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Heterogeneity Among Patent Plaintiffs: An Empirical Analysis of Patent Case Progression, Settlement, and Adjudication

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Heterogeneity Among Patent Plaintiffs: An Empirical Analysis of Patent Case Progression, Settlement, and Adjudication

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This article empirically studies current claims that patent trolls, also known as patent assertion entities (PAEs) or non-practicing entities (NPEs), behave badly in litigation by bringing frivolous patent infringement suits and seeking nuisance fee settlements. The study explores these claims by examining the relationship between the type of patentee-plaintiffs and litigation outcomes (e.g., settlement, grant of summary judgment, trial, and procedural dispositions), while taking into account, among other factors, the technology of the patents being asserted and the identity of the lawyers and judges. The study finds significant heterogeneity among different patent holder entity types. Individual inventors, failed operating companies, patent holding companies, and large patent aggregators each have distinct litigation strategies largely consistent with their economic posture and incentives. These PAEs appear to litigate differently from each other and from operating companies. Accordingly, to the extent any patent policy reform targets specific patent plaintiff types, such reforms should go beyond the practicing entity versus non-practicing entity distinction and understand how the proposed legislation would impact more granular and meaningful categories of patent owners.

I. Introduction

There is a popular belief that an "explosion of patent litigation," driven by a particular type of patent holder, is the key contributor to a national epidemic that supposedly has

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cost the economy $320 billion within five years.[1] Even President Obama announced a number of actions and asked Congress to enact legislation to combat this patent assertion problem.[2] And this increase in patent litigation is driven, the current thinking goes, by a particular class of patent holder— "patent assertion entities" (PAEs)[3] or "nonpracticing entities" (NPEs)[4] (also referred to by some as "patent trolls"). Those proposing this legislation point to these PAEs in general as causing the sharp increase in patent litigation and settling more cases before trial than in the past.[5] Because these entities make no products, they are immune from counterclaims for patent infringement in a way that operating companies are not.[6] The current narrative is that they sue thousands of defendants,[7] from operating companies to individual consumers of allegedly infringing products,[8] carefully picking the judicial districts where they bring their patent lawsuits[9] and asserting questionable Internet patents.[10] PAEs[11] rely heavily on the

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[1]Laurie White & Dale Venturini, Protect Main Street from Patent Trolls, Providence J., Feb. 27, 2014 (http://www.providencejournal.com/opinion/commentary/20140227-laurie-white-and-dale-venturini-protect-main-street-from-patent-trolls.ece).

[2]The White House Office of the Press Secretary, FACT SHEET—Executive Actions, Answering the President's Call to Strengthen Our Patent System and Foster Innovation (http://www.whitehouse.gov/the-press-office/2014/02/20/fact-sheet-executive-actions-answering-president-s-call-strengthen-our-p).

[3]Colleen V. Chien, From Arms Race to Marketplace: The New Complex Patent Ecosystem and its Implications for the Patent System, 62 Hastings L.J. 297 (2010) (coining the term "patent assertion entity").

[4]Robin Feldman, Thomas Ewing & Sara Jeruss, The AIA 500 Expanded: The Effects of Patent Monetization Entities, 11 Duke L. & Tech. Rev. 357 (2014).

[5]Megan M. La Belle, Against Settlement of (Some) Patent Cases, 67 Vand. L. Rev. 375 (2014).

[6]Brian J. Love, An Empirical Study of Patent Litigation Timing: Could a Patent Term Reduction Decimate Trolls Without Harming Innovators? 161 U. Pa. L. Rev. 1316 (2013) ("Because NPEs do not sell products that could be the subject of a counterclaim, they do not face this risk when filing suit.").

[7]RPX 2015 Report, NPE Litigation, Patent Marketplace, and NPE Cost at 8, Chart 3 (2015) (finding over 4,000 defendants in NPE cases in 2014).

[8]Joe Mullin, Patent Trolls Want $1,000—For Using Scanners, Ars Technica (Jan. 2, 2013) ("But in the history of patent trolls, 2012 may go down as the 'year of the user.' The [letters described in the article] are a particularly alarming example of a practice that has become commonplace in the past year or two—going after the users of basic technologies.").

[9]The patent lawsuit venue criticism may change after the recent U.S. Supreme Court decision in T.C. Heartland LLC v. Kraft Foods Group Brands LLC, No. 16–341 (decided May 22, 2017) (https://www.supremecourt.gov/opinions/16pdf/16-341_8n59.pdf).

[10]Colleen Chien & Michael Risch, Recalibrating Patent Venue, 77 Md. L. Rev. (forthcoming 2018); Brian Love & James Yoon, Predictably Expensive: A Critical Look at Patent Litigation in the Eastern District of Texas, 20 Stanford Tech. L. Rev. 1 (2017).

[11]While we recognize that some people use NPE, PAE, and patent troll interchangeably while others differentiate among the terms, in this article we will use "PAE" to mean all entities that assert patents in litigation without concurrently manufacturing or selling products. We divide PAE into various types, which is explained in Section III.A.

asymmetric costs of litigation, which swing heavily in their favor since they have few documents to produce in discovery.[12] PAEs also collect "nuisance fees" from those afraid of expensive litigation.[13] In contrast to this general class of PAEs, companies that assert patents that are embodied in their own products and/or services, referred to as "operating companies," are seen as behaving in an acceptable and more predictable manner when engaged in patent litigation. To combat this "explosion" of PAE litigation, in 2016 Congress proposed new litigation and civil procedure rules applicable only to patent cases, including some directed specifically at those who do not practice the patent.[14]

However, there is also a counternarrative in the literature that is supported with data and analysis. There is an increasing realization among academics that this "explosion" in patent litigation may be overblown. A major factor is the anti-joinder provision of the 2011 Leahy-Smith America Invents Act (AIA).[15] That provision required that a patent holder file a separate lawsuit against each unrelated defendant,[16] reversing the practice of some courts that permitted unrelated defendants to be sued in a single lawsuit.[17] After the AIA was passed, there were an increased number of suits filed,[18] as

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[12]General Accounting Office, Intellectual Property: Assessing Factors that Affect Patent Infringement Litigation Could Help Improve Patent Quality at 10 (August 2013) (http://www.gao.gov/assets/660/657103.pdf) ("parties that do not offer products or services using the patents at issue often have far fewer documents to disclose—because they do not have any documents related to their products or services—than patent owners or accused infringers who do offer products or services").

[13]Jim Spencer, Patent Trolls Collect "Nuisance Fees" and Political Enemies, Star Tribune, June 15, 2013 (http://www.startribune.com/business/211615651.html) ("You end up with companies that aren't making anything, trying to extract a nuisance fee.")

[14]Paul R. Gugliuzza, Patent Litigation Reform: The Courts, Congress, and the Federal Rules of Civil Procedure, 95 B.U. L. Rev. 279 (2015); see Innovation Act, Proposed Revision to 35 U.S.C. 299 (requiring that, upon a showing that the patentee "has no substantial interest in the subject matter at issue other than asserting such patent claim in litigation," the other interested parties can be joined to the lawsuit to pay potential awards of attorney fees.)

[15]35 U.S.C. § 299 (2012). See generally David O. Taylor, Patent Misjoinder, 88 N.Y.U. L. Rev. 652 (2013).

[16]Section 299, in relevant part, requires that accused infringers may be "joined in one action as defendants or counterclaim defendants, or have their actions consolidated for trial, only if—(1) any right to relief is asserted against the parties jointly, severally, or in the alternative with respect to or arising out of the same transaction, occurrence, or series of transactions or occurrences relating to the making, using, importing into the United States, offering for sale, or selling of the same accused product or process; and (2) questions of fact common to all defendants or counterclaim defendants will arise in the action."

[17]Fabio E. Marino & Teri H.P. Nguyen, Has Delaware Become the "New" Eastern District of Texas? The Unforeseen Consequences of the AIA, 30 Santa Clara High Tech. L.J. 527 (2014) (http://digitalcommons.law.scu.edu/chtlj/vol30/iss4/3).

