

# HOW ESSENTIAL ARE STANDARD-ESSENTIAL PATENTS?

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## INTRODUCTION

Courts, commentators, and companies have devoted enormous time and energy to the problem of standard-essential patents (SEPs)—patents that cover (or at least are claimed to cover) industry standards. With billions of dollars at stake, there has been a great deal of litigation and even more lobbying and writing about problems such as how, if at all, standard-

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setting organizations (SSOs) should limit enforcement of patent rights, whether a promise to license SEPs on fair, reasonable, and non-discriminatory (FRAND)<sup>1</sup> terms is enforceable in court or in arbitration, what a FRAND royalty is, and whether a refusal to comply with a FRAND commitment violates antitrust law.<sup>2</sup>

In this study, we explore what happens when SEPs go to court. What we found surprised us.<sup>3</sup> We expected that proving infringement of SEPs would be easy—they are, after all, supposed to be essential—but that the breadth of the patents might make them invalid. In fact, the evidence shows the opposite. SEPs are more likely to be held valid than a matched set of litigated non-SEP patents, but they are significantly *less* likely to be infringed. SEPs, then, don't seem to be all that essential, at least when they make it to court.

At least part of the explanation for this surprising result comes from another one of our findings: many SEPs asserted in court are asserted by non-practicing entities (NPEs),<sup>4</sup> also known as patent trolls. NPEs do much worse in court, even when they assert SEPs. And the fact that they have acquired a large number of the SEPs enforced in court may bring the overall win rate down significantly.<sup>5</sup>

Our results have interesting implications for the policy debates over both SEPs and NPEs. Standard-essential patents may not be so essential after all, in part because companies tend to err on the side of over-disclosing patents that may or may not be essential.<sup>6</sup> The failure of NPEs to win cases even

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<sup>1</sup> Yeah, we know, that's a lot of acronyms for the first paragraph of a paper. Bear with us. It gets better.

<sup>2</sup> See Mark A. Lemley & Carl Shapiro, *A Simple Approach to Setting Reasonable Royalties for Standard-Essential Patents*, 28 BERKELEY TECH. L.J. 1135, 1164–66 (2013) [hereinafter Lemley & Shapiro, *Simple Approach*]; Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991, 2016, 2043–44 (2007) [hereinafter Lemley & Shapiro, *Holdup*].

<sup>3</sup> It should surprise you too.

<sup>4</sup> There we go with the acronyms again.

<sup>5</sup> See discussion *infra* subpart III.A.

<sup>6</sup> Many authors have made the point that many patents *declared* to SSOs are not actually essential. *E.g.*, Jorge L. Contreras, *Essentiality and Standards-Essential Patents*, in CAMBRIDGE HANDBOOK OF TECHNICAL STANDARDIZATION LAW: COMPETITION, ANTITRUST, AND PATENTS 209, 222–23 (Jorge L. Contreras ed., 2017); Robin Stitzing et al., *Over-Declaration of Standard Essential Patents and Determinants of Essentiality* 10 (2017) (available at <https://ssrn.com/abstract=2951617> [<https://perma.cc/E9WZ-D8LH>]); Rudi Bekkers et al., *Disclosure Rules and Declared Essential Patents*, 3 (Nat'l Bureau of Econ. Research, Working Paper No. 23627, 2017). However, it is surprising to us that a substantial share of declared essential patents are found non-essential even after they have been carefully chosen for litigation.

with what seems like a strong set of patents raises interesting questions about the role of NPEs in patent law and the policy efforts to curb patent litigation abuse.

We discuss the background of SEPs in Part I. In Part II we explain our study. We present our results in Part III and discuss some implications of those results in Part IV.

## I

### THE SEP CONTROVERSY

Standard-essential patents are so important and so controversial because they are supposedly just that—essential to a standard. Unlike most other patents, when a patent is truly essential there is no way to design around it and still comply with the standard. And industry standards are in turn critical to major sectors of the market economy. The computer, Internet, and telecommunications industries in particular depend on standards to ensure that different companies' products work together well.<sup>7</sup> If you want your phone or computer to connect wirelessly to the Internet, for instance, you need to use WiFi. And using WiFi means sending and receiving data according to a specific set of protocols. Those protocols are patented. In fact, they are the subject of lots of patents, all claimed to be necessary to implement WiFi. And if you want your phone to be able to talk to other people's phones, you need to implement the agreed protocol. Changing it to something incompatible won't do—even if there were viable alternatives before the standard was widely adopted.

Standards, then, are important. We want innovation in new standards. But precisely because they are important, we also worry that if patent holders have broad rights to exclude other companies from practicing standards, it could interfere

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<sup>7</sup> See, e.g., 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, 102–03 (2007); Daniel J. Gifford, *Developing Models for a Coherent Treatment of Standard-Setting Issues Under the Patent, Copyright, and Antitrust Laws*, 43 IDEA: J.L. & TECH. 331, 336, 341–42 (2003); Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CALIF. L. REV. 1889, 1896–97 (2002) [hereinafter Lemley, *IP & SSOs*]; Marc Rysman & Timothy Simcoe, *Patents and the Performance of Voluntary Standard-Setting Organizations*, 54 MGMT. SCI. 1920, 1920 (2008); Carl Shapiro, *Setting Compatibility Standards: Cooperation or Collusion?*, in EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 81, 81–84 (Rochelle Cooper Dreyfuss et al. eds., 2000) [hereinafter Shapiro, *Cooperation*]; see also Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in 1 INNOVATION POLICY AND THE ECONOMY 119, 119, 138 (Adam B. Jaffe et al. eds., 2001) [hereinafter Shapiro, *Navigating*] (discussing the costs and benefits of compatibility and standards).

with widespread adoption and therefore with interoperability.<sup>8</sup> SSOs have responded by limiting the use of patents that cover the standards they adopt. While a few SSOs require royalty-free licensing of patents that cover a standard, others simply require disclosure of the existence of those patents.<sup>9</sup> Most commonly, they permit the creation of standards that incorporate SEPs, but require patent owners to disclose patents that may become essential and license their SEPs on FRAND terms to anyone who adopts the standards.<sup>10</sup> Most SSOs have no review of the content or essentiality of declared SEPs.<sup>11</sup>

Even subject to those limitations, SEPs are potentially extremely powerful. Because successful standards are adopted by the entire industry, owning the right to be paid a license every time that standard is used—even a FRAND price—can be quite valuable. And if the patentee doesn't agree to (or seeks to evade) a FRAND commitment, the possibility of an injunction against a technology everyone has to adopt can be powerful indeed.<sup>12</sup> A number of scholars have worried about the risk of patent holdup that could result.<sup>13</sup>

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<sup>8</sup> Microsoft Corp. v. Motorola, Inc., 795 F.3d 1024, 1029–31 (9th Cir. 2015); Broadcom Corp. v. Qualcomm Inc., 501 F.3d 297, 310–12 (3rd Cir. 2007); PATENT CHALLENGES FOR STANDARD-SETTING IN THE GLOBAL ECONOMY: LESSONS FROM INFORMATION AND COMMUNICATIONS TECHNOLOGY 17 (Keith Maskus & Stephen A. Merrill eds., 2013); Shapiro, *Cooperation*, *supra* note 7, at 88; Joseph Farrell et al., *Standard Setting, Patents, and Hold-Up*, 74 ANTITRUST L.J. 603, 604–05 (2007); Geradin et al., *supra* note 7, at 101; Gifford, *supra* note 7, at 367; Lemley, *IP & SSOs*, *supra* note 7, at 1893; Shapiro, *Navigating*, *supra* note 7, at 136.

<sup>9</sup> Lemley, *IP & SSOs*, *supra* note 7, at 1904.

<sup>10</sup> *Id.* at 1906; see also Justus Baron & Daniel F. Spulber, *Technology Standards and Standards Organizations: Introduction to the Searle Center Database*, 27 J. ECON. MGMT. & STRATEGY 462, 478 (2018) (finding that of the thirty-six SSOs studied, nine require FRAND licensing and twenty-two more provide patent holders with a menu of options, from which FRAND licensing is the least restrictive option); Brad Biddle et al., *How Many Standards in a Laptop? (And Other Empirical Questions)*, 1 (2010), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1619440](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1619440) [<https://perma.cc/Q42S-SDNZ>] (finding that of the 197 laptop standards studied, 75% were developed under FRAND terms, and an additional 22% under “royalty free” terms).

<sup>11</sup> Stitzing et al., *supra* note 6, at 1 (finding “incentives for firms to over-declare patents or at least to err towards declaring when in doubt”).

<sup>12</sup> For this reason, many SSOs require that standards be abandoned or redesigned if a key technology contributor withholds its FRAND commitment during the development process. See, e.g., *ETSI Intellectual Property Rights Policy*, ETSI § 8.1.1 (Nov. 29, 2017), <https://www.etsi.org/images/files/IPR/etsi-ipr-policy.pdf> [<https://perma.cc/9VGL-VTUT>] (requiring any work on the standard to cease if the key technology has no viable replacement).

<sup>13</sup> E.g., Thomas F. Cotter, *Patent Holdup, Patent Remedies, and Antitrust Responses*, 34 J. CORP. L. 1151, 1152 (2009); Mark A. Lemley, *Ten Things To Do About Patent Holdup of Standards (And One Not To)*, 48 B.C. L. REV. 149, 149 (2007); Lemley & Shapiro, *Holdup*, *supra* note 2, at 2016; Dan L. Burk, *Punitive Patent Liability: A Comparative Examination* (March 2, 2018), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3188888](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3188888).

Licensing SEPs is also complicated by the fact that products can incorporate many standards<sup>14</sup> and multiple SEPs cover most standards. Complex standards like WiFi and 3G wireless communications attract hundreds and even thousands of declared SEPs.<sup>15</sup> If each of those patents is truly essential, there is a risk of double-marginalization or “royalty stacking” if each patent owner demands a disproportionate share of the revenue from the product.<sup>16</sup> The FRAND commitment can theoretically solve that problem, but only if a FRAND royalty is based on the joint value of all the relevant SEPs rather than the incremental contribution of a single SEP owner considered in isolation, and only if the royalty is in fact reasonable.<sup>17</sup>

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ssrn.com/sol3/papers.cfm?abstract\_id=3118029 [https://perma.cc/B4N4-5KDZ] (arguing that injunctions in SEP cases are unduly punitive and that damages are a better remedy); Jorge L. Contreras, *Much Ado About Hold-Up*, (2018) [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3123245](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3123245) [https://perma.cc/CS5X-JKYU]. There are questions as to whether patent holdup is a problem in practice. See, e.g., Jonathan M. Barnett, *The Anti-Commons Revisited*, 29 HARV. J.L. & TECH. 127, 132–33 (2015) (asserting that markets can resolve anti-commons effects through transactional solutions); Alexander Galetovic & Stephen Haber, *The Fallacies of Patent-Holdup Theory*, 13 J. COMPETITION L. & ECON. 1, 10 (2017) (arguing that patent-holdup theory ignores economic fundamentals). Qualcomm, a leading SEP holder in mobile telephony, is a critic of the patent-holdup theory. See, e.g., FTC Patent Standards Workshop, *Comments of Qualcomm Incorporated*, Project No. P11-1204 (June 13, 2011), [https://www.ftc.gov/sites/default/files/documents/public\\_comments/request-comments-and-announcement-workshop-standard-setting-issues-project-no-p-111204-00011%2C%2A0/00011-60525.pdf](https://www.ftc.gov/sites/default/files/documents/public_comments/request-comments-and-announcement-workshop-standard-setting-issues-project-no-p-111204-00011%2C%2A0/00011-60525.pdf) [https://perma.cc/RHD5-EPKP] (asserting there is no empirical evidence that license fees and market-driven negotiations harm innovation or consumers, whereas monopsonistic bargaining by manufacturers could discourage research and development).

