A Generation of Patent Litigation

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TABLE OF CONTENTS

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I. INTRODUCTION

Despite a virtual avalanche of patent studies issued during the past few years, simple but fundamental questions necessary to address patent reform remain unanswered. Most importantly, the studies do not tell us whether the currency of the patent system—the patent itself—is the core part of the problem. Is patent quality the cause of patent woes? Are litigants the problem? Current studies do not disaggregate these questions. This study adds to the literature by considering every outcome of every patent in every case, and finding that litigation choices drive outcomes more than anything observable on the face of the patent. That is, whom the parties sue and other choices are more likely to predict patent invalidity than any measurable aspect of the patent.

Patent quality is a slippery concept; there are many ways to consider quality, such as disclosure and technology breadth.[1] Perhaps the simplest measure of quality is whether a patent is valid, that is, whether it is novel, nonobvious, and otherwise compliant with the Patent Act.[2] Validity quality can only be observed when a court finally adjudicates a patent, but patents are never adjudicated valid. Instead, courts merely rule that they will survive *this* challenge, and the next time could be different.

1. *See* R. Polk Wagner, *Understanding Patent-Quality Mechanisms*, 157 U. PA. L. REV. 2135, 2138 (2009) (describing the difference between quality and value); *see also* Michael Risch, *Patent Portfolios as Securities*, 63 DUKE L.J. 89, 137–51 (2013) (surveying various methods for valuing patents).

2. *See* Michael Risch, *Everything Is Patentable*, 75 TENN. L. REV. 591, 594 (2008) ("Thus, this Article assumes that maximum social value is obtained by the issuance of only those patents that are justified under the statute."); Wagner, *supra* note 1, at 2138.

Moreover, most cases settle without ever ruling on the patent, and the issue of whether the patent would have eventually been invalidated is never resolved. Because actual invalidity rulings are rare, there are very few observations available to predict when patents are of low quality, that is, invalid.

This study changes that by examining patents that are tested on the merits—and those that are not—over twenty-five years, allowing a peek into the lifespan of each patent instead of just one case. This Article follows *Patent Troll Myths*,[3] which studied the ten most litigious patent licensors—some might call them trolls—and their litigation over a twenty-five year period. Starting with these highly litigious nonpracticing entities (NPEs), we identified a set of random patent plaintiffs (nonNPEs) selected to match the rate of assertion over the same twenty-five year period and gathered all of the cases involving their asserted patents.

This Article reports many of the results of that comparison: some that are surprising, some that are not, and some that are consistent with other studies. The ten primary findings follow, though there are many more throughout:

1. **Complexity**. The highly litigious NPEs generally filed more complex cases: more defendants per case, more interdistrict transfers and consolidations, more patents per case, and more cases for each patent.
2. **Duration**. All else equal, the NPE litigation studied here was shorter than nonNPE litigation, with higher settlement rates. Of course, the NPEs did things that would lengthen any litigation more often, such as suing many defendants. Even so, NPE litigation was shorter.
3. **Comparative Invalidation**. Patents asserted by the highly litigious NPEs were invalidated twice as often as their randomly selected counterparts' patents, or in about half of the cases where there was a test of the patent's validity.
4. **Small Magnitude**. However, very few patents were actually tested on the merits. This occurred in about 7% of the cases, with invalidations in about half of those.
5. **Later Invalidation**. In data collected unique to this study, about 17% of the untested NPE cases involved patents that were partially or completely invalidated in some other case. This is more than five times the 3% of random cases involving a patent later invalidated.

3. Michael Risch, *Patent Troll Myths*, 42 SETON HALL L. REV. 457 (2012).

6. **Untested Patents**. More than 75% of the litigious NPE cases involved patents that were never tested on the merits and did not involve a patent later invalidated. One's perception of these cases depends in large part on inferences about settlements.
7. **Contention Predicts Invalidation**. It turns out that invalidity findings are better predicted by whom these NPEs sued than who they are. The best explanation for when patent invalidation occurred included high stakes cases with many defendants, hotly contested patents, or otherwise heavily defended cases. The NPEs were more likely to be involved in such cases because they sued more defendants more often in remote districts. Once this selection effect was considered, NPE status had no statistically significant impact. Product companies that sued more defendants at once were also invalidated more often.
8. **Backward Citations Imply Lower Quality**. The data also shows—surprisingly again—that a key metric of patent quality, namely a patent's citations to other inventions, is negatively correlated with validity. That is, the more backward citations a patent has, the more likely it is that it will be invalidated.[4] This is directly contrary to the current view that such citations are an indicator of patent quality.[5]

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4. *See* Zhen Lei & Brian Wright, Why Weak Patents? Rational Ignorance or Pro-'Customer' Tilt? 3–4 (July 14, 2009) (unpublished manuscript), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1434275 [https://perma.cc/EZ5G-TDEZ?type=pdf] (suggesting that patent examiners work harder to find prior art to invalidate weaker patents and providing evidence that more citations imply weaker patents).

5. *See, e.g.*, John R. Allison et al., *Valuable Patents*, 92 GEO. L.J. 435, 453–55 (2004) (finding backward citations significant); John Hagedoorn & Myriam Cloodt, *Measuring Innovative Performance: Is There an Advantage in Using Multiple Indicators?*, 32 RES. POL'Y 1365, 1365 (2003) (discussing backward citations as indicator of patent quality); Maayan Perel, *An Ex Ante Theory of Patent Valuation: Transforming Patent Quality into Patent Value*, 14 J. HIGH TECH. L. 148, 202–13 (2014) (describing several objective measures of patent valuation); Manuel Trajtenberg, *A Penny For Your Quotes: Patent Citations and the Value of Innovations*, 21 RAND J. ECON. 172, 172 (1990) (noting that citations have long been presumed to be indicative of patent value); Manuel Trajtenberg et al., *University Versus Corporate Patents: A Window on the Basicness of Invention*, *in* PATENTS, CITATIONS & INNOVATIONS: A WINDOW ON THE KNOWLEDGE ECONOMY 51, 60, 63 (Adam B. Jaffe & Manuel Trajtenberg eds., 2002) (including backward citations in measures of patent quality); Jean O. Lanjouw & Mark Schankerman, *The Quality of Ideas: Measuring Innovation with Multiple Indicators* 10 (Nat'l Bureau of Econ. Research, Working Paper No. 7345, 1999), http://www.nber.org/papers/w7345 [http://perma.cc/G3T5-AVG9] (modeling value based on citations). *But see* John R. Allison, Mark A. Lemley & Joshua Walker, *Patent Quality and Settlement Among Repeat Patent Litigants*, 99 GEO. L.J. 677, 681, 686–87 (2011) [hereinafter Allison et al., *Patent Quality*] (finding that most litigated patents won less often, despite having more backward citations); Alan C. Marco, *The Dynamics of Patent Citations*, 94 ECON. LETTERS 290, 295 (2007) (observing that citations may not fully encapsulate value); Lanjouw & Schankerman, *supra*, at 16 (finding that backward references did not affect the probability that maintenance fees would be paid on the patent).

9. **Noninfringement**. Noninfringement may be a greater concern with the highly litigious NPEs. More than 66% of cases testing infringement involved a noninfringement finding, and only two cases—out of more than 870—found infringement. Among the control group, 27% of the cases found noninfringement, about the same percentage that found infringement.
10. **Magnitude, Revisited**. The scope of the noninfringement problem is ambiguous. Only 7.5% of all the NPE cases involved a noninfringement finding.[6] More than 75% of the cases never involved a test of infringement one way or the other.

These findings do not imply that all is right in patent litigation. The increasing number of lawsuits, increasing case complexity, and increasing stakes are all important. So-called patent trolls are at the center of this maelstrom, and they provoke a visceral reaction in many who read about them. The goal of this study is to take a step back from rhetoric, consider the data in a neutral way, and detail policy implications that arise.

To provide this analysis, this Article fills two persistent gaps in the literature studying patents and patent litigation. First, it provides long-term trends involving the same patents in multiple cases rather than cross-sectional snapshots examining the outcomes of a single year or a few patents. Second, it examines the entirety of patent litigation in detail, rather than only those cases that result in a ruling on the merits of the case.

Study after study examines the results of patent litigation. Most of these studies historically only looked at opinions available in research databases.[7] With a few exceptions, only recently have studies begun to look at

6. In other words, that 66% was two-thirds of a small percentage of cases that tested infringement at all.

7. *See, e.g.*, John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AIPLA Q.J. 185, 187 (1998) (using *United States Patents Quarterly* (*USPQ*) reports); Alan C. Marco, *The Selection Effects (and Lack Thereof) in Patent Litigation: Evidence From Trials*, 4 TOPICS ECON. ANALYSIS & POL'Y 1, 5 (2004) (using *USPQ*); Matthew D. Henry et al., Dynamics of Patent Precedent and Enforcement: An Introduction to the UGA Patent Litigation Datafile (Mar. 4, 2013) (unpublished manuscript), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2228103 [http://perma.cc/835C-RKNP] (describing a data set built to analyze patent litigation in the United States during 1929–2006 using *USPQ*). *But see* Paul M. Janicke & LiLan Ren, *Who Wins Patent Infringement Cases?*, 34 AIPLA Q.J. 1, 7 (2006) (studying only patent cases that reached a final disposition on the merits and were reviewed by the Federal Circuit); Jean O. Lanjouw & Mark Schankerman, *Protecting Intellectual Property Rights: Are Small Firms Handicapped?*, 47 J.L. & ECON. 45, 57 (2004) (using docket data but only at a coarse level).

orders—when judges rule on patents in unpublished rulings.[8] A few studies examine what happens when judges do not rule, counting settlements, denials of summary judgment, and the like.[9] But gathering quality data is time consuming and error prone, and until 2001, was nearly impossible. Thus, every study faces a tradeoff between detail and breadth.[10] As a result, longitudinal surveys in the literature often lack detail.[11] Conversely, detailed outcome studies often cover a small sample, limited by time and to cases that actually reached some judicial ruling one way or the other.[12] Limiting detailed samples this way causes two problems. First, it can lead

8. *See, e.g.*, John R. Allison, Mark A. Lemley & David L. Schwartz, *Understanding the Realities of Modern Patent Litigation*, 92 TEX. L. REV. 1769, 1769 (2014) [hereinafter Allison et al., *Realities of Patent Litigation*]; 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, 258 (2006); Gwendolyn G. Ball & Jay P. Kesan, *Transaction Costs and Trolls: Strategic Behavior by Individual Inventors, Small Firms and Entrepreneurs in Patent Litigation* 14 (Ill. Law & Econ. Papers Series, Research Papers Series No. LE09-005, 2009), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1337166 [https://perma.cc/ D9WV-S42J?type=pdf].

9. *See, e.g.*, Allison et al., *Patent Quality*, *supra* note 5, at 686 (evaluating patent cases resolved by settlements, including consent judgments); Robin Feldman et al., *The AIA 500 Expanded: The Effects of Patent Monetization Entities*, UCLA J.L. & TECH. 59–62 (Dec. 31, 2013), http://www.lawtechjournal.com/articles/2013/041024-Feldman.pdf [http://perma.cc/EJL6-WL5Y] (summarizing outcomes of patent cases that settled and those that were decided at summary judgment or trial); Kesan & Ball, *supra* note 8, at 258 (studying docket reports and determining how patent disputes are resolved); Ball & Kesan, *supra* note 8, at 9–10 (same).

10. *See* Kesan & Ball, *supra* note 8, at 259.

11. *See, e.g.*, CHRIS BARRY ET AL., PRICEWATERHOUSECOOPERS, 2014 PATENT LITIGATION STUDY: AS CASE VOLUME LEAPS, DAMAGES CONTINUE GENERAL DECLINE 1 (2014) [hereinafter PWC 2014], http://www.pwc.com/en_US/us/forensic-services/publications/assets/2014-patent-litigation-study.pdf [http://perma.cc/T3DG-FJ59] (providing general observations from final decisions at summary judgment and trial recorded in two Westlaw databases); CHRIS BARRY ET AL., PRICEWATERHOUSECOOPERS, 2013 PATENT LITIGATION STUDY: BIG CASES MAKE HEADLINES, WHILE PATENT CASES PROLIFERATE (2013) [hereinafter PWC 2013], http://www.pwc.com/en_US/us/forensic-services/publications/assets/2013-patent-litigation-study.pdf [http://perma.cc/M4KU-TLED] (same); Feldman et al., *supra* note 9 (coding all patent litigation for four years by end result but not by patent); Lanjouw & Schankerman, *supra* note 7, at 49–50 (noting that granular litigation data was unavailable); Michael J. Mazzeo et al., *Do NPEs Matter? Non-Practicing Entities and Patent Litigation Outcomes*, 9 J. COMPETITION L. & ECON. 879 (2013) (examining only judge and jury trial outcomes in U.S. district courts); Shawn P. Miller, *Where's the Innovation: An Analysis of the Quantity and Qualities of Anticipated and Obvious Patents*, 18 VA. J.L. & TECH. 1 (2013) (considering only obviousness and anticipation decisions); Henry et al., *supra* note 7 (manuscript at 3) (focusing only on published opinions).

12. Allison et al., *Patent Quality*, *supra* note 5, at 682 (considering only the most litigated patents); Allison et al., *Realities of Patent Litigation*, *supra* note 8, at 1778 (considering two years only and merits decisions only); Christopher A. Cotropia et al., *Unpacking Patent Assertion Entities (PAEs)*, 99 MINN L. REV. 649, 662–66 (2014) (considering two years of litigation and for plaintiff status only).

to a sample too small to statistically test theories about patent quality. Second, it leads to potential explanatory data loss by leaving out patent and outcome information from cases that end without a judge ever passing on the merits. Even those studies that consider cases that never reach a merits ruling only do so for a few years or a few patents.

The data collected in this Article attempts to bridge the gap by providing detail *and* longevity. Rather than considering a short sample of judicial rulings, it opts instead to consider a large sample of lawsuits over a twenty-five year period to determine what happened in every case associated with a set of patents through appeal, whether a court ruled on the merits or not. This twenty-five year history of litigation allows for an unprecedented comparison between highly litigious NPEs and other patent litigants. While prior studies, including my own, helpfully examine pieces of the puzzle, this Article seeks a glimpse at the entire picture.

Thus, this Article builds on the very best parts of current cross-sectional work[13] by adding a longitudinal component that finds every case that asserted a set of patents and then separately tracing the outcome of every patent asserted in each of those cases.

Part II discusses the debate about patent troll litigation. It focuses on how other studies have measured patent quality through patent litigation data.

Part III discusses this study's methodology: the collection of data about highly litigious NPEs and a control group of randomly selected nonNPEs. It describes how the cases were selected and the data collected in different phases of the study. This includes collection of previously untapped data: reexamination outcomes.

Part IV presents the data in a variety of formats, and follows each subpart with a discussion of potential policy implications associated with the data.

Subpart IV.A shows the growth in case complexity, including defendant counts, transfers and consolidations, and selection of district court venue. This subpart includes a linear regression showing the effect of NPEs on case duration.

Subpart IV.B shows how much more often the NPEs settled and all of the different ways that cases ended. For example, NonNPEs ended a large

13. Allison et al., *Realities of Patent Litigation*, *supra* note 8, at 1778 (examining every case from 2008 and 2009, including denials of summary judgment).

portion of their cases with consent judgments, though the NPEs used consent judgments as well.

Subpart IV.C presents data about invalidity in a number of ways: in terms of adjudicated patents, all patents, and cases. This subpart presents a novel regression estimating the likelihood that an asserted patent will be invalidated and finds that NPE status is not among the factors.

Subpart IV.D examines infringement findings and shows that the primary concern with NPEs may be noninfringement rather than invalidity. Both subparts C and D show that decisions on the merits of cases are so rare that it is difficult to base policies on them.

This Article concludes with some thoughts about how the results might guide policy.

II. BACKGROUND

The costs and, for some, benefits of patent litigation have captured the public's attention in a way that few could have predicted only four years ago. News stories have shifted from President Obama having famous patented devices in his office[14] to President Obama decrying the cost of frivolous litigation both in town hall meetings[15] and even in the State of the Union address.[16]

As a result, the pressure to study patent litigation has grown, and the production of these studies has been aided by great improvement in patent litigation docket data, which allows access not only to cases filed but also to each document filed in recent cases.[17]

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14. *See* Nancy Benac, *Obama Oval Office Gets an Updated Look*, HUFFINGTON POST, http://www.huffingtonpost.com/2010/01/07/obama-oval-office-gets-an_n_411365.html [http://perma.cc/WV7J-CYH2] (last updated May 25, 2011, 3:05 PM) ("Also new to the Obama bookshelves are three mechanical devices on loan from the National Museum of American History's patent collection: models for Samuel Morse's 1849 telegraph register, John Peer's 1874 gear-cutting machine and Henry Williams' 1877 feathering paddlewheel for steamboats.").

15. Ali Sternburg, *Obama Acknowledges Patent Troll Problem*, PAT. PROGRESS (Feb. 14, 2013), http://www.patentprogress.org/2013/02/14/obama-acknowledges-patent-troll-problem-w-transcript [http://perma.cc/A2V6-FXXA] (describing a Google Hangout discussion: "I do think that our efforts at patent reform only went about halfway to where we need to go and what we need to do is pull together additional stakeholders and see if we can build some additional consensus on smarter patent laws").

16. Erin Mershon, *Obama Backs Patent Reform Effort in State of the Union*, POLITICO (Jan. 28, 2014, 9:22 PM), http://www.politico.com/blogs/politico-live/2014/01/obama-backs-patent-reform-effort-in-state-of-the-union-182139.html.

17. Bloomberg's docket search functions provide every electronically available federal filing to subscribers—not just docket entries but also the underlying document. Services such as Docket Navigator, Lex Machina, Patent Freedom (now purchased by RPX), and RPX have improved their coverage with varying degrees of public accessibility.

Data is so available that studies of litigation behavior have almost become a cottage industry.[18] Some of the studies provide rallying cries for reform,[19] some present different conclusions from essentially the same data,[20] and some argue that there is no real problem.[21] Each of these studies has some role to play in the formation of public policy.