[18]Robin Feldman, Thomas Ewing & Sara Jeruss, The AIA 500 Expanded: The Effects of Patent Monetization Entities, 17 UCLA J.L. & Tech. 1, 48 (2013) (reporting a spike of approximately 500 percent around September 2011, when the AIA was signed into law).

each defendant needed to be sued in a separate lawsuit since many defendants could no longer be joined in the same action.[19] This largely ministerial change caused the number of lawsuits to rapidly increase, while the underlying amount of litigation (i.e., the number of plaintiffs and the number of defendants) remained constant.[20] After accounting for the changes in the joinder provision, the apparent explosion of PAE activity from 2010 until 2012 appears to be a mirage.[21] There is also some recognition in academic research—less so in the popular press—that not all "non-practicing entities" are the same.[22]

But there has been little empirical investigation of the other allegations driving the calls for legislation—that all patent trolls or PAEs behave the same in litigation and seek early settlement and, in turn, act distinctively different from operating companies.[23] For instance, do all PAEs settle their cases quickly?[24] Do all PAEs avoid adjudication of their claims on the merits?[25] More broadly, do all PAE lawsuits look the same and, in turn, are they noticeably different from lawsuits asserted by other types of patentees such as operating companies?[26] It could be that within the full universe of PAEs, one group, such as individual inventors, behave differently from other groups within the broader category.[27] For example, failed companies may litigate differently from

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[19]There was an uptick in litigation after the joinder provisions were publicly announced and just before they went into effect in Sept. 2011. Brian Howard, Year in Review, Continued Analysis, Lex Machina (July 23, 2014) (https://lexmachina.com/2014/07/year-review-continued-analysis/).

[20]Christopher A. Cotropia, Jay P. Kesan & David L. Schwartz, Unpacking Patent Assertion Entities, 99 Minn. L. Rev. 649, 655 (2014) ("most of the differences between the years [2010 and 2012] are likely explained by, and attributable to, a change in the joinder rules adopted in 2011 as part of the America Invents Act").

[21]Id. at 660–73 (analyzing the patent litigation data based on number of lawsuit, number of patent owners, and number of defendants).

[22]Id.; Mark A. Lemley & A. Douglas Melamed, Missing the Forest for the Trolls, 113 Colum. L. Rev. 217 (2017) (distinguishing among various business models of "patent trolls"); see also Edward Lee, Patent Trolls: Moral Panics, Motions in Limine, and Patent Reform, 19 Stanford Tech. L. Rev. (2016) (noting differences among types of "patent trolls").

[23]Ira Blumberg, Why Patent Trolls Won't Give Up, Tech Crunch (June 5, 2016) (https://techcrunch.com/2016/06/05/why-patent-trolls-wont-give-up/ (patent "trolls" are "aggressive" and "operate with near impunity").

[24]James F. McDonough III, The Myth of the Patent Troll: An Alternative View of the Function of Patent Dealers in an Idea Economy, 56 Emory L.J. 189 (2006).

[25]For an analysis of adjudicated cases, see John R. Allison, Mark A. Lemley & David L. Schwartz, How Often Do Non-Practicing Entities Win Patent Suits? Berkeley Tech. L.J. (forthcoming 2017) (http://ssrn.com/abstract=2750128).

[26]David Segal, Have Patent, Will Sue: An Alert to Corporate America, N.Y. Times, July 13, 2013 (quoting the owner of a PAE as saying that if there is enough resistance to an allegation of patent infringement, he can "go thug. . . . Once you go thug, though, you can't unthug").

[27]Christopher A. Cotropia, Individual Inventor Motif in the Age of the Patent Troll, 12 Yale J.L. & Tech. 52 (2009) (arguing that since its inception, patent law has viewed individual inventors as special in the innovation system).

companies whose sole business purpose is to purchase patents.[28] There is very little, if any, empirical evidence to date that supports the current thinking on PAEs and provides a detailed account as to how various patent entities behave during litigation.[29] Answering these questions with extensive data and robust empirical analysis is the focus of this article.

In this work, we present an empirical study of the relationship between the type of patentee-plaintiffs and litigation behavior (e.g., settlement, duration, grant of summary judgment, trial, and procedural dispositions) in patent lawsuits to test the current assumptions about PAEs as a group and as compared to operating companies. We take into account, among other factors, the technology of the patents being asserted, the judicial districts where these lawsuits were filed, the judge to whom the case was assigned, and the lawyers representing the patent holder.[30] Using a unique, hand-coded dataset, we break down the different types of patentee-plaintiffs on a refined basis, distinguishing among operating companies, patent holding companies, large patent aggregators, individual inventors, universities, and failed startups.[31] To study the relationship between patentee entity type and case progression and disposition, we employ a variety of empirical approaches. We present summary statistics, regression results, and duration/survival analyses. As a result, we are able to provide a detailed picture of the relationship between the type of patentee-plaintiffs, choice of patented technology, and venue and litigation outcomes, including settlement.

We recognize that the role of PAEs in the patent system is not confined to litigation.[32] It may be interesting to study patent grants,[33] patent assignments and related transactions among various entities,[34] and patent demands that do not result

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[28]Kristen J. Osenga, Formerly Manufacturing Entities: Piercing the Patent Troll Rhetoric, 47 U. Conn. L. Rev. 435 (2015) (arguing that "formerly manufacturing entities do not impose the harms associated with patent trolls more broadly and, in fact, provide unique benefits for commercialization of new technologies").

[29]Laurie Self, Misleading Patent Troll Narrative Driven by Anecdote, Not Data, IPWatchdog (Nov. 12, 2015) (http://www.ipwatchdog.com/2015/11/12/misleading-patent-troll-narrative-driven-by-anecdote-not-facts/id=63122/).

[30]As we explain in Section III, there are preexisting theories on why each of these variables may relate to the decision to settle or press a patent infringement lawsuit.

[31]We use the same coding schema as Cotropia et al., supra note 20.

[32]For a broad overview of PAE-related transactions outside of litigation, see Andrei Hagiu & David B. Yoffie, The New Patent Intermediaries: Platforms, Defensive Aggregators, and Super-Aggregators, 27 J. Econ. Perspectives 45 (2013).

[33]Before the present debate about PAEs, researchers studied patent prosecution. John R. Allison & Mark A. Lemley, Who's Patenting What: An Empirical Exploration of Patent Prosecution, 53 Vand. L. Rev. 2099 (2000)

[34]The U.S. Patent & Trademark Office (USPTO) recently released a dataset with assignment, security interest, and other information that was recorded with the USPTO. No one, to our knowledge, has analyzed the PAE issue using this new dataset. For information about the dataset, see Alan C. Marco, Amanda F. Myers, Stuart J.H. Graham, Paul A. D'Agostino & Kristen Apple, The USPTO Patent Assignment Dataset: Descriptions and Analysis (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2636461).

in litigation.[35] However, most of the charges about PAEs are focused on litigation abuses by patent holders. As such, we focused our initial inquiry on PAE litigation behavior, focusing on cases that resulted in a settlement or other voluntary disposition. Most patent cases settle and we think that studying settlement behavior is the best way to understand the PAE litigation ecosystem, especially since much of the anecdotal evidence relates to nuisance fee settlements. We also report information on the small subset (less than 10 percent) of defendants whose cases reach a substantive outcome. We are cautious about extrapolating too much from this small subset, which most scholars theorize is skewed relative to the population of all lawsuits.[36] We are not aware of other prior academic research on settled PAE patent cases, and we believe that our study is substantially different from and, in important ways, represents an advance over, studies that focus only on the small subset of adjudicated disputes.

In sum, and counter to the some of the current assumptions about PAEs in the literature, we find significant heterogeneity among different patent holder entity types, both between various types of PAEs and as compared to operating companies. Individual inventors, failed operating companies, patent holding companies, and large patent aggregators each have distinct strategies largely consistent with their economic posture and incentives.[37] These PAEs appear to litigate differently from each other and from operating companies. At minimum, the notion that patent holders fall into two categories—operating companies and PAEs/non-practicing entities—is deeply flawed. Hence, we urge that to the extent any patent policy reform targets specific patent plaintiff types, it should go beyond the practicing entity versus non-practicing entity distinction and understand how the proposed legislation would impact more granular and meaningful categories of patent owners.