<sup>14</sup> See Biddle et al., *supra* note 10.

<sup>15</sup> David J. Goodman & Robert A. Myers, *3G Cellular Standards and Patents*, PROCEEDINGS OF IEEE INTERNATIONAL CONFERENCE ON WIRELESS NETWORKS, COMMUNICATIONS AND MOBILE COMPUTING 2 (2005), <http://eeweb.poly.edu/dgoodman/wirelesscom2005.pdf> [https://perma.cc/LS6T-CNV4]; Lemley & Shapiro, *Holdup*, *supra* note 2, at 2027–28.

<sup>16</sup> Lemley & Shapiro, *Holdup*, *supra* note 2, at 1992–93. The basic Cournot theory might yield different predictions, however, when licensees can challenge patent portfolios with differing quality. Gerard Llobet & Jorge Padilla, *The Inverse Cournot Effect in Royalty Negotiations with Complementary Patents*, 3–4 (March 13, 2017) [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2866389](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2866389) [https://perma.cc/2RD4-JEP8].

<sup>17</sup> For example, consider a standard that has a value of \$10 if two SEPs—owned by two different patentees—are included, and zero otherwise (that is, there are no feasible alternative technologies). The marginal or incremental value of each SEP is \$10, but clearly that is not a FRAND royalty, since paying both SEP holders \$10 would lead to royalties that exceed the value of the standard. While \$5 is a natural candidate in this example, that assumes that all the value of the standard should be attributed to patents and none to those who actually make the products. See Lemley & Shapiro, *Holdup*, *supra* note 2, at 2041 n.162. The problem of dividing the total surplus becomes quite complex in more realistic

Given the value of SEPs, it is no surprise that they are much more likely to be enforced in court than other kinds of patents. One of us found in prior work that SEPs are more than five times as likely to be litigated as comparable non-SEPs.<sup>18</sup> When those patents are enforced, virtually everything about the FRAND commitment has proven to be controversial. Litigants and scholars have fought about whether a FRAND commitment prevents a patentee from getting an injunction,<sup>19</sup> whether the fact that a patent is standard-essential should bar an injunction even if there is no FRAND commitment,<sup>20</sup>

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examples, and is beyond the scope of this paper. See, e.g., David Salant, *Formulas for Fair, Reasonable and Non-Discriminatory Royalty Determination*, PROCEEDINGS OF THE IEEE SIIT (2007), <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=4629324> [<https://perma.cc/FD3J-NL64>]. For a suggestion that we bring all SEP owners together in a single proceeding to allocate royalties and avoid the royalty stacking problem, see Jason Bartlett & Jorge L. Contreras, *Rationalizing FRAND Royalties: Can Interpleader Save the Internet of Things?*, 36 REV. LITIG. 285 (2017).

<sup>18</sup> Bekkers et al., *supra* note 6, at 3. Jorge Contreras finds that this is true of telecommunications but not Internet patents, and he attributes that to the fact that Internet standards deemphasize patent monetization. Jorge L. Contreras, *A Tale of Two Layers: Patents, Standardization, and the Internet*, 93 DEN. L. REV. 855, 855 (2016).

<sup>19</sup> See, e.g., *Microsoft Corp. v. Motorola, Inc.*, 795 F.3d 1024, 1049–52 (9th Cir. 2015) (finding that Motorola violated its contractual reasonable and non-discriminatory obligations by seeking injunctive relief); *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1331–32 (Fed. Cir. 2014) (recognizing that a patentee subject to FRAND commitments may have difficulty establishing irreparable harm and therefore attaining an injunction, but noting that an injunction may be justified where an infringer unilaterally refuses a FRAND royalty or unreasonably delays negotiations); Douglas H. Ginsburg et al., *Enjoining Injunctions: The Case Against Antitrust Liability for Standard Essential Patent Holders Who Seek Injunctions*, THE ANTITRUST SOURCE (2014), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2515949](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2515949) [<https://perma.cc/7M9U-WHFK>] (asserting that antitrust law should not limit a patent holder's right to seek injunction against infringing users because Supreme Court jurisprudence adequately prevents unwarranted injunctions, an antitrust sanction would excessively deter SEP holders in need of injunctions, and the Noerr-Pennington Doctrine protects SEP holders who wish to file for injunction); Jay P. Kesan & Carol M. Hayes, *FRAND's Forever: Standards, Patent Transfers, and Licensing Commitments*, 89 IND. L.J. 231, 304–14 (2014) (asserting that absent extreme circumstances, such as when an adopter refuses to pay royalties at any price, neither injunctions nor exclusion orders should be available to patentees bound by a FRAND commitment); Gregor Langus et al., *Standard-Essential Patents: Who is Really Holding Up (and When)?*, 9 J. COMPETITION L. & ECON. 253, 253 (2013) (asserting that, in line with European practices, courts should only grant injunctions if prospective licensees are unwilling to make a FRAND royalty offer); Lemley & Shapiro, *Simple Approach*, *supra* note 2, at 1143–44 (asserting SSOs should require patent holders with FRAND commitments to cede the right to seek injunctions against willing licensees, and should require binding arbitration to remedy infringement).

<sup>20</sup> See Robert P. Merges & Jeffrey M. Kuhn, *An Estoppel Doctrine for Patented Standards*, 97 CALIF. L. REV. 1, 50 (2009). Cf. *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1232 (Fed. Cir. 2014) (holding that in the damages context courts

whether a patentee that makes a FRAND commitment must offer it to everyone or only willing licensees,<sup>21</sup> who is a willing licensee,<sup>22</sup> whether the FRAND commitment is an enforceable contract,<sup>23</sup> who decides what royalty is FRAND,<sup>24</sup> what a

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must separate the intrinsic value of a patent from the value it obtains as a result of adoption as a standard). The logic of *Ericsson* might well lead a court to conclude that a patentee could not satisfy the *eBay* factors for injunctive relief with a standard-essential patent. See also Colleen V. Chien & Mark A. Lemley, *Patent Holdup, the ITC, and the Public Interest*, 98 CORNELL L. REV. 1, 8 (2012) (discussing the problems with granting injunctions in SEP cases).

<sup>21</sup> See, e.g., *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1332–34 (Fed. Cir. 2014) (Rader, C.J., dissenting) (disagreeing with the majority’s denial of an injunction because, in his view, if Apple was an unwilling licensee, Motorola would have had strong support for its injunction request); *Motorola Mobility LLC v. Google Inc.*, No. C-4410, 2013 WL 3944149, 7 (F.T.C. July 13, 2013) (prohibiting respondents from revoking or rescinding FRAND commitments, but finding exception where a potential licensee refuses to license the patent); Lemley & Shapiro, *Simple Approach*, *supra* note 2, at 1152–53 (arguing that a patentee who makes a FRAND commitment is not obligated to license to someone who is unwilling to accept reasonable terms set by an arbitrator during a binding arbitration).

<sup>22</sup> See, e.g., *Apple Inc.*, 757 F.3d at 1332–34 (Rader, C.J., dissenting) (disagreeing with the majority’s denial of an injunction because, in his view, the record contained evidence sufficient to create a dispute as to whether Apple was an unwilling licensee); Lemley & Shapiro, *Simple Approach*, *supra* note 2, at 1142, 1152–53 (arguing that if a potential licensee refuses to participate in royalty-setting arbitration, the licensee is unwilling and the patentee can sue for damages and injunctive relief); Eur. Comm’n, *Antitrust: Commission Sends Statement of Objections to Motorola Mobility on Potential Misuse of Mobile Phone Standard-Essential Patents—Questions and Answers*, EUROPA.EU (May 6, 2013), [http://europa.eu/rapid/press-release\\_MEMO-13-403\\_en.htm](http://europa.eu/rapid/press-release_MEMO-13-403_en.htm) [<https://perma.cc/3W8F-NP75>] (concluding that a licensee’s acceptance of a binding, third party determination for the terms of a FRAND license indicates the licensee’s willingness to enter a FRAND license).

<sup>23</sup> See, e.g., *Microsoft Corp. v. Motorola, Inc.*, 795 F.3d 1024, 1037–38 (9th Cir. 2015) (holding that enforcing a contractual commitment does not violate the First Amendment); *Motorola Mobility LLC v. Google Inc.*, No. C-4410, 2013 WL 3944149, 6 (F.T.C. July 13, 2013) (defining a “license agreement” as “a complete, binding, enforceable agreement between the signatories to license the patents”); Roger G. Brooks & Damien Geradin, *Interpreting and Enforcing the Voluntary FRAND Commitment* 4 (2010), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1645878](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1645878) [<https://perma.cc/P43T-V4SV>] (discussing the role of courts in enforcing FRAND contractual commitments); Damien Geradin et al., *The Complements Problem Within Standard Setting: Assessing the Evidence On Royalty Stacking* 6–20 (2008), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=949599](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=949599) [<https://perma.cc/936R-624A>] (arguing that enforcement costs limit enforcement of patent claims); Lemley, *supra* note 7, at 1909–11 (discussing the enforceability of SSO bylaws).

<sup>24</sup> See, e.g., Lemley & Shapiro, *Simple Approach*, *supra* note 2, at 1138–39 (recommending baseball-style binding arbitration to determine royalty rates); J. Gregory Sidak, *The Meaning of FRAND, Part I: Royalties*, 9 J. COMPETITION L. & ECON. 931, 934–45 (2013) (asserting that reasonable-royalty damages should fall between the minimum royalty a patent holder would accept and the maximum royalty the infringer would be willing to pay, approximating the price that parties would have bargained for *ex ante* in a voluntary exchange).

FRAND royalty rate actually is,<sup>25</sup> and what the consequences are of renegeing on a FRAND commitment.<sup>26</sup> The fights have produced not only some of the longest court opinions in history,<sup>27</sup> but also extraordinary efforts by companies like Qualcomm to fund scholarship and even entire centers at universities devoted to influencing the answers to these questions.<sup>28</sup>

Despite this outpouring of litigation and scholarship, we actually know surprisingly little about the enforcement of SEPs. We have good evidence on what organizations actually

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<sup>25</sup> See, e.g., *Microsoft Corp.*, 795 F.3d at 1040–45 (upholding the district court's reasonable and non-discriminatory determination for Motorola's patents); *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1229–35 (Fed. Cir. 2014) (holding that jury instructions on reasonable and non-discriminatory obligations should avoid rote reference to particular damages formulas, should distinguish between value that SEP holders added with their invention and value the invention gained by becoming standard essential, and should refrain from mentioning patent-holdup and royalty stacking absent evidence of holdup and stacking); *Realtek Semiconductor, Corp. v. LSI Corp.*, No. 12-CV-3451, 2014 WL 2738216, at \*5 (N.D. Cal. June 16, 2014) (upholding a jury verdict that decided the reasonable and non-discriminatory royalty rate using substantial expert testimony and other evidence); *Golden Bridge Tech. v. Apple Inc.*, No. 12-CV-4882, 2014 WL 2194501, at \*4–5 (N.D. Cal. May 18, 2014) (excluding expert testimony on how to calculate royalty base and rate because of the expert's methodology); *In re Innovatio IP Ventures, LLC*, No. 11-CV-9308, 2013 WL 5593609, at \*12 (N.D. Ill. Oct. 3, 2013) (deciding the RAND rate based on the testimony of five experts).