Some studies have looked at NPE litigation. Many studies have examined the number of NPE suits in comparison with patent litigation generally, and the nearly uniform findings indicate that NPE filings have grown in recent years.[22] As late as 2009, the evidence showed NPEs filing

18. Docket Navigator, Lex Machina, Patent Freedom, and RPX all provide litigation data services. Lex Machina, PricewaterhouseCoopers, and RPX all issue annual litigation reports.

19. *See, e.g.*, COLLEEN CHIEN, NEW AMERICA FOUNDATION, PATENT ASSERTION AND STARTUP INNOVATION 4–5 (2013), http://oti.newamerica.net/sites/newamerica.net/files/policydocs/Patent%20Assertion%20and%20Startup%20Innovation_updated.pdf [http://perma.cc/EC3K-3MNG] (recommending several interventions to ameliorate the harms of patent assertion on small companies, keeping in mind the special needs of startups who, with their fewer resources, less time, and greater focus on building the business, are at a relative disadvantage when patent processes are expensive, slow, or require deep patent expertise); James Bessen & Michael J. Meurer, *The Direct Costs from NPE Disputes*, 99 CORNELL L. REV. 387, 407–12 (2014) (estimating the direct costs to defendants arising from NPE patent assertions); Colleen Chien, *Startups and Patent Trolls*, STAN. TECH. L. REV. 462, 464 (May 19, 2014), https://journals.law.stanford.edu/sites/default/files/stanford-technology-law-review/online/startupsandpatenttrolls.pdf [https://perma.cc/UT98-ARRD] (finding most unique defendants to troll suits are small and presenting data that suggest a number of reforms put in place over the last year are having a positive impact); Catherine Tucker, *The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity* 2 (MIT Sloan Sch. of Mgmt., Working Paper No. 5095-14, 2014), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2457611 [http://perma.cc/MK8H-DLM8] (investigating the statistical relation between levels of patent litigation and venture capital investment in the United States).

20. *Cf.* Cotropia et al., *supra* note 12, at 692–96 (comparing different results from three studies).

21. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-13-465, INTELLECTUAL PROPERTY: ASSESSING FACTORS THAT AFFECT PATENT INFRINGEMENT LITIGATION COULD HELP IMPROVE PATENT QUALITY 17 (2013) [hereinafter GAO] (finding only slight increase in patent monetization entity lawsuits between 2007 and 2011); Steve Moore & Kelley Drye, *Probing 10 Patent Troll Myths—A Factured Fairytale Part 2*, IPWATCHDOG (July 30, 2013), http://www.ipwatchdog.com/2013/07/30/probing-10-patent-troll-myths-a-factured-fairy tale-part-2/id=43754 [http://perma.cc/VWF6-AFVD] (finding few differences between NPEs and nonNPEs).

22. *See, e.g.*, Cotropia et al., *supra* note 12, at 674; Sara Jeruss, Robin Feldman & Joshua Walker, *The America Invents Act 500: Effects of Patent Monetization Entities on U.S. Litigation*, DUKE L. & TECH. REV. 388 (Nov. 30, 2012), http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1239&context=dltr [http://perma.cc/5YTP-RZHK].

only a small fraction of all patent infringement suits,[23] though many highly litigated patents are owned by NPEs.[24] But since then, NPE lawsuits have grown to more than half of filings, depending on how one defines an NPE.[25]

Other studies have examined the quality of patents owned by trolls, but either they are noncomprehensive[26] or they focus only on merits rulings.[27]

Finally, a few studies have examined NPE case outcomes not on the merits. One study found that licensing companies are more likely to settle cases than other small entities.[28] Another study considered the outcome of cases over a six-year period but did not track consolidated cases, appeals, or specific patents.[29] A study of highly litigated patents found a 90% settlement rate among the most litigated patents.[30] This follows a theory that NPEs are most successful when they do not reach a jury verdict.[31]

But each study suffers from some particular drawbacks. First, they are virtually all cross-sectional, looking at a year or two—sometimes four or

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23. *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, 1572 (2009) (finding NPEs bring 17% of high-tech patent suits in eight years); Ball & Kesan, *supra* note 8, at 25 (noting that a small percentage of patent plaintiffs are licensing companies); Axel Haus & Steffen Juranek, Patent Trolls, Litigation, and the Market for Innovation 8–9 (May 15, 2014) (unpublished manuscript), http://papers.ssrn.com/abstract=2424407 [http://perma.cc/F67V-N7YT] (indicating a random sample of litigation between 2004 and 2007 showed only 12% of cases as NPEs); *see also* David L. Schwartz & Jay P. Kesan, *Analyzing the Role of Non-Practicing Entities in the Patent System*, 99 CORNELL L. REV. 425, 440–41 (2014) (highlighting debates about what constitutes an NPE).

24. *See* John R. Allison, Mark A. Lemley & Joshua Walker, *Extreme Value or Trolls on Top? The Characteristics of the Most-Litigated Patents*, 158 U. PA. L. REV. 1, 24–25 (2009) [hereinafter Allison et al., *Most-Litigated Patents*] (showing that approximately half of the most litigated patents are enforced by NPEs).

25. *See* Cotropia et al., *supra* note 12, at 652, 655, 674.

26. *See* Sannu K. Shrestha, Note, *Trolls or Market-Makers? An Empirical Analysis of Nonpracticing Entities*, 110 COLUM. L. REV. 114, 119–31 (2010) (examining a small high-profile set of cases).

27. *See* PwC 2014, *supra* note 11 (examining only win rates); PwC 2013, *supra* note 11 (same); Jonathan H. Ashtor et al., *Patents at Issue: The Data Behind the Patent Troll Debate*, 21 GEO. MASON L. REV. 957 (2014) (studying merits rulings only); Miller, *supra* note 11 (examining only obviousness and anticipation rulings).

28. Ball & Kesan, *supra* note 8, at 20; *see also* Ashtor et al., *supra* note 27, at 959 (interpreting data to mean NPEs could be more likely to settle than other patent plaintiffs); Haus & Juranek, *supra* note 23 (manuscript at 2) (finding NPE cases resolve faster).

29. Feldman et al., *supra* note 9, at 61.

30. Allison et al., *Patent Quality*, *supra* note 5, at 689.

31. *See* Gerard N. Magliocca, *Blackberries and Barnyards: Patent Trolls and the Perils of Innovation*, 82 NOTRE DAME L. REV. 1809, 1813 (2007) ("[S]ince trolls and sharks succeed as long as they reach settlements, a substantive solution will be ineffective because most of these cases never get to court.").

five—of patent litigation but never tracing the same patents throughout their lives. This is helpful for some purposes but not helpful to determine whether current observations are different from long-term trends. Second, many of them lack a control group; they present data for one type of group without showing that the results differ from the other groups.

Cross-sectional data without a control group significantly detracts from the ability of a study to inform policy.[32] This study provides longitudinal data. It also provides a control group.[33] These two improvements alone should aid policy.

III. METHODOLOGY AND DATA COLLECTION

A goal of this study was to compare evidence about litigation by patent plaintiffs with the evidence previously gathered about NPEs. Thus, the study collected data from the same basic sources as those described in *Patent Troll Myths*; those sources are summarized below.[34]

A. Selecting the NPEs

The study begins with the ten most litigious NPEs of the 2000s.[35] Some of these entities are still the most litigious, but many are not.[36] These particular NPEs are worth studying for several reasons. First, as the most litigious entities, they likely impose the greatest social cost in litigation defense and otherwise.[37] Second, their cases are more likely to be completed than more recent litigious NPEs. Third, at least two of the

32. *See* Gerald H. Kramer, *The Ecological Fallacy Revisited: Aggregate- versus Individual-Level Findings on Economics and Elections, and Sociotropic Voting*, 77 AM. POL. SCI. REV. 92, 93 (1983) (mounting influential critique of cross-sectional studies of behavior).

33. *Cf.* Haus & Juranek, *supra* note 23 (manuscript at 8) (criticizing another study for lacking a control group).

34. However, data sources have improved somewhat since 2010, and a collection of detailed case outcome information revealed some erroneous or duplicative data from the prior article. Thus, some of the data here will not identically match the results from *Patent Troll Myths*, though the differences are minor.

35. More accurately, these are the plaintiffs that filed the most lawsuits between 2003 and 2009, though we gathered their cases for all years.

36. These include Acacia Research, Catch Curve, Cygnus Systems, F&G Research, General Patent Corporation, Millenium, Papst Licensing, Plutus IP (now IPNav), Rates Technology, and Ronald A. Katz Technology Licensing.

37. *See* Risch, *supra* note 3, at 467–68.

NPEs, Acacia and Plutus—now IPNav—continue to be active and highly litigious.

Fourth, there is no reason to believe that the patents themselves are unrepresentative of NPE patents generally,[38] though admittedly this is not proven statistically. The NPEs in this study represent a mix of business types, including aggregators, inventor-owned companies, and privateering,[39] and thus obtain their patents from the same sources as other NPEs. Further, these very patent plaintiffs are the objects of derision in articles about patent trolls.[40]

Fifth, if they are unrepresentative, then the bias likely runs against NPEs in general rather than in favor of them—at least among those NPEs that file lawsuits.[41] Many companies classified as NPEs are design houses or

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38. *See* Michael Risch, *A Patent Behemoth Rears Its Head*, MADISONIAN (Dec. 8, 2010), http://madisonian.net/2010/12/08/a-patent-behemoth-rears-its-head [http://perma.cc/B25E-777F] (arguing that Intellectual Ventures' patents have characteristics similar to the patents in this study, such as the fact that they are coming from individual inventors, startups, and large corporations).

39. Privateers enforce practicing company patents.

40. *See, e.g.*, Preston H. Heard, *Georgia Federal Court Does Not Require Internal Communications of Outside Counsel To Be Listed On Privilege Log*, NAT'L L. REV. (Feb. 7, 2014), http://www.natlawreview.com/article/georgia-federal-court-does-not-require-internal-communications-outside-counsel-to-be [http://perma.cc/VM4T-WU35] (discussing sham litigation allegation against Catch Curve); David Segal, *Has Patent. Will Sue.*, N.Y. TIMES, July 14, 2013, at BU1, http://www.nytimes.com/2013/07/14/business/has-patent-will-sue-an-alert-to-corporate-america.html [http://perma.cc/2HJZ-HZC5] (profiling of Erich Spangenberg and IPNav); Paul Belleflamme, *What To Think of 'Patent Trolls'? The Return*, IPDIGIT (Oct. 31, 2011), http://www.ipdigit.eu/2011/10/what-to-think-of-patent-trolls-the-return [http://perma.cc/2AHE-Y9TR] (debating merits of General Patent Corporation as a troll); Joe Mullin, *Rackspace Sues "Most Notorious Patent Troll in America,"* ARS TECHNICA (Apr. 4, 2013, 8:15 PM), http://arstechnica.com/tech-policy/2013/04/rackspace-sues-most-notorious-patent-troll-in-america [http://perma.cc/5EZ3-CWE7] (claiming wrongful assertion by IPNav); Rik Myslewski, *Survey: Patent Litigation Skyrocketing, Trolls Top 10 Sueball Chuckers*, REGISTER (May 13, 2014, 8:33 PM), http://www.theregister.co.uk/2014/05/13/survey_patent_litigation_skyrocketing_trolls_top_10_sueball_chuckers [http://perma.cc/7R6B-PFBC] (showing Ronald A. Katz Technology Licensing in top ten list for most patents involved in lawsuits); Bill Rigby, *Microsoft Sues Acacia Over Smartphone Patents*, REUTERS (Nov. 20, 2013, 2:50 PM), http://www.reuters.com/article/2013/11/20/us-microsoft-patents-idUSBRE9AJ14X20131120 [http://perma.cc/C7EU-FFFJ] (quoting industry lawyer: "Acacia's lawsuits are the worst kind of abusive litigation behavior, attempting to extract payment based on litigation tactics and not the value of its patents.").

41. While there may be NPEs with a few weak patents under fire for sending abusive settlement demands without intending to file suit, no litigation study would capture their activities. *See, e.g.*, Press Release, Office of the Minnesota Attorney General Lori Swanson, Attorney General Lori Swanson Announces First-in-the-Nation Order To Stop Delaware Company from "Patent Trolling" in Minnesota (Aug. 20, 2013), http://www.law.berkeley.edu/files/Panel_17b_Documents.pdf [http://perma.cc/B9E3-LVE2]; Joe Mullin, *Patent Stunner: Under Attack, Nation's Most Notorious "Troll" Sues Federal Gov't*, ARS TECHNICA (Jan. 14, 2014, 6:44 AM), http://arstechnica.com/tech-policy/2014/

assert just a few patents, such that the likelihood of complex mass litigation is unlikely.[42] Furthermore, as will be seen below, NPEs in general are far more successful in litigation than the NPEs studied here.[43]

If these highly litigious plaintiffs lose more often than other NPEs, then the quality differences found here may be smaller among the general patent assertion population. In other words, if these NPEs are not representative, they are biased in a way that implies more patents, weaker patents, more cost, and more litigation. If it exists, such bias is preferable for policymaking over assuming every other NPE holds better patents than these NPEs. These cases are, after all, a large portion of the docket.

But that is the worst-case scenario. It is unclear that the patents in this study are unrepresentative. For example, individual plaintiffs have a much lower win rate than other NPEs,[44] and many of the NPEs in this study are inventor-owned companies that might also have lower win rates. Further, if there are differences from the general NPE population, those differences may manifest themselves in different ways. For example, the patents in this study may have the same quality, but they may be asserted against noninfringing products.[45] Or the patents and cases may be of the

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01/patent-stunner-under-attack-nations-most-notorious-troll-sues-federal-govt [http://perma.cc/LD9Q-YXWM] (noting if the FTC sues MPHJ Technology Investments, it will be the first time the FTC has taken direct legal action against a patent assertion entity); Julie Samuels, *MPHJ Exposed: The Real Dirt on the Notorious Scanner Troll,* ELECTRONIC FRONTIER FOUND. (Jan. 14, 2014), https://www.eff.org/deeplinks/2014/01/mphj-exposed-the-real-dirt-notorious-scanner-troll [https://perma.cc/M4TG-LLK9] (discussing demand letters sent by MPHJ Technology Investments); Martyn Williams, *Patent Troll MPHJ Will Repay All New York Licenses in Settlement with State*, PC WORLD (Jan. 14, 2014, 8:35 AM), http://www.pcworld.com/article/2087720/patent-troll-mphj-will-repay-all-new-york-licensees-in-settlement-with-state.html [http://perma.cc/HF69-JADG] (discussing that the MPHJ Technology Investments settlement should serve as a warning to other patent owners engaged in similar practices).

42. *See* Cotropia et al., *supra* note 12, at 650 (describing different business models for NPEs); Mark A. Lemley & A. Douglas Melamed, *Missing the Forest for the Trolls*, 113 COLUM. L. REV. 2117, 2127–28 (2013) (discussing the implications of different assertion business models); Colleen Chien, *Patent Trolls by the Numbers* (Santa Clara Univ. Legal Studies, Research Paper No. 08-13, 2013), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2233041 [http://perma.cc/8CMF-E69E] (describing different "trolls" to include a variety of business models).

43. *See* PwC 2014, *supra* note 11, at 10 (finding that NPEs win 25% of cases decided on the merits, including 65% of their cases at trial).

44. *See, e.g.*, PwC 2014, *supra* note 11, at 20.

45. *Cf.* Allison et al., *Realities of Patent Litigation*, *supra* note 8, at 1778 (finding more cases determined on noninfringement than invalidity).

same general quality but simply have been asserted more times, and thus they may be more likely to be unsuccessful.[46]

From this discussion it bears noting, though, that throughout this paper the term NPE is used generally to refer to *these ten* NPEs. How much and how to extrapolate the data to the general population is a more complex question.

B. Selecting a Loosely Matched Random Control Set

The control group consists of a randomly selected set of asserted patents and the cases in which they were asserted. These patent owners and cases are not necessarily highly litigious.

1. Choosing "Normal" Cases

If data about the most litigious NPEs might be biased, this raises an alternative question: why not compare them against the most litigious practicing entities? It turns out that some of the most litigious practicing entities, such as Monsanto, are in the matched set, but some are not. There are three reasons not to select only highly litigious nonNPEs.

First, and most practically, the most litigious practicing entities assert many fewer patents[47] and thus are not likely to generate a comparable set of patents or even litigations to consider.

Second, a primary goal of this study is to compare NPE litigation to the "average" litigation. Selecting highly litigious practicing entities will not achieve this goal. It might answer other questions, such as whether the most litigious NPEs behave differently than the most litigious nonNPEs,[48] but it will not help determine whether these NPEs are different in kind from the usual case. This is why the potential bias of using the most litigious NPEs is not problematic; however the most litigious NPEs compare with the average nonNPE, the average nonlitigious NPE will compare the same or better.

Third, and more technically, to the extent that the most litigious practicing entities hold patents in a few technology classes—as one might expect from a product company—it becomes impossible to compare

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46. *Infra* Part IV.C finds that more assertion leads to a higher likelihood of invalidity. Allison, Lemley & Walker found that more assertion led to more losses. *See* Allison et al., *Patent Quality*, *supra* note 5, at 688.

47. Monsanto, for example, filed 116 cases using the same patent and included 13 other patents in a few of the cases—at most 35—for two of its patents.

48. For studies of highly litigated patents, which is a similar question, see Allison et al., *Most-Litigated Patents*, *supra* note 24, and Allison et al., *Patent Quality*, *supra* note 5.

whether NPEs assert patents in similar classes to random practicing entities. The same concern does not necessarily run the other direction because many of the studied NPEs have an incentive to obtain diversified portfolios. This same justification applies more generally to other comparisons, such as original patent assignees; NPEs obtain patents from a variety of sources, whereas the most litigious practicing entities likely obtain theirs from only a few.

2. Selecting the Cases

The studied NPEs were involved in more than 900 cases associated with about 350 patents. The goal was to find a random set of nonNPE cases distributed over the same time period—a matching set. Because we[49] had patent data and litigation data, we had two primary choices for selecting this random control sample: choosing cases from the same time periods or choosing patents from the same time periods.

We used a hybrid matching solution that used information about both the patents and the cases. We began with the number of patents and identified 350 random cases distributed by year in the same proportions as NPE litigation. We did not match patents, though; instead, we took the number of patents as our initial draw of random cases.