The remainder of this article is organized as follows. In Section II, we propose an economic explanation of the litigation incentives for the disparate types of patent holders. We continue, in Section III, by setting forth our study design and methodology. Next, in Section IV, we provide the results of the study. The results include information about case duration and case dispositions. We discuss implications in Section V. We briefly conclude in Section VI.

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[35]Professor Robin Feldman surveyed venture capitalists about patent demands. See Robin Feldman, Patent Demands & Startup Companies: The View from the Venture Capital Community, 16 Yale J.L. & Tech. 236 (2014).

[36]George L. Priest & Benjamin Klein, The Selection of Disputes for Litigation, 13 J. Legal Stud. 1, 16–17 (1984). Others have criticized parts of the Priest-Klein theory. See, e.g., Yoon-Ho Alex Lee & Daniel M. Klerman, The Priest-Klein Hypotheses: Proofs and Generality, 47 Int'l Rev. of L. & Econ. 59 (2016).

[37]We discuss these economic motivations in Section II.

II. Economic Motivations of Patent Holders in Litigation

In this section, we expound a basic economic theory of how various patent holders might be expected to litigate.[38] We provide separate theories for operating companies, patent holding companies, large aggregators, individual inventors, and other types of patent plaintiffs.[39]

Until very recently, patent litigation was primarily between operating companies offering goods and services in the same technology sector.[40] For instance, until about 2008–2009, there were four times as many operating companies as there were non-operating companies filing patent lawsuits.[41] While each case is different, often when an operating company sued another operating company, the stakes and overall litigation exposure of both parties were quite symmetric.[42] The defendant entity in this scenario may assert a patent infringement counterclaim based on its patent portfolio and thereby even the liability exposure for both sides.[43] The discovery costs (such as e-discovery, documentary evidence, depositions, and experts) and challenges of proving infringement *vel non* were also symmetric.[44] Remedies including reasonable royalty estimates, lost profit claims, possible price erosion, injunctive relief, and willful infringement were equally available to both patent-plaintiffs and counterclaim defendants, since they were both operating companies.[45]

This scenario becomes considerably more asymmetric when the patent plaintiff is not an operating company.[46] An individual inventor, a research university, a failed

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[38]See Kenneth Dam, The Economic Underpinnings of Patent Law, 23 J. Legal Studies 247, 247–49 (1994) (detailing various economic theories of patent law).

[39]These theories were discussed briefly in our earlier work. See Cotropia et al., supra note 20.

[40]See, e.g., Colleen V. Chien, Of Trolls, Davids, Golaiths, and Kings: Narratives and Evidence in the Litigation of High-Tech Patents, 87 N.C. L. Rev. 1571, 1574 (detailing this historic "sport of kings").

[41]See Kirti Gupta & Jay P. Kesan, Studying the Impact of *eBay v. MercExchange* on Injunctive Relief in Patent Cases (2016) (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2816701) (showing the number of lawsuits filed by operating companies and non-practicing entities from 2000–2012 in Figure 5).

[42]See, e.g., John R. Allison et al., Valuable Patents, 92 Geo. L.J. 435, 474 (2004) (finding that semiconductor patents are litigated only one-third as often as other patents, and offering the symmetry of relationships as an explanation).

[43]See Mark Lemley, Are Universities Patent Trolls? 18 Fordham Intell. Prop. Media & Ent. L.J. 611, 615 (one of the assumptions corporations in patent intensive industries (such as IT or, increasingly, biotechnology) make about patenting is symmetry: that if a competitor sues you for infringement you can sue them back).

[44]James Bessen & Michael J. Meurer, The Direct Costs from NPE Disputes, 99 Cornell L. Rev. 387, 413 (2014) ("NPEs have a bargaining advantage over practicing-entity patent plaintiffs because NPEs are invulnerable to patent counterclaims and have lower litigation costs, especially discovery costs").

[45]Id.

[46]Id. at 412–13 (detailing the bargaining advantage due to this asymmetry for NPEs).

startup, or a patent holding company that does not make goods or offer services is not exposed to a patent infringement counterclaim.[47] As a result, the defendant is limited in terms of increasing the litigation risk and exposure of the plaintiff.[48] The discovery costs become more asymmetric as the patent plaintiff may not possess significant documentary evidence to turn over to the defendant, although it still bears the costs of proving infringement based on the defendant's evidence.[49] In addition, the available remedy that must be proven by the plaintiff is limited in this scenario since it most often comprises an estimate of the reasonable royalty for past and future sales.[50] In short, when a non-operating company sues an operating company for patent infringement, the costs involved and the litigation stakes may be more asymmetric compared to a patent lawsuit between two operating companies.[51]

That said, all non-operating companies are far from being similarly situated. The motivations of different types of non-operating, non-practicing companies vary greatly.[52] For instance, when a patent holding company or large aggregator of patents (also referred to as a patent assertion entity) is the plaintiff, there are several relevant factors at play that influence the outcome of the patent lawsuit.[53] First, the patent holding company may create a new entity for holding the patents that are asserted in the lawsuit, thereby minimizing the discovery burden and the downside litigation exposure. The new entity has few assets other than the patents and may be dissolved in the event the lawsuit fails. The lack of potential downside risk from their limited liability status may encourage riskier patent owner behavior, resulting in cases that last longer and more adjudications on the merits. Second, the patent holding company may be able to spread any potential loss arising from this lawsuit over many other patent lawsuits involving the same patent portfolio. Thus, the patentee's costs may be lower, permitting it to litigate longer and at a cheaper cost. In addition, large patent aggregators, companies who purchase and aggregate numerous patent portfolios from various sources, may be monetizing several other patent portfolios and can spread their risks even more widely.[54] Third,

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[47]Lemley, supra note 43, at 615–16 (detailing the lack of symmetry for patentees such as universities).

[48]See, e.g., Jason Rantanen, Slaying the Troll: Litigation as an Effective Strategy Against Patent Threats, 23 Santa Clara Computer & High Tech. L.J. 159, 160 (2007) (noting this difference in risk).

[49]Bessen & Meurer, supra note 44, at 412–13.

[50]See Christopher B. Seaman, Permanent Injunctions in Patent Litigation After *eBay*: An Empirical Study, 101 Iowa L. Rev. 1949 (2016) (establishing the de facto use requirement for an injunction empirically).

[51]Bessen & Meurer, supra note 44, at 412–13.

[52]David L. Schwartz & Jay P. Kesan, Analyzing the Role of Non-Practicing Entities in the Patent System, 99 Cornell L. Rev. 425, 429–30 (2014) (discussing some of these differences between assertion entity types).

[53]David L. Schwartz, On Mass Patent Aggregators, 114 Colum. L. Rev. Sidebar 51, 56–61 (2014) (noting the complexity of the mass aggregators role in the patent system).

[54]Id. at 56–57.

since the patent holding company is a third-party purchaser and not the inventor, it does not have to contend with any issues related to the genesis of the invention(s) that resulted in the asserted patent(s) and is insulated from any litigation issues related to the inventors. As the cases reach adjudication on the merits, especially trial, the lack of an "inventor story" may disadvantage patent purchasers, resulting in a lower win rate. Fourth, a large aggregator may be seen by a defendant to be a repeat player in the world of patent litigation and thus the defendant's strategies (such as aggressively continuing the lawsuit or offering a settlement) will take that into account. Moreover, the large aggregator will also consider the possibility that it may have to sue the same defendant again in connection with another patent portfolio. In short, a large aggregator can pursue a patent monetization strategy that is highly diversified, with reduced risk, involving cumulative assimilation of specialized knowledge over time.[55] The repeat-player nature of large aggregators may result in more settlements, and quicker settlements, since the parties know each other and expect to continue to interact with each other in the future.

Individual inventors, research universities, and failed startups, while falling within the broad rubric of non-operating companies, find themselves in a very different position compared to a patent holding company and large aggregators.[56] First, the patents that are asserted by them in litigation are the result of their own research efforts and their involvement in the development of the underlying technology. The resulting patents being asserted are of personal importance and their association with the patents are often intimate.[57] Consequently, these entities may be inclined to overvalue their patents and their exclusivity in the market, a phenomenon that is referred to as the inventors'/creators' endowment effect.[58] As a result, individual inventors and other similar entities may be inclined to continue litigating a patent case (including spurning a settlement offer), even if continued litigation is not in their objective best interest. Such overoptimistic behavior may lead to higher loss rates for individual inventors. Second, unlike patent holding companies, the patents that individual inventors, universities, and failed startups choose to monetize are necessarily limited in number since they can typically only assert patents that arise from technologies created by them. Third, individual inventors, universities, and failed startups may be seen to be rare patent plaintiffs, and thus defendants may be incentivized to continue to litigate these patent cases or not offer a

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[55]Id. at 60–65 (describing this monetization strategy).