<sup>26</sup> *Broadcom Corp. v. Qualcomm Inc.*, 501 F.3d 297, 310–17 (3rd Cir. 2007); *Fed. Trade Comm'n v. Qualcomm Inc.*, No. 17-CV-220, 2017 WL 2774406, at \*5–6 (N.D. Cal. June 26, 2017); *Microsoft Mobile Inc. v. Interdigital, Inc.*, No. 15-CV-723, 2016 WL 1464545, at \*1–3 (D. Del. Apr. 13, 2016); *Apple Inc. v. Samsung Elecs. Co.*, No. 11-CV-1846, 2012 WL 1672493, at \*2–4, \*7, \*9, \*13 (N.D. Cal. May 14, 2012); *Research in Motion Ltd. v. Motorola Inc.*, 644 F. Supp. 2d 788, 791, 797 (N.D. Tex. 2008); ROBERT A. MATTHEWS, JR., 5 ANNOTATED PATENT DIGEST § 34.53.50 (2018); Lemley, *supra* note 13, at 157–58.

<sup>27</sup> See *Microsoft Corp.*, 795 F.3d at 1024–57.

<sup>28</sup> To be sure, companies on both sides have funded work in this area. But Qualcomm's investment has been extraordinary, and has led to the creation of entire centers as well as funding scholarly papers. See, e.g., HOOVERIP2.ORG, <https://hooverip2.org/about/> [<https://perma.cc/4MRZ-SXUH>] (acknowledging financial support from Qualcomm); TILEC NEWS (Apr. 26, 2007), [https://uvtapp.uvt.nl/tsb11/nb.nb\\_lib.frmtoonnieuwsbrief?v\\_nieuwsbrief\\_id=10764&v\\_rubriek\\_id=0&v\\_taal=](https://uvtapp.uvt.nl/tsb11/nb.nb_lib.frmtoonnieuwsbrief?v_nieuwsbrief_id=10764&v_rubriek_id=0&v_taal=) [<https://perma.cc/2ET3-CDAK>] (acknowledging Qualcomm's \$400,000 donation to TILEC for a five-year research and teaching program); *Qualcomm Gives \$2 Million for Patent Research*, NORTHWESTERN PRITZKER SCHOOL OF LAW (Aug. 2013), <https://www.law.northwestern.edu/campaign/gifts/qualcomm/index.html> [<https://perma.cc/UQW4-BUH6>] (acknowledging a \$2 million donation to the Searle Center on Law, Regulation, and Economic Growth); *U.S. Telecom Firm Boosts Research Funds at Tilburg University Law and Economics Center Beneficiary*, GODUTCH.COM, <http://www.godutch.com/newspaper/index.php?id=1181> [<https://perma.cc/3H9B-VTPT>] (acknowledging Qualcomm's €300,000 donation).

impose what sorts of policies,<sup>29</sup> and at least access to evidence on how many patents are declared essential to standards at various SSOs.<sup>30</sup> More recently, a new study by Jorge Contreras focuses on one of the questions we ask here: What happens when NPEs enforce SEPs in court?<sup>31</sup> Contreras began the process of evaluating SEP litigation outcomes. His paper is important, and has findings similar to ours, but lacks several pieces of data we provide that tell a more complete story. These include validity vs. infringement data and a matched set of non-SEPs for comparison.<sup>32</sup>

## II

### WHAT WE DID

We set out to understand how SEPs fared in court. We hypothesized that compared to ordinary patents, SEPs would fare well in court, at least when it came to infringement. After all, these are patents owned by companies that participated in developing the standard and which they identified as essential to the practice of that standard. In most cases the patentees have agreed to forego certain remedies, including injunctions, in order to promote the adoption of the standard their patent covers.<sup>33</sup> That should make proving infringement easy: it will usually be undisputed that the defendant practices the stan-

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<sup>29</sup> See, e.g., PATENT CHALLENGES FOR STANDARD-SETTING IN THE GLOBAL ECONOMY, *supra* note 8, at 31–49 (reviewing and comparing twelve major SSOs’ policies regarding IP rights management and licensing rules); Benjamin Chiao et al., *The Rules of Standard-Setting Organizations: An Empirical Analysis*, 38 RAND J. ECON. 905, 919–27 (2007) (examining the relationship between concessions SSOs demanded and the orientation of these SSOs to sponsors relative to users); Lemley, *supra* note 7, at 1903–09 (surveying the rules and bylaws of forty-three different SSOs, finding significant variation in policies, and observing that this diversity makes it difficult for IP owners to know, *ex ante*, what rules govern their rights).

<sup>30</sup> Knut Blind et al., *Study on the Interplay between Standards and Intellectual Property Rights (IPRs)* 29 (2011), [http://www.iplytics.com/download/docs/studies/ipr\\_study\\_final\\_report\\_en.pdf](http://www.iplytics.com/download/docs/studies/ipr_study_final_report_en.pdf) [<https://perma.cc/UWE2-3698>] (“Most SSOs make databases of such FRAND declarations by IPR owners public, and these databases allow us to identify, quantify and analyse the IPRs in standards . . .”). For an example of a database provided by an SSO, see ETSI, <http://ipr.etsi.org/> [<https://perma.cc/6WUW-ACT4>]. For a privately generated database providing an overview of all disclosed IPRs from thirteen major SSOs, see Rudi Bekkers et al., *Intellectual Property Disclosure in Standards Development*, PROCEEDINGS FROM NBER CONFERENCE ON STANDARDS, PATENTS, & INNOVATION TUCSON (AZ) (2012), <http://www.ssopatents.org/> [<https://perma.cc/Z5AV-H662>].

<sup>31</sup> Jorge L. Contreras et al., *Assertion of Standards-Essential Patents by Non-Practicing Entities*, in PATENT ASSERTION ENTITIES AND COMPETITION POLICY 50 (D. Daniel Sokol ed., 2017).

<sup>32</sup> *Id.* at 10–13.

<sup>33</sup> Lemley, *IP & SSOs*, *supra* note 7, at 1967; Lemley & Shapiro, *Simple Approach*, *supra* note 2, at 1140.

dard, so if the patent is necessary to practice the standard, proving that fact should suffice to prove infringement.

A careful observer, however, might have some questions regarding the “standard” narrative of SEP infringement. First, patents that are declared to the SSO before the standard is complete may not be infringed by the final version of the standard that the SSO adopts, so the plaintiff must still prove its case on infringement. Second, major standards can have many different features and components. Patents that are “essential” to optional features may not be infringed by a particular implementation of the standard. Although this explains how it is possible to find patents that are declared essential but not infringed, we might still expect that careful selection of patents to assert in litigation would minimize the number of such cases.<sup>34</sup>

But infringement is not all there is to patent litigation. Broad patent claims come at a cost. A patent that is sufficiently broad that it can’t be designed around might be more likely invalid, because it is more likely to tread on the prior art<sup>35</sup> or because it is harder to describe and teach the full scope of the invention.<sup>36</sup> So, we also hypothesized that when SEPs go to court they may be more likely than non-SEPs to be held invalid. Our confidence in that hypothesis was weaker, because it assumes that SEPs are more powerful and more likely to be infringed because they are broader than non-SEPs. That might not be true. It might be that SEPs are narrow but lucky—they just happen to cover the particular way we agreed to do something, but very little else. In particular, if companies are able to anticipate the direction that a standard will take because they are participating in its development, it may be possible to file narrow applications that are nevertheless likely to be valid and essential.<sup>37</sup> Or it might be that the patent was essential because it was truly ground-breaking, and so it was valid despite its importance and breadth.

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<sup>34</sup> It is also possible that cases are litigated *because* the claims of essentiality are weak, and that defendants license truly essential patents without litigation to judgment.

<sup>35</sup> 35 U.S.C. §§ 102, 103 (2018).

<sup>36</sup> 35 U.S.C. § 112(a) (2018).

<sup>37</sup> Byeongwoo Kang & Rudi Bekkers, *Just-in-Time Patents and the Development of Standards*, 44 RES. POLY 1948, 1951 (2015); Cesare Righi, *Essays on Patent Examination and Standard Essential Patents 40–44* (2017) (Ph.D. dissertation, Boston University Questrom School of Business), [https://open.bu.edu/bitstream/handle/2144/23353/Righi\\_bu\\_0017E\\_13083.pdf?sequence=5](https://open.bu.edu/bitstream/handle/2144/23353/Righi_bu_0017E_13083.pdf?sequence=5) [<https://perma.cc/AEE5-MHP3>].

To evaluate these hypotheses, we collected data on lawsuits for patents declared essential to a sample of thirteen SSOs that maintain a publicly accessible database of SEP disclosures. The SSOs in our sample include the major global standards-developing organizations (ISO, ITU and IEC), the main U.S. representative to these multi-national groups (ANSI), a set of SSOs that govern significant technology platforms including cellular telephone infrastructure (ETSI), Wi-Fi (IEEE) and the internet (IETF), and a handful of smaller organizations. For these SSOs, we can identify 6,633 U.S.-issued U.S. utility patents.<sup>38</sup> We relied on the patent owner's self-identification of SEPs to the SSO during the standard-setting process because that is the primary source of public data. It is also what triggers FRAND and other obligations with respect to third-party standards implementers.

We merged our SEP data to the Lex Machina litigation file and identified 422 patents that have been asserted in at least one case.<sup>39</sup> Because we are interested in litigation outcomes, however, we limit our attention to the sub-sample of 355 patents where we have complete data on the outcome of at least one case.<sup>40</sup> Those 355 patents were litigated in a total of 537 unique cases, but in many of those cases more than one SEP was asserted, so we have a total of 1,446 SEP assertions.

We matched each SEP patent-case pair to a randomly-selected non-SEP patent from the same patent class that was filed in the same year and was first litigated in the same year as its SEP "twin." The 355 matched non-SEPs were litigated in a total of 1,175 unique cases with 1,633 total assertions. Thus, our final analysis sample has a total of 3,079 assertions, but our primary focus is on the 1,719 unique lawsuits, of which just over 30% are SEP lawsuits.<sup>41</sup>

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<sup>38</sup> Our baseline SEP data are publicly available at [www.sso Patents.org](http://www.sso Patents.org) [<https://perma.cc/Z5AV-H662>]. For more information on the sample of SSOs, and the process used to clean and harmonize the disclosure data, see Bekkers et al., *supra* note 6, at n.8.

<sup>39</sup> Lex Machina collects, processes, and refines litigation data from sources such as PACER. It "identif[ies] asserted properties (such as patents), findings, and outcomes, including any damages awarded." LEX MACHINA, <https://lexmachina.com/what-we-do/how-it-works/> [<https://perma.cc/NME8-TLSV>].

<sup>40</sup> Litigation outcomes can be missing because a patent was asserted before the start of the Lex Machina data set, or more often, because the matter was still pending as of May 2017.

<sup>41</sup> Decisions on the same patent are not independent of each other. Nor are decisions on different patents in the same suit. See John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AIPLA Q.J. 185, 245 (1998). To avoid skewing our results, we ran our results testing only the first decision on each patent. As a robustness check we also ran an alternative specifi-

TABLE 1: CASES IN OUR SAMPLE

	<b>Unique Patents</b>	<b>%</b>	<b>Unique Cases</b>	<b>%</b>	<b>Total Assertions</b>	<b>%</b>	<b>Merits Decisions*</b>	<b>%</b>
<b>Declared SEP</b>	355	50%	537	31%	1,446	53%	117	49%
<b>Matched Control</b>	355	50%	1,175	69%	1,633	47%	123	51%
<b>Total</b>	710		1,712		3,079		240	

We assign each SEP to the SSO where it was disclosed, and if a patent was committed under more than one SSO patent policy, we assigned it using the date of the first license commitment. Table 2 shows the distribution of patents and cases/assertions across the various standard-setting organizations in our sample.<sup>42</sup>

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cation testing only one randomly selected patent from each case. In most of what follows, we report only the results for the first decision on each patent.

