royalty stacking. As the cumulative royalty yield rises, total royalty revenues fall, because the number of smartphones sold declines precipitously. As the number of patent holders grows, each licensor progressively gets a smaller share of a smaller pie. This effect is, in fact, what makes royalty stacking a tragedy of the anticommons: everyone, including the patent holders, are worse off than if there was only a single monopolist.

#### IV. ESTIMATING THE ROYALTY YIELD WHEN PATENT HOLDERS EXERCISE MONOPOLY POWER

We can now estimate how much patent holders would charge if they were exploiting monopoly power in the smartphone value chain. We do this in three steps.

**Step 1:** As we have seen, the profit-maximizing royalty yield depends on the relationship between the cost,  $c$ , and the maximum amount that a consumer is willing to pay for a smartphone,  $v$ . To operationalize this relationship, let  $v \equiv \lambda c$ . While we do not know the long run marginal cost of producing a smartphone, we can provide a conservative estimate by subtracting a rough estimate of the cumulative average cost of patent licenses to produce a smartphone (\$9.60) from a rough estimate of the average selling price of a smartphone in 2016 (\$281.60).<sup>38</sup> We therefore conservatively estimate the marginal cost,  $c$ , at  $\$281.60 - \$9.60 \approx \$272$ .<sup>39</sup> We can also estimate the maximum price that a consumer is willing to pay for a smartphone as the inflation-adjusted price of a 2G phone when that technology was introduced in 1992, which is \$1,400 in 2016 dollars.<sup>40</sup>

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37. The effect is the same with nonlinear demand. See Galetovic & Gupta, *supra* note 7, at 3.

38. Galetovic et al., *supra* note 16, § 1.8.

39. Note that, as we mentioned before, almost all profits in the industry accrue to Apple and Samsung. The rest of the smartphone manufacturers barely cover their costs. Hence, the average selling price less royalties paid is a reasonable estimate of the marginal cost of production, even though the average cost is somewhat lower. In any case, our conservative approach biases against the hypothesis that there is a big difference between predicted and actual cumulative royalty yields. If we assume that the marginal cost of producing a smartphone is lower, the slope of the demand curve would increase, which would push up the marginal impact of each additional royalty stacker, thereby producing an even higher predicted cumulative royalty yield.

40. See Galetovic & Gupta, *supra* note 7, at fig. 7.

Thus, the maximum willingness to pay for a phone equals five times the cost of providing a smartphone:

$$\lambda \equiv \frac{v}{c} = \frac{1,400}{272} \approx 5$$

Note that our estimate of consumers' maximum willingness to pay for a smartphone with current data capabilities is conservative and almost surely underestimates its actual value, because it is based on the market wholesale price of a phone that was not smart. Indeed, when 2G phones were introduced around 1992, they lacked data service beyond SMS and could not send emails; data services were not introduced until years later when services such as CDPD, iMode, and GPRS/EDGE arrived. This conservative assumption biases against the hypothesis that there is a large difference between predicted and actual cumulative royalty yields. If we assume that the marginal cost of producing a smartphone is lower, the slope of the demand curve would increase, which would push up the marginal impact of each additional royalty stacker, thereby producing an even higher predicted cumulative royalty yield.<sup>41</sup>

**Step 2:** The second step is to obtain an expression for the predicted royalty yield. Some algebra implies that:

$$R_N = \frac{N(\lambda - 1)}{1 + N} \cdot c$$

And,

$$p_N = \frac{1 + \lambda N}{1 + N} c$$

Hence,

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41. One might also take the inflation-adjusted price of the first 1G phone introduced in 1983, the Motorola Dynatac, as the maximum willingness to pay, which would be about \$10,000 in current dollars (\$4,000 in 1983). See Steward Wolpin, *The First Cellphone Went on Sale 30 Years Ago for \$4000*, MASHABLE (Mar. 13, 2014), <https://mashable.com/2014/03/13/first-cellphone-on-sale/>. Either would bias in favor of finding an even higher predicted cumulative royalty yield, and thus bias in favor of finding an even larger difference between the predicted cumulative royalty yield and the actual cumulative royalty yield. Therefore, again we bias our calculation against the hypothesis that there is a large difference between predicted and actual cumulative royalty yields.

$$\frac{p_N - c}{p_N} = \frac{R_N}{P_N} = \frac{(\lambda - 1)N}{1 + \lambda N} = \frac{4N}{1 + 5N}$$

is the predicted royalty yield.