[56]See, e.g., Gwendolyn G. Ball & Jay P. Kesan, Transaction Costs and Trolls: Strategic Behavior by Individual Inventors, Small Firms and Entrepreneurs in Patent Litigation, U Illinois Law & Economics Research Paper No. LE09-005; Illinois Public Law Research Paper No. 08–21 (Feb. 1, 2009) (http://ssrn.com/abstract=1337166).

[57]Chien, supra note 40, at 1586–87 ("some independent inventors are perceived as seeking not only money, the main objective of licensing shops, but also justice or vindication by a court").

[58]See Christopher Buccafusco & Christopher Sprigman, Valuing Intellectual Property: An Experiment, 96 Cornell L. Rev. 1, 17–31 (2010) (conducting experiments "that demonstrated a substantial valuation asymmetry between authors of poems and potential purchasers of them").

meaningful settlement, knowing that these entities are less sophisticated litigants against whom they may never have to litigate again.[59] These aspects of their interaction may result in longer case durations, with greater numbers of cases reaching a substantive disposition.

There is even a diversity among individual inventors, research universities, and failed startups. Universities' primary business is in education and research, not patent enforcement, and their reputation is very important.[60] Failed startups, in contrast, have little ongoing business. They may feel that the alleged infringer unfairly beat them in the marketplace. The alleged infringer may have the opposite view of the marketplace battle, and these underlying divergent views may affect the patent case. This divergence in views between failed startup plaintiffs and defendants may make disputes more difficult to settle, resulting in longer disputes. Failed startups also have investors who may desire some return, via the patent lawsuit, on their otherwise lost capital.[61] Even within individual patent holders, there is diversity. Individual inventors sue in their personal capacity (i.e., John Doe) or they can form a corporate vehicle (i.e., John Doe LLC). Those with access to sophisticated counsel are likely to be advised to form a corporate vehicle.[62] Those without may even litigate pro se, representing themselves in the litigation. Defendants may litigate against individuals, especially pro se individuals, quite differently. They may be less willing to offer meaningful settlements and take more aggressive litigation positions.

We pause here to acknowledge that not all patents are created equal, and that patents are not randomly assigned to companies. Even before litigation, some patents are more likely to be valid than others. Some parties may be more willing to enforce a patent that has suspect validity, or assert a weak claim of infringement, than other parties. Non-practicing entities that purchase patents from others have the ability to select which patents to purchase, while many operating companies have limited themselves to the patented technologies they have invented.[63] Thus, even before the litigation process, the various patent owners may carry patents of varying quality. We cannot observe this underlying quality, and suggest caution in comparing litigation outcomes (including settlements) among entity types.

Based on the foregoing, it is clear that a straightforward examination of the economic incentives faced by different types of patent plaintiffs to settle or to

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[59]See Mark Lemley, The Myth of the Sole Inventor, 110 Mich. L. Rev. 709, 710–11 (2012) (detailing the rarity of truly individual inventions).

[60]Cleopatra Veloutsou et al., University Selection: Information Requirements and Importance, 18 Int'l J. Educ. Mgmt. 160, 161 (noting that applicants consider reputation when selecting universities).

[61]See John E. Dubiansky, An Analysis for the Valuation of Venture Capital-Funded Startup Firm Patents, 12 B.U. J. Sci. & Tech. L. 170, 172 (2006) (noting that patent assertion is a viable exit strategy for failed startups).

[62]See Robert W. Hamilton, The Corporate Entity, 49 Tex. L. Rev. 979 (1971).

[63]David L. Schwartz, On Mass Patent Aggregators, 114 Colum. L. Rev. Sidebar 51, 63 (2014) (arguing that non-practicing entities may be purchasing undervalued patents).

continue to litigate a patent case even to trial can be distinctly different.[64] Therefore, dividing the world of patent plaintiffs into binary categories—operating entities and non-operating entities—as a way to understand behaviors in patent litigation may well be unjustifiable and misguided or, at the very least, less than illuminating and incomplete. More granular categories of patent plaintiffs will necessarily be more revealing.

III. Study Design and Methodology

In the following section, we set forth how data were located, collected, and coded. Our work here expands on a unique dataset we previously collected by hand. As described in detail elsewhere,[65] the authors previously spent several weeks personally attending to gathering information about all patent lawsuits brought in 2010 and 2012. For the sake of comprehensiveness, we briefly review the contents of the unique dataset with particular emphasis on additional information about the lawsuits that we added for the present study.

In what follows, we explain the contours of our initial dataset and the additional coding we conducted for this article.

A. The Previously Collected Data

The previously collected dataset includes information from all patent infringement lawsuits filed in two complete calendar years: 2010 and 2012. We used Bloomberg Law's Federal Docket Database to identify the patent lawsuits filed in these years.[66] We verified that Bloomberg Law's database was substantially identical to that of PACER,[67] the database maintained by the federal courts.[68]

For the present study, we focus on only lawsuits filed in 2010 because almost all the lawsuits filed then have been resolved, permitting us to investigate outcomes, settlements, and other information related to litigation. Of course, if we had chosen a more recent year, a much larger number of cases would still be pending, reducing our ability to observe settlement and judgment patterns. Lawsuits filed in 2010 are, nevertheless,

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[64]See Michael Risch, Patent Troll Myths, 42 Seton Hall L. Rev. 457, 458–59 (2012) (noting the variety of non-practicing entities that may assert patents).

[65]Cotropia et al., supra note 20 at 660–73.

[66]We limited the docket search on Bloomberg Law to lawsuits between Jan. 1 and Dec. 31 of the given year. We used the Nature of Suit field to isolate "830 – Patent" cases.

[67]PACER stands for Public Access to Court Electronic Records. It is an electronic database that permits access to federal courts. Access is available at https://www.pacer.gov/.

[68]See Cotropia et al., supra note 20 at 663–64.

relatively recent.[69] Although there are reasons to think that recent changes, including adjustments to the law of patentable subject matter,[70] joinder,[71] and administrative reviews of patents,[72] are significant, our results indicate an accurate portrayal of patent litigation in 2010. We contend that information about patent litigation in 2010 has continued relevance toward understanding what patent litigation looks like in 2016.[73] More importantly, patent litigation in 2010 provides a telling snapshot of economic incentives of a plaintiff related to settlement and case duration and progression.

For every lawsuit, we reviewed the docket report and a copy of the complaint, amended complaints, answers, and amended answers. The complaint is the legal document that initiates a lawsuit,[74] and the answer is the legal response filed by the defendant to the lawsuit's allegations.[75] While the complaint frequently does not contain detailed factual contentions, it always identifies the parties to the lawsuits, and sometimes includes background information about the parties.[76] We eliminated several types of cases from the dataset, including all complaints alleging patent false marking,[77]

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[69]In many areas of law, one may expect lawsuits filed today to be resolved similarly to lawsuits filed six years ago. However, patent law may be different. Several major changes have occurred in the last six years, including the rise of inter partes review (IPR) that is concurrent with much patent litigation, and the Supreme Court decision in Alice Corp. v. CLS Bank, 134 S. Ct. 2347 (2014). Furthermore, the pleading standards for patent cases changed in Dec. 2015, when revisions to the Federal Rules of Civil Procedure went into effect.

[70]There are several Supreme Court consequential cases since 2010. See, e.g., Alice Corp. v. CLS Bank, 134 S. Ct. 2347 (2014); Mayo Collaborative Servs. v. Prometheus Labs., Inc., 132 S. Ct. 1289 (2012).

[71]The America Invents Act (AIA) requires that lawsuits filed against multiple unrelated parties are filed separately. 35 U.S.C. § 299 (2012). For example, in 2010, while a patentee could sue three defendants in one patent lawsuit in some venues, after the implementation of the AIA, the same patentee may have to sue each defendant separately, resulting in three patent lawsuits. The number of defendants in a lawsuit may relate to the measured variables, including duration.