After identifying 350 nonNPE cases distributed proportionally during the same years as our NPE litigation, we identified the patents asserted in those cases. We then found every case asserting those patents regardless of year filed and also logged the patents asserted in those cases. We only dug one level deep; we did not seek to find all of the cases asserting each new patent identified in later cases. This will likely bias the tally of how many times each patent was asserted because many of our nonNPE patents are truncated at one. However, the bias is likely negligible because the median even among NPEs is only two cases per patent.

The end result of the matching is a set of 1311 patent cases involving 791 patents. Table 1 shows the difference between the two sets; the percentage distributions are roughly equal—close enough to avoid a bias associated with too much emphasis on early years—but the differences are statistically significant.[50] The drop in cases by NPEs in 2009 implies that many of the individual inventor NPEs were winding down activities,

49. The use of "we" throughout refers to the Author, research assistants, and data coders. Final decisions about methodology and data collection were the Author's alone.

50. p=0.000 in a chi-squared test.

perhaps as their patents expired. Table 1 lists the number of cases filed each year, along with the mean, standard deviation, and median number of defendants in each case.[51] The table shows that—for these NPEs—2006 and 2007 were the most active years, with about 30% of all the cases filed in just those two years. The table also shows the steady growth in the number of defendants filed in each case, both for NPEs and nonNPEs. In the 1990s, approximately 1.5 defendants per case was the norm, but that grew as high as four or five defendants per case. However, the medians were lower—one or two—and standard deviations were high, implying skewed data resulting in a few cases with many defendants driving the averages.

TABLE 1

	NonNPE					NPE				
Year	Cases	% Total	Mean Δs	StdDev Δs	Median Δs	Cases	% Total	Mean Δs	StdDev Δs	Median Δs
<1995	47	3.58%	1.28	0.74	1	23	2.51%	2.09	1.76	1
1995	12	0.91%	1.92	1.24	1.5	12	1.31%	2.75	3.93	1.5
1996	7	0.53%	1.14	0.38	1	9	0.98%	1.11	0.33	1
1997	16	1.22%	1.31	0.60	1	15	1.64%	1.73	1.58	1
1998	24	1.83%	1.25	0.61	1	25	2.73%	1.92	1.53	1
1999	50	3.81%	2.38	5.97	1	42	4.58%	1.62	1.68	1
2000	73	5.56%	2.03	1.80	2	24	2.62%	2.63	2.55	1
2001	61	4.65%	2.46	2.92	2	36	3.93%	2.31	2.10	2
2002	119	9.06%	2.06	2.70	1	72	7.85%	1.88	2.19	1
2003	136	10.36%	2.11	2.80	1	82	8.94%	1.63	1.14	1
2004	110	8.38%	2.06	2.51	1	52	5.67%	2.46	2.88	1
2005	110	8.38%	3.67	5.56	1	100	10.91%	2.02	2.92	1
2006	133	10.14%	2.53	3.09	1	131	14.29%	4.16	6.60	1
2007	181	13.81%	5.38	21.69	2	153	16.68%	5.71	11.16	2
2008	111	8.45%	1.98	1.82	2	88	9.60%	4.49	9.06	1
2009	121	9.22%	2.06	3.19	1	53	5.78%	5.75	9.99	1
Grand Total	1311	100.0%	2.67	8.65	1	917	100.0%	3.38	6.75	1

51. Some data for the NPEs will not exactly match the data in *Patent Troll Myths*; new and improved docket access tools coupled with better data deduplication associated with determining case outcome resulted in some changed case counts. The changes were not biased in any direction. For example, the prior set included some consolidated cases; tracing the individual cases back to the original filings both (a) increased the number of cases, and (b) changed the date the litigation commenced. However, there were also cases that had both the original and the transferred cases listed. Removing the transferred case left the litigation initiation the same but decreased the number of cases.

The selected cases are representative of the types of plaintiffs in the general population. Table 2 compares the plaintiff types for both nonNPEs and NPEs with similar categories for the population of *all* patent plaintiffs in 2010, a year later.[52] It also includes a rough breakdown of patent plaintiffs for all litigation from 2000 and 2002.[53]

The table shows patent plaintiffs broken down by category, according to the Lemley-Myhrvold categorization of patent owners.[54] The first group compares the makeup of plaintiff types in this study with all plaintiff types in 2010 and also in 2000 and 2002. The percentages are based only on the NPE and nonNPE category types, with overlap for individuals.[55]

TABLE 2

	Category	nonNPE	CKS2010	BK2002	NPE	CKS2010
1	Licensing Entity				53.38%	67.17%
2	University	0.00%	0.92%	1.42%		
3	Failed Startup	0.23%	0.21%			
5	Individual-Inventor-Owned Co.	1.45%	2.94%		41.70%	19.78%
8	Product or Service Co.	92.16%	86.00%	84.86%		
9	Individual	4.35%	6.37%	13.72%		9.15%
10	Undetermined	0.15%	0.19%			
12	IP Licensing Arm of Product Co.	1.68%	1.25%		4.91%	3.90%

As compared to 2010, this study slightly oversamples product companies and undersamples individual plaintiffs and inventor-owned companies. This is an acceptable tradeoff, given scholarship that favors product companies as a plaintiff class. Among the NPE samples, this

52. The 2010 data was compiled by Christopher Cotropia, Jay P. Kesan, and David L. Schwartz and is available for download at http://npedata.com [http://perma.cc/43CX-PWP6]. See Cotropia et al., *supra* note 12, for an analysis of the data.

53. See Ball & Kesan, *supra* note 8, at 31, for a summary of the 2000 and 2002 data. The 2000 and 2002 counts are not as granular, such that individuals and individual-owned companies are not distinguished from small companies, and no NPEs other than licensing entities were tracked.

54. *See* Allison et al., *Most-Litigated Patents*, *supra* note 24, at 10.

55. Unfortunately, most studies do not gather data on every single case, making it difficult to compare this sample with other measures.

study undersamples licensing companies and oversamples inventor-owned companies. The difference is primarily explained by two factors. First, about 5% of the 2010 NPE cases were filed by ArrivalStar, which is likely an inventor-owned company,[56] but were coded by Christopher Cotropia, Jay Kesan, and David Schwartz as a licensing entity.[57] Second, it may reflect a historical change away from individual firms to licensing entities, given that the plaintiffs studied here were active from 1985 to 2009. For example, when limited to just 2008 and 2009, the cases in this study were 68% in Category 1 (licensing) and 24% in Category 5 (inventor-owned), which is much closer to the 2010 distribution for the entire population. Of course, there is also likely to be some random variation from year to year. As compared with 2000 and 2002, this study undersamples individuals. This is not surprising in longitudinal data, as individuals have been a decreasing proportion of plaintiffs over time.

As discussed further below, several case outcome measures are generally similar to those of cross-sectional studies.[58]

Further, comparisons of technology types also imply a representative sample. A comparison of the nonNPEs in this study with earlier cross-sectional studies of all litigation shows representative similarities and cross-sectional differences. Table 3 shows the broad National Bureau of Economic Research (NBER) technology classification[59] profiles for four groups of patents: *Valuable Patents*,[60] which covers all cases that terminated in 1999 and 2000; Ball & Kesan,[61] which covers all nonlicensing entity cases initiated in 2000 and 2002; this study, which covers all nonNPE patents; and this study, but limited to only nonNPE patents in cases terminating in 1999 and 2000. The NBER classifications are rough but suitable to broadly show representative sampling.

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56. *See* Paul Brinkmann, *Delray Beach Inventor Files Hundreds of Patent Suits Nationwide*, S. FLA. BUS. J. (Jan. 25, 2013, 6:00 AM), http://www.bizjournals.com/southflorida/print-edition/2013/01/25/delray-beach-inventor-files-hundreds.html [http://perma.cc/B97B-2G98] ("Hundreds of patent lawsuits . . . lead back to one South Florida-based inventor, Martin Kelly Jones, and a company associated with him, ArrivalStar S.A.").

57. *See supra* note 52.

58. *See, e.g.*, *supra* note 57.

59. Bronwyn H. Hall et al., *The NBER Patent-Citations Data File: Lessons, Insights, and Methodological Tools*, *in* PATENTS, CITATIONS & INNOVATIONS, *supra* note 4, at 403, 415.

60. Allison et al., *Valuable Patents*, *supra* note 5, at 472 (showing classification of all patents whose litigation terminated in 1999 and 2000).

61. Ball & Kesan, *supra* note 8, at 37.

TABLE 3

	This Study All Years	This Study 1999–2000	Valuable Patents 1999–2000	Ball & Kesan 2000/2002
Chemicals	11.38%	9.43%	10%	8.28%
Computer & Comm.	24.65%	16.98%	20%	19.50%
Drugs & Meds.	15.04%	18.87%	16%	17.18%
Elec. & Electronic	19.22%	18.87%	12%	9.90%
Mechanical	12.26%	13.21%	16%	15.67%
Others	17.45%	22.64%	26%	29.48%

The comparison shows that the cross-sectional sample from this study and the others is relatively close, with a slight shift between electronics and computers. This full longitudinal sample from this study also shows a similar profile but with a shift from "others" to electronics and computers. This is to be expected, given that most of the cases in this study were filed about ten years after the cross-section and thus were more likely to involve more high technology patents, even among nonNPEs.

3. Using a Hybrid Solution

The hybrid-matching algorithm is a bit unusual; most studies either match by case or by patent. These usual solutions leave much to be desired for a sample of *all* litigation relating to particular patents asserted by a representative sample of litigants.[62]

Picking a proportional number of cases filed in a given year appears preferable because the goal of the study is to compare patents and litigation outcomes, and those might be dependent on the year. For example, choosing a disproportionate number of cases from 1989—when there were few NPE cases—would yield a biased match in testing whether a particular technology was asserted at the same rates; a group with too many early patents would appear to have much more technology from the 1980s. It

62. *See generally* Allison et al., *Most-Litigated Patents*, *supra* note 24 (considering the 106 most litigated patents and comparing them to 106 random patents, but not comparing litigation results to those random patents); Allison et al., *Patent Quality*, *supra* note 5 (same).

would be better to match the rate of case filings by year and then compare technologies between groups.

But strict case proportionality has its own problems. Selecting 900 random cases distributed between 1985 and 2009 is also inappropriate. Although the control set would be random, it would include only one case per patent and ignore all other cases in which the patent might be asserted. Limiting cases to one per patent would neither reflect the realities of patent litigation nor provide an adequate comparison for repeat assertion, an important aspect of patent litigation. The random set must contain as many cases asserting a patent as can be found.

Matching on 350 patents and then finding the cases in which they were asserted would also be insufficient. The preferred criteria to match would be the earliest priority date, the grant date, or maybe the application date. But each of these would also be divorced from the date of litigation because patents are often held for years and asserted in lawsuits at highly varying ages.[63] Indeed, measuring the age of patents in litigation is a goal of this study,[64] so matching patents by age would not allow for a comparison.

Thus, the hybrid method, which begins with cases distributed by year but then also finds all the other litigation associated with the patents in those cases, is a useful compromise to glean full knowledge from the data.

4. NPEs in the Matching Set

With some exceptions discussed below, litigation by any NPE plaintiff, including those studied here, was discarded from the random cases identified.[65] Because individuals have always made up a measurable portion of patent plaintiffs,[66] we retained individual inventors[67] and individual-inventor companies.[68]

We also retained three companies that may be controversial. First, we retained Network Signatures. This company might be controversial

63. *Cf.* Miller, *supra* note 11, at 21–28 (matching patents to estimate likelihood that a random patent would be adjudicated but also counting other assertions of the patents).

64. This will be discussed in a later article.

65. Not surprisingly, this became more common for later litigation years.

66. *See* Ball & Kesan, *supra* note 8, at 31; Cotropia et al., *supra* note 12, at 667.

67. A couple of patents wound up in both sets: first asserted by an individual, then assigned to Nike, and finally asserted by Plutus/IPNav. Cases like these are a key reason why individuals were not excluded—there is often a fine line between the individual and the manufacturer.

68. For example, we retained Barry J. Fiala, Inc., which also appears to have been a practicing entity at the time of litigation.

because both RPX[69] and Jeruss et al.[70] list it as one of their top ten most litigious NPEs for a particular year. Network Signatures may well be an NPE now, but at the time of its first lawsuits that are part of our study it was providing a service. Archived versions of its website show that it offered a beta test of a virtual private networking portal,[71] released an iPhone app,[72] and hired a public relations firm to aid it in selling services to business customers.[73] Other researchers examining the evidence independently came to the same conclusion.[74] There were no rulings on the merits in any of these cases.

Second, we encountered U.S. Ethernet Innovations, an LLC that enforces 3Com's patents. The difficulty is that 3Com asserted these very same patents earlier, and quite successfully. We included all patents and outcomes originally assigned to 3Com but excluded patents issued directly to US Ethernet Innovations on the theory that ownership by an NPE might somehow change the characteristics and assertion of such patents. There was only one case in the sample brought directly by U.S. Ethernet Innovations, which involved four patents and no judgment on the merits.

Third, Card Activation Technologies actively asserted a single patent assigned to it and had no other business. However, we treated this plaintiff as a licensing arm of a public company. MedCom USA, a product company, acquired the patent through the acquisition of the original assignee, another product company, and then spun out Card Activation

69. RPX CORP., 2012 NPE ACTIVITY REPORT 30 (2013), http://patentlyo.com/media/docs/2013/07/0BF995E82CFF591EE80EFE8AC69259E7.pdf [http://perma.cc/S2VQ-C2RU].

70. Jeruss et al., *supra* note 22, at 382.

71. *See The Power of Secure Global Communications in Your Hand*, NETWORK SIGNATURES, https://web.archive.org/web/20080222024502/http://vpn.networksignatures.com [https://perma.cc/3VFH-9QYV] (last visited Mar. 30, 2015).

72. *See Get Real Protection. Get NetSig.*, NETWORK SIGNATURES, https://web.archive.org/web/20110208005402/http://vpn.networksignatures.com [https://perma.cc/LJK8-5J6V] (last visited Mar. 30, 2015).

73. *See Network Signatures Retains CrowdGather for Online Marketing*, BUS. WIRE (Aug. 17, 2009, 8:00 AM), http://www.businesswire.com/news/home/20090817005283/en/Network-Signatures-Retains-CrowdGather-Online-Marketing#.VNgIpULP704 [https://perma.cc/GB28-WHAJ?type=pdf].

74. *See* Christopher Cotropia et al., *2010 Patent Holder and Litigation Dataset*, http://www.npedata.com [http://perma.cc/43CX-PWP6] (last updated May 28, 2014).

Technologies to manage a single patent.[75] When the patent was eventually invalidated, the company ceased operations.[76] The regressions in this Article were re-estimated with these parties excluded, and the results did not meaningfully change.

C. Litigation Identification and Data

We identified litigations based on both entity name and patents asserted.[77] Party name searching was impractical for finding other cases in our matching set; there may have been many patents owned by a plaintiff that were not litigated, and there may have been other litigation by the same plaintiff that did not involve the patents from the original case. When we searched, we identified cases by patent number only using Westlaw docket reports, Lex Machina, Federal Circuit appellate opinions, the U.S. Patent and Trademark Office (PTO), Derwent/Litalert, Lexis databases of patent litigation notices,[78] and even Google. We found mistakes and typos in many of the databases, and even in some of the source documents filed by the parties themselves.

We also kept track of transferred cases to ensure there was no double counting.[79] This differentiates this study from many other "patent count" studies that do not do so or simply drop transferred cases.[80]

The litigation data was coded to include case name, location, filing date, and number of parties.[81] We also gathered data about duration and outcomes of litigation.[82] The outcome data included the status of patent

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75. *See MedCom USA, Inc. Has Organized and Named Its New Subsidiary Company, Card Activation Technologies, Inc.*, MEDCOM USA (Sep. 11, 2006), http://www.medcomusa.com/pages/displaynews.asp?id=52 [http://perma.cc/C7QK-76ML].

76. *See Card Activation Advises No Further Enforcement Activities Can Be Taken Concerning Its Patent*, CARD ACTIVATION TECHNOLOGIES (Dec. 18, 2012), http://www.cardactivationtech.com/news_detail.php?news_id=144 [http://perma.cc/U8SB-R3PD].

77. *Patent Troll Myths* describes our methodology for finding NPE litigation data. *See* Risch, *supra* note 3, at 469–70.

78. 35 U.S.C. § 290 (2012) requires district court clerks to notify the PTO when any patent litigation is initiated.

79. We noted the source and destination case numbers, such that movement of cases might be studied in the future.

80. *See, e.g.*, Feldman et al., *supra* note 9, at 60 (listing transfer and consolidation as the third and fourth most common case termination events but deducting them rather than tracing them); Haus & Juranek, *supra* note 23 (manuscript at 8–9) (dropping transferred and consolidated cases, more than 25% of cases).

81. Defendant names were not recorded with precision; some cases had more than 100 defendants. Additionally, we kept track of whether the NPE filed the case or was a declaratory relief defendant.

82. Case dispositions change on a daily basis, though this study allowed sufficient time to let most cases resolve. The Author verified every merits outcome. Other studies have also tracked outcomes. *See, e.g.*, Allison et al., *Valuable Patents*, *supra* note 5, at

challenges—summary judgment motions—whether granted, denied, or pending at case dismissal.

D. Patent Identification and Data

The next phase of the study identified the patents at issue in each of the litigation cases identified. The ten NPEs were involved in 917 unique litigations,[83] which were consolidated into 752 final actions, 82% of the total. These litigations involved 352 patents. In turn, the 352 patents resulted from 176 initial patent applications, many of which spawned multiple patents. The maximum was 41 patents from one application.

The matching litigation involved 1311 unique cases, which were consolidated into 1152 final actions, 88% of the total. The litigations involved 791 patents stemming from 536 applications, and the maximum was 9 patents from one application.

To find the asserted patents, we read the complaints, answers, motions, and other documents accessible in docketing databases. We also—again—searched the PTO, Lexis, and Derwent/Litalert databases of litigation notices. As described above, we used patents discovered in each case to identify additional litigation to include in the database. Thus, litigation identification and patent identification were symbiotic: litigation led us to patents and patents led us to other litigation.