<sup>42</sup> The full list of SSOs in our disclosure data is:

ANSI = American National Standards Institute

ATIS = Alliance for Telecommunications Industry Solutions (a US telecom SDO focused on hardware)

BBF = Broadband Forum

CEN = Comité Européen de Normalisation (a European NGO for standards development)

CENELEC = European Committee for Electrotechnical Standardization (Europe's answer to IEEE)

ETSI = European Telecommunications Standards Institute

IEC = International Electrotechnical Commission

IEEE = Institute of Electrical and Electronics Engineers

IETF = Internet Engineering Task Force

ISO = International Organization for Standardization

ITU = International Telecommunications Union

JTC = Joint Technical Committee (a collaboration of ISO, IEC and ITU to set ICT standards)

OMA = Open Mobile Alliance

TIA = Telecommunications Industry Association

In Table 2 we group these organizations. Big-I is the IEC, the ISO, and the ITU.

ANSI+ includes CEN, IEEE includes CENELEC, and OTHTEL (other telecom) includes other telecommunications SSOs that are not listed.

We observe no litigation for patents disclosed to CEN, CENELEC, and TIA because few patents are disclosed to those SSOs.

TABLE 2: SEPS AND UNIQUE CASES ALLOCATED BY SSO GROUP

	<b>Declared SEPs</b>	<b>%</b>	<b>Total Cases</b>	<b>%</b>	<b>Cases/ SEP</b>
ANSI+	32	9%	148	10%	4.6
BIG-I	57	16%	159	11%	2.8
ETSI	150	42%	590	41%	3.9
IEEE	58	16%	374	26%	6.4
IETF	22	6%	34	2%	1.5
OTHTEL	36	10%	141	10%	3.9
Total	355		1,446		4.1

Notes: This table reports summary statistics for SEPs asserted in at least one case completed before May 2017 and assigned to an SSO based on the date of the first recorded licensing commitment.

The overwhelming majority of the SEPs (95%) in our sample were subject to a FRAND commitment. There were two patents disclosed with a royalty-free licensing commitment (where litigation could have preceded the disclosure, or taken place outside the scope of the standard); three patents disclosed with specific license terms; two patents where the licensing commitment was withheld; and thirteen “others” where it was difficult to classify the nature of the licensing commitment based on the information provided in the disclosure.

We also determined whether a practicing entity or NPE asserted each patent. Because the definition of an NPE is a contested issue,<sup>43</sup> we used Lemley and Myhrvold’s categorization of patent plaintiffs into twelve different types.<sup>44</sup> Our classification is based on the entity status coded by the Stanford NPE Litigation Database.<sup>45</sup> We ran two different specifications, one treating an NPE as any entity that was not purely a product

<sup>43</sup> See, e.g., Mark A. Lemley, *Are Universities Patent Trolls?*, 18 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 611, 629–31 (2008) (discussing the appropriate definition of “patent troll” and arguing that universities generally do not fit the definition); James F. McDonough III, *The Myth of the Patent Troll: An Alternative View of the Function of Patent Dealers in an Idea Economy*, 56 EMORY L.J. 189, 192–93, 197–200 (2006); Gene Quinn, *In Search of a Definition for the Term “Patent Troll”*, IPWATCHDOG (July 18, 2010), <http://www.ipwatchdog.com/2010/07/18/definition-patent-troll/id=11700/> [<https://perma.cc/U7W6-KZPY>]; *Patent Trolls*, ELECTRONIC FRONTIER FOUND, <https://www.eff.org/issues/resources-patent-troll-victims> [<https://perma.cc/BVB9-P9QT>].

<sup>44</sup> John R. Allison et al., *Extreme Value or Trolls on Top? The Characteristics of the Most-Litigated Patents*, 158 U. PA. L. REV. 1, 10–11 (2009).

<sup>45</sup> *Stanford NPE Litigation Dataset*, SLS, <https://law.stanford.edu/projects/stanford-npe-litigation-dataset/#snav-brief-dataset-methodology> [<https://perma.cc/P7Q8-FJDL>].

company, and one defining a case as brought by a product company if at least one plaintiff was a product company or the IP subsidiary of a product company, even if other plaintiffs were not. We use this latter, narrower definition of NPE in the remainder of our analysis, but our results don't change significantly using the alternative specification.<sup>46</sup>

For each case we used outcome data from Lex Machina.<sup>47</sup> We report whether the case went to a merits decision and, if so, which party won the first case involving that patent to get to a merits decision.<sup>48</sup> We also report whether the merits decision involved infringement or validity.

### III FINDINGS

#### A. Descriptive Statistics

Based on our narrower definition of NPEs, 719 of the 2,647 total (SEP and non-SEP) assertions, or 27.2%, were made by practicing entities and the remainder by NPEs. The fact that NPEs brought roughly three-fourths of the assertions may surprise some, given that previous work suggests NPEs file just over half of all lawsuits.<sup>49</sup> We think this is at least in part an artifact of the nature of the industries we studied. Previous studies have shown that NPE suits are far more prevalent in the computer, Internet, and telecommunications industries that are also responsible for most standard-setting activity.

Notably, the prevalence of NPEs in our sample is not due to the non-SEP cases. There is relatively little difference between

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<sup>46</sup> Appendix A lists the full breakdown of entities in each entity status category.

<sup>47</sup> LEX MACHINA, <https://lexmachina.com/> [<https://perma.cc/4RVQ-XYBZ>].

<sup>48</sup> As noted above, in alternative specifications we evaluate the results in all cases involving a patent, not just the first case. But multiple decisions on the same patent are not unrelated events, so it is difficult to draw useful inferences from that alternative specification.

<sup>49</sup> Robin Feldman et al., *The AIA 500 Expanded: The Effects of Patent Monetization Entities* 9 (U.C. Hastings Research Paper No. 45, 2013), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2247195](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2247195) [<https://perma.cc/MBU3-JPBC>] (finding that "patent monetization entities filed 58.7% of the patent lawsuits in 2012"); RPX Corp., *NPE Litigation, PATENT MARKETPLACE, AND NPE COST* 9 (2015), <https://www.rpxcorp.com/wp-content/uploads/sites/2/2016/07/RPX-2015-Report-072616.FinalZ.pdf> [<https://perma.cc/A6UP-MYNN>]; *2016 Annual Patent Dispute Report*, UNIFIED PATENTS (Jan. 1, 2017), <https://www.unifiedpatents.com/news/2016/12/28/2016-annual-patent-dispute-report> [<https://perma.cc/9ZLE-XCDX>] (finding that NPEs accounted for approximately 55% of all new patent cases in 2016). That number has increased over time, see Love, *infra* note 88, at 1309, so NPEs may have been a smaller share of overall patents litigated in the earlier years of our data set.

the share of SEPs and non-SEPs that NPEs asserted, as we show in Table 3.

TABLE 3: ASSERTIONS OF SEPs VS. NON-SEPs BY NPEs AND PRODUCT COMPANIES<sup>50</sup>

	<b>NPE Patent Share</b>	<b>NPE Case Share</b>	<b>Avg. Cases per NPE Patent</b>	<b>Avg. Cases per Non-NPE Patent</b>
<b>Declared SEP</b>	37%	71%	7.5	2.3
<b>Matched Control</b>	46%	75%	8.4	2.5
<b>Total</b>	42%	73%	8.0	2.4

The numbers remain virtually indistinguishable (and the differences remain statistically insignificant) if we limit our study to the number of unique cases. By contrast, the NPE share drops dramatically if we count only unique *patents* asserted. NPEs assert less than half of the patents, and only 37.6% of the SEPs in our sample.<sup>51</sup> That's because NPEs in our sample filed many more cases per patent than did practicing entities.<sup>52</sup>

NPEs, then, are responsible for a high percentage of the SEP assertions in our sample—over 70%. That number is particularly remarkable because we selected our SEPs from the universe of patents disclosed to the SSO at the time the standard was adopted. NPEs are much less likely to participate in SSOs than practicing entities, so most of those cases involve patents that NPEs bought in the secondary market. NPEs make much more intensive use of the patents they do acquire, asserting them in more than three times as many cases as product companies do.

The rate at which NPEs assert patents varied quite a lot across the different SSOs we studied. NPE assertion rates

<sup>50</sup> The difference in the NPE share of total assertions between SEPs and matched controls is statistically significant using the narrow definition of NPEs but not when using the broader definition.

<sup>51</sup> If we use the broader definition of NPEs, the percentage of patents asserted by NPEs is around 50%, but the difference between assertion of SEPs and non-SEPs is no longer statistically significant.

<sup>52</sup> For similar results using a somewhat different methodology, see Jorge L. Contreras, *When a Stranger Calls: Standards Outsiders and Unencumbered Patents*, 12 J. COMPETITION L. & ECON. 1 (2016); Michael Risch, *A Generation of Patent Litigation*, 52 SAN DIEGO L. REV. 67 (2015); John R. Allison et al., *Patent Quality and Settlement Among Repeat Patent Litigants*, 99 GEO. L.J. 677 (2011).

ranged from a low of 31% in the “Big-I” grouping (a group of large multinational SSOs comprising the IEC, the ISO, and the ITU) to a high of 85% of the assertions of patents committed to the IEEE.<sup>53</sup>

TABLE 4: SHARE OF NPE ASSERTIONS BY SSO

<b>SSO Group</b>	<b>Declared SEP</b>	<b>Matched Control</b>
ANSI+	80%	86%
BIG-I	31%	61%
ETSI	78%	77%
IEEE	85%	70%
IETF	38%	33%
OTHTEL	45%	83%
Assertions (N)	1,220	1,427

There doesn't seem to be any obvious relationship between the subject matter of the SSOs or their IP policies, and the share of NPE assertions. But it seems clear that patents essential to some SSOs, including ANSI, ETSI, and the IEEE, are more likely to be purchased by the NPEs who assert them. Further evidence for this is found by comparing the SEP and Control columns in Table 4. There is considerable variance between the likelihood that a patent essential to a particular SSO is asserted by an NPE and the likelihood that its matched counterpart is asserted by an NPE.<sup>54</sup>

This differentiation suggests, though it does not prove, that SSO policies or at least member norms have a sizeable effect on assertion. The most likely mechanism is that members of different SSOs differ in their propensity to sell their SEPs—perhaps partly because patents covering certain standards are more attractive to NPEs. For example, the BIG-I members exist in technology fields like computer networking that have a fairly high rate of troll assertion (61% of non-SEPs). But trolls only assert 31% of BIG-I SEPs. That may mean that the companies that develop the patents are more likely to keep and assert those patents and less likely to sell them to NPEs. By contrast,

<sup>53</sup> The groupings in Table 4 are identical to those in Bekkers et al., *supra* note 30, and reflect our effort to increase within-group sample size for statistical analysis by combining SSOs that work on similar technology. Most of the IEEE patents relate to a single standard: 802.11, or Wi-Fi.

<sup>54</sup> These differences are statistically significant for the Big-I, IEEE and OTHTEL groups in a logistic regression.

the situation seems to be the opposite in the IEEE, where NPEs represent 70% of the non-SEPs asserted and 85% of the SEPs asserted.

## B. Litigation Outcomes

### 1. *Nature of the Cases*

We compared the win rates for SEP and non-SEP patents using Lex Machina data. As with all litigation, most cases in our sample settled (75.9%) or were resolved on procedural grounds (16.1%). Only 8% (247 patent-case pairs) went to merits judgment.