[72]The America Invents Act created new forms of administrative review and modified existing ones. More specifically, the AIA created post-grant review and covered business method review. 35 U.S.C. § 282(b); 35 U.S.C. § 314(a). It also established inter partes review, 35 U.S.C. § 311(a), and supplemental examination, 35 U.S.C. § 257.

[73]In 2010, the advent of non-practicing entities in patent litigation in significant numbers was well underway, see supra note 41.

[74]Complaint, Legal info. Inst. (http://www.law.cornell.edu/wex/complaint/). The requirements for notice pleading in complaints is set forth in Fed. R. Civ. P. 8.

[75]Answer, Legal info. Inst. (http://www.law.cornell.edu/wex/answer/). The rules for answers are set forth in Fed. R. Civ. P. 9.

[76]Id.; see generally Fed. R. Civ. P. 8–10.

[77]False marking disputes are cases in which someone, often a member of the general public, complains that a company labeled its product as "patented" when, in fact, no unexpired patent covered the product. The issues in patent false marking cases are quite different from disputes about whether a party infringes a patent. For instance, the validity of the patent is not at issue in patent false marking cases. Many of the cases involved companies that, without bad intent, continued to mark their products with a patent number even though the patent had expired. In these cases, infringement was not at issue either. Furthermore, none of the current debate about PAEs involves claims about false marking. Consequently, we thought it best to remove these cases from the dataset.

complaints alleging only design (and not utility) patents,[78] non-patent infringement allegations (i.e., legal malpractice,[79] inventorship disputes,[80] demands for patent term adjustments,[81] interferences,[82] motions to quash or enforce subpoenas,[83] other actions against the Patent Office, and mislabeled trademark and copyright infringement actions[84]), and duplicate cases (i.e., mirror-image complaints for patent infringement and declaratory judgment actions for no patent infringement[85] involving the same patents and parties). After elimination, our dataset contained 2,520 patent infringement lawsuits in 2010.

We obtained certain specific information for each lawsuit from Bloomberg Law. We recorded the judicial district[86] in which the lawsuit was brought, the judge assigned to the case, the civil action number, the filing date of the lawsuit, the utility patent numbers asserted in the lawsuit,[87] and a list of all parties to the lawsuit. Patent numbers asserted in the 2010 cases were used to categorize the lawsuits by technology.[88]

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[78]Design patents cover ornamental aspects of articles of manufacture, in contrast to the functional aspect. For a thorough discussion of the history of design patent law, see Jason J. Du Mont & Mark D. Janus, Origins of American Design Patent Protection, 88 Ind. L.J. 837 (2013).

[79]In 2013, the Supreme Court clarified that actions alleging malpractice in the handling of a patent case do not arise under federal law. Gunn v. Minton, 568 U.S. 310 (2013).

[80]Inventorship can be challenged in the federal courts. See 35 U.S.C. § 256; Thomas M. Morrow, Challenging Inventorship in Patent Litigation, HIPLA Fall Institute (Oct. 5, 2012) (http://www.hipla.org/Morrow_Thomas.pdf). These cases do not involve contested issues of infringement or validity, and the debate about PAEs does not touch directly on false inventorship issues.

[81]Patent owners can contest the term of the patent and challenge whether an extension is owed. See, e.g., 35 U.S.C. § 154(b).

[82]A patent interference is a proceeding within the U.S. Patent & Trademark Office to determine which of multiple applicants is entitled to a patent. 35 U.S.C. § 135(a).

[83]Parties may move to quash a subpoena pursuant to Fed. R. Civ. P. 45.

[84]Jay P. Kesan & Gwendolyn G. Ball, How Are Patent Cases Resolved? An Empirical Examination of the Adjudication and Settlement of Patent Cases, 84 Wash. U. L. Rev. 237, 261 tbl. 1 (2006) (noting that a small number of trademark and copyright cases are miscoded as patent cases in PACER).

[85]An accused infringer can initiate a lawsuit seeking a declaration of non-infringement, invalidity, or unenforceability, provided that there is a sufficient case or controversy between the parties. See MedImmune, Inc. v. Genentech, Inc., 549 U.S. 118 (2007).

[86]There are 94 separate judicial districts in the federal courts.

[87]The complaints included an explicit identification of the patents-in-suit.

[88]Information about the NBER patent classification can be found in B.H. Hall, A. B. Jaffe & M. Trajtenberg, The NBER Patent Citation Data File: Lessons, Insights and Methodological Tools, NBER Working Paper 8498 (2001).

We hand coded the defendants in the 2010 patent lawsuits. To hand code them, we relied on the complaint, and any amended complaints, for each coded lawsuit and counted the number of defendants listed. We included in the defendant count any party identified by the plaintiff(s) as a defendant in the complaint.[89] For declaratory judgment cases,[90] we counted plaintiffs as "defendants." A defendant was counted as a "defendant" even if that party was dismissed from a lawsuit.[91]

Then, we determined the type of patent holder involved in the lawsuit. We classified all patent holders into one and only one of the following groups: (1) University; (2) Individual Inventor; (3) Large Patent Aggregator; (4) Failed Operating or Startup Company; (5) Patent Holding Company; (6) Operating Company; and (7) Technology Development Company.[92]

Below is a brief description of each category:

1. *University*: A public or private institution of higher learning. It includes foreign and domestic institutions.[93] An example is Cornell University.
2. *Individual Inventor*: One or more inventors who own(s) a patent (i.e., it is unassigned to a company). Often, the party to the litigation would be an individual litigating in his individual capacity. We also included family trusts in this category. Additionally, if it appeared that an individual had formed a corporate vehicle that she completely controlled for the primary purposes of litigation, we coded this as an individual, and we also created a separate subcategory of individuals litigating in a corporate capacity. This arose when the name of the corporate vehicle included the name of the Individual Inventor and no products were being sold. For instance, Ronald A. Katz Technology Licensing, L.P. (RAKTL) asserts patents invented by Ronald A. Katz.[94] While Ronald Katz does

[89]Unfortunately, it was not feasible to exclude "related" defendants. Thus, if two distinct yet apparently related corporate entities (i.e., LG Electronics Inc. and LG Electronics USA Inc.) appeared as separate defendants, we counted those as two defendants. In follow-on research, we are manually identifying such related parties to permit them to be removed, when appropriate.

[90]Typically, declaratory judgment cases are brought under jurisdiction under 28 U.S.C. § 2202.

[91]We included dismissals with and without prejudice.

[92]To determine the proper classification for a plaintiff we looked at several sources. First, we reviewed the complaint filed in the lawsuit. Sometimes, the complaint mentioned whether products were being manufactured by the patent holder and whether those products were covered by the patents at issue. If the complaint made that sort of statement, then we coded the patent holder as an Operating Company. When the complaint was silent (as it was in the majority of cases), we used web searches to obtain information about the patent holder. If the patent holder had a website indicating that it manufactured products, then we classified it as an Operating Company.

[93]We do not believe that any of the entities we categorized as universities were instead patent holding companies that were named to sound like universities. We reviewed the complaints for all cases and the complaints contained recitations of each party in the case. The recitation of universities typically indicated something along the lines that they were not-for-profit educational institutions.

[94]See Company Overview of Ronald A. Katz Technology Licensing, L.P., Bloomberg Businessweek (http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=7672486, last visited Sept. 19, 2014).

not technically hold these patents in his individual capacity, we believe that RAKTL is best understood as an Individual Inventor. Sometimes, our review of corporate records revealed that the Individual Inventor owned all shares of the corporation. Unfortunately, such corporate records were not available for all companies, especially for companies we identified as Patent Holding Companies. Consequently, we suspect we may undercount the number of individuals litigating in a corporate capacity and, similarly, overcount Patent Holding Companies.