**Step 3:** As we showed in Part II, we identified twenty-one technology companies, patent assertion entities, and patent pools that earned positive royalties in the smartphone value chain in 2015. If each exploited monopoly power, the average cumulative royalty yield would have been:

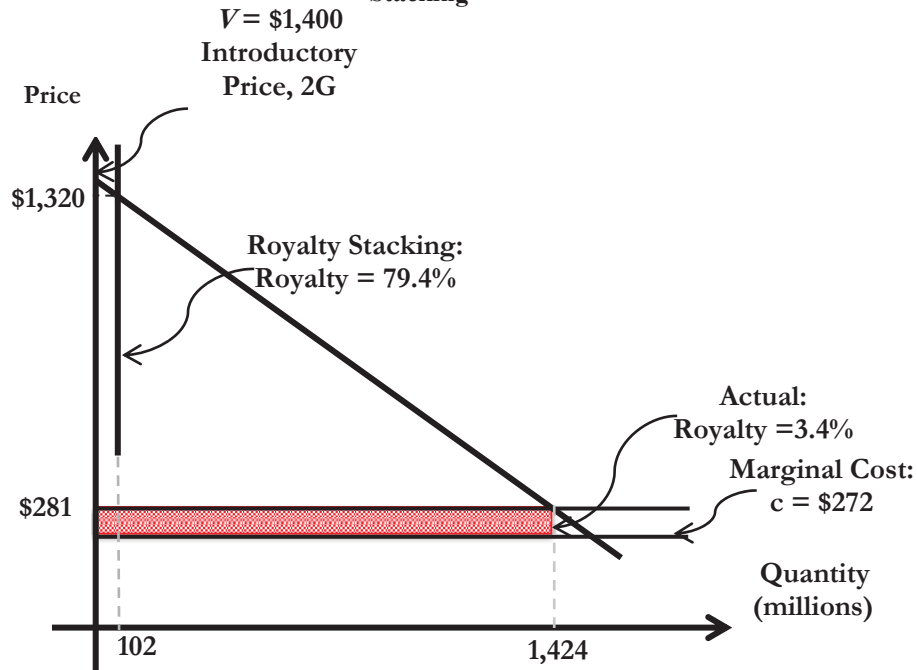
$$\frac{R_{29}}{p_{29}} = \frac{(5 - 1) \cdot 29}{1 + 5 \cdot 29} \approx 79.4\%$$

That is, theory predicts that almost eighty percent of the good's final price would be collected as royalties. The actual royalty yield, however, was 3.4 percent. In short, the cumulative royalty yield predicted by royalty stacking theory is around twenty-three times the actual royalty yield.

What would be the effect on the price and quantity of smartphones sold if the royalty yield were the 79.4 percent predicted by the theory of royalty stacking, rather than the 3.4 percent that obtains in reality? Figure 5(a) shows the results. The equilibrium price of a smartphone in 2016 would have been \$1,320, more than four times the actual price of \$281, and smartphone sales would have been only 102 million, instead of the 1.474 billion that were actually sold.



Figure 5(a): Actual Royalty in the Smartphone Industry Compared with Royalty Stacking



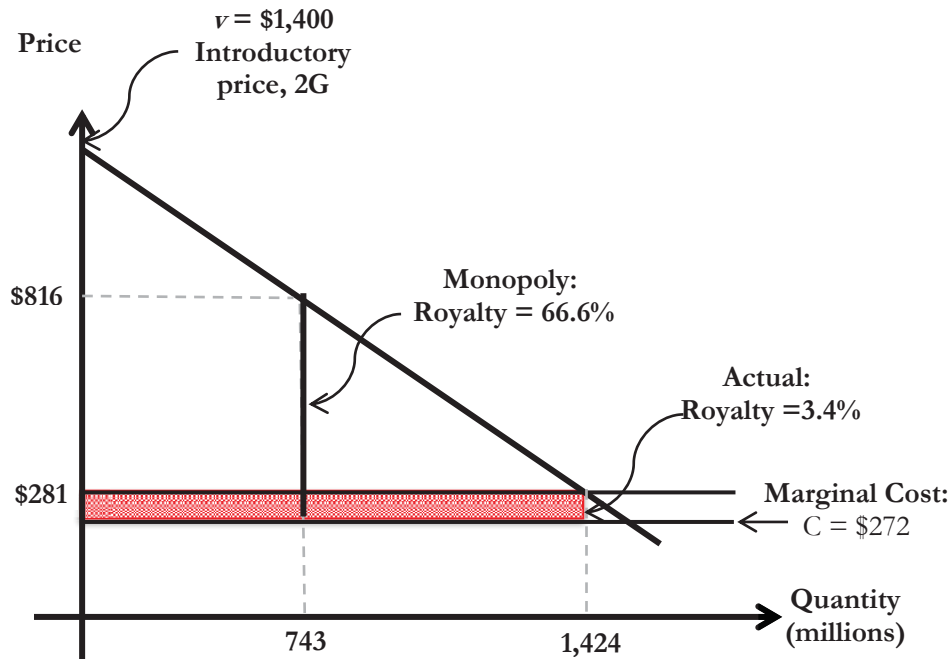
Perhaps it is the case that some of the 21 firms, pools, and PAEs charge for their patents as if monopolists, while the others do not. Perhaps that explains the difference between the predicted royalty yield of 79.2 percent and the actual royalty yield of 3.4 percent? This hypothesis is easy to test. All we need to do is ask what the royalty yield would be if twenty of the firms charged zero, and only one firm exploited its monopoly power. The predicted royalty yield of the single monopolist would be:

$$\frac{R_m}{P_m} = \frac{5 - 1}{5 + 1} \approx 66.6\%$$

That is, two-thirds of the price of a smartphone would go to pay royalties—still almost twenty times the actual rate. Therefore, the observed average cumulative royalty yield also rejects the hypothesis that any single patent holder, or a group of patent holders who are coordinating among themselves, set prices as if a monopolist. In fact, if there was a single monopolist, theory would predict much lower levels of output and much higher prices for smartphones. As Figure 5(b) shows below, if there was a single monopolist, the equilibrium price of a smartphone in 2016 would

have been \$816, almost three times the actual price, and only 743 million smartphones would have been sold, about half of the quantity actually sold. In short, there is no reason to think that patent holders in the smartphone industry exploit monopoly power to raise smartphone prices materially.

Figure 5(b): Actual Royalty in the Smartphone Industry Compared with Monopoly



## V. CAN THE “MONOPOLY ROYALTY” CLAIM BE SAVED?

Given the difference between the predicted royalty and the observed royalty, it is worth considering if there is any way to reconcile these differences.

### A. WHAT IF THE OBSERVED ROYALTY IS GENERATED BY A PROCESS OF ROYALTY STACKING AFTER ALL?

A skeptical reader might be inclined to think that that the stark discrepancy between the royalty yield predicted by the theory of royalty stacking and the actual, observed royalty yield may stem from the particular demand function we that we used to obtain our estimates. Perhaps the observed average cumulative royalty yield is generated by a process of royalty stacking, but the parameters of our simple linear demand function are wrong.

One can check the calculation by asking what the elasticity of the derived demand for smartphones consistent with a 3.4 percent equilibrium royalty yield would be. As we have already seen, in an equilibrium with royalty stacking and perfect competition downstream:

$$\frac{R_N}{p_N} = \frac{p_N - c}{p_N} = \frac{N}{\eta}$$

That is, royalty stacking multiplies the traditional Lerner margin by the number of patent holders who exploit monopoly power. Simple arithmetic shows that if  $N = 29$  and the royalty yield is 3.4 percent, then  $\eta = 853$ . That is, if the price of a smartphone falls by 10 percent, an elasticity of demand of 853 implies that the quantity of phones sold would increase by 8,530 percent. This is an absurd prediction. We know, for example, that the price of a smartphone fell by 11 percent between 2013 and 2015, while smartphone sales increased by 47 percent. One does not need algebra to show that the difference between 8,530 percent and 47 percent is large.

#### B. BUNDLING PATENTS WITH OTHER COMPONENTS

An even more skeptical reader might wish to argue that the observed royalty rate might conceal the exploitation of monopoly power by patent holders who bundle their patents with other components. Could it be the case that patent holders earn monopoly rents through some other mechanism beyond patent licenses themselves, thereby biasing our estimates of actual royalties downward?

As we discussed in Part III, any claim of this nature must deal with the fact that the total rent that can be extracted by patent holders is limited by the difference between consumers' willingness to pay as reflected in the derived demand for smartphones and the physical cost of providing them (see Figure 2). A patent holder may exploit monopoly power by setting the royalty for her patents, the price of a manufactured input (if she also produces a physical input to a smartphone), or the price of a phone (if she is a smartphone OEM in addition to being a patent holder). Theoretically, if a patent holder also produced inputs and smartphones, she could exploit monopoly power through all three mechanisms. Regardless of the combination, however, there is only one profit-maximizing margin for the firm. There are not different margins for different inputs; the amount of surplus is bounded by the market demand curve.

As a practical matter, the scope of the businesses of major patent holders in the smartphone value chain is rather narrow. Indeed, there are only two

significant patent holders in our dataset that either act as a smartphone OEM (i.e. Huawei) or provides a physical input to a smartphone (i.e. Qualcomm).