SEP cases were significantly more complex than non-SEP cases, generating over one-third more docket entries than non-SEP cases (a mean of 230 entries for non-SEPs and 308 for SEPs).<sup>55</sup>

For purposes of our merits analysis, we ran several alternative specifications. In the first, we included every case involving the patents in our sample. In the second, we dropped all but the first case filed on each patent so that our results were not skewed by the same patent being held infringed (or not infringed) multiple times in different decisions, since those decisions are not likely to be truly independent. Selecting only the first case filed increased the share of cases that went to a merits decision from 8% to 15% of tested cases. That makes some intuitive sense, as later-filed cases involving the same patent are more likely to be stayed or transferred, and may also be more likely to settle after the resolution of the first suit. We also ran an alternative specification in which we selected only one random patent from each lawsuit. Previous work has shown that patents that are litigated together generally share the same fate,<sup>56</sup> so this alternative specification avoids a different sort of interdependence problem.

### 2. *Effect of Standard-Essential Patents*

Interestingly, selecting only the first case for each patent (though not selecting only one patent for each case) signifi-

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<sup>55</sup> That difference was statistically significant ( $p=0.01$ ). Jay Kesan and Gwendolyn G. Ball have used the number of docket entries as a rough measure of the cost and complexity of a lawsuit, or at least how hard-fought it is. Jay P. Kesan & Gwendolyn G. Ball, *How are Patent Cases Resolved? An Empirical Examination of the Adjudication and Settlement of Patent Disputes*, 84 WASH. U. L. REV. 237, 246 (2006).

<sup>56</sup> Allison & Lemley, *supra* note 41, at 245; John R. Allison et. al, *Understanding the Realities of Modern Patent Litigation*, 92 TEX. L. REV. 1769, 1796 (2014).

cantly changed the merits outcomes. Considering all the patent-case pairs in our sample, patentees won 41.7% of the cases that went to a merits judgment.<sup>57</sup>

TABLE 5: WIN RATES OF CASES REACHING A MERITS DETERMINATION BY SEP STATUS<sup>58</sup>

	<u>All Assertions</u>		<u>First-Case per Patent</u>	
	<b>Control</b>	<b>SEP</b>	<b>Control</b>	<b>SEP</b>
Claimant Win	39%	42%	52%	67%
Total Assertions (N)	123	117	54	54
Pearson Chi-square p	0.652		0.117	

There was no significant difference between SEP and non-SEP win rates. The same was true when we selected one random patent from each case (to avoid near-collinearity among suits that involve multiple related patents). In that sample, patentees won 50 of 140 cases, or 35.7%. There was no significant difference between SEPs and non-SEPs in that sample either. Indeed, in that sample the win rates of SEPs and non-SEPs were identical (35.7% for non-SEPs and 35.6% for SEPs).

But when we dropped all but the first case filed on each patent, patentees did much better, winning 59% of the cases that went to judgment. SEPs won 66.7% while non-SEPs won 51.9%. Both numbers are quite a bit higher than the overall win rate for patentees in general, and particularly for patentees in the computer and telecommunications industries in which our patents are concentrated.<sup>59</sup>

The difference in outcomes between our specifications suggests that patentees in our sample (both SEP and non-SEP patent owners) who litigate multiple cases to judgment may win their first case but eventually are likely to lose. This may simply be survivor bias—if a patent is invalidated in the first case it can't be enforced against anyone else.<sup>60</sup> And even if it is found not infringed in the first case the incentive to sue again may be significantly reduced. But if not, it suggests a variance

<sup>57</sup> We include only substantive rulings in the definition of a merits judgment and exclude decisions on procedural questions such as venue or personal jurisdiction.

<sup>58</sup> Most cases settle or are resolved on non-merits grounds. Appendix C reports the full results, including those categories.

<sup>59</sup> John R. Allison et al., *Our Divided Patent System*, 82 U. CHI. L. REV. 1073, 1097–98, 1098 tbl.3 (2015); Allison et al., *supra* note 56, at 1787–88.

<sup>60</sup> *Blonder-Tongue Labs., Inc. v. Univ. Ill. Found.*, 402 U.S. 313, 350 (1971).

in outcomes in different cases involving the same patent, a variance that will hurt patentees more than accused infringers, since they will be bound by the effects of their losses.

None of the differences between SEPs and non-SEPs were statistically significant. That itself is a very interesting result. We would expect SEPs to be stronger than non-SEPs, but that doesn't turn out to be true in cases litigated to judgment.<sup>61</sup>

### 3. *Effect of NPE Status*

Next, we measured how different entity types fared in our study. We report the results for the narrower definition of NPEs discussed above, treating any company that makes products or is a subsidiary of one that does as a product company. The results are dramatic and statistically significant.

TABLE 6: WIN RATES BY NPE STATUS<sup>62</sup>

	<u>All Assertions</u>		<u>SEP Cases Only</u>	
	<b>Implementer</b>	<b>NPE</b>	<b>Implementer</b>	<b>NPE</b>
Claimant Win	72%	13%	71%	6%
Total Assertions (N)	102	120	62	53
Pearson Chi-square p-value	0.000		0.000	

The results are equally striking when we use either of our alternative samples—indeed, even more dramatic. If we count only the first case for each patent, practicing entity patentees won 72.3% of their cases while NPEs won only 5.7%.<sup>63</sup> And they are statistically significant ( $p=0.00$ ). Practicing entities in our study win their cases at more than twice the rate of NPEs. That is consistent with other work showing that NPEs fare worse in litigation outcomes than other plaintiffs generally.<sup>64</sup> But it is worth noting that practicing entities in our study did quite well, better than practicing entities generally or in the IT fields in other studies.<sup>65</sup> It is not clear what explains this discrepancy,

<sup>61</sup> While in one of our specifications—the one-case-per-patent sample—the win rate for SEPs was higher than for non-SEPs, that result was not statistically significant ( $p=0.29$ ).

<sup>62</sup> Appendix D reports the results including non-merits cases and settlements.

<sup>63</sup> If we count only one patent per case, practicing entity patentees won 72.5% of their cases while NPEs won only 22.9%.

<sup>64</sup> John R. Allison et al, *How Often do Non-Practicing Entities Win Patent Suits?*, 32 BERKELEY TECH. L.J. 237, 268–69 (2017), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2750128](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2750128) [<https://perma.cc/N4KC-BNYP>].

<sup>65</sup> *Id.* at 274, 277.

but it may trace back to the nature of the patents we have selected, which are either SEPs or are matched to them and therefore are unrepresentative of litigated patents more generally.

NPEs did significantly better in the broader alternative specification, winning 30% of their cases—still far less than practicing entities, but twice as many cases as in the narrower definition of NPE we report here.<sup>66</sup> The difference between the two specifications is interesting. It suggests that entities that don't themselves make products but are closely connected with those who do—failed startups, for instance, and IP holding subsidiaries of product companies—do just fine in litigation. It is those with no connection to a practicing entity that fare poorly in court.

The interaction of the NPE and SEP characteristics for cases litigated to judgment was even more striking. As we show in Table 7, practicing entities win virtually the same percentage of their SEP and non-SEP cases. NPEs, by contrast, win many fewer cases. But they are particularly unlikely to win their SEP cases, winning only 6% of them. The difference in win rates between the SEPs and non-SEPs asserted by NPEs is highly statistically significant ( $p=0.00$ ).

TABLE 7: PATENTEE WIN RATE PERCENTAGE BY  
NPE AND SEP STATUS<sup>67</sup>

	<b>Declared SEP</b>	<b>Matched Control</b>
<b>Implementer</b>	71%	73%
<b>NPE</b>	6%	19%

<sup>66</sup> We present the data from that alternative specification in Appendix B.

<sup>67</sup> These data include plaintiff wins on default judgments. If we exclude default judgments, the win rates change modestly, as shown in Appendix E.

The statistical significance of the results does not change. There were many substantive decisions classified by Lex Machina as consent judgments. Interestingly, almost all of them were judgments for defendants in NPE SEP cases. That struck us as surprising, since consent decrees generally favor patentees. We investigated those decisions. Each of them involved a claim construction decision unfavorable to the patentee, after which the patentee stipulated to noninfringement in order to appeal the claim construction decision. While that type of result is literally a consent judgment, it is for all practical purposes a substantive win on noninfringement by the defendant. So we kept these cases in our data set.

#### 4. *Does Infringement or Validity Explain the Results?*

We tested whether the similar SEP and non-SEP win rates illustrated in Table 5 are a result of our offsetting hypotheses discussed above—that SEPs are more likely to be infringed but may also be more likely to be held invalid. For this test, unlike previous ones, we look at interim as well as final merits rulings, such as denials of summary judgment. We find that neither part of our hypothesis holds up. SEPs are no more likely to be found infringed than non-SEPs. Of the 215 infringement decisions in our study, 127 involved SEPs and 88 did not. The SEP infringement win rate was 30.7%, not appreciably (or statistically) different than the non-SEP infringement win rate of 29.5%. When we restricted our sample to the first case involving each patent, we were left with 71 observations, 41 of which involved SEPs. While SEPs won more of those cases (46.3% as opposed to 33.3%), the results were not statistically significant ( $p=0.28$ ).

We did find significant differences between SEPs and non-SEPs when it came to validity, but not in the direction we expected. SEPs were more likely to be held valid. Of the 100 validity decisions in our study, 49 involved SEPs and 51 did not. The SEP validity win rate was 83.7%, significantly higher than the non-SEP validity win rate of 60.8% ( $p=0.01$ ). The statistical results were the same for the restricted sample involving only the first suit on each patent. Thus, surprisingly, SEPs do no better in infringement cases than their matched non-SEP counterparts, but are less likely to be held invalid.

When we add in the effect of NPE status, we see one noticeable difference. NPEs fare worse than practicing entities in all infringement decisions, but there isn't much difference between SEPs and non-SEPs once we know what kind of entity is asserting the patent.

TABLE 8A: INFRINGEMENT AND VALIDITY RATE BY PATENT AND ENTITY TYPE

	<b>Infringement Rate</b>		<b>Validity Rate</b>	
	<b>SEP</b>	<b>Control</b>	<b>SEP</b>	<b>Control</b>
<b>Implementer</b>	42%	39%	80%	75%
<b>NPE</b>	21%	20%	88%	52%

TABLE 8B: INFRINGEMENT AND VALIDITY DECISIONS (COUNT) BY  
PATENT AND ENTITY TYPE

	<b>Infringement Decisions</b>		<b>Validity Decisions</b>	
	<b>SEP</b>	<b>Control</b>	<b>SEP</b>	<b>Control</b>
<b>Implementer</b>	59	31	25	20
<b>NPE</b>	66	49	24	23

When it comes to validity, however, we do see a difference in results. NPEs do better on validity with SEPs than non-SEPs, and indeed do better even than practicing entities. But parsed this finely, the numbers of cases are relatively small and the differences are not statistically significant.<sup>68</sup>

#### IV IMPLICATIONS

Our study has produced at least three interesting findings. First, despite their name, SEPs don't seem to be all that essential. At least, they aren't often found infringed. Second, when SEPs go to court they don't fare significantly differently than other patents of similar age and type. Third, NPEs do very poorly even when they assert SEPs. In this section we leave the world of reporting data and consider some possible policy implications of these findings.