3. *Large Patent Aggregator*: A company with a large patent portfolio whose primary business is enforcing patents of numerous other individuals and entities.[95] This includes Acacia companies, Wi-Lan, and Intellectual Ventures. We believe that there are few to no false positives in our coding of Large Patent Aggregators. All the entities that we identify as Large Patent Aggregators are indeed so. However, we acknowledge that there may be some false negatives. There may be companies that are affiliated with a larger patent enforcer, but that relationship is not evident from the publicly available sources we consulted.
4. *Failed Operating or Startup Company*: A company that originally invented the patent-in-suit and attempted to commercialize the technology. At present, the company sells no products, and its primary business appears to be patent litigation. An example of a Failed Operating or Startup Company is Broadband Graphics LLC.
5. *Patent Holding Company*: Typically, limited liability companies that appear to have been formed solely to hold and enforce a patent or small portfolio of patents. As far as we can tell, the original inventor does not own these companies. Frequently, these companies were formed shortly before litigation was commenced. Because pubic information about private companies is difficult to obtain, we cannot rule out that some entities that we classified as Patent Holding Companies are instead either Individual Inventors who formed a corporate non-practicing vehicle to enforce their patents or Large Patent Aggregators who formed separate entities for different patent portfolios. We believe, however, that most of the entities we have classified as Patent Holding Companies are one-off companies asserting patent rights that they obtained from another.
6. *Operating Company*: Companies that manufacture products or deliver services (other than licensing patents). An example of an Operating Company is Hewlett Packard. We have not analyzed whether the Operating Company is actually making use of the patent-in-suit.[96] We also included IP holding companies

[95]The line between Patent Holding Company and Aggregator is not completely clear. We generally used the Aggregator category sparingly, limiting it to companies that had assembled via acquisition of portfolios hundreds of patents or more.

[96]We know that some operating companies assert patents that they do not utilize in their business operations. See Ted M. Sichelman, The Vonage Trilogy: A Case Study in "Patent Bullying," 90 Notre Dame L. Rev. 543 (2014).

owned by manufacturing companies in this category. For instance, AT&T Intellectual Property I, L.P. was considered an Operating Company.[97]

7. *Technology Development Company*: A company that invested in the development of technology, perhaps with the intention of licensing rather than commercializing. A Technology Development Company is the original owner of the patents but does not manufacture products covered by the patents. Examples of Technology Development Companies are Walker Digital LLC and Tessera Technologies.

As previously reported, our intercoder reliability for the coding of patentee entity types is high.[98]

Our data are publicly available at http://www.npedata.com, and the data have been downloaded by hundreds of users, including legal and business scholars, employees of governmental agencies, consultants, lawyers, and interested members of the public.[99] Since the data's public release, the coding schema (and the raw data) has been used in academic studies by many researchers.[100] Some of these researchers have used the specific codings we performed for the 2010 and 2012 patent litigation data in their own research.[101] Others have taken our coding schema and used it to code other, raw

[97]There were only 150 defendants that were sued by IP holding companies of manufacturing companies. As a robustness check, we performed all statistical analysis both separating IP holding companies owned by manufacturing companies and combining them with operating companies. The results were entirely consistent. Because we believe these entities are very close to the manufacturing companies—they typically report to the same management—we report in this article only the combined results.

[98]The three co-authors personally coded the entity types of the patent holders, with each co-author completing slightly more than one-third of the lawsuits.

[99]The three co-authors maintain the website npedata.com. As of July 17, 2017, 346 individuals had registered to download the data.

[100]See, e.g., Lauren Cohen, Umit G. Gurun & Scott D. Kominers, Patent Trolls: Evidence from Targeted Firms (http://www.nber.org/papers/w20322) (working with "hand-coded, finely classified public data assembled by Cotropia et al. (2014)"); Christopher B. Seaman, Permanent Injunctions in Patent Litigation After *eBay*: An Empirical Study, 101 Iowa L. Rev. 1949, 1987 (2016) ("This study classified each patent holder into one of eight categories based on a classification system developed in a recent empirical study by Christopher Cotropia, Jay Kesan, and David Schwartz regarding the role of PAEs in the patent system."); Christopher B. Seaman, Ongoing Royalties in Patent Cases After *eBay*: An Empirical Assessment and Proposed Framework, 23 Texas. Intell. Prop. L.J. 203, 236 (2015) (explaining that the empirical study article relied "on the coding methodology developed by Professors Chris Cotropia, Jay Kesan, and David Schwartz"); Hannah Jiam, Fee-Shifting and Octane Fitness: An Empirical Approach Toward Understanding "Exceptional," 30 Berkeley Tech. L.J. 611, 628 n91 (2015) (using "a dataset compiled by Christopher A. Cotropia et al." to determine if an entity was an NPE); Jay P. Kesan & Kirti Gupta, Studying the Impact of *eBay* on Injunctive Relief in Patent Cases (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2629399) ("We utilize a systematic methodology for identifying potential non-manufacturing entities, as explained by Cotropia, Kesan and Schwartz."). See also Stephen Kiebzak, Greg Rafert & Catherine Tucker, The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity, 45 Research Policy 218 (2016) (noting that the Cotropia, Kesan, and Schwartz classification system is more nuanced than the coding schema used by the authors, but arguing that the schema used in the article was sufficient for the claims the article is testing).

[101]See, e.g., Lauren Cohen, Umit G. Gurun & Scott D. Kominers, Patent Trolls: Evidence from Targeted Firms (http://www.nber.org/papers/w20322).

patent litigation data.[102] We have also "crowd-sourced" testing of the robustness of the coding schema and the actual coding itself through significant feedback on the publicly available dataset.[103]

We recognize that there are other classifications of patent holders upon which some scholars rely. For instance, one of us, in other work with John Allison and Mark Lemley, has coded patent owners using a slightly different schema.[104] There is much overlap between all the coding schemes of patent plaintiffs, including separating universities from other types of non-practicing entities. However, the coding schema used in the present study is more granular in a key aspect that is relevant to our area of inquiry. More specifically, our coding schema attempts to separate patent aggregators from more run-of-the-mill patent holding companies. Other classification systems do not separate these entity types. We believe that the behaviors of these two types of patent holders may systematically differ, and we exploit the separation of these entity types in the results that follow.

B. Enhanced Data

For the present article, we gathered new information about the 2010 patent lawsuits. More precisely, we gathered information about when and how each defendant in each lawsuit exited the lawsuit. It is important to emphasize that we gathered this information on a per-*defendant* basis, not on a per-lawsuit basis. Thus, if a lawsuit had five unrelated defendants, we would record separate disposition information for each of the five defendants. Our dataset includes 9,101 defendants in total, not all of whom are unique. If, instead, we had gathered the information on a per-lawsuit basis, we would capture only information about the last defendant to settle or exit the lawsuit. Although it was substantially more time intensive for us to gather information on a per-defendant basis, we believe that this information is significantly more useful when analyzing patent litigation. A majority of the 2010 lawsuits involved multiple defendants.[105] If most defendants settled earlier than the final defendant, then using a per-lawsuit method may substantially overestimate case durations. On the other hand, if most defendants settled early, but one defendant litigated the case until judgment, then reviewing only the judgment would not completely or accurately represent the litigation. A large number of early settlements may show evidence of patentees' strategic behavior that would otherwise be missed by viewing the data on a per-lawsuit basis. Again, only by evaluating data on a per-defendant basis can patent litigation be comprehensively unpacked and untangled.

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[102]See, e.g., Christopher B. Seaman, Ongoing Royalties in Patent Cases after *eBay*: An Empirical Assessment and Proposed Framework, 23 Texas. Intell. Prop. L.J. 203, 236 (2015).

[103]See Cotropia et al., supra note 20, at 690–91 (detailing this feedback we have obtained on the data and our responses to such feedback).

[104]See supra note 25.

[105]One-thousand-three-hundred-sixty-four of the 2,520 (54.13 percent) cases in 2010 included two or more defendants.