Many litigated cases involved multiple patents coming from the same initial patent filing, emphasizing the repeated use of a relatively small number of inventions. The average number of litigations for each NPE patent was 8.59 and for each NonNPE patent was 3.23. The average number of NPE patents per litigation was 3.35, and the average number of NonNPE patents per case was 1.96. However, the number of patents per case was highly variable year over year without a clear growth trend. Further, there were comparable means between the parties for most years, except two during which there were significant outliers among the NPEs—mean of more than five patents per case—that skew the average.[84]

437; Chien, *supra* note 23, at 1605–06; Kesan & Ball, *supra* note 8, at 246; Miller, *supra* note 11, at 16–17; Shrestha, *supra* note 26, at 118.

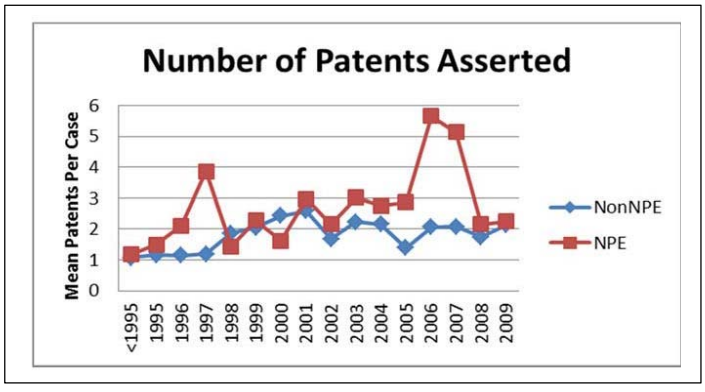
83. One had almost no information available and thus is not counted in most of the other tables in this Article.

84. Despite comparable means, a Fisher's Exact Test shows a population difference with p=0.000.

TABLE 4

	NonNPE			NPE		
Year	Mean Patents/ Case	StdDev	Median	Mean Patents/ Case	StdDev	Median
<1995	1.06	0.44	1	1.18	0.85	1
1995	1.09	0.30	1	1.50	1.45	1
1996	1.14	0.38	1	2.11	1.69	1
1997	1.19	0.54	1	3.87	5.94	1
1998	1.87	0.87	2	1.44	1.04	1
1999	2.06	1.53	1	2.29	3.29	1
2000	2.46	0.79	2	1.63	1.28	1
2001	2.59	3.08	2	2.97	3.43	2
2002	1.69	1.75	1	2.15	1.22	2
2003	2.24	1.58	2	3.02	2.66	2
2004	2.15	1.91	1	2.75	2.18	2
2005	1.39	0.89	1	2.87	2.80	2
2006	2.08	2.50	1	5.66	7.76	2
2007	2.04	1.44	2	5.13	7.59	2
2008	1.75	1.20	1	2.16	1.49	2
2009	2.11	1.88	1	2.25	2.50	1
Total	1.96	1.73	1	3.35	4.92	2

FIGURE 1



This phase revealed a limitation of the study; prior to the introduction of electronic court filing in the late 1990s, PACER did not contain litigation documents. Indeed, because complaints were always filed in paper form to open a case, many districts did not make complaints available online until approximately 2002, even if they had adopted electronic filing rules.

As a result, there are a few cases with missing patents in the 2000s[85] and several cases filed prior to 1999 that are missing patent data.

Given that we searched by name for NPEs only, it is not surprising that the NPE data includes more missing patent numbers. While finding cases by name revealed cases with missing patent data, if we started with the patent data then our work was already done once we found a case.[86] Even with gaps, we were remarkably successful at identifying patents at issue. We missed patent data for forty-two NPE cases and nineteen nonNPE cases, almost all before 2000 and many before 1990.[87]

We were able to obtain outcome information for virtually all of these missing cases, and none that we could locate included a judgment on the merits of an unknown patent. Further, because NPEs typically litigated the same patents multiple times, it is likely that many of the cases for which data is unavailable involved the same patents already included in the study.[88]

Patent data included the patent number, patent filing and issue dates, technology classifications, total number of claims, inventors and assignees, and number of continuations.[89] We also determined the earliest claimed priority date for each patent. Patent citation data were gathered, including references cited—backward cites—and citing patents—forward cites.[90]

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85. Many gaps were filled using litigation notices, but not all court clerks followed the statute in every case.

86. However, this is not entirely so. There were many errors in reporting cases by patent data due to typos, machine coding errors, and linkings of extraneously named but not asserted patent numbers. This study is differentiated from many others because we verified each case by reading court documents where possible rather than relying on data reported by a service.

87. Rates Technology was the plaintiff in thirty-two of the forty-two cases, many of which dated back to the late 1980s and early 1990s.

88. Also, given that many commentators associate the rise of particular NPE behavior with the 2000s, a data set covering post-1999 activity will still provide useful information. Of course, there might be a difference in the types of patents litigated now and those litigated before 2003. However, most of the patents litigated after 2003 were issued before 2003 and were certainly applied for before 2003, such that this is a minor concern. Future studies might obtain paper court filings to determine the patents at issue in pre-1999 cases.

89. No distinction was made between continuations and continuations-in-part, and divisionals were not recorded.

90. Forward citations were adjusted in two ways: by average per year and by normalization by the average number of forward citations received in the same grant year. *See* Hall et al., *supra* note 59, at 434–41. The latter method captures year effects for citations.

Finally, we obtained data on entity size, assignment and conveyance history, and reexamination outcomes.

IV. ANALYSIS AND POLICY IMPLICATIONS

This Part analyzes the data, primarily by comparing NPEs with nonNPEs. Because so many diverse areas are being considered, each subpart contains two further subparts: an analysis of the data and the primary policy considerations associated with the results.

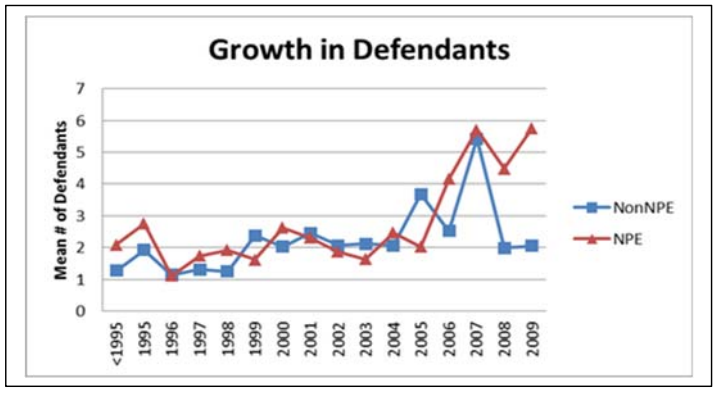
A. Case Complexity

The first area of consideration is case complexity, which the Article considers by defendant count and case transfers.

1. The Data

Table 1 in Part III(B) above shows defendant counts by year, as reflected by the graph in Figure 2.

FIGURE 2



The median litigation for each group for all years combined involved one defendant. Surprisingly, the nonNPE group had more years with a median of two defendants than the NPE group did. However, the skew in the data is unmistakable. Beginning in 2006, the means and standard deviations in the NPE group begin to grow much larger—exceeding five in later years—reflecting the growth in mass patent litigation.[91] In short,

91. One year for the nonNPEs includes a large standard deviation, but this is driven by a single outlier.

run-of-the-mill litigation involved few defendants but more and more cases, though far less than half, included many more defendants, as many as 200.

Cases that are transferred also increase complexity, especially those that consolidate multiple cases into one, which essentially turns any litigation into a mass litigation. Table 5 shows the number of cases transferred to other districts or consolidated with other cases, including multidistrict litigation.[92]

TABLE 5

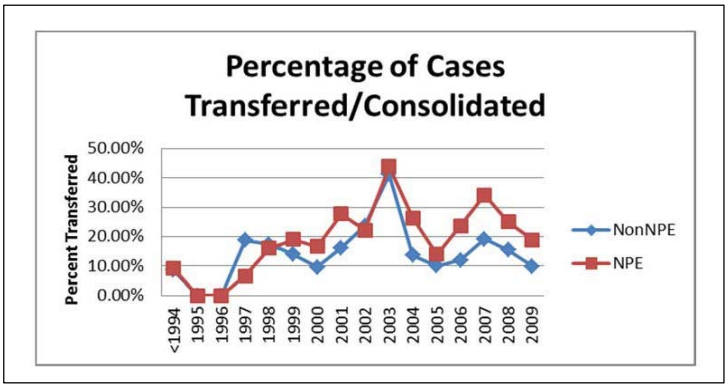
	NonNPE			NPE		
Year	**Cases**	**Transfer/ Consolidate**	**%**	**Cases**	**Transfer/ Consolidate**	**%**
<1995	47	4	8.51%	22	2	9.09%
1995	11	0	0.00%	12	0	0.00%
1996	7	0	0.00%	9	0	0.00%
1997	16	3	18.75%	15	1	6.67%
1998	23	4	16.67%	25	4	16.00%
1999	50	7	14.00%	42	8	19.05%
2000	72	8	11.11%	24	4	16.67%
2001	63	13	20.63%	36	10	27.78%
2002	118	28	23.73%	72	16	22.22%
2003	136	57	41.91%	82	36	43.90%
2004	110	16	14.55%	53	14	26.42%
2005	110	11	10.00%	100	16	16.00%
2006	133	16	12.03%	131	31	23.66%
2007	183	34	18.58%	152	52	34.21%
2008	110	17	15.45%	88	23	26.14%
2009	122	12	9.84%	53	10	18.87%
Total	**1311**	**230**	**17.54%**	**916**	**227**	**24.78%**

While cases appear to grow more complex over time, a regression estimate on case duration shows that cases have actually gotten *shorter* as the years progress. Further, various regressions suggest that taking into

92. Multidistrict litigation consolidates cases pending in different federal district courts for pretrial activities but then returns the cases to their original courts for trial. *See* 28 U.S.C. § 1407 (2012). In this study's set, only one initial filing was returned for trial, and it settled shortly thereafter. A few others settled as they were about to be returned for trial. Thus, consolidation to a multidistrict litigation is, for most purposes, a consolidation.

account case complexity, merits rulings, transfers, and other factors show that NPE cases are actually shorter, all other things being equal.[93]

FIGURE 3



The following model tests the various effects on duration:

$$\text{Log(duration)} = \alpha + \sum \beta_i x_i + \varepsilon$$

where *duration* is the number of days between the filing of the complaint and the final disposition of a patent or case,[94] α is the estimated intercept, β_i are coefficients, x_i are independent variables, and ε is error.

The following table shows the results of four ordinary least squares regressions with the following factors that one would expect might increase case complexity or otherwise affect the length of a case:

1. NPE: 0 for nonNPE, 1 for NPE.

93. A recent study also finds that NPE cases are shorter than other cases, all other things equal. *See* Haus & Juranek, *supra* note 23 (manuscript at 12). However, this study excluded transferred and consolidated cases, which are both important predictors for longer litigation and also more associated with NPEs. *See id.* (manuscript at 8–9). The regression in this study considers the interaction effects in order to capture which duration effects are associated with NPEs and which are merely due to the fact of transfer. Further, Haus & Juranek use docket entries as the measure of duration. *See id.* (manuscript at 11). This is possible for their random sample, but for the complex multidistrict litigation here, it fails. The number of docket entries dealing with counsel changes, for example, is large, but this number has no bearing on duration. On the other hand, a single docket entry might stay a case for a year or more.

94. Open cases were given an arbitrarily late date, December 31, 2013, rather than excluded. Because some patents were terminated from cases at different times, each patent is a data point, but each data point was given an importance weighting based on the number of patents in the case. Thus, a one-patent case would get full weight, and the durations of each patent in a four-patent case would get a one-fourth weight each.

Dec. Relief: 1 if the case was only filed for declaratory relief.
Xfer/Consol: 1 if the case was transferred to another district or consolidated with another case.
NPExXfer: an interaction dummy variable because NPE cases are transferred disproportionately.
Stayed: 1 if the case was stayed.
Appeal: 1 if a judgment was appealed.
AnyMerits: 1 if the court issued a merits ending ruling on invalidity, infringement, or unenforceability.[95]
NumPatents: the number of patents at issue in the case.
NumDefs: the number of defendants sued in the case.
Logclaims: the logarithm of the number of claims in the patent.
Yearfiled: the year the case was initiated.

2. Same as Regression (1), but with district court effects included. Every district was included in the regression, but only those that were statistically significant are included.[96]

3. Same as Regression (2), but with Xfer and Anymerits interaction effects removed as test of robustness.

4. Same as Regression (3), but with NPExDistrict interaction effects because NPEs choose some districts disproportionately.

The regression suggests that many of the things that one might expect to lengthen—or shorten—duration, such as whether a case is transferred, stayed, or appealed, actually do so. Interestingly, when courts rule on the merits, cases tend to be longer,[97] probably because of the briefing time, trial, potential appeals, and lack of settlement. Furthermore, factors that increase complexity, such as the number of defendants and the number of patents, increase duration, though the number of patent claims has no statistically significant effect. Surprisingly, cases initiated each passing year are shorter on average, all other things equal.

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95. Where possible, duration was recorded for each patent. Only rulings that would dispose of a patent issue are included. A denial of summary judgment is not included because that would not shorten the case as to that patent.

96. Not surprisingly, the statistically significant districts were those with the most case volume.

97. *But see* Christina L. Boyd & David A. Hoffman, *Litigating Toward Settlement*, 29 J.L. ECON. & ORG. 898, 918–19, 923 (2013) (finding that the filing of substantive motions shortens duration).

TABLE 6

	(1) logtime	(2) logtime	(3) logtime	(4) logtime
NPE=1	0.732*** (0.000)	0.720*** (0.000)	0.718*** (0.000)	0.994 (0.957)
DJ=1	0.921 (0.342)	0.881 (0.162)	0.880 (0.160)	0.854 (0.085)
Xfer out?=1	2.023*** (0.000)	1.894*** (0.000)	1.856*** (0.000)	1.755*** (0.000)
NPE=1 X Xfer out?=1	0.895 (0.336)	0.947 (0.646)		
Stayed=1	2.265*** (0.000)	2.333*** (0.000)	2.342*** (0.000)	2.328*** (0.000)
Appeal=1	2.073*** (0.000)	2.027*** (0.000)	2.041*** (0.000)	2.007*** (0.000)
AnyMerits=1	2.278*** (0.000)	2.142*** (0.000)	2.213*** (0.000)	2.135*** (0.000)
NPE=1 X AnyMerits=1	0.978 (0.881)	1.090 (0.562)		
NumPatents	1.031*** (0.000)	1.025*** (0.000)	1.024*** (0.000)	1.022** (0.002)
NumDefs	1.011*** (0.000)	1.011*** (0.000)	1.011*** (0.000)	1.010*** (0.000)
Logclaims	0.988 (0.574)	0.985 (0.492)	0.985 (0.501)	0.999 (0.979)
Yearfiled	0.989 (0.064)	0.983** (0.010)	0.983** (0.009)	0.984* (0.014)
D. Del.		1.344* (0.033)	1.344* (0.033)	1.680** (0.002)
E.D. Tex.		1.400*** (0.000)	1.397*** (0.000)	1.406* (0.024)
N.D. Cal.		1.309* (0.028)	1.310* (0.027)	1.639** (0.003)
NPE=1 X D. Del.				0.557* (0.043)
NPE=1 X E.D. Tex.				0.851 (0.413)
NPE=1 X N.D. Cal.				0.603* (0.036)
Observations	2063	2063	2063	2063
Adjusted R^2	0.302	0.318	0.318	0.339

Exponentiated coefficients;[98] *p*-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

98. Exponentiated coefficients in a log-linear regression can be read as a percentage change in the nontransformed dependent variable. For each unit the independent variable changes, the duration increases or decreases by the percentage above or below one. Thus, a coefficient below one implies a decrease in duration.

Given all other factors held equal, NPE cases tend to be shorter than nonNPE cases. Interestingly, transferred NPE cases are slightly longer (13%) than transferred nonNPE cases on average, primarily due to consolidation of many cases into very lengthy multidistrict cases. On the other hand, nontransferred NPE cases tend to be much shorter than nonNPE cases (by 44%). Of course, not all factors are equal; NPEs are 40% more likely to file a case that is eventually transferred or consolidated, which means that some NPE cases may well be longer because NPEs select improper venues. The inferences from this are ambiguous, though. If NPE cases that are transferred are longer, then this implies that these NPEs settle faster if they win their choice of venue, which is contrary to the conventional wisdom that NPEs walk away when cases transfer.[99]

Duration is likely affected by district choices. Caseload and patent data by judge was not available for the entire timespan of the data, especially given transferred and consolidated cases.[100] Thus, district effects were modeled by including both district location (Regression (3)) and a district-NPE interaction dummy (Regression (4)) because NPEs were more likely to choose certain districts. Although only three districts were statistically significant, district selection as a whole was significant to the estimate. Each of the significant districts' coefficients was about 35%–65% longer in duration than the Central District of California, the baseline here.[101] It is important to note, though, that these are the initial districts. The final district may be different, and this effect is captured in the transfer-consolidation factor.

However, a curious thing happens when district-NPE interactions are included. The coefficient on NPE becomes statistically indistinguishable from 1—meaning no effect. The interaction factors, however, are virtually all less than 1, and many less than 0.5.[102] Rather than imply that the other regressions are not robust, this implies that duration is highly variable by district; however, in most districts, the duration for NPEs is much lower than for nonNPEs.

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99. Of course, some NPEs may do that, but not the most litigious.

100. *Cf.* Haus & Juranek, *supra* note 23 (manuscript at 12–13) (using caseload and patent propensity to isolate judge based effects on duration).

101. *See* Mark A. Lemley, *Where To File Your Patent Case*, 38 AIPLA Q.J. 401, 414–15 (2010) (showing the Central District of California with relatively short time to resolution, in part due to early disposition of cases).

102. This includes unreported districts. Although most were not individually statistically significant, as a group they add explanatory power.

2. Policy Implications

a. Venue and Filing Rules

The America Invents Act in 2011 (AIA) required that each defendant be sued in a separate case.[103] The data here implies that the separate case requirement was warranted, but it only affected particular patent plaintiffs. In that sense, it was targeted not just at patent trolls but also at very particular patent trolls.