##### A. Maybe SEPs Aren't So Essential After All

One implication seems to be that overdisclosure of SEPs is rampant. When SEPs are asserted in court, most of them turn out not to be infringed.<sup>69</sup> That is a surprising finding for a set

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<sup>68</sup> Because we report in this section decisions on either infringement or validity, even if they did not finally resolve the case, the universe of decisions in this section does not completely overlap with the discussion of final rulings in prior sections. We do find that NPEs settle SEP cases—but not other cases—much more frequently after a partial win on either validity or infringement than do practicing entities. So the low win rate for NPEs on SEPs at judgment may in part reflect the fact that NPEs settle their best cases after a partial win rather than taking them to judgment.

<sup>69</sup> While it is possible that the SEPs are being asserted against devices that do not practice the standard, that seems unlikely to explain most of our cases. When plaintiffs assert SEPs in litigation they are likely to assert them against the standard they purport to cover. And in many cases, adoption of that standard is sufficiently widespread that almost any defendant uses it. It would be surprising to sue on a patent that covers a standard widely used in the industry but to assert that something other than that standard infringes a patent on the standard. Nonetheless, we cannot exclude the possibility that that is happening in some of the cases we observe.

of patents that were declared essential to the standard by participants in the SSO at the time the standard was adopted. These are not patents only claimed to cover a successful standard years later in litigation, a circumstance in which we might expect strategic overclaiming in an effort to reach the standard.<sup>70</sup> The overclaiming of patents as standard-essential seems to happen much earlier than litigation, often when the standard itself is adopted.<sup>71</sup> And it is done by the participants in the standard-setting process themselves, not those who later have an incentive to read the patent creatively to cover something it was not intended to reach.

There is prior evidence that suggests that overdisclosure of SEPs is common.<sup>72</sup> Companies might rationally err on the side of disclosing rather than concealing, perhaps because they might view it as giving them an advantage in later royalty negotiations but also because the failure to disclose SEPs might violate the antitrust laws.<sup>73</sup> Some literature suggests that downstream firms and those with weaker patents tend towards

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<sup>70</sup> In the ongoing Apple-Qualcomm litigation, Qualcomm has identified 1800 patents that it claims are essential to telecommunications standards Apple uses, most of which were disclosed to ETSI. Scott Graham, *Federal Judge Looking to Pare Back Apple-Qualcomm Dispute*, THE RECORDER, (Oct. 14, 2017), <https://www.law.com/therecorder/almID/1202800451514/Federal-Judge-Looking-to-Pare-Back-Apple-Qualcomm-Dispute/?mcode=1202617583863&curindex=24> [<https://perma.cc/KU53-3M79>].

<sup>71</sup> Some companies did engage in late disclosure, adding patents after the formal adoption of the standard. We do not distinguish those patents in our study, and it is possible they have different characteristics than patents disclosed *ex ante*.

<sup>72</sup> See, e.g., Jason R. Bartlett & Jorge L. Contreras, *Rationalizing FRAND Royalties: Can Interpleader Save the Internet of Things?*, 36 REV. LITIG. 285, 300–01 (2017) (“[R]ecent studies [have found] variably that [only] 28%, 29% and 50% of patent families declared ‘essential’ to ETSI’s 2G, 3G and 4G wireless telecommunications standards . . . were actually essential . . . .”); Jorge L. Contreras, *supra* note 6, at 222–23 (referencing a Cyber Creative study that found only 56% of sampled SEPs were “truly” essential, 29% were partially essential, and 15% were not essential at all); Stitzing et al., *supra* note 6, at 10 (noting that over-declaration rates of SEPs could be as high as 80%). Prior work that has delved into the technology has concluded that only about a quarter of the patents declared essential to a standard actually are. Goodman & Myers, *supra* note 15, at 4; Fairfield Resources Int’l, *Analysis of Patents Declared as Essential to GSM as of June 6, 2007* (Dec. 31, 2007) (27% of GSM cellular technology); Fairfield Resources Int’l, *Review of Patents Declared as Essential to WCDMA Through December 2008*, (Jan. 6, 2009) (28% of WCDMA cellular technology). Our results are broadly consistent with that work.

<sup>73</sup> *In re Union Oil Co. Cal.*, 138 F.T.C. 1, 113–18 (2004); *In re Dell Computer Corp.*, 121 F.T.C. 616, 624–25 (1996); cf. *In re Rambus, Inc.*, No. 9302, 2006 WL 2330117, at \*3, \*11, \*19–20 (F.T.C. Aug. 2, 2006) (finding that Rambus, a developer of computer memory technologies, violated the Sherman Act by failing to disclose certain SEPs).

broader disclosures than firms with specific technologies that are actually essential inputs.<sup>74</sup>

Policy makers have mostly worried about the problem of strategic nondisclosure because it permits a patent owner to lure an SSO into adopting a standard without understanding the full costs of implementation. The patent owner could then hold up adopters of the standard, charging a higher royalty after the industry becomes locked in to the standard.<sup>75</sup> Rambus engaged in just such a strategy.<sup>76</sup>

It is less clear that we should be troubled by overdisclosure as a policy matter. True, claiming as standard-essential patents that aren't creates clutter, and so it might increase the cost of figuring out what licenses we need. It might also distort the true cost of a standard, making it appear more encumbered than it is or changing the allocation of royalties among patent owners.<sup>77</sup> That risk will be compounded if courts use counts of declared essential patents to apportion royalties in damages calculations, as some have done.<sup>78</sup> If a FRAND royalty is determined by how many other patents have been declared essen-

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<sup>74</sup> Josh Lerner et al., *Patent Disclosures and Standard-Setting*, 4, 13 (Nat'l Bureau of Econ. Research, Working Paper No. 22768, 2016); Bekkers et al., *supra* note 6, at 3.

<sup>75</sup> Lemley & Shapiro, *Holdup*, *supra* note 2, at 2009, 2016.

<sup>76</sup> *Id.*; Mark R. Patterson, Commentary, *Antitrust and the Cost of Standard-Setting: A Commentary on Teece & Sherry*, 87 MINN. L. REV. 1995, 2001 n.33 (2003) (referring to the different royalties Rambus charged).

<sup>77</sup> See Contreras, *supra* note 6, at 224–25 (making this point and suggesting solutions).

<sup>78</sup> *TCL Commc'n Tech. Holdings v. Telefonaktiebolaget LM Ericsson*, No. 14-CV-341, 2017 WL 6611635, at \*9 (C.D. Cal. Dec. 21, 2017) (“The Court adopts a simple patent counting system which treats every patent as possessing identical value . . . .”); *GPNE Corp. v. Apple, Inc.*, No. 12-CV-2885, 2014 WL 1494247, at \*7–10 (N.D. Cal. Apr. 16, 2014) (admitting expert testimony based on a patent counting approach where the expert adjusted her final royalty figure based on the value of the asserted patent relative to the other standard-essential patents). *But see Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1323–24 (Fed. Cir. 2014) (rejecting a modified patent counting method because “proof of damages must be carefully tied to the claimed invention itself”); *Golden Bridge Tech. v. Apple Inc.*, No. 12-CV-4882, 2014 WL 2194501, at \*6 (N.D. Cal. May 18, 2014) (“If anything, the case law is clear that mere patent counting and dividing is not enough.”); *In re Innovatio IP Ventures, LLC*, No. 11-CV-9308, 2013 WL 5593609, at \*39 (N.D. Ill. Oct. 3, 2013) (choosing a particular method to calculate a RAND royalty rate in part because the “proposal does not apportion to the value of Innovatio’s patented features based solely on the numerical proportionality of Innovatio’s patents” and can instead “account for its conclusion that Innovatio’s patents are of moderate to moderate-high importance to the standard”); *Microsoft Corp. v. Motorola, Inc.*, No. 10-CV-1823, 2013 WL 2111217, at \*80 (W.D. Wash. Apr. 25, 2013) (“Another problem with using patent pools as the *de facto* RAND royalty rate is that the patent-counting royalty allocation structure of pools does not consider the importance of a particular SEP to the standard . . . .”).

tial, which makes some sense,<sup>79</sup> overdeclaration can skew the royalty payments towards companies that overdeclare and away from those that don't. It can also complicate the adoption of standards.

At the same time, overdisclosure of patents can benefit the world. Most SSOs (and almost all of the ones in our study) require that disclosed SEPs be licensed on specified terms, most commonly on FRAND terms but sometimes royalty-free. Indeed, 322 of the 355 patents in our study were encumbered by such a requirement, and a FRAND requirement applied to 317 of those patents. Those commitments should bind their patent owners even if the patent wasn't truly essential and so did not have to be disclosed at all.<sup>80</sup> So overdisclosure of patents may mean overgenerous licensing—patentees making concessions (such as the absence of injunctive relief)<sup>81</sup> that they didn't have to make.<sup>82</sup> We can see why patentees wouldn't want to do that; that's why we worry about them hiding SEPs until after the standard has been chosen. But if they decide (deliberately or accidentally) to err in the other direction, society may benefit by getting license terms (like the absence of injunctions or treble damages) it wouldn't otherwise have been able to insist on. It may also get more transparency about patent ownership of related technologies.

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<sup>79</sup> Daralyn J. Durie & Mark A. Lemley, *A Structured Approach to Calculating Reasonable Royalties*, 14 LEWIS & CLARK L. REV. 627, 637–38 (2010); Lemley & Shapiro, *Simple Approach*, *supra* note 2, at 1151–52.

<sup>80</sup> While that is not a foregone conclusion, a party who represents a patent as essential to a standard should be read as committing to license that patent, even if it turns out that they were wrong to consider it essential. See Lemley, *IP & SSOs*, *supra* note 7, at 1967; Merges & Kuhn, *supra* note 20, at 7–10.

<sup>81</sup> See, e.g., FTC Patent Standards Workshop, *Comments of Qualcomm Incorporated*, Project No. P11-1204, at 39–43 (June 13, 2011), [https://www.ftc.gov/sites/default/files/documents/public\\_comments/request-comments-and-announcement-workshop-standard-setting-issues-project-no.p111204-00011%2%A0/00011-60525.pdf](https://www.ftc.gov/sites/default/files/documents/public_comments/request-comments-and-announcement-workshop-standard-setting-issues-project-no.p111204-00011%2%A0/00011-60525.pdf) [<https://perma.cc/8UYZ-FET3>] (noting that “the Commission has suggested that in the standard-setting context, a patentee’s prior RAND commitment should be considered powerful evidence . . . that injunctive relief should be denied”).

<sup>82</sup> A FRAND commitment should extend to patents declared to be essential to a standard, even if they turn out not to be (as many apparently do). Contreras, *supra* note 6, at 224; see also Shapiro, *Navigating*, *supra* note 7, at 147 n.25 (“[SSO terms] can create the perverse incentive for patent holders to assert that at least some of their patents are not in fact essential . . .”). So, a patentee that overdiscloses is restricting their remedies for patents they could otherwise have enforced without restriction. That restriction applies only to cases brought against implementation of the standard, however. A FRAND commitment shouldn't prevent enforcement of the patent against a defendant who infringes in a way other than using the standard.

The nonessential nature of many “essential” patents has a final implication for current policy debates. Some have sought to counter the problem of patent holdup and royalty stacking with objections to “holdout,” arguing that defendants who refuse to pay patent licenses are creating an economic problem parallel to holdup.<sup>83</sup> That argument fails on its own terms as a matter of economic theory; unlike holdup, where there is collective action to create the standard and the patent holder has committed to license implementers on FRAND terms, holdout involves unilateral conduct by an alleged infringer that has made no prior promise to take a license. In that respect, holdout is no different from ordinary patent infringement, which can be corrected by suing the alleged infringer and obtaining damages or an injunction.<sup>84</sup> But even if it were a problem as a matter of theory, our data undermines the basis for the holdout story. Accused infringers are right not to just pay up in most cases involving declared SEPs; most of them turn out not to be essential after all.