For each defendant, we identified the date that the party entered the case and exited the case. The entrance date is the date of the first complaint naming the party, which is typically the original date of the lawsuit.[106] Sometimes, a party is added after the original filing date via an amended complaint.[107] In such instances, we used the date of filing of the amended complaint.[108] The date of exit from a lawsuit is the date that the party was dismissed from the lawsuit. In most instances, there is a voluntary dismissal entered by the court,[109] presumably and often clearly following a settlement agreement.[110] We used the date of an actual dismissal as the exit date.[111] In lawsuits without dismissal, we used the date of judgment by the district court.[112] From the entry and exit dates, we determined the case duration for each *party* in each lawsuit filed in 2010.[113]

We also recorded the reason for the dismissal of each defendant from the lawsuit. There are many reasons that a defendant may exit a case, and we call this reason the "disposition." We recorded this information on a very granular level. For simplicity, we group these types of dispositions into three categories: (1) voluntary dispositions; (2) procedural dispositions; and (3) substantive dispositions. Voluntary dispositions include stipulated dismissals and voluntary dismissals by the patent holder. Procedural dispositions include dismissals for lack of standing,[114] improper joinder,[115] lack of personal jurisdiction,[116] and lack of subject matter jurisdiction.[117] We classified default

[106]The complaint is typically the first document filed in PACER. It always identifies the defendant to the lawsuit, both in the caption and in the text.

[107]Amended complaints are covered by Fed. R. Civ. P. 15. Leave is freely given to parties to amend their complaints. Foman v. Davis, 371 U.S. 178, 182 (1962).

[108]A small number of cases had "John Doe" defendants. If a defendant was later substituted in place of a John Doe defendant, we used the date that the defendant was specifically named in a complaint as the entrance date.

[109]Voluntary dismissals are pursuant to Fed. R. Civ. P. 41.

[110]Private settlement agreements typically include a provision that the parties will dismiss pending lawsuits. For an example of such a settlement agreement, see Section 8 at https://images.template.net/wp-content/uploads/2016/03/24054857/Confidential-Settlement-of-Known-Unknown-Claims.pdf.

[111]Rarely, there was a motion for violation of a settlement agreement. We did not consider the case still open if such a motion was filed. Once the party was dismissed from the lawsuit, even if there was a later dispute, we counted the party as having resolved the lawsuit.

[112]Judgment is a term of art. See Fed. R. Civ. P. 54.

[113]More precisely, to determine the duration of a party, we subtracted the party's exit date from its entry date. It is the raw number of days between these two milestones. We did not adjust for weekends or holidays.

[114]A motion to dismiss for lack of standing is typically brought under Fed. R. Civ. P. 12(b)(1).

[115]A motion to dismiss for improper joinder is typically brought under Fed. R. Civ. P. 20(a).

[116]A motion to dismiss for personal jurisdiction is typically brought under Fed. R. Civ. P. 12(b)(2).

[117]A motion to dismiss for lack of subject matter jurisdiction is typically brought under Fed. R. Civ. P. 12(b)(3).

judgments,[118] which occur when the defendant does not appear in court to answer the complaint, as procedural dispositions. Substantive dispositions include trial outcomes[119] and grants of summary judgment[120] on merits issues. We also included the small number of cases decided under Rule 12(b)(6) for failure to state a claim as substantive dispositions. There were a small number of defendants—245—that were still pending when we completed our coding in November 2015.[121] We report some information on these pending defendants in Figure 5. For our analysis, we right censored the data by assuming that the close date of these defendants is November 2015.[122]

We recorded if the case had been stayed[123] or transferred.[124] Stayed and transferred cases lasted longer than run-of-the-mill cases. Much of the delay was caused by the stay or transfer itself. For that reason, we omit stayed and transferred cases from the analysis below, unless we specify otherwise.

We made another important classification of defendants. Many times, a patent owner asserts infringement against multiple, related parties. For instance, a patentee may sue Fujitsu America, Inc., and Fujitsu Components America, Inc.[125] These companies are frequently represented by the same counsel, and they enter and exit the case on the same date.[126] These entities, when they file papers in the litigation, always file a joint brief, motion, or other filing.[127] For the purposes of our analysis, we had concerns

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[118]A default judgment, entered under Fed. R. Civ. P. 55, is typically entered when a party fails to plead or otherwise defend in a litigation.

[119]We include both bench and jury trials under the category of trials.

[120]A motion for summary judgment is brought under Fed. R. Civ. P. 56. A party is entitled to summary judgment on an issue if there is no genuine dispute as to material fact on that issue, and the law favors the moving party.

[121]See Section IV.A.1.

[122]As a robustness check, we also analyzed the data assuming that all open defendants reached a substantive disposition. Because the number of open cases was large relative to the number of substantive dispositions, our results with respect to individual inventors on substantive dispositions lost significance when assuming that all open cases would reach a substantive disposition. We believe that such an assumption is too conservative as even cases that pend for a long period of time frequently settle. However, one should know that this result is more vulnerable than others to what transpires in the open cases.

[123]Courts have inherent power to stay or pause litigation. Courts may stay litigation if, for instance, the U.S. Patent & Trademark Office is reexamining the patent in suit. See Wayne O. Stacy, Reexamination Reality: How the Courts Should Approach a Motion to Stay Pending the Outcome of Reexamination, 66 Geo. Wash. L. Rev. 172 (1997).

[124]Cases can be transferred from one judicial district to another, through, for instance, 28 U.S.C. § 1404.

[125]These defendants are parties to PACID Group, LLC v. Asustek Computer Inc. et al (6–10-cv-00108) (E.D. Texas).

[126]These defendants are both represented by Christopher M. Joe of Buether Joe & Carpenter. They were both dismissed on Feb. 1, 2011 through a single court order, in response to a joint motion by these defendants.

[127]These defendants, for instance, filed a joint motion to extend time to answer, at docket entry 55.

about considering the two Fujitsu parties as two defendants. We are primarily measuring case duration, settlement behavior, and adjudications. The costs for these two defendants are likely the same as if either one were sued. The burden on the court and the plaintiff is similarly the same for one or two parties. In fact, it appears that multiple, related parties are often sued because plaintiffs may be overly cautious, desiring to make sure that there is no possibility of naming the wrong defendant. For that reason, we chose to collapse related defendants into a single defendant for the purposes of our analysis.

To collapse related defendants into a single defendant, we identified "related" defendants using two different definitions, one broad and one narrow. Our narrow definition of related defendants required that the parties share a root name, like the Fujitsu example above,[128] and enter and exit the case on the same dates. If two parties fit our narrow definition of related defendants, we would exclude one of the two for our analysis. Our broad definition of related defendants included everything in the narrow definition, and a small number of additional parties. The broad definition included multiple defendants where one defendant owned another, even if they did not share the same name. For instance, in one lawsuit, the patentee sued the American Broadcasting Company (ABC), as well as various Disney entities.[129] Disney owns ABC,[130] so we identified ABC within our broad category of related defendants. We recognize that the ABC and Disney defendants may be duplicative for the same reasons that we identify above with respect to narrow defendants. However, these defendants *may* make different allegedly infringing products, requiring additional time for the court and the parties. It is not feasible for us to investigate each of these defendants more fully; consequently, we identify them as broadly related.

In the results section, we identified where we exclude related defendants using the narrow definition. In unreported results, we analyzed the data using the broad definition of related parties. There are no material differences in the results, given that few defendants fell within our broad definition and not our narrow definition.[131]

Finally, we supplemented our dataset with information about the lawyers and law firms who represented the parties in the cases. Docket Navigator provided us with a list of every attorney who ever represented a party in a 2010 lawsuit.[132] We matched these attorneys to our cases. Some of the individual inventors in our dataset represented

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[128]See supra note 125.

[129]See Civil Action No. 3:10-cv-00146 in the Southern District of California.

[130]See Geraldine Fabrikant, Walt Disney to Acquire ABC in $19 Billion Deal to Build a Giant for Entertainment, N.Y. Times, Aug. 1, 1995 (http://www.nytimes.com/1995/08/01/business/media-business-merger-walt-disney-acquire-abc-19-billion-deal-build-giant-for.html?pagewanted=all).

[131]In fact, only 45 defendants fell within the broad definition as compared to the narrow definition.

[132]Docket Navigator obtained the attorney information from PACER. It includes all attorneys who filed appearances in the case, including trial and local counsel, as well as counsel whose representation was terminated before the conclusion of the case. Docket Navigator provided us a list of attorneys and their respective law firms.

themselves as pro se litigants.[133] A case was deemed pro se if the patent holder was an individual inventor,[134] the lawyer's name was the individual inventor, and there was no law firm identification present.