Separate case filing, along with more stringent venue rules,[104] affected everyone. While NPE cases were more likely to be transferred, consolidated with others, or both, nonNPEs filed plenty of cases—including 16% of declaratory judgment cases filed by nonNPEs against competitors and NPEs alike—that were later transferred or consolidated.[105] Obtaining an improper venue advantage is not a purely NPE pursuit. Though more cases were transferred as time passed, they were never more than a minority.

b. The Rise of the Eastern District of Texas

Table 7 shows the initial choice of venue over time in four popular districts: Central District of California, District of Delaware, Eastern District of Texas, and the Northern District of California. These are the venues in which cases were filed, not the final venue; many cases may have been transferred in or out of districts after filing.

The growth in plaintiffs using the Eastern District of Texas is unmistakable, rising from zero in 2001 to 37% of all cases filed in 2007. But there are a few interesting data points to note. First, the choice of that district is relatively new, with no selection among these NPEs before 2002 and no widespread adoption until 2005. It is likely that other NPEs filed in the Eastern District of Texas prior to 2005 with positive results, and these plaintiffs followed suit. Second, despite being considered a haven for these NPE plaintiffs, only about 19% of all cases were filed there as late as 2009, though the percentages were higher in the three preceding years. Third, the number of NPE cases filed in the Northern District of

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103. *See* 35 U.S.C. § 299 (2012).

104. *See, e.g.*, *In re* TS Tech USA Corp., 551 F.3d 1315, 1318–19 (Fed. Cir. 2008) (applying Fifth Circuit precedent and reversing district court to allow transfer of case out of Eastern District of Texas); Efrén Garcia, Presentation at the Eleventh Annual Texas Intellectual Property Law Journal Symposium: Effects of *In re TS Tech USA Corp.* on Patent Cases in the E.D. Texas 28–29 (Feb. 19, 2010) (showing increased number of granted transfer motions).

105. Theoretically, filing against many defendants would lower the number of transfers because only one defendant's venue need be proper. In reality, this likely had little effect. Many high defendant cases were transferred or consolidated.

California—consistently about twice the percentage as nonNPEs—is surprising given that cases filed in that district are less likely to be successful.[106] Fourth, the Eastern District of Texas is not just for NPEs anymore. While the percentage of cases filed is not as high, beginning in 2005, nonNPEs filed a substantial number of cases—between 7% and 9%—in the Eastern District of Texas.

TABLE 7

	NonNPE				NPE			
Year	C.D. Cal.	D. Del.	E.D. Tex.	N.D. Cal.	C.D. Cal.	D. Del.	E.D. Tex.	N.D. Cal.
<1995	4.26%	2.13%	0.00%	2.13%	13.04%	8.70%	0.00%	8.70%
1995	8.33%	8.33%	0.00%	8.33%	0.00%	0.00%	0.00%	8.33%
1996	0.00%	0.00%	0.00%	14.29%	0.00%	0.00%	0.00%	22.22%
1997	6.25%	0.00%	0.00%	0.00%	13.33%	0.00%	0.00%	6.67%
1998	16.67%	4.17%	0.00%	8.33%	0.00%	4.00%	0.00%	20.00%
1999	6.00%	2.00%	0.00%	6.00%	9.52%	2.38%	0.00%	14.29%
2000	27.40%	1.37%	0.00%	5.48%	4.17%	4.17%	0.00%	8.33%
2001	11.48%	1.64%	1.64%	4.92%	11.11%	0.00%	0.00%	8.33%
2002	6.72%	1.68%	0.84%	2.52%	38.89%	0.00%	1.39%	6.94%
2003	16.18%	1.47%	0.00%	2.94%	40.24%	0.00%	0.00%	4.88%
2004	13.64%	2.73%	0.00%	6.36%	9.62%	3.85%	7.69%	11.54%
2005	20.91%	3.64%	7.27%	2.73%	12.00%	1.00%	6.00%	8.00%
2006	18.05%	6.02%	8.27%	0.75%	6.11%	6.11%	30.53%	3.05%
2007	8.84%	3.87%	8.29%	1.66%	4.58%	5.23%	37.25%	3.27%
2008	13.51%	1.80%	3.60%	3.60%	7.95%	2.27%	25.00%	4.55%
2009	15.70%	4.96%	9.09%	1.65%	18.87%	0.00%	18.87%	3.77%
Grand Total	**13.73%**	**3.05%**	**3.89%**	**3.20%**	**13.52%**	**2.84%**	**15.27%**	**6.54%**

Finally, despite the continued popularity of the Eastern District of Texas, since the passage of the AIA, Delaware is now the most popular place to file a patent claim.[107] This growth may seem surprising given the percentages above, which show almost no filings in Delaware as late as 2009. The antijoinder provisions were intended to stem the tide of litigation but

106. PwC 2014, *supra* note 11, at 18 (showing that NPEs win only 14% of their cases in the Northern District of California, but 46% of their cases in the Eastern District of Texas); Lemley, *supra* note 101, at 407–11 (showing below average win rates and likelihoods of trial in the Northern District of California).

107. *See* James C. Pistorino & Susan J. Crane, *2011 Trends in Patent Case Filings: Eastern District of Texas Continues To Lead Until America Invents Act is Signed*, PERKINS COIE 12–13 (March 2012), http://www.perkinscoie.com/files/upload/PL_12_03PistorinoArticle.pdf [http://perma.cc/E9BY-GEA8].

have not done so. This implies that patent plaintiffs will merely adapt to procedural restrictions.

c. Case Management

A third lesson to draw from the data concerns case management. For example, as courts have taken a more active role in more recent years, the cases have actually grown shorter.

However, the AIA was responsible for a large increase in the number of patent cases filed.[108] Based on history, it is unclear what effect this will have. Both the NPE and the nonNPE data sets included sets of litigation that were consolidated into multidistrict litigation cases for all purposes other than trial. This had the practical effect of including many defendants together as if they had been sued at the same time. To the extent that post-AIA cases are consolidated, they may look very similar to pre-AIA cases.

However, many consolidated cases were only for pretrial actions, and when those pretrial proceedings were completed, cases were to be sent back to their original districts. Procedures that maintain separate cases but consolidate them for pretrial proceedings preserve the separate right to a trial for each defendant but create other problems. First, pretrial proceedings still require coordination, and some defendants may not want to be consolidated even for pretrial. Second, multidistrict litigation costs more than other cases with many defendants because defendants must find counsel to defend them in two different districts: one district for pretrial and, if the case should go that far, the original district for trial.[109]

Given the costs of consolidation, efficient case management probably dictates the current rule: filing separate cases against unrelated defendants. At the very least, each defendant will have an opportunity to argue noninfringement based on different product configurations. Further, cases may be resolved more simply. The number of docket entries seemed to

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108. *See* GAO, *supra* note 21, at 14–15.

109. Plaintiff costs can also rise. Remand from multidistrict proceedings gives defendants another opportunity to seek delay or otherwise avoid a trial with a new judge unfamiliar with the case history. For example, in *In re Katz Interactive Call Processing Patent Litigation*, Defendant Geico objected to a remand, but its argument that more summary judgment challenges should be allowed in multidistrict litigation was rejected. *See* Conditional Remand Order at 1–2, In re Katz Interactive Call Processing Patent Litig., MDL No. 1816, No. 07-cv-00361-GMS, ECF No. 48 (J.P.M.L. June 5, 2013). Geico nonetheless moved for another stay pending reexamination of the patent and also argued that further claim construction was necessary. *See* Joint Statement Pursuant to Local Rule 81.2, Ronald A. Katz Tech. Licensing L.P. v. Geico Corp., No. 07-cv-361-GMS (D. Del. June 28, 2013).

grow exponentially[110] with consolidated cases, even as defendants settled out. Given that most cases settle before trial, bringing separate cases seems like a good use of judicial resources.

However, there is a cost to requiring nonconsolidation. First, there is a likelihood of many more claim construction hearings—and conflicting ones at that—especially as patent reform proposals seek to hold discovery until after claim construction.[111] Courts will be faced with patentee arguments—with debate about the estoppel effect of any nonfinal construction in another case—defendant arguments, and orders from other cases, if any. All of this is supposed to be done with an eye toward determining which claim terms are important to the *particular* litigation heard by the court.[112] This is a potentially costly exercise.

d. Reporting

There is one more problem caused by cases with many defendants: they are much harder to study. This consideration is relatively minor in the scheme of things; the courts should not be organized to make it easier for professors and the media to find out who won which case and how. Even so, consolidation has a significant impact on how data is reported.

Quite often, a consolidated case with hundreds of defendants will lead to settlements with defendants over a period of time on varying terms; in some cases the defendant will pay, and in others the plaintiff will be convinced there is no infringement. But the final challenge is often only by a single defendant. The final judgment of the case—and more importantly the media—will usually reflect only the final merits outcome of a single defendant, despite a long history of other outcomes associated with each of the other defendants.

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110. *See* Eugene Volokh, *Careful With Those Scientific Allusions*, VOLOKH CONSPIRACY (Jan. 5, 2008, 2:00 PM), http://volokh.com/2008/01/05/careful-with-those-scientific-allusions [http://perma.cc/9FWG-8WET] ("'Exponential increases' does communicate 'large increases,' in a way I have to grudgingly accept (down, math pedant self, down!).").

111. *See Patent Progress's Guide to Federal Patent Reform Legislation*, PAT. PROGRESS, http://www.patentprogress.org/patent-progresss-guide-patent-reform-legislation [http://perma.cc/WH3T-5BVY] (last visited Mar. 30, 2015).

112. *See* Jeff Steck, *Construing Claims "Without Reference to the Accused Device" Is Put to the Test*, PATENTLY-O (Mar. 23, 2006), http://patentlyo.com/patent/2006/03/construing_clai.html [http://perma.cc/73J2-UGMQ] ("[T]he Federal Circuit has sent the message that a district court's claim construction must include some analysis of the accused products.").

Those who believe the patent system is already broken would likely argue that being able to study each of the settlement outcomes adds little value. They might argue that if the patentee loses against the lone holdout, then such a loss proves that all of those earlier settlements must have been due to strong-arm tactics or cost of litigation attrition. One problem with attributing a single loss to all prior settlements, though, is that those who believe this system is broken do not make the same assumption about prior settlements when the patentee wins against the final holdout defendant.[113] Instead of recognizing that perhaps the patentee had a valid claim and the other parties rationally settled to avoid risk of loss or to receive a discount for settling early, winning patentees are often portrayed as lucky and likely to lose on appeal.[114] Thus, complex litigation can mask all of the underlying settlement activity in a case, for better or worse. It would better serve transparency if each case outcome were clearly recorded with respect to each defendant.

B. Non-Merits Outcomes

A longitudinal analysis of asserted, adjudicated, and dismissed litigation provides a broad look into the patent landscape. As others have reported,[115] most patent cases end with some sort of settlement or other dismissal. It

113. *See, e.g.*, Allison et al., *Patent Quality*, *supra* note 5, at 687 (listing eight trial wins among the most litigated patents but not counting prior settlements with other defendants in those cases as wins).

114. *See* Joe Mullin, *Jury: Newegg Infringes Spangenberg Patent, Must Pay $2.3 Million*, ARS TECHNICA (Nov. 25, 2013, 9:20 PM), http://arstechnica.com/tech-policy/2013/11/jury-newegg-infringes-spangenberg-patent-must-pay-2-3-million [http://perma.cc/JHE4-B2DA]; *see also* Mike Masnick, *Insanity Rules in East Texas: Jury Finds Newegg Infringes on Ridiculous Encryption Patent*, TECHDIRT (Nov. 26, 2013, 5:44 AM), https://www.techdirt.com/articles/20131125/23252625370/insanity-rules-east-texas-jury-finds-newegg-infringes-ridiculous-encryption-patent.shtml [https://perma.cc/37P8-TS5B] (describing TQP win: "It shows how arbitrary jury trials can be, especially when you have jurors who simply don't understand the technology or the history at play."). Of course, sometimes they do lose on appeal. *See, e.g.*, Joe Mullin, *How Newegg Crushed the "Shopping Cart" Patent and Saved Online Retail*, ARS TECHNICA (Jan. 27, 2013, 1:00 PM), http://arstechnica.com/tech-policy/2013/01/how-newegg-crushed-the-shopping-cart-patent-and-saved-online-retail [http://perma.cc/C859-L63V] (describing loss on appeal by Soverain Software). But, sometimes they win. *See, e.g.*, Kirk Teska, *The Story Behind the BlackBerry Case*, IEEE SPECTRUM (Mar. 1, 2006, 5:00 AM), http://spectrum.ieee.org/consumer-electronics/gadgets/the-story-behind-the-blackberry-case/0 [http://perma.cc/8TEC-MJDE] (describing infringement litigation regarding BlackBerry's e-mail technology); Tom Krazit & Anne Broache, *Blackberry Saved*, CNET NEWS, http://news.cnet.com/BlackBerry-saved/2100-1047_3-6045880.html [HTTP://PERMA.CC/S598-ZSZL] (last updated Mar. 3, 2006, 4:00 PM) (reporting the $612.5 million settlement after NTP won on appeal).

115. *See* Allison et al., *Patent Quality*, *supra* note 5, at 680; Allison et al., *Realities of Patent Litigation*, *supra* note 8, at 1777; Feldman et al., *supra* note 9, at 59–60; Lemley, *supra* note 101, at 405.

is difficult to tell which party was favored in each settlement, and we did not systematically record this information. We did, however, collect information about default judgments, consent judgments, and dismissals that did not appear to be settlements.

Table 8 lists summary data for outcomes for each *initial* case. There were, of course, fewer final cases after consolidation. However, tracking outcomes by the initial case allowed the ability to track settlements with some parties that exited consolidated suits while others remained in the suit.

The table first lists settlements and consent judgments, which together constitute all settlements. It then lists injunctions, most of which were obtained as part of consent or default judgments. Finally, it lists other ways that cases were terminated, such as procedural terminations for lack of personal jurisdiction or, in the case of declaratory relief actions, lack of case or controversy. It then lists cases with a merits ruling, cases that have been stayed, and cases that are open. There is some overlap in these categories, as there might be two types of merits rulings, or there might be a merits ruling but the case is still open on appeal.

TABLE 8

	NonNPE			NPE		
Cases	1311			916		
	N	% Total	% Resolved	N	% Total	% Resolved
Resolved	735	56.06%	100%	509	55.57%	100%
Settled	274	20.90%	37.28%	242	26.42%	47.54%
Consent Judgment[1]	239	18.23%	32.52%	67	7.31%	13.16%
Default Judgment	20	1.53%	2.72%	17	1.86%	3.34%
Injunction	287	21.89%	39.05%	16	1.75%	3.14%
Procedural Ruling	53	4.04%	7.21%	70	7.64%	13.75%
Validity Ruling	61	4.65%	8.30%	96	10.48%	18.86%
Infringe Ruling	115	8.77%	15.65%	69	7.53%	13.56%
Stayed	30	2.29%	4.08%	59	6.44%	11.59%
Open	8	0.61%	1.09%	24	2.62%	4.72%

Coding case resolution was necessarily a judgment call because the reasons for termination were not always clear. We coded for a settlement

primarily when the documents in the case, the timing, or the state of the docket made it relatively clear there was a settlement.[116] We surely missed many.

As a result, about 45% of the cases were left in an "other dismissal" category. Most of these were likely settlements of one sort or another, though undoubtedly some of the dismissals were to avoid a negative judgment. The normative implications will depend in part on (a) whether one views a walkaway as a settlement, and (b) one's guess at how many dismissals were to avoid an invalidity judgment. Note, however, that merits rulings were recorded so that dismissals to avoid a negative judgment after a summary judgment loss do not affect the merits findings. Furthermore, the count of summary judgment motions pending at dismissal is reported in later sections.

When consent judgments are included, the nonNPEs settled *more* than the NPEs, 39% of cases to 34%. This does not lend too much support to prior studies—and the conventional wisdom—finding that NPEs prefer to settle more often.

However, it should be no surprise that nonNPEs prefer to settle if the defendant is agreeing to an injunction, and it may be that nonNPEs are using the same few patents to obtain consent judgments.[117] A look at settlements by patent sheds more light on this question because many cases involve multiple patents, each leveled at different defendants. Table 9 shows resolution statistics but this time counting patents rather than cases settled.

When viewed through the lens of patents, the differences between the two groups become stark. While only 55% of the cases in each group had some measurable resolution, a total of 67% and 78% of nonNPE and NPE *patents*, respectively, had at least one outcome.

More importantly, the settlement percentages are much more differentiated. Only 29% of nonNPE patents were involved in a settlement, and 18% were the subject of a consent judgment.[118] For the NPEs, 48% of all patents were part of some settlement, with another 19% in consent judgments.

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116. For representative/comparative purposes, the verifiable outcomes, such as consent judgments and defaults, match the outcomes of all litigation from 1995, 1997, 2000, and 2002. *See* Ball & Kesan, *supra* note 8, at 28. However, the judgment-based calculations do not match, presumably because this study was more conservative about calling cases a settlement.

117. Monsanto, for example, obtained seventy-four consent judgments using just two or three patents, and Mag Instruments obtained another twenty-four.

118. Unlike the case data, these two counts cannot be combined for patents. Because patents are asserted in more than one case, there were patents that were settled in one case and subject to a consent judgment in another.

This equates to 70% of all resolved nonNPE patents and 86% of all resolved NPE patents being settled at least once.

TABLE 9

	NonNPE			NPE		
Patents	791			352		
	N	% Total	% Resolved	N	% Total	% Resolved
Resolved	533	67.38%	100%	277	78.69%	100%
Settled	227	28.70%	42.59%	170	48.30%	61.37%
Consent Judgment	145	18.33%	27.20%	68	19.32%	24.55%
Default Judgment	22	2.78%	4.13%	15	4.26%	5.42%
Injunction	119	15.04%	22.33%	13	3.69%	4.69%
Procedural Dismissial	99	12.52%	18.57%	103	29.26%	37.18%
Validity Ruling	69	8.72%	12.95%	48	13.64%	17.33%
Infringe Ruling	123	15.55%	23.08%	51	14.49%	18.41%
Stayed	43	5.44%	8.07%	86	24.43%	31.05%
Open	12	1.52%	2.25%	23	6.53%	8.30%

This difference from the case-by-case settlements implies that the NPE propensity to assert more patents often yields more settlements associated with those patents, even if it results in many cases that wind up not looking like a favorable settlement.