## B. Maybe SEPs Aren’t So Special After All

Second, we find surprisingly little difference between SEPs and matched non-SEPs overall. There are some important differences between the patents in our study and the results in patent cases overall. Specifically, both the SEP and non-SEPs in our sample do better than ordinary patents in other studies, for which the patentee win rate has stayed unchanged at about 25% for some time.<sup>85</sup> And they definitely do better than normal IT patents, for which the win rate is lower than for most other industries.<sup>86</sup> But it is interesting that those differences don’t seem to be driven by a patent’s standard-essential status.

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<sup>83</sup> Indeed, the Trump Administration has taken the position that holdout is a bigger problem than holdup. Makan Delrahim, Assistant Attorney Gen., Remarks at IAM’s Patent Licensing Conference in San Francisco: Antitrust Law and Patent Licensing in the New Wild West (Sept. 18, 2018) (transcript available at <https://www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-iam-s-patent-licensing> [<https://perma.cc/PJ3L-M879>]).

<sup>84</sup> See Timothy J. Muris, *Bipartisan Patent Reform and Competition Policy* 9–10 (George Mason L. & Econ. Research Paper No. 18-46, Nov. 2018), available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3292476](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3292476) [<https://perma.cc/W3XA-EB3B>] (making this point).

<sup>85</sup> Allison et al., *supra* note 59, at 1098; see also Paul M. Janicke & Lilan Ren, *Who Wins Patent Infringement Cases?*, 34 *AIPLA Q. J.* 1, 5 (2006) (finding that patent owners won 25% of 262 dispositive cases studied); Mark A. Lemley, *The Surprising Resilience of the Patent System*, 95 *TEX. L. REV.* 1, 25 (2016) (noting that for over two decades, patent holders have consistently won around 25% of cases).

<sup>86</sup> Allison et al., *supra* note 59, at 1098 tbl.3.

This result may be related to the first. If many SEPs are not in fact essential, it is less surprising that the win rates don't diverge much between otherwise-similar SEPs and matched non-SEPs. Maybe few of them are truly essential patents to begin with. Another explanation for this finding is that selection of what patents to assert leads to similar litigation outcomes. To the extent that plaintiffs have a choice, they will assert non-SEPs only if the expected outcome at the margins from asserting a non-SEP is better than asserting SEPs (and vice versa), so a similar distribution of outcomes is not a total surprise.

It is particularly notable that the patents in our study, SEPs or not, do far better on validity issues than ordinary patents, and certainly than ordinary IT patents. That does, however, leave us with a puzzle: if it isn't because of SEP status, why do patentees in our study do significantly better than other patentees? We can't give a definitive answer to that question. The difference in the win rate between our patents and other studies may have more to do with the particular technology area<sup>87</sup> or the age profile of the patents<sup>88</sup> than with their status as SEPs. Perhaps the characteristics of the patents in our study look different than patents in those industries more generally.<sup>89</sup>

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<sup>87</sup> There is a great deal of evidence that the nature of the patent system is industry-specific. See, e.g., Allison et al., *supra* note 59, at 1098 tbl.3 (finding dramatic differences in patent win rates between industries); DAN L. BURK & MARK A. LEMLEY, *THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT* (2009) and sources cited therein (addressing how, despite the uniformity of legal rules covering patent systems, the patent system itself allows for industry tailoring).

<sup>88</sup> See, e.g., Brian J. Love, *An Empirical Study of Patent Litigation Timing: Could a Patent Term Reduction Decimate Trolls Without Harming Innovators?*, 161 U. PA. L. REV. 1309, 1340 (2013) (finding empirical support for the proposition that NPEs are more likely to assert patent rights near the end of the patent term than at the beginning).

<sup>89</sup> There is a substantial literature using the metrics of patents as evidence of patent value. See, e.g., David E. Adelman & Kathryn L. DeAngelis, *Patent Metrics: The Mismeasure of Innovation in the Biotech Patent Debate*, 85 TEX. L. REV. 1677, 1677 (2007) (discussing the holdup arguments in the biotechnology industry); Allison et al., *supra* note 44, at 2 (finding that the most-litigated patents are also the most valuable patents); John R. Allison & Thomas W. Sager, *Commentary, Valuable Patents Redux: On the Enduring Merit of Using Patent Characteristics to Identify Valuable Patents*, 85 TEX. L. REV. 1769, 1769 (2007) (responding to criticism of the use of patent characteristics to identify valuable patents); John R. Allison et al., *Valuable Patents*, 92 GEO. L. REV. 435, 435 (2004) (examining what characteristics make a patent valuable); James Bessen, *The Value of U.S. Patents by Owner and Patent Characteristics*, 37 RES. POL'Y 932, 932 (2008) (using renewal data to estimate the value of U.S. patents); Dietmar Harhoff et al., *Citation Frequency and the Value of Patented Inventions*, 81 REV. ECON. & STAT. 511, 511 (1999) (finding that full-term patents tend to be more valuable than patents

Or perhaps it has to do with the nature of the parties. If the plaintiffs in our patent cases are for some reason better positioned than ordinary plaintiffs, either as litigants (they are more attractive to judges and juries) or as inventors, that might translate into a different win rate. Still, the difference between our findings and more general studies is large and surprising, and we can't fully explain it. We do know one thing that *doesn't* explain it: SEP status. There is no significant difference between the SEP patents in our study and matched patents that aren't standard-essential.

That fact may have implications for antitrust as well as patent law. We shouldn't assume that a declared essential patent confers market power on its own, even if the standard is widely adopted, because the patent itself might not truly be essential.

### C. NPEs Lose

In one respect, our evidence does demonstrate that who owns the patent absolutely matters. While some NPE SEPs are patents the NPE developed and disclosed in-house, many of the patents NPEs asserted were owned by practicing entities at the time they were disclosed to the SSO and later sold to an NPE.<sup>90</sup> Indeed, Broadcom, Nokia (later Nokia Siemens Networks), Nortel and Micron are all in the top ten list of original owners of patents later asserted by NPEs in our data. Together, patents sold by those four companies to NPEs account for more than a third of all the NPE assertions and nearly a quarter of the patents in our study.

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allowed to lapse before the end of their term, and that among full-term patents, citation frequency rises with reported economic value); Jean O. Lanjouw et al., *How to Count Patents and Value Intellectual Property: The Uses of Patent Renewal and Application Data*, 46 J. INDUS. ECON. 405, 405 (1998) (discussing how patent renewal and application data can be used to better understand the value of patent law protections); Jean O. Lanjouw & Mark Schankerman, *Patent Quality and Research Productivity: Measuring Innovation with Multiple Indicators*, 114 ECON. J. 441, 441 (2004) (finding that research productivity at the firm level is inversely related to patent quality, and that patent quality is positively associated with the stock market value of firms).

<sup>90</sup> On the phenomenon of "privateering"—selling patents to NPEs to use to harass competitors—see Tom Ewing, *Indirect Exploitation of Intellectual Property Rights by Corporations and Investors: IP Privateering and Modern Letters of Marque and Reprisal*, 4 HASTINGS SCI. & TECH. L.J. 1, 3 (2012); Tom Ewing & Robin Feldman, *The Giants Among Us*, 2012 STAN. TECH. L. REV. 1, 63 (2012).

TABLE 9A: TOP TEN OWNERS OF SEPS (AT TIME OF DISCLOSURE)  
LATER ASSERTED BY NPES (MEASURED BY ASSERTIONS)

Declaring Company	NPE Assertions (Count)
Elastic Networks	198
Broadcom	174
Nokia / NSN	63
InterDigital	43
Scanbuy	38
Micron	36
Ensemble Communications	35
Tesseron	32
VoiceAge	32
SPH America	29

TABLE 9B: TOP TEN OWNERS OF SEPS (AT TIME OF DISCLOSURE)  
ASSERTED BY NPES (MEASURED BY PATENTS)

Declaring Company	NPE Asserted Patents (Count)
InterDigital	17
Nokia / NSN	11
Ensemble Communications	10
Wi-Lan	9
Tesseron	6
Nortel Networks	5
Broadcom	4
Hybrid Networks	4
SPH America	4
VirnetX	4

NPEs that do not participate in SSOs have the advantage that their patents aren't burdened by FRAND licensing requirements. So when NPEs do buy patents subject to a FRAND requirement, we might expect that they take on that burden because they think they are getting better patents as a result.<sup>91</sup> NPEs do poorly even with what seem like they should be strong

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<sup>91</sup> Both NPEs and operating companies do, of course, also assert patents that are not subject to a FRAND commitment because the original owner was not a member of the SSO. For a study on the assertion of these "outsider" patents, see Jorge L. Contreras, *When a Stranger Calls: Standards Outsiders and Unencumbered Patents*, 12 J. COMPETITION L. & ECON. 1, 1 (2016).

patents. And they do very poorly indeed. While practicing entities won 72% of the time, NPEs won only 13% of the time.<sup>92</sup> And NPEs did even worse with SEPs, winning only 6% of those cases. And just as a reminder, these aren't random patents later asserted to cover a standard; they are patents that were owned by participants in the organization and declared essential at the time the standard was adopted. Moreover, our definition of NPEs includes not just patent assertion entities, which prior work has shown fare poorly across the board,<sup>93</sup> but other kinds of NPEs who have traditionally done better in court.<sup>94</sup>

Why do NPEs do so poorly? We don't know the answer, but we can envision several possible explanations.

First, it might be that the quality of the patents NPEs asserted in our cases was dramatically worse than the patents asserted by practicing entities. They may have bought worse patents, either deliberately or because they have less money,<sup>95</sup> and they have incentives to assert or monetize all the patents they buy, while practicing entities let many lie fallow.

There are some reasons to doubt the low-quality patents explanation. We matched SEPs and non-SEPs by age, year asserted, and patent class, removing those sources of observable variation. And the SEPs were all originally owned and identified by participants in the SSO. That doesn't exclude the possibility that the original owners sold their lousy patents and kept their good ones to assert, but the original owners had at one point thought the patents were essential. Further, even if that were true of the SEPs, it doesn't explain why NPEs did so much worse when asserting non-SEPs from the same era and in the same industry class. Previous work indicates that one common type of NPE, patent assertion entities (PAEs) try to purchase patents that seem to have objective indicia of value.<sup>96</sup>

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<sup>92</sup> See Appendix D.

<sup>93</sup> Allison et al., *supra* note 64, at 237.

<sup>94</sup> *Id.*

<sup>95</sup> For empirical support for that proposition as a general matter, see Josh Feng & Xavier Jaravel, *Crafting Intellectual Property Rights: Implications for Patent Assertion Entities, Litigation, and Innovation* 1, 4 (working paper Dec. 4, 2017) (finding that patent assertion entities "overwhelmingly purchase and assert patents granted by 'lenient' examiners, who craft patents with higher litigation and invalidity risks"); Brian Love et al., *Determinants of Patent Quality: Evidence from Inter Partes Review Proceedings*, 70–71 (Santa Clara Univ. Sch. of Law Legal Studies Research Paper Series No. 2018-06, Feb. 7, 2018) (finding that patents issued by more lenient examiners are more likely to be challenged in IPR proceedings).

<sup>96</sup> Timo Fischer & Joachim Henkel, *Patent Trolls on Markets for Technology—An Empirical Analysis of NPEs' Patent Acquisitions*, 41 RES. POL'Y 1519, 1520

And our data show that NPEs mostly lose on infringement, not validity,<sup>97</sup> suggesting that the problem isn't low patent quality.