IV. Results and Analysis

A. Influence of Patentee Entity Type on Overall Case Progression

Based on our data, we looked at whether the category of patentee entity type was correlated with the duration of the case and how the case was disposed. We also explored if the technology of a given case or the venue or judge was correlated to the patentee entity type. Our main focus was whether the entity was linked to litigation behavior, the popular narrative being that PAEs either brought weak cases or engaged in "hit and run" tactics, and thus their cases were voluntarily disposed of (most likely via settlement), and this disposition happened early. We also sought to determine if the cases had particular settlement patterns based on entity type.

1. Duration of the Cases

As previously mentioned, we coded for duration by defendant, and not by case. For the 9,101 defendants we coded for from 2010, 8,399 of those defendant's cases were closed at the time of coding. Among those remaining, 245 were still open, 347 had been transferred or consolidated,[135] and for 110 of the defendants, termination was impossible to reliably code. The transferred or consolidated cases were often merged into other cases. Thus, excluding the transferred or consolidated cases, 96.2 percent of the cases were closed at the time of coding.

In Figure 1, we report the median and mean of the duration of these closed cases. These durations are separated by patentee entity type—with Figure 1 separately reporting case durations on a defendant basis for lawsuits brought by Individual Inventors (including family trusts), Operating Companies, Failed Operating Company, Patent Holding Companies, and Large Aggregators.[136] These last two could be considered collectively as PAEs—or non-operating companies. We also collected data for other non-operating companies such as Universities and Technology Development Companies, but

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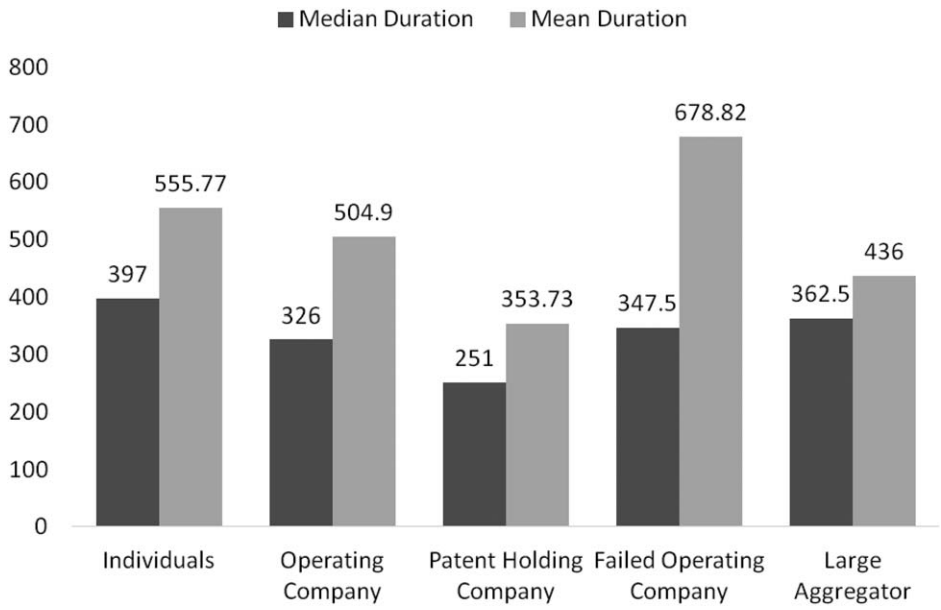
[133]Pro se is Latin meaning "on one's own behalf." It refers to parties who represent themselves in court without retaining a lawyer.

[134]Under the rules of legal ethics, only individuals can appear pro se. Corporations must appear through an attorney.

[135]Under Fed. R. Civ. P. 42(a), the court may consolidate multiple separately filed lawsuits into a single action. The multiple lawsuits must involve common issues of fact. Cases can be consolidated for discovery, claim construction, and/or summary judgment, without necessarily consolidating the lawsuits for trial purposes.

[136]We are aware of only one study investigating duration of lawsuits by entity type. That study uses the broad classifications of NPE or non-NPE, not the granular categories that we use. See Alex Haus & Steffan Juranek, Patent Trolls: A Specialization or Hold-Up Story (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2424407).

Figure 1: Case duration by patentee entity type.



do not report those results here because of the small number of defendants falling under these three categories.[137]

Notably, Failed Operating Companies showed the longest mean duration at almost 700 days, with Individuals having the second longest duration. The difference in mean duration for such patentees was statistically significant.[138] Patent Holding Companies had a lower mean and median duration than Operating Companies and this difference was statistically significant.[139] The range of median durations was fairly large, ranging from a low of 251 days for Patent Holding Companies to a high of 397 days for Individual/Family Trust patentees. We focus here on median durations since they are not influenced as much by outliers.

While mean and median durations are a useful start, we further analyzed the data by examining the complete distribution of durations. In Figure 2, we plot the duration of each defendant by patentee entity type.

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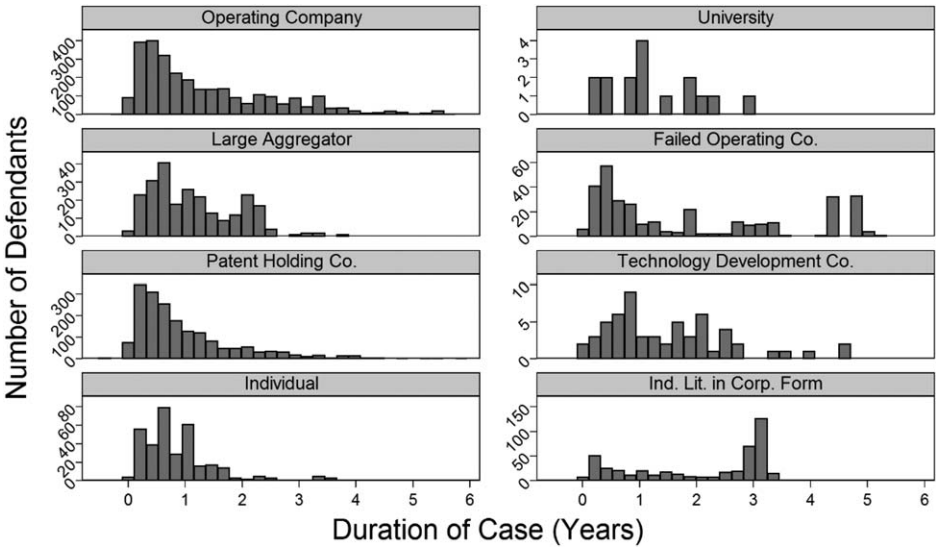
[137]We follow this convention throughout—reporting the descriptive statistics for patent holding companies, failed operating companies, and large aggregators to give the reader an insight into the behavior of non-operating companies/PAEs. However, when we perform other statistical analysis, we look at all categories of patentees.

[138]A t test assuming unequal variance reported a two-tailed p value of 0.0005, with a t statistic of −3.3284 with 451.275 degrees of freedom.

[139]A t test assuming unequal variance reported a two-tailed p value of 0.0000, with a t statistic of −6.7264 with 3596.84 degrees of freedom. Accord Risch, A Generation of Patent Litigation.

Figure 2: Histogram of case duration by patentee entity type.



From the histogram, we observe that durations for defendants sued by Operating Companies and Patent Holding Companies are both right skewed. The Patent Holding Company distribution is slightly thicker at shorter durations, hinting at a great propensity of Patent Holding Companies to settle earlier in litigation. The Large Aggregator and Failed Operating Company durations are most evenly spread apart. The Individual Inventor, especially the individuals who have formed a corporate vehicle to litigate (the right-bottom box in Figure 2), show a bimodal distribution, with some defendants exiting the case very early and others exiting very late in the litigation.

Next, we used a hazard model to fit the case durations. A hazard model estimates how various factors affect a known hazard.[140] These models, such as the Cox proportional hazard model that we employ, are widely employed in the medical field where the hazard is patient death.[141] Our hazard is termination of the case for a particular defendant. To better understand the effect of entity types on case duration, we used the hazard model to estimate how entity type affects the time to termination (i.e., survival time)—both any type of termination in general and just those terminations that were settlements.

The first hazard model looked at all defendants that terminated, regardless of the type of termination (substantive ruling by the court, procedural ruling by the court, or

[140]Stephen J. Walters, What is a Cox Model? Statistics (2009), http://www.medicine.ox.ac.uk/