We think that it is unlikely that Huawei earns significant economic rents on its intellectual property by selling phones. The smartphone handset business is competitive and, with the exception of Apple and Samsung, the operating profits of manufacturers are small.<sup>42</sup>

The situation is similar in the case of Qualcomm, which produces baseband processor chips. The world baseband processor market is highly competitive. In addition, handset manufacturers can license Qualcomm's patents without purchasing its baseband processor.<sup>43</sup> Finally, as can be seen in Figure 1, gross revenues from baseband processors across all manufacturers account for only 5.1 percent of the value of the average phone, not two-thirds or more, as would be the case if any one of five major baseband processor manufacturers were able to exploit monopoly power. The implication is straightforward: monopoly power over prices is not being exercised upon the world smartphone market through the sale of baseband processors.

#### C. EXCESSIVE ROYALTIES AND THE NEXT-BEST TECHNOLOGY

We have shown that patent holders do not exercise any meaningful monopoly power as conventionally defined in economics. Nevertheless, could it be the case that the 3.4 percent royalty yield is still "excessive" because of the way that courts tend to compensate patent holders in cases of infringement? That is, the royalties earned by patent holders are the product of negotiations in the shadow of litigation. Do the results of that process tend to overcompensate patent holders?

A long line of legal scholarship argues that a patent holder is entitled at most to the incremental difference between the value of his technology and that of the next-best alternative.<sup>44</sup> They postulate that the "appropriate price" for a technology is what patent holders would have charged had there been ex ante price competition between the technology that was adopted

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42. See Chuck Jones, *No Surprise That Apple's iPhone Dominates Smartphone Profits*, FORBES (Nov. 20, 2017, 12:20 PM), <https://www.forbes.com/sites/chuckjones/2017/11/20/no-surprise-that-apples-iphone-dominates-smartphone-profits/>.

43. See generally *Qualcomm Technology Licensing*, QUALCOMM, <https://www.qualcomm.com/invention/licensing> (last accessed Mar. 8, 2018).

44. See Cary et al., *Antitrust Implications of Abuse of Standard-Setting*, 15 GEO. MASON L. REV. 1241, 1258–59 (2008); Cary et al., *supra* note 4, at 915; Contreras & Gilbert, *supra* note 3, at 1468–69.

into a standard and the technology that was rejected.<sup>45</sup> This formulation has been accepted by the Federal Trade Commission:

Courts should recognize that, when it can be determined, the incremental value of the patented technology over the next-best alternative establishes the maximum amount that a willing licensee would pay in a hypothetical negotiation. Courts should not award reasonable royalty damages higher than this amount.<sup>46</sup>

In theory, one might be tempted to carry out such an analysis, but the fact that the observed cumulative royalty yield is only 3.4 percent would create a very steep hill for a researcher to climb. In the first place, the FTC's formulation requires researchers to compare observed royalties with a theoretical construct. There is, in fact, no price data to assess the value of technologies that were rejected before any products were actually created.

Second, sustaining a claim of excessive royalties would require a researcher to demonstrate that the group of technologies that were chosen as the standard added less than 3.4 percentage points to the value of smartphones in excess of the value that would have been created by the group of patented technologies that were rejected. It would imply that the researcher had the capacity to make extremely fine-grained engineering and marketing analyses. Indeed, he or she would have to be able to measure the difference in quality, as both an engineering and consumer preference matter, across each adopted and rejected technologies. And he or she would have to be able to do so with minute precision, because the differences across individual adopted and rejected technologies would be priced on the order of pennies per smartphone.

## VI. WHY IS THE OBSERVED AVERAGE CUMULATIVE ROYALTY YIELD SO LOW?

We have seen that patent holders have either chosen not to exploit conventional monopoly power or have been prevented from doing so, raising the question as to why we do not see monopoly royalty levels that some observers expect. Possible explanations could involve potential competition of substitute technologies, industry business practices, patent law, patent damages law, and more. Here we explore the possibility that monopoly power exploitation is prevented by the manner in which licensors and licensees typically arrive at royalty pricing.

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45. *See supra* note 45.

46. FTC, EVOLVING IP MARKETPLACE, *supra* note 2, at 22.

When a smartphone OEM produces an infringing device, a licensor may approach it to negotiate an agreement, typically a nonexclusive patent license. The licensor knows that it can pursue licensing negotiations, and that if those fail it may resort to patent litigation to obtain compensation. Likewise, the licensee knows that if the licensor asks for an “excessive” royalty it can litigate to obtain a more reasonable royalty rate or avoid royalties altogether. In other words, patent litigation is the ultimate forum for price discovery in this market. As this is common knowledge, each party makes efforts to ascertain the likely scenarios in litigation and works backwards to create bids and asks. It seems that the systematic outcomes of this game are royalty yields which are far from what any standard monopolist would charge.