Finally, this data challenges the conventional wisdom that 90% or more of cases settle. For these NPEs, at least, procedural dismissals entailed more than 7% of the outcomes, and merits rulings involved at least another 10% of all original cases filed—though, as discussed below, a much smaller percentage of final consolidated cases. Thus, no more than 85% of the NPE cases could ever settle, and many of these are disposed of by default judgments and "other" dismissals.[119] It is true that very few cases go through to trial, but not all cases are settling.[120]

119. Other than three exceptions, consent judgments were also coded as settlements. However, they are not included in the settlement tally here.

120. The rate of pretrial resolution is consistent with all cases, including the growth in pretrial challenges in recent years. *See* Gene Quinn, *Patent Litigation Statistics: 1980–2010,* IPWATCHDOG (Aug. 2, 2011), http://www.ipwatchdog.com/2011/08/02/patent-litigation-statistics-1980-2010/id=17995 [https://perma.cc/ZQP6-72SQ?type=pdf].

C. *Invalidity Outcomes*

Economists often judge a patent's quality by the technology breadth it covers.[121] This study prefers a more basic metric of patent quality: whether the patent is valid.[122] Thus, one of the most important results of this study is a comparison of validity outcomes between highly litigious NPEs and a random group of nonNPEs.

1. The Data

Table 10 shows the basic data associated with those patents whose validity was tested on the merits. The table shows cases adjudicating the merits: patents found valid (technically not invalid), patents held partially invalid—and partially not invalid—and patents in which all the asserted claims are invalid. The table also shows cases in which challenges—summary judgment motions by accused infringers—were denied[123] and in which challenges were pending when the case was dismissed.

The table reports two percentages for each group. The first is the percent occurrence for each outcome among all of the patents asserted. The second is the percentage of each outcome among only patents that were tested.

TABLE 10

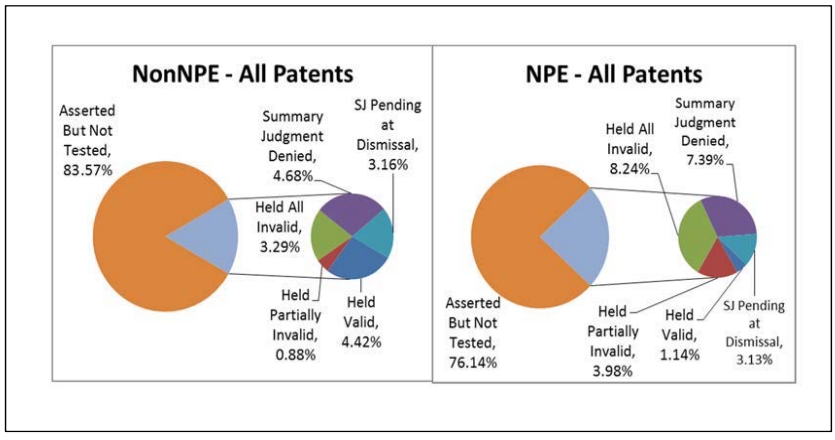
	NonNPE			NPE		
Patents	791			352		
	N	% All Patents	% Tested Patents	N	% All Patents	% Tested Patents
Patents Tested	130	16%	100%	84	23.86%	100.00%
All Claims Valid	35	4.42%	26.92%	4	1.14%	4.76%
Any Claim Invalid	7	0.88%	5.38%	14	3.98%	16.67%
All Claims Invalid	26	3.29%	20.00%	29	8.24%	34.52%
Summary Judgment Denied	37	4.68%	28.46%	26	7.39%	30.95%
SJ Pending at Dismissal	25	3.16%	19.23%	11	3.13%	13.10%
Asserted But Not Tested	661	83.57%		268	76.14%	

121. *See, e.g.*, Trajtenberg et al., *supra* note 5, at 60–63 (defining generality and originality).

122. A follow-up article will consider technology distribution. Michael Risch, *The Layered Patent System*, 101 IOWA L. REV. (forthcoming 2016).

123. Motions by patent owners were not recorded unless granted because they did not test the patent.

FIGURE 4



When considered as a percentage of those patents actually adjudicated, the NPE patents performed much more poorly than nonNPE patents. When challenged, some or all of the claims were invalidated slightly more than 50% of the time, compared to 25% for nonNPEs. The summary judgment attempts were denied at about the same rates, at around 30%. Interestingly, the nonNPE group had a higher dismissal rate with summary judgment challenges pending (19% to 13%) than the NPEs. This is contrary to a view that these NPEs dismiss rather than see their patents challenged. The primary difference appears to be the much higher percentage of patents found valid among nonNPEs, a phenomenon discussed further below.

In the end, about 12% of the NPE patents asserted over twenty-five years were invalidated either partially or completely. The remainder either went untested or survived pretrial challenge.[124] The many untested patents lived on for other cases filed after 2009, but the data does not allow any inferences about their validity.

Looking at only patents reveals just part of the story, however. Most cases do not involve any invalidated patents or even any challenges testing patents. As the Table 11 shows, merits rulings occurred in even fewer contested cases. The following table summarizes the percentage of final—consolidated—cases in which patents where challenged, validity

124. A survival of trial challenge would result in a validity finding.

rulings issued, or both.[125] The columns are the same, first reporting percentages of all cases and then reporting percentages of cases involving a tested patent.

Table 11 also adds new information unavailable in other studies: an accounting for patents asserted in cases but later held invalid.[126]

This table shows that patents are partially or completely invalidated in 45% of all the NPE cases that tested at least one patent. This is slightly less than the 51% tally when measured on a per patent basis, which means that the invalidated patents are bunched into fewer cases.[127] The percentage of cases invalidating nonNPE patents remains about the same, at 25%, presumably because there are fewer patents in such cases and fewer consolidations.

TABLE 11

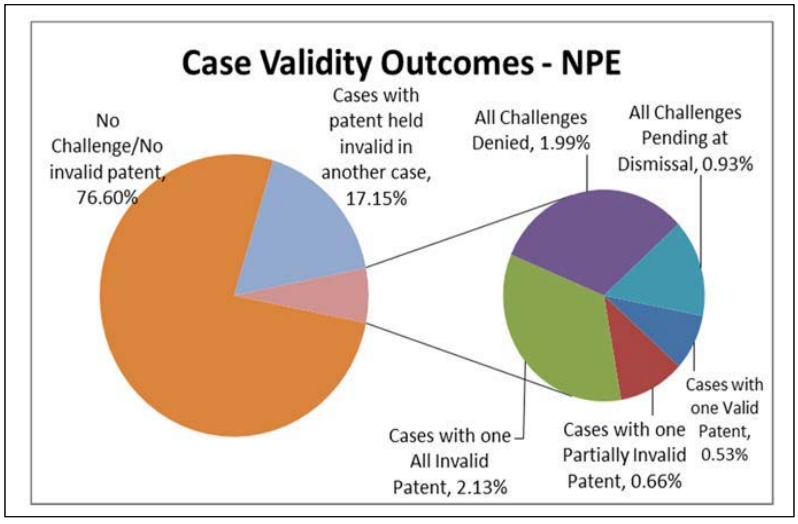
	NonNPE			NPE		
Consolidated Cases	1154			752		
Average Patents per Case	1.92			2.40		
	N	% All Cases	% Cases w/ Tested Patent	N	% All Cases	% Cases w/ Tested Patent
Cases Testing Patent	84	7.28%	100%	47	6.25%	100%
Cases with One Valid Patent	19	1.65%	22.62%	4	0.53%	8.51%
Cases with One Partially Invalid Patent	4	0.35%	4.76%	5	0.66%	10.64%
Cases with One All Invalid Patent	14	1.21%	16.67%	16	2.13%	34.04%
All Challenges Denied	26	2.25%	30.95%	15	1.99%	31.91%
All Challenges Pending at Dismissal	21	1.82%	25.00%	7	0.93%	14.89%
No Challenge/No Invalid Patent	1033	89.51%		576	76.60%	
Cases with Patent Held Invalid in Another Case	37	3.21%		129	17.15%	

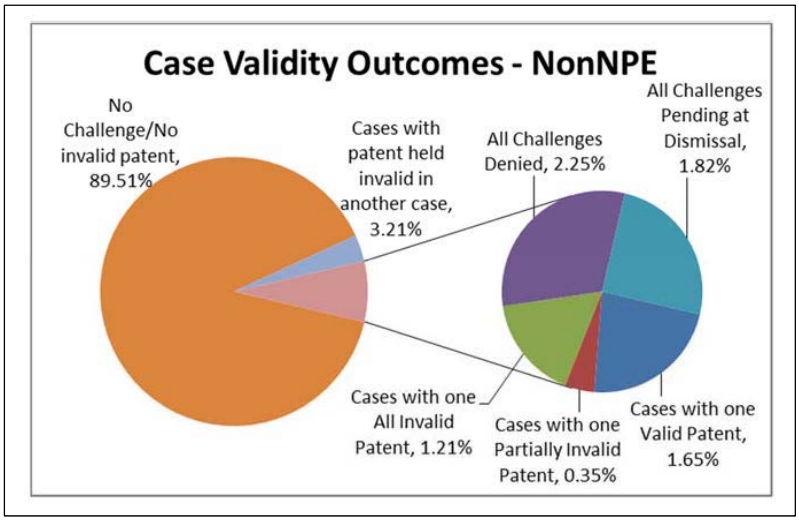
125. There were duplicates because multiple patents were tested in each case; duplicates were eliminated so that the most relevant holding of the case is reported.

126. Technically, they could have been held partially invalid in an earlier case as well.

127. *But see* Allison et al., *Realities of Patent Litigation*, *supra* note 8, at 1796 (noting that when multiple patents were asserted in a case, patentees were more likely to avoid loss).

FIGURE 5


Case Validity Outcomes - NPE
No Challenge/No invalid patent, 76.60%
Cases with patent held invalid in another case, 17.15%
All Challenges Denied, 1.99%
All Challenges Pending at Dismissal, 0.93%
Cases with one Valid Patent, 0.53%
Cases with one Partially Invalid Patent, 0.66%
Cases with one All Invalid Patent, 2.13%


Case Validity Outcomes - NonNPE
No Challenge/No invalid patent, 89.51%
Cases with patent held invalid in another case, 3.21%
All Challenges Denied, 2.25%
All Challenges Pending at Dismissal, 1.82%
Cases with one Valid Patent, 1.65%
Cases with one Partially Invalid Patent, 0.35%
Cases with one All Invalid Patent, 1.21%

Indeed, invalidated patents tend to group together in just a few cases. One reason for this may be that the patents are related. This is certainly true of invalidity findings in cases brought by Ronald A. Katz Technology Licensing. Allison, Lemley, & Walker call these patents the "Katz Effect" because the company filed so many cases based on so many patents.[128] In this study, Katz had ten patents partially or completely invalidated in a single ruling in a single case[129]—all based on one defective patent application.

A remaining key question is what happens in all of the cases—the vast majority—where courts do not invalidate a patent. The NPE-invalidated patents occurred in less than 3% of the cases, which means that only 21 out of 752 cases involved a partially or completely invalidated patent.[130] Four cases involved patents held valid, and the other 727 cases did not result in any kind of final merits ruling. This percentage is consistent with other cross-sectional studies of outcome.[131]

Here, there are some similarities and some differences between the studied groups. A similar percentage of cases led to the denial of all summary judgment challenges, about 2%. About twice as many of the nonNPE cases dismissed/settled with a challenge pending, but still less than 2%.

That leaves about 93% of nonNPE cases in which the validity of the patents is not challenged. A 3% chunk of the untested nonNPE cases involved patents that were later invalided. The NPE group saw a similar 93% of cases with untested patents. However, the portion of cases involving a patent partially or completely invalidated in later cases is much larger, at 17%. The effect of this difference is ambiguous. On a comparative basis, these NPEs were more than five times as likely to assert a patent of lower quality, and many settlements occurred based on patents that were later invalidated in whole or in part. Nonetheless, the plaintiffs' belief in validity at the time of assertion is unknown. Further, on an absolute basis, this still leaves 77% of the cases asserting patents with no challenge, no invalid patent, and no assertion of a patent later invalidated. Thus, while the impact is certainly disparate, the data does

128. *See* Allison et al., *Most-Litigated Patents*, *supra* note 24, at 26.

129. There had been more, and some were partially revived on appeal. *See In re* Katz Interactive Call Processing Patent Litig., 639 F.3d 1303 (Fed. Cir. 2011).

130. When recalculated by preconsolidated cases, the percentage is higher: 113 cases out of 916, about 12%, resulted in an eventual invalidation of some or all of a patent claim. But even this is a relatively small percentage of all cases. The compression of 113 preconsolidation cases down to twenty-two final cases implies that the preconsolidation cases most likely to involve invalidations are those with many patents or those with the same patents used many times against different defendants. For nonNPEs, by contrast, thirty-two preconsolidation cases compress to twenty-two postconsolidation cases.

131. *See* Kesan & Ball, *supra* note 8, at 275–76.

not allow any inferences about plaintiffs' prescience of which patents would eventually be tested and invalidated and which would not.

As the table shows, a key difference in merits outcomes is findings of patent validity. The nonNPE group had many more patents survive into trial, where the patents were upheld overwhelmingly and there were no appeals to test the jury's verdict. This is a marked difference from the NPEs, which preferred to settle their cases rather than go to trial. That is, there are selection effects at play. First, only the weakest patents are likely to be the subject of invalidation rulings; for many patents untested on the merits, summary judgment is denied[132] and parties often settle. Second, the NPEs were more likely to settle, even if they survived summary judgment challenges. That is, NPEs select into settlement rather than trial. This is not to say that there are no selection effects the other way. Competitors may settle to maintain business relationships. Further, nonNPEs are more likely to get an injunction,[133] which may change settlement dynamics. Nonetheless, NPE preference for settlement is relatively well documented—including in this Article[134]—and the data imply that NPE preferences to avoid trial outweigh nonNPE preferences.

This Article cannot answer what the 80% of cases involving untested patents and cases with pending and denied motions say about patent quality. Some believe that small settlements—under $2 million—make them nuisance cases and that NPEs will drop or settle as soon as defeat looks likely. There is surely some truth to this, though the small number of cases settled with motions pending does not strongly support the notion. Others believe that one cannot know whether a patent will be meritorious until it is actually tested and NPEs are simply asserting their rights. There is likely truth to this as well. And the truth may well apply differently to different entities.

Whether one considers such settlements a nuisance or not, the fact remains that many settled patents may have been found valid if they were

132. *See* Allison et al., *Realities of Patent Litigation*, *supra* note 8, at 1785 (finding that 70% of invalidity motions for summary judgment were unsuccessful for all cases filed in 2008 and 2009).

133. *See* eBay Inc. v. MercExchange, L.L.C., 547 U.S. 388, 396–97 (2006) (describing licensing firms as less likely to obtain injunctions).

134. *See, e.g.*, Ashtor et al., *supra* note 27, at 959 (finding NPEs more likely to settle); Ball & Kesan, *supra* note 8 at 20–21 (finding that licensing firms are more likely to settle); Haus & Juranek, *supra* note 23 (manuscript at 2) ("[W]e find that NPE cases are indeed resolved significantly faster.").

taken to trial.[135] When only judicially examined trial outcomes are at issue, the invalidation rates for NPEs and nonNPEs are much closer. Table 12 presents invalidity findings with trial verdicts removed. Thirty of the thirty-five nonNPE patents found valid at trial were not appealed.

TABLE 12

	NonNPE			NPE		
Patents	761			352		
	N	% All Patents	% Tested Patents	N	% All Patents	% Tested Patents
Tested	100	13%	100%	84	23.86%	100.00%
Held Valid	5	0.66%	5.00%	4	1.14%	4.76%
Held Partially Invalid	7	0.92%	7.00%	14	3.98%	16.67%
Held All Invalid	26	3.42%	26.00%	29	8.24%	34.52%
SJ Denied	37	4.86%	37.00%	26	7.39%	30.95%
SJ Pending at Dismissal	25	3.29%	25.00%	11	3.13%	13.10%
Asserted but Not Tested	661	86.86%		268	76.14%	

On an absolute basis, the number of patent invalidations is essentially the same as before. This is expected because the column measures how many patents in the entire population are invalidated rather than simply counting percentages of those patents that happen to make it to a merits ruling.

The column measuring the percentage of tested patents shows how sensitive the reporting is to the number of patents found valid. When patents held valid—more technically not invalid—but not tested on appeal are removed, the nonNPE invalidation rate gets closer to the NPE invalidation rate, moving from 25%:51% to 33%:51%, with an additional 7% increase in cases dismissed with challenges pending. In other words, one reason why nonNPEs have a smaller portion of invalidated patents is patents held valid without appeal—often by juries, an admittedly easier audience[136]—crowd out the other categories. When the selection preference for trial is negated, nonNPE patents are invalidated at a higher rate, though still not as high as NPE patents.

In other words, it could be—though we have no way of actually knowing—that if more NPE cases were tried and *then* settled without an

135. *See* PwC 2014, *supra* note 11, at 19 (showing that company NPEs from 1995–2013 won 25% of all their cases that reached a definitive merits ruling).

136. *See id.* at 8, 10–11 (showing differential win rates for bench trials, jury trials, and at the summary judgment stage).

appeal,[137] then the invalidation rates even among those adjudicated patents would match nonNPE rates.

This exercise is not meant to make a statement about the quality of patents so much as the reporting about the quality of patents. After all, NPE patents are still invalidated about twice times as often. Instead, the revised table shows that validity findings—which are not really findings at all, given that the next case can invalidate the same patent—are unhelpful in reporting patent quality.

2. Bases for Invalidity

Table 13 lists the primary bases for invalidity for each of the two groups.