Our data don't discount the possibility that the NPE-purchased patents are significantly worse than the practicing-entity patents and that this explains the difference in win rate. There is a great deal of variation in patent quality that can't be explained by objective metrics evident from the face of the patent itself. But the unobserved quality gap would have to be quite large to explain the dramatic difference in NPE and practicing entity win rates.

Second, perhaps NPEs but not practicing entities are systematically over-asserting their patents. This hypothesis fits the repeated anecdotal story of patent trolls filing suit against an entire industry.<sup>98</sup> It fits our data showing that NPEs file more suits per patent than practicing entities. It also fits our finding that even SEPs usually lose, not on invalidity, but on noninfringement. Maybe the problem is that NPEs overreach, and so are more likely to lose their cases. We think this is at least a partial explanation for our results. But it can't be a full explanation. NPEs lose on SEPs at an even higher rate than they do on non-SEPs, and it seems unlikely that patentees are systematically overclaiming the scope of SEPs, which are, after all, supposed to be essential to the standard. It is possible that they are buying primarily the supposedly-essential patents that don't actually cover a standard (and that might be the ones operating companies are most willing to sell).

Third, perhaps there is something about the nature of NPEs that makes them less likely to win. That could conceivably be a matter of business strategy. If an NPE wants to settle its case for money, perhaps it settles the good cases and only ends up going to judgment if its case is so bad that no one will

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(2012) (finding that the "probability that a traded patent is acquired by an NPE rather than a practicing entity increases (a) in the scope of the patent, and thus the probability that it is infringed; (b) in the patent density of the technology field, and thus in the cost of substituting for the patented technology; and, most importantly and contrary to common belief (c) in the patent's technological quality, and thus in its probability of being upheld in court"); see Michael Risch, *Patent Troll Myths*, 42 SETON HALL L. REV. 457, 460–61 (2012) (finding that "while measuring patent quality is extremely difficult, the available information implies that NPE patent quality is not drastically lower than other litigated patents.").

<sup>97</sup> See *supra* section III.B.4.

<sup>98</sup> There is evidence to support this. NPEs sue more defendants than practicing entities. See Colleen V. Chien, *Of Trolls, Davids, Goliaths, and Kings: Narratives and Evidence in the Litigation of High-Tech Patents*, 87 N.C. L. REV. 1571, 1604 (2009) (finding that between 2000 and 2008, while NPEs brought only 19% of the high-tech lawsuits, they brought these lawsuits against 28% of the unique defendants).

pay it. Or they may assert patents in bulk with less interest in the outcome of any one patent. Practicing entities, by contrast, might take a wider variety of cases to court because they may be interested in injunctions or business outcomes other than royalty payments. We're not persuaded that is likely. First, NPEs don't settle their cases with significantly higher frequency than other parties do.<sup>99</sup> Second, the willingness to take money should affect the universe of cases that settle but won't necessarily skew cases that go to judgment towards weak cases. A plaintiff with a weak case might just take less money to settle the case. Indeed, most NPE settlements are for quite small amounts of money,<sup>100</sup> less than it would cost to take the case to trial.<sup>101</sup>

NPE cases differ in other respects that might be more relevant. They are more likely to be represented by solo practitioners or small law firms, often working on a contingent fee basis.<sup>102</sup> Perhaps those lawyers aren't as good as the big-firm lawyers who more commonly represent practicing entity plaintiffs. Or perhaps they don't have as many resources to devote to the case as big firms do, or as much incentive to do so given the contingent fee.

Alternatively, it is possible that the low NPE win rates reflect the fact that judges and juries don't like them. There has been a lot of public discussion and criticism of "patent trolls,"<sup>103</sup> and it may be that that criticism has taken root. Or

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<sup>99</sup> Compare the figures in Appendix D (showing settlement rates of 69–78%) to John R. Allison et al., *Patent Quality and Settlement Among Repeat Patent Litigants*, 99 GEO. L.J. 677, 694 (2011) (finding settlement rates of 85–90%); but see Risch, *supra* note 52, at 69 ("All else equal, the NPE litigation studied here was shorter than nonNPE litigation, with higher settlement rates.").

<sup>100</sup> FED. TRADE COMM'N, PATENT ASSERTION ENTITY ACTIVITY: AN FTC STUDY 8–9, 10, 91 (2016).

<sup>101</sup> AM. INTELLECTUAL PROP. LAW ASS'N, REPORT OF THE ECONOMIC SURVEY 35 (2013) (reporting the mean cost to take an NPE case to trial).

<sup>102</sup> See Ronen Avraham & John M. Golden, *From PI to IP: Yet Another Unexpected Effect of Tort Reform 2* (2012), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1878966](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1878966) [<https://perma.cc/5WAV-CS8P>]; David L. Schwartz, *The Rise of Contingent Fee Representation in Patent Litigation*, 64 ALA. L. REV. 335, 380 (2012).

<sup>103</sup> See, e.g., Edward J. Black, *Patent Trolls and the Growing Toll on Innovation*, HUFFPOST (July 12, 2012, 3:26 PM ET), [https://www.huffingtonpost.com/edward-j-black/patent-trolls-innovation\\_b\\_1666542.html](https://www.huffingtonpost.com/edward-j-black/patent-trolls-innovation_b_1666542.html) [<https://perma.cc/F2XP-T3UY>] (arguing that "the toll patent wars are taking on our overall economy and innovation is ultimately incalculable"); Brian Fung, *The Supreme Court's Big Ruling on 'Patent Trolls' Will Rock Businesses Everywhere*, WASH. POST (May 23, 2017), [https://www.washingtonpost.com/news/the-switch/wp/2017/05/23/the-supreme-court-just-undercut-patent-trolls-in-a-big-way/?utm\\_term=.A36006df7603](https://www.washingtonpost.com/news/the-switch/wp/2017/05/23/the-supreme-court-just-undercut-patent-trolls-in-a-big-way/?utm_term=.A36006df7603) [<https://perma.cc/D8YC-LPD9>] (discussing the effect the Supreme Court case *TC Heartland v. Kraft Foods* might have on where "patent trolls"

perhaps a company in the business of buying and asserting patents is simply a less sympathetic plaintiff than a company that actually invents them. Even among practicing entities, prior work suggests that patentees do better when they assert patents they invented in-house than when they assert patents they bought.<sup>104</sup> The fact that NPEs, and particularly PAEs, do poorly across the board when they get to court might reflect anti-troll animus—perhaps bias, or perhaps a conclusion that they provide less value to society.<sup>105</sup> We have no way to evaluate whether that is true, but it seems possible. And the fact that otherwise similar patents do worse in the hands of NPEs than in the hands of practicing entities does suggest that there may be something about the plaintiff, not the patent, that drives the results.

### CONCLUSION

Standard-essential patents that go to judgment look quite a bit like their non-essential counterparts. They don't appear to be all that essential, at least judged by the large number that lose on infringement. The most significant difference in our data is between practicing entities and NPEs. Practicing entities win far, far more cases than NPEs, whether or not the patents are essential. Our results suggest that we might focus less attention as a matter of patent policy on the “special” case of standard-essential patents and more attention on who brings a patent lawsuit and why.

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assert patent infringement claims); Haydn Shaughnessy, *Patent Trolls are Now Crushing Parts of the Developer Economy*, FORBES (July 4, 2013, 8:02 AM), <https://www.forbes.com/sites/haydnshaughnessy/2013/07/04/patent-trolls-are-now-crushing-parts-of-the-developer-economy/#3e0680e379b9> [https://perma.cc/44ZE-CW9L] (arguing that small companies are defending against “patent trolls” by the companies themselves becoming “patent trolls”). One commentator has conducted an empirical study of NPE treatment in the media and found that the media generally referred to NPEs as “patent trolls” and also generally portrayed them in a negative light with little analysis or empirical support. Edward Lee, *Patent Trolls: Moral Panics, Motions in Limine, and Patent Reform*, 19 STAN. TECH. L. REV. 113, 133–39 (2015).

<sup>104</sup> Mark A. Lemley et al., *Patent Purchases and Litigation Outcomes*, 2016 PATENTLY-O PATENT L.J. 15, 19 (2016).

<sup>105</sup> Bernard Chao and Roderick O'Dorisio find in experimental work with mock juries that those mock juries are more likely to favor practicing entities than NPEs when making infringement decisions. Bernard Chao & Roderick O'Dorisio, *Testing the White Hat Effect in Patent Litigation* 167 (Univ. of Denver Sturm Coll. of Law Legal Research Paper Series, Working Paper No. 17-34, 2017).

## APPENDIX A

## BREAKDOWN OF PLAINTIFF ENTITY TYPE

	<b>Control</b>	<b>NPE</b>	<b>Total</b>
1	0	1,383	1,383
1, 11	0	2	2
1, 12, 8	10	0	10
1, 3	0	1	1
1, 5	0	7	7
1, 8	3	0	3
1, 8, 9	0	2	2
1, 9	0	2	2
11	0	24	24
11, 12, 6, 8	0	7	7
11, 8	0	6	6
12	46	0	46
12, 13, 6, 8	0	7	7
12, 13, 8	3	0	3
12, 6, 8	7	0	7
12, 8	39	0	39
13	0	58	58
13, 5	0	8	8
2, 8	2	0	2
3	0	8	8
4	0	6	6
5	0	358	358
5, 8	19	0	19
5, 9	0	1	1
6	0	29	29
6, 7	0	1	1
6, 8	7	0	7
8	580	0	580
8, 9	3	0	3
9	0	13	13
NA	0	3	3
<b>Total</b>	<b>719</b>	<b>1,928</b>	<b>2,647</b>

The numbered categories are briefly described in the Stanford NPE Litigation Dataset. <https://law.stanford.edu/projects/stanford-npe-litigation-dataset/#slnav-brief-dataset-methodology> [<https://perma.cc/YMA5-FFFT>].

APPENDIX B

OVERALL WIN RATES BY ENTITY STATUS —  
ALTERNATIVE NPE SPECIFICATION (ONE  
RANDOMLY SELECTED PATENT PER CASE FILED)

	<b>Control</b>		<b>NPE</b>		<b>Total</b>	
Claimant Win	48	65.8%	47	30.3%	95	41.7%
Defendant Win	25	34.2%	108	69.7%	133	58.3%

APPENDIX C

RESOLUTION OF ALL CASES IN STUDY BY SEP  
STATUS

	<b><u>All Assertions</u></b>		<b><u>First-Case per Patent</u></b>	
	<b>Control</b>	<b>SEP</b>	<b>Control</b>	<b>SEP</b>
Claimant Win	2.9%	3.4%	7.9%	10.2%
Defendant Win	4.6%	4.7%	7.3%	5.1%
Procedural	15.6%	16.7%	12.7%	10.7%
Settlement	76.8%	75.2%	72.1%	74.0%
Total Assertions (N)	1,630	1,442	355	354
Pearson Chi-square p	0.722		0.375	

APPENDIX D

WIN RATES BY NPE STATUS

	<b><u>All Assertions</u></b>		<b><u>SEP Cases Only</u></b>	
	<b>Implementer</b>	<b>NPE</b>	<b>Implementer</b>	<b>NPE</b>
Claimant Win	10.6%	1.0%	13.1%	0.4%
Defendant Win	4.0%	5.4%	5.0%	5.8%
Procedural	16.1%	15.7%	14.9%	17.0%
Settlement	69.3%	78.0%	67.0%	76.8%
Total Assertions (N)	719	1,928	357	863
Pearson C-square p	0.000		0.000	

APPENDIX E

PATENTEE WIN RATE PERCENTAGE BY NPE AND  
SEP STATUS EXCLUDING DEFAULT  
JUDGMENTS

	<b>Control</b>	<b>NPE</b>
Non-SEPs	73%	19%
SEPs	71%	6%