How have courts informed these estimations of royalties? The value of a smartphone depends upon an array of technologies, nontechnological inputs, as well as the business capabilities of the smartphone OEM. The technologies involved may include those which are patented, others which cannot be patented, and still others which were previously patented but for which the patents are no longer in force. Non-technological inputs can include the use of materials ranging from cardboard packing to precious metals embedded for aesthetic purposes. The business capabilities add further commercial value to the smartphone through branding, marketing, distribution, support, and the like.

As an example, one can compare Apple’s iPhone 7 Plus (currently \$669 in its most expensive configuration)<sup>47</sup> with the Vertu Signature Touch Pure Jet Red Gold (currently \$23,100 in its most expensive configuration).<sup>48</sup> The iPhone arguably features many of the finest technologies, including components, system and application software. The Vertu, by contrast, features “Quilted Jet Calf Leather,” “Polished Red-Gold detailing,” and a “Sapphire Crystal Screen.”<sup>49</sup> Most of the additional value and willingness to pay for the Vertu does not stem from the technology but from the expensive nontechnological inputs. A patent licensor should find it difficult to appropriate the incremental value created by these Vertu features because

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47. See *iPhone 7*, APPLE, <https://www.apple.com/shop/buy-iphone/iphone-7> [<https://perma.cc/A28N-4AVW>] (last visited Feb. 23, 2018) (showing \$669 for a 5.5-inch display and 128GB capacity).

48. See Cory McNutt, *At \$23,100, Vertu Signature Touch’s Newest Smartphone Really is Pure Jet Red Gold*, ANDROID HEADLINES (Feb. 17, 2015), [www.androidheadlines.com/2015/02/23100-vertu-signature-touchs-newest-smartphone-really-pure-jet-red-gold.html](http://www.androidheadlines.com/2015/02/23100-vertu-signature-touchs-newest-smartphone-really-pure-jet-red-gold.html).

49. See *Pure Jet Red Gold*, VERTU, <http://vertu.com/product/pure-jet-red-gold/> (last visited Feb. 23, 2018).

their value does not stem from the patent portfolio. A court would probably agree.

Consequently, patent licensors and licensees will seek bids and asks based upon their positions regarding each portfolio's proportional value to the smartphones to be licensed, and these bids and asks will be substantially less than the royalty rate that would be charged by monopolies. Hence, we should not be surprised to find that we do not observe patent licensors who obtain the expected monopolist royalty yield.

Of course, royalty yields far below those that monopoly theory predicts suggest that patent holders are not monopolists, and that they confront competitive pressure, perhaps from other technologies. Indeed, to act as a classical monopolist in the smartphone market, an owner of a substantial patent portfolio would probably need to vertically integrate into manufacturing and sales, just as, for example, pharmaceutical companies do. But to do this such a company would need a comprehensive array of capabilities from technology development to design, manufacturing, marketing, branding, distribution, sales and more. In practice, patent licensors typically lack many of these capabilities by design, having chosen deliberately to specialize in a subset of capabilities such as technology development and licensing, where they are strongest or see most advantage for their own enterprises. In doing so, they reduce or eliminate their ability to seek comprehensive lost profits in patent litigation, which would otherwise provide a direct way toward obtaining a monopolist royalty yield.

None of this is a secret to typical smartphone OEMs and patent holders; all can be expected to backward induct, so patent holders should not seek to charge as if monopolists, and OEM's therefore should not face substantial likelihood of paying a monopoly price. There is no Cournot Complements problem at all.

## VII. CONCLUSION

What, then, are we to make of the claims of some public officials and academics that there is an anticommons problem in the smartphone industry in need of government intervention? Looking at the data, we are led to conclude that the smartphone market is an unlikely ecosystem in which to find a tragedy of the anticommons. This raises an interesting political economy question: why did public officials decide to turn their attention to this unlikely industry? Though this Article does not attempt to answer that question, it makes clear that smartphone patent holders do not exercise meaningful monopoly power upon prices in the world smartphone market. While royalty stacking theory predicts a cumulative royalty yield of nearly



eighty percent, actual data from licensors in the smartphone value chain demonstrates that in 2016, the cumulative royalty yield in the world smartphone value chain was only approximately 3.4 percent of the average selling price of a smartphone. This result dispels the notion that there is an anticommons tragedy in the smartphone industry.