The numbers are too small to reach any definitive conclusions, but two results—and a missing result—stick out. First, the NPE patents were far more likely to be invalidated for lack of written description and definiteness.[138] However, the result is subject to the Katz Effect. Ten of the thirteen NPE patents invalidated on written description were owned by Ronald A. Katz Technology Licensing, and they were all defective for very similar, if not the same, reasons.

Second, more of the NPE patents were invalidated based on statutory bars of publication and use more than one year before the filing date. On the other hand, nonNPE patents were invalidated on anticipation—based on the invention date—and obviousness—based on combining references. The reasons for these differences are unclear. It may be that the litigious NPEs were more likely to assert patents on inventions that were old, whereas nonNPEs were more likely to assert patents on improvements.

137. Consider a recent case involving Soverain, whose patent was affirmed as valid by a jury, like so many nonNPE patents. Newegg, found to have infringed on Soverain's patent, vowed never to settle and appealed to reverse the judgment. *See* Mullin, *How Newegg Crushed the "Shopping Cart" Patent and Saved Online Retail*, *supra* note 114.

138. A written description determines whether patentees described enough to show that they possessed the full claim scope, not whether the patent taught others to practice the claim. *See* Ariad Pharm., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1349 (Fed. Cir. 2010).

TABLE 13

	NonNPE		NPE	
Patents w/ Invalidated Claims	32	%	41	%
102(a)	7	21.21%	12	27.91%
102(b) Publication	0	0.00%	8	18.60%
102(b) Use	0	0.00%	4	9.30%
102(b) On Sale	4	12.12%	3	6.98%
103 Obvious	16	48.48%	3	6.98%
112 Enablement	0	0.00%	3	6.98%
112 Written Description	3	9.09%	13	30.23%
112 Definiteness	0	0.00%	14	32.56%
116 Inventorship	2	6.06%	5	11.63%

Third, notably absent are any invalidations based on patentable subject matter. Patent cases filed in 2008 and 2009 saw growth in such invalidations,[139] but none of the patents in the study were invalidated on that basis. This may weakly support the conclusion from *Patent Troll Myths* that the patents asserted by these particular NPEs were not all business methods[140] at the cost of weakly undermining the view that these NPEs are like other NPEs. A more likely explanation may just be that subject matter invalidations were new and rare at the time of this study.

3. Reexamination

Reexamination provides a different way to consider patent quality. During reexamination, the PTO reconsiders all of the claims of a patent, confirms validity of some claims, cancels some claims as invalid, and allows amendments and added claims. Several of the stays and "other dismissals" in the data were due to reexamination and invalidation of patents at the PTO.

Table 14 shows reexamination results for the patents in this study.

139. *See* Allison et al., *Realities of Patent Litigation*, *supra* note 8, at 1782.
140. Risch, *supra* note 3, at 475–77.

TABLE 14

	NonNPE		NPE	
Patents	791		352	
N Reexamined	137	17.32%	80	22.73%
Reexams Per Patent	1.31		1.34	
All Claims Valid	59	7.46%	28	7.95%
Any Claims Invalid	40	5.06%	49	13.92%
All Claims Invalid	21	2.65%	6	1.70%
Claims Amended	45	5.69%	26	7.39%
Claims Added	34	4.30%	22	6.25%

As the table shows, a slightly higher percentage of NPE patents were reexamined, though each reexamined patent faced the same average number of challenges.[141] The most striking difference between the two groups is the number of patents in which some, but not all, of the claims were held invalid. Surprisingly, the percentage of patents in which *all* claims were held invalid is smaller for the NPE group.[142] Because patentees can amend in reexamination, it is not surprising that higher invalidity findings were coupled with more amended and added claims.

An interesting question is whether the PTO is ruling on the same patents in the same way as the courts. It turns out that it is not. There is very little correlation between the patents adjudicated by the PTO, and the rulings are not highly correlated with litigation rulings.

Table 15 shows the correlations in rulings. Only two correlations are significant ($p<0.01$), and none of the others were below the 5% threshold.

141. A patent can be reexamined multiple times.

142. *See* Brian J. Love & Shawn Ambwani, *Inter Partes Review: An Early Look at the Numbers*, 81 U. CHI. L. REV. DIALOGUE 93, 94 (2014), https://lawreview.uchicago.edu/sites/lawreview.uchicago.edu/files/uploads/Love_Ambwani_Dialogue.pdf [https://perma.cc/8YP9-6Q3W] (finding NPE patents less likely to be invalidated in inter partes review).

TABLE 15

NonNPE		Litigation		
		Valid	Any Invalid	All Invalid
ReExam	Valid	0.17*	0	-0.05
	Any Invalid	0.07	-0.03	0
	All Invalid	-0.03	-0.02	0.02

NPE		Litigation		
		Valid	Any Invalid	All Invalid
ReExam	Valid	-0.03	0.07	0.02
	Any Invalid	-0.04	0.27*	0.03
	All Invalid	-0.01	-0.03	-0.04

As the table shows, for nonNPEs, the greatest overlap is for validated patents. There is very little correlation otherwise. Interestingly, the same correlation does not hold for NPEs. Instead, the only statistically significant correlation is whether some, but not all, patent claims are invalid.

The lack of correlation is not terribly surprising. Many of the stays granted in cases were to allow reexaminations to go forward. If the reexamination found a patent invalid, then it was not further tested in litigation and would have been logged as an "other dismissal" without a ruling on the merits.

4. Testing Measures of Patent Quality

One benefit of measuring outcomes in every case, rather than just those that resulted in a court order on the merits, is that the data allows for the first test of objective measures of patent "quality," such as the number of claims, the number of references cited by a patent, and the number of references citing a patent have almost no bearing on whether a court will eventually find the patent invalid. Because so few patents are actually judged on the merits—fewer than 100 out of 1600 in our sample—it is nearly impossible to statistically test whether a patent—once tested on the merits—will be invalidated. However, patents are asserted many times and most patents are never invalidated at all, either because they go untested or because they survive pretrial challenges and cases are settled before trial. This allows for a sufficiently large sample to fully test what

factors will lead to a likely invalidity finding of a given patent once asserted, as opposed to once tested.[143]

The problem is essentially a two-step selection problem: which patents are selected for merits consideration and, once considered, which patents are invalidated. However, estimates using the Heckman selection method revealed something curious: there is no correlation between those two questions. This is not terribly surprising because most of the factors one would use to test patent quality, such as citations and claims, have no statistically significant basis on outcomes.[144]

But this is not to say that outcomes are random. Using stepwise regression, this Article suggests that selection effects outweigh any measurable patent quality effects in determining which patents are invalidated.

The following table shows five successive logistic regressions.[145] They each test for a binary outcome: AnyClaimInvalid, which is 1 if the case held any claim in the patent invalid and 0 if the case did not. The estimations test whether a case invalidated one or all of a patent's asserted claims.

Regression (1) tests whether courts invalidate patents using traditional patent quality metrics—with the existence of NPEs included, given that a primary goal is determining whether NPEs assert weaker patents. The independent variables in estimate (1) include:

NPE: Is the plaintiff one of the most litigious NPEs.
Reexam-AnyClaimInvalid: 1 if the PTO found any claim invalid during a reexamination, 0 otherwise.
Reexam-Amended: 1 if the inventor amended a patent claim in reexamination—presumably to avoid invalidity—0 otherwise.

143. Miller, *supra* note 11, at 6–7, 52, attempts to estimate which patents in the general population would be invalidated.

144. This study becomes part of the growing body of work that questions the use of such metrics for patent value, including Allison et al., *Realities of Patent Litigation*, *supra* note 8, at 1798–99 (finding that patent citations do not affect validity outcomes), and David S. Abrams et al., *Patent Value and Citations: Creative Destruction or Strategic Disruption?* 21 (Nat'l Bureau of Econ. Research, Working Paper No. 19647, 2013), http://www.nber.org/papers/w19647 [http://perma.cc/DG54-LLX5] (finding that forward citations have U-shaped correlation with patent license value).

145. For robustness, errors in each regression are clustered by patent number because identical patents are presumably not independent.

Reexam-Added: 1 if claims were added to the patent in reexamination, 0 otherwise.
Log backwardcitations: The logarithm of the number of patents and other references cited by the patent at issue.
Log adjustedforwardcitations: The logarithm of the number of patents that cite to the studied patent, adjusted by yearly cohort.
Log pendency: The logarithm of the number of days between the very earliest priority date of the patent and its issuance.[146]
Log claimcount: The logarithm of the number of claims in the patent.
Log prioritytosuit: The logarithm of the number of days between the earliest patent application date and the lawsuit; a larger difference reduces prior art and makes it harder to invalidate.
Yearfiled: The year the case was filed.
Number of inventors: The number of inventors on a patent.
Number of continuations: how removed from the original filing are the claims?

The results of Regression (1) were a bit surprising. It was no surprise that NPE patents would be much more likely to be invalidated. Indeed, that factor seems to be doing all of the work because the NPE patents are invalidated much more often.[147] However, the fact that a patent claim was invalidated in reexamination is not significant. Although this is contrary to expectations, it is not surprising; as reported above, correlation between reexamination outcomes and invalidation in litigation is not high.

However, *adding* claims in reexamination is statistically significant and associated with a large reduction in the likelihood of an invalidity finding. Perhaps this is because such patents with added claims survive stronger than before, or perhaps because the added claims are narrower and more difficult to invalidate.

The only significant patent metric is backward citations, but the direction is surprising. One would think that more citations means the patent is stronger because it survived examination despite the PTO being aware of more prior art. Instead, more backward citations are associated with a fairly substantial increase in the odds of invalidation. The implications of this are discussed further below.

Finally, the year the case was filed is not significant. This is a bit surprising because the conventional wisdom is that asserted patents have

146. As an alternative, the regressions using the number of continuations were also tested with similar nonsignificant results.

147. To be clear, this regression is testing invalidity in the *original* case, and in the original case, NPE patents are invalidated in whole or part about five times as often. However, because cases are consolidated, that ratio is reduced for *final* cases. These regressions use original cases because the selection effects can be better tested that way.

become weaker over time.[148] The fact that some cases remain open may not be a sufficient explanation; more cases are open from 2006/2007 than from 2008/2009, and many open cases have invalidity findings in any event.

Regression (2) adds several more factors that relate more to selection for challenge than to quality:

> *Reexamined*: The number of times the patent has been reexamined, either because the patentee sought to enforce the patent or because threatened defendants sought reexamination.
>
> *Stayed*: 1 if the case was ever stayed, 0 otherwise. Cases are often stayed pending reexamination by aggressive defendants, though there were a few bankruptcy stays.
>
> *Xfer/Consolidation*: 1 if the case was ever transferred or consolidated. This too can imply an active defendant or a high-activity patent.
>
> *NumDefs*: The number of defendants in a case. The more defendants, the more likely one will challenge the patent.
>
> *Dec. Relief*: Whether the case was solely a declaratory relief action by a defendant.
>
> *PriorAssertions*: The number of times the patent has been asserted as of the case filing date, including the current case. Cases filed on the same day have the same number assigned.
>
> *TotalAssertions*: The number of times the patent was asserted in all cases in the set.
>
> *NumPatentsCase*: The number of patents in the same case as the studied patent.
>
> *MeritInfringeRuling*: Whether the judge or jury issued a ruling on infringement in favor of either party in the case. Presumably, active cases will be more likely to have an infringement ruling.[149]

148. Other unreported regressions suggested by others for results after claim construction—Markman hearings—and after 2006 yielded little differences, for example.

149. For a discussion on the overlap between validity and infringement rulings, see *infra* Part IV.D.

TABLE 16

AnyClaim Invalid	(1)	(2)	(3)	(4)	(5)
NPE	3.592** (0.004)	2.128 (0.083)	2.213 (0.066)	1.983 (0.093)	
Rinvalid once	2.269* (0.019)	0.833 (0.745)			
Amended	1.615 (0.613)	1.303 (0.744)			
Added	0.0715** (0.002)	0.0278*** (0.001)	0.0325*** (0.001)	0.0451** (0.001)	0.0283*** (0.001)
Logbackward	1.439* (0.020)	1.441* (0.033)	1.446* (0.032)	1.432* (0.023)	1.443* (0.020)
Log adjforward	1.082 (0.581)	1.226 (0.270)	1.228 (0.265)	1.182 (0.362)	1.197 (0.335)
Logpendency	1.281 (0.648)	0.999 (0.999)	0.999 (0.997)	0.997 (0.993)	0.992 (0.984)
Logclaims	1.068 (0.676)	1.080 (0.634)	1.063 (0.711)	1.067 (0.677)	1.086 (0.589)
Yearfiled	0.993 (0.846)	1.063 (0.291)	1.059 (0.318)	1.061 (0.288)	1.045 (0.424)
Logpriority tosuit	0.478 (0.087)	0.400* (0.034)	0.377* (0.022)	0.383* (0.024)	0.538 (0.124)
Number of Inventors	0.847 (0.192)	0.900 (0.264)	0.896 (0.257)	0.904 (0.392)	0.886 (0.308)
Number of Continuations	0.995 (0.877)	1.002 (0.948)	1.001 (0.979)	0.993 (0.818)	0.991 (0.775)
Rexamined		1.502 (0.124)	1.439* (0.020)	1.478** (0.009)	1.489** (0.009)
Stayed		7.335*** (0.000)	7.207*** (0.000)	6.209*** (0.000)	7.118*** (0.000)
Xfer out?		8.792*** (0.000)	8.773*** (0.000)	9.076*** (0.000)	9.155*** (0.000)
NumDefs		1.032*** (0.000)	1.032*** (0.000)	1.032*** (0.000)	1.032** (0.002)
DJ		0.969 (0.936)	0.968 (0.932)	1.051 (0.889)	1.077 (0.835)
TimeAssert		0.970* (0.031)	0.971* (0.032)	0.969* (0.024)	0.969* (0.022)
TimesAsserted		1.042*** (0.000)	1.041*** (0.000)	1.035*** (0.000)	1.038*** (0.000)
NumPatents		0.963* (0.041)	0.962* (0.041)	0.964* (0.039)	0.963* (0.046)
Merit Infringement		10.17*** (0.000)	10.03*** (0.000)		
Observations	5565	5562	5562	5562	5562
Pseudo R^2	0.180	0.354	0.354	0.317	0.314
Chi-squared	115.5	239.0	241.4	209.7	211.8
p>chi2	0.000	0.000	0.000	0.000	0.000

Exponentiated coefficients; *p*-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results of Regression (2) are somewhat less surprising. Most of the factors that one would expect might lead a patent to be challenged are statistically significant. Rulings on infringement especially appear to be highly correlated with rulings on invalidity. It appears that selection metrics play a more important role in determining whether a patent is invalidated than quality metrics.

The one surprise in Regression (2) is that NPE status is no longer statistically significant. Once other case factors are considered, such as the number of defendants, the number of assertions, et cetera, whether the party is an NPE adds little explanatory value. This will be tested further in Regression (5).

Regression (2) does expose one oddity: invalidity in reexamination is no longer significant. On the other hand, whether a patent was reexamined is positively correlated but not significant either. These two likely offset each other.

Regression (3) drops the insignificant reexamination outcome factors, and the result is that the fact of reexamination is now statistically significant. It appears that reexamination may be a selection factor as well; high impact patents are more likely to be reexamined and also more likely to be challenged in court.

Whether the court ruled on infringement is surely explanatory, but it may overdetermine the model by capturing all of the unobserved reasons why some parties take their cases to judgment and others do not. Regression (4) tests this by removing the factor from the regression. As the drop in Pseudo R^2 shows, the model captures less of the variation, but the chi-squared statistic actually increases. However, most of the other coefficients stay essentially the same, except for Xfer/Consolidate, which doubles. This implies that some of the same factors that led to more infringement rulings may have led to more transfers and consolidations. To the extent that NPEs might assert more noninfringed patents—as discussed below—and *also* file cases subject to more transfers—as discussed above—this means that NPE choices lead to patent invalidity decisions even if the quality of their patents might not.

Finally, Regression (5) tests the NPE question directly. It drops NPEs from the regression, and finds it virtually unchanged. NPE status has almost no explanatory value above and beyond other measurable selection effects. As noted, some of the factors relate to NPE status but do not fully explain it. For example, an unreported regression replacing Xfer/

Consolidate with NPE in Regression (5) does not lead to a statistically significant result (p=0.065).

These stepped regressions imply that, among the more than 5500 opportunities for courts to invalidate a patent, the most statistically—and magnitudinally—significant factors influencing invalidation related to whether the plaintiff asserted a patent in a way that was more likely to invite a patent challenge.

In Regression (4), NPE status yields a coefficient of nearly 2 and is nearly significant. One question is whether a larger sample that included less litigious NPEs—who win more often—or more individuals—who lose more often—would change this. The answer is unclear. In an unreported regression, inventor-owned companies and product companies were significantly less likely to have their patents invalidated than licensing-only companies. Some of the inventor-owned companies were in the nonNPE group. Further, individual plaintiffs, which were only in the nonNPE group, and IP-licensing arms of product companies, which were in both groups, did not see a single invalidation and were dropped from the regression. This implies that while plaintiff type may be relevant to patent invalidation, more granularity than "NPE" is required in assessing likelihood of invalidity.

To be sure, there were unobserved patent quality factors that affected whether to mount a challenge and whether that challenge was successful, but those quality factors are neither on the face of the patent nor explained by aggregated NPE status.[150]

Most counterintuitively, the *more* prior art cited by a patent, the more likely a patent was to be invalidated. This is the exact opposite of what one would expect to see. The conventional wisdom is that more prior art means that the claims have been "bullet-proofed" against prior art. More likely, however, it appears that more prior art means that the claims are the most likely to be aggressively challenged in patent office reexaminations—leading to more prior art citations—and more aggressively litigated—leading to more invalidity findings.[151]

5. Policy Implications

Do NPEs really assert weaker patents than other patent plaintiffs? The answer is yes, NPE patents are invalidated more often. But the level of

150. Testing using NBER technology categories yielded little information. Most NPE patents were in group twenty-one, computer communications—so many that the results were unhelpful. A future article will test whether software patents are invalidated more often.

151. *See, e.g.*, Lei & Wright, *supra* note 4 (manuscript at 4) (suggesting that patent examiners work harder to find prior art to invalidate weaker patents).

concern depends on how one frames the data. Reporting invalidations as a percentage of all *patents* asserted makes the absolute difference appear much smaller. Reporting them as a percentage of all *cases* reduces the difference even further, and the absolute effect to less than three percent of all cases filed.

In other words, while any given NPE case was about twice as likely to result in invalidation, the magnitude of this difference was a blip in the patent litigation ecosphere, affecting less than 3% of all pending cases. The quality of the remaining patents is ambiguous: settlements might occur because the patents are strong, because the patents are weak, because defendants feared a jury, because the NPE sought a reasonable settlement that reflected the value of the patent, or because the NPE sought a nuisance settlement that overvalued the patent but remained less than trying the case.

The regression estimates in this case imply that the NPE patents were invalidated more often because the plaintiff sued more defendants more often and more aggressively. This implies that invalidation is largely based on a combination of selection and unobserved patent quality characteristics. It would be helpful to discover what factors might lead to the invalidation of a patent, but—at least among these parties—mere status as a litigious NPE does not provide enough information.

Furthermore, the data implies the PTO and the courts run on two different tracks, examining different patents. Patents that survive reexamination are tested in litigation, and vice versa. This is a consideration for any policy considering delay of litigation for PTO proceedings.

Thus, the invalidity findings have important implications. First, they show that only a very small percentage of all patents asserted and an even smaller percentage of cases involve patents held invalid. Second, they show that patents tested at trial but not appealed tend to be upheld. Third, they are important for what they do not show: whether the lack of NPE validity findings at trial is due to socially undesirable behavior by highly litigious NPEs or is otherwise indicative of quality of their patents.

In this sense, this study both confirms and contradicts other studies to date. It is consistent with overall win rates reported in recent comprehensive studies.[152] It contradicts other studies of only final rulings, showing that the most litigious NPEs win far less often than NPEs generally.[153] For the

152. *See, e.g.*, Allison et al., *Realities of Patent Litigation*, *supra* note 8.
153. *See* PwC 2014, *supra* note 11.

most part, however, it provides data that is simply unavailable in other studies of NPEs generally or of highly litigious NPEs specifically.

The finding about backward citations is surprising and has an important policy implication: spending time and effort bulletproofing a patent, whether by the patentee[154] or during a "gold plating"[155] review, may be wasted.[156] If a patent is asserted multiple times, it will be invalidated regardless of such efforts.

D. Infringement Outcomes

A patentee must win two halves of each case: validity and infringement. If the facts support it, noninfringement may be an easier defense, as it requires no research in old prior art.[157] This section considers infringement outcomes in this study.

1. The Data

Of specific interest are those cases in which patent infringement was tested on the merits. Table 17 shows cases with any infringement motion or trial on the merits. The results are similar to invalidity—nonNPEs go to trial much more often, and when they do, they win more often. The NPE patents were found noninfringing almost twice as often: 53% of the tested patents versus 28%. Additionally, another 15% of NPE cases—compared to 1.5% for nonNPE—involved findings of noninfringement as to some defendants in a case but not others. The NPE patents were asserted against more defendants at once, so this difference is not surprising. Of the two infringement findings in favor of NPEs, one was at trial with a $16 million damages award and one was on summary judgment for the plaintiff and is still pending.

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154. *See* F. Scott Kieff, *The Case for Registering Patents and the Law and Economics of Present Patent-Obtaining Rules*, 45 B.C. L. REV. 55, 116 (2003) (identifying problems with the ex parte nature of patent reexamination).

155. *See* Doug Lichtman & Mark A. Lemley, *Rethinking Patent Law's Presumption of Validity*, 60 STAN. L. REV. 45, 50 (2007) ("Congress or PTO officials should create a new opportunity for patent applicants to 'gold-plate' their patents—funding and submitting to a vigorous review process in the PTO, and in return earning a significant presumption in favor of patent validity.").

156. This is supported further by evidence that patent examiners generally do not consider material cited by applicants. Christopher A. Cotropia, Mark A. Lemley & Bhaven N. Sampat, *Do Applicant Patent Citations Matter?*, 42 RES. POL'Y 844, 853 (2013).

157. *See generally* Allison et al., *Realities of Patent Litigation*, *supra* note 8 (finding that defendants were much more successful in noninfringement motions than on invalidity motions, and that the combination of the two meant that patentees win only 25% of the time).

TABLE 17

	NonNPE			NPE		
Patents	791			352		
	N	% Total	% Tested	N	% Total	% Tested
Tested	224	28.32%	100.00%	94	26.70%	100.00%
Infringed	57	7.21%	25.45%	2	0.57%	2.13%
Inf. By Equivalents	6	0.76%	2.68%	0	0.00%	0.00%
Not Infringed	64	8.09%	28.57%	50	14.20%	53.19%
Some D's Do Not Infringe, Others SJ Denied	4	0.51%	1.79%	15	4.26%	15.96%
SJ Denied/Moot	95	12.01%	42.41%	50	14.20%	53.19%
SJ Pending at Dismissal	52	6.57%	23.21%	23	6.53%	24.47%

More than 14% of all the NPE patents asserted were found noninfringing at one point or another. This is almost twice the 8% of patents found invalid. More nonNPE patents were found noninfringing versus invalid as well.[158] Further, the very small number of infringement findings for these NPEs was surprising, as it is well below the win rate for all NPEs.[159] This illustrates concerns with defining NPEs as any company or person that does not sell a product. There is clearly a large variation in litigation merits among parties collectively called NPEs.

Like invalidity, the noninfringement findings appear to be limited to fewer cases than the percentage of patents. This is not surprising, given that multiple patents are asserted in each case. The following table shows the infringement data by *original* case number. Unlike validity, in which consolidated defendants will each attack the patent on similar grounds, infringement defendants in different cases will often have different products and thus different bases for noninfringement. Thus, reporting by original case rather than final case provides the appropriate level of granularity.

158. *See id.* at 1784, 1790 (finding that noninfringement was a basis for defendant victory twice as often as invalidity).

159. *See* PwC 2014, *supra* note 11, at 19.

TABLE 18

	NonNPE			NPE		
Cases	1292			874		
	N	% All Cases	% Tested	N	% All Cases	% Tested
Cases Testing Infringement	177	13.70%	100.00%	100	11.44%	100.00%
Infringed	58	4.49%	32.77%	2	0.23%	2.00%
Infringed By Equivalents	6	0.46%	3.39%	0	0.00%	0.00%
Not Infringed	49	3.79%	27.68%	66	7.55%	66.00%
Some D's Do Not Infringe, Others SJ Denied	2	0.15%	1.13%	1[160]	0.11%	1.00%
SJ Denied/Moot	39	3.02%	22.03%	18	2.06%	18.00%
SJ Pending at Dismissal	23	1.78%	12.99%	13	1.49%	13.00%
Cases Not Testing Infringement	1115	86.30%		774	88.56%	

It appears that 14.2% of the NPE patents were found noninfringing in 7.55% of the cases. More importantly, an NPE case was about twice as likely to end with a noninfringement ruling.[161] Even nonNPEs were subject to noninfringement rulings in many more cases than invalidity.

The data implies that a greater failing of NPEs and nonNPEs alike is not the assertion of invalid patents—though that certainly exists—but instead the assertion of noninfringed patents.[162] For NPEs, especially, this is consistent with a "war chest" model, in which more broad and potentially lucrative patents are asserted against more and larger defendants as time passes.[163]

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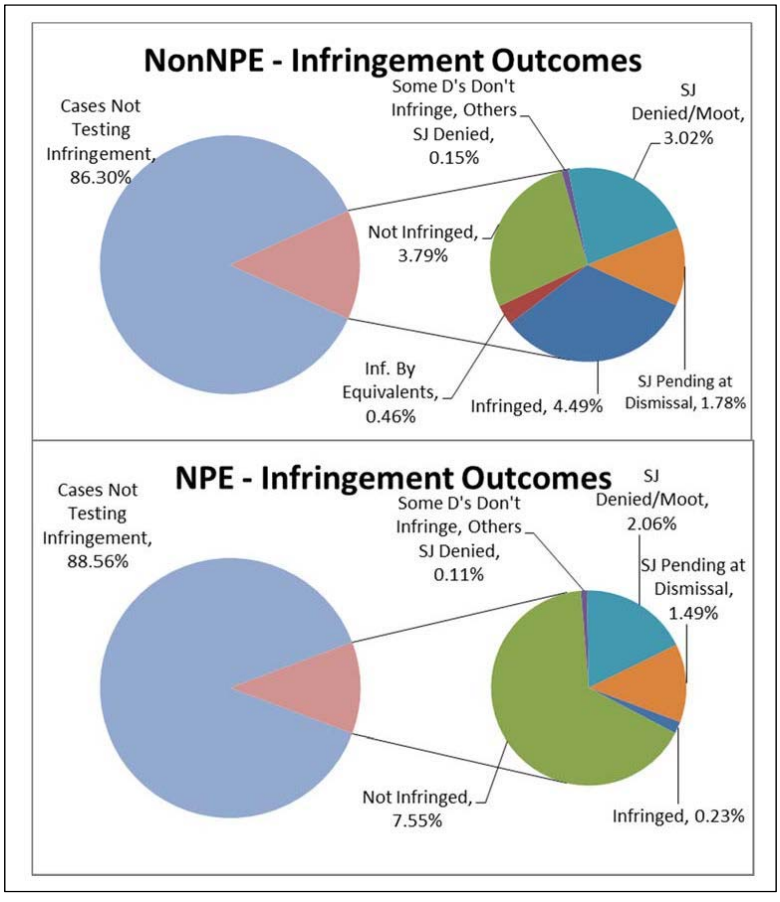
160. There were actually three such cases, but two were removed because the cases were included in another category.

161. This is consistent with other cross sectional studies. *See, e.g.*, Kesan & Ball, *supra* note 8, at 275.

162. *See* Michael Risch, *What Is a Patent Troll?*, PRAWFSBLAWG (Apr. 15, 2011, 4:50 PM), http://prawfsblawg.blogs.com/prawfsblawg/2011/04/what-is-a-patent-troll.html [http://perma.cc/U88F-Q4ZR] ("Individuals are rarely called trolls. One might think this is because of the garage inventor ethos. I'm doubtful, though, because individuals become trolls when they gather enough resources and sue enough defendants to get noticed. At that point, they may be more likely to try to stretch their patents to cover technologies that they did not invent. This, I think, leads to the real definition for me—I think trolls are trolls when they overreach.")

163. *See* David L. Schwartz, *The Rise of Contingent Fee Representation in Patent Litigation*, 64 ALA. L. REV. 335, 368 (2012) ("Rather than suing them all at once, the patentee asserts its patent in waves. Typically, weaker defendants are approached or sued initially.").

FIGURE 6



However, one should not overextend inferences of the data. Like invalidity, these results were only a small fraction of all the patents asserted. Motions for summary judgment were denied and left pending at dismissal at nearly equal rates between the two groups. A jury never saw most of those cases, especially for NPEs, and they are not reflected here. Thus, there may well be a selection effect: perhaps only the most clearly noninfringing defendants filed and won motions, whereas the remaining 85% or more of the cases included at least a colorable claim for infringement.

Further, unlike validity, there is no principled way to tally patents asserted that are found noninfringing in other cases because infringement is different for each defendant.

Of course, a few of the NPE cases may have overextended the claims *and* relied on a poor quality patent. Table 19 shows infringement findings for just those patents where all asserted claims are found invalid. There is a noticeable overlap with noninfringed patents. Of the 59 NPE patents found noninfringing, 11 were *also* found completely invalid.[164] NonNPEs fared little better and arguably worse—four of their infringed patents were found completely invalid, and eight of their noninfringed patents were also found completely invalid. This leaves 39 NPE patents and 56 nonNPE patents held noninfringing available to be asserted in other cases.

TABLE 19

Patents Completely Invalid	NonNPE	NPE
Patents Literally Infringed at Least Once	2	0
Patents Infringed by Equiv. at Least Once	2	0
Patents Found Noninfringed at Least Once	8	11

Table 20 presents findings of patent validity. Only 21 of the original 57 nonNPE literally infringed patents were found both fully valid and infringed. This odd result stems from the nature of validity challenges. Invalidity is a defense, so if there is no real evidence then the jury never rules. Patentees simply win infringement without any validity ruling. This result is common in, for example, Monsanto cases where the patent is never seriously challenged. The one NPE valid and infringed result is the *one* jury verdict in favor of an NPE—the other infringement finding came on a patent held partially invalid. However, a finding of validity in the noninfringed cases allows the patent to be asserted in the future, such as the three NPE patents found valid but not infringed.

164. Another 12 NPE patents were found noninfringed with some, but not all, of the claims held invalid. The remaining claims could live another day.

TABLE 20

Patents Found Valid	NonNPE	NPE
Patents Literally Infringed at Least Once	21	1
Patents Infringed by Equiv. at Least Once	1	0
Patents Found Noninfringed at Least Once	11	3

The final infringement comparison counts how many patents survived validity challenges at least partially intact but avoided any infringement ruling at all on the merits—they were simply never tested, presumably due to settlement. The totals are relatively small: seventeen for nonNPEs and sixteen for NPEs. This was a bit surprising because one would expect more settlements when patents survive validity challenges. However, the small numbers may imply the opposite. First, if the patents survive validity challenge, then some patent holders—NPEs included—are unlikely to settle. This may mean that at least some cases are not simply cost of litigation nuisance suits. Second, when a patent holder does reach, it tends to be a complete overreach—a weak patent stretched to the limits of claim breadth[165] such that very few losing patents escape judgment on both validity and infringement.

Alternatively, judges could be predisposed against patent trolls, finding against them in every way possible to end each case. This is unlikely—with respect to this particular issue, at least—because NPEs and nonNPEs seem to have the same small rate of patents that survive challenge but avoid infringement.

Finally, it could mean that there are several defendants that know they are infringing but believe the patent is invalid. They would maintain the case long enough to challenge validity but settle if they lose. This would explain these examples and perhaps those three patents that were found infringed but were later held invalid.[166]

165. The broader patentees claim their patents to be, the more likely they are to be invalid because more prior art might apply.

166. Note that two of those three—the NPE patents—were found invalid in *different* cases.

2. Policy Implications

Comparing infringement outcomes is a bit ambiguous from a policy perspective. On the one hand, infringement findings have little to do with the quality of the patent because they are based on the accused product or service. On the other hand, lack of infringement success implies that a party is bringing a meritless case.[167]

In this sense, patent troll critics are attempting to have their cake and eat it too, claiming that the patents are software that is so broadly defined it covers everything but simultaneously bringing weak cases against products that do not infringe. The data here helps settle that issue a bit: to the extent that courts actually rule on infringement, the NPE claims do not seem to be overbroad—even though the patent owner might wish it were so. Instead, defendants who challenge infringement seem to be able to convince courts that their products are not covered by the patent.[168] This is not to say that the enterprise is costless; getting to that judgment costs time and money. However, that is a different problem than patentees asserting claims that are so broad that everything infringes. Furthermore, even though patents are not so broad as to be infringed, they are still ruled invalid, though for highly litigious NPEs this is often based on things other than the prior art.

Because adjudicated patents are such a small portion of the total, this small window does not tell us about all of the patents that resulted in settlements. Some would argue that settled patents are the ones that are too broad or perhaps just nuisances. Others would argue that settled patents are most likely to win and thus are never challenged. The truth surely lies in between.

This data set provides more information than was available before: a number of cases ended in default judgments and consent judgments. The damages sought in many of these cases were quite small—some as low as $7500—implying that the suits may not have even been to extract a settlement based on litigation costs. As to the rest, unfortunately, the answer depends on whether one thinks the unchallenged patents look like the challenged ones. It is likely that the narrowest patents are challenged, and therefore the untested patents are probably broader. Just how much broader is a difficult question.

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167. *See* Allison et al., *Patent Quality*, *supra* note 5, at 687 (finding a 10% win rate among the most litigated patents).

168. *See* Mark A. Lemley et al., *Does Familiarity Breed Contempt Among Judges Deciding Patent Cases?*, 66 STAN. L. REV. 1121, 1140–43 (2014) (finding that judges who issue more merits rulings are more likely to find more noninfringement rather than invalidity).

V. CONCLUSION

Patent policy in the age of NPEs has many moving parts. The key is to find the right combination of rules and reforms to improve outcomes for all participants in the system. This Article sheds light on patent quality and outcomes among highly litigious NPEs and nonNPEs. There are four key takeaways, among other interesting results.

First, although a larger percentage of NPE patents were invalidated, very few cases involved an invalidated patent. Second, predicting which patents were invalidated had more to do with case-specific factors, such as the number of defendants, than with objectively measurable patent quality indicators. Third, once these factors are considered, whether the plaintiff was an NPE was not statistically significant. Of course, NPEs made choices about who to sue and how many cases to bring. But nonNPEs who made similar choices faced similar odds of invalidation for the same choices. Fourth, while still a small fraction of all cases, noninfringement was a more common reason for NPE loss.

Together, these findings imply some direction for patent reform proposals. Rules targeted at specific entities would be missing the point because plenty of invalid patents would still be asserted by nonNPEs. Further, any rules designed to increase the likelihood that parties avoid settlement and instead seek judgments on the merits should be balanced against (a) the costs of getting to such judgments, and (b) the possibility that NPEs might win more often if their cases are pushed to the merits rather than settled. After all, many motions for summary judgment were denied. Of course, NPEs might not win, and so the goal should be reducing duration and costs. Mutual fee shifting may be an option that serves these dual purposes because defendants would have an incentive to challenge, but it would also face the risk of driving up defense costs if the challenge is ill-advised. Fee shifting might also make it easier for small defendants to obtain contingency defense counsel.

Furthermore, rules that make it easier to determine whether a case is high-stakes enough to challenge may be helpful. Improved certainty in damages might help the parties make such determinations. Ironically, the AIA's requirement that each defendant be sued separately may not have been a helpful change. Given that cases with many defendants were those most likely to see challenges and invalidation, forcing NPEs to sue defendants separately may have reduced the likelihood of invalidation.

Finally, early certainty about infringement might be the best place to focus reforms. Early claim construction conducted in light of the accused

product would give all parties a better, cheaper look at whether a case will be successful.

In all events, this Article provides data that might guide policy in the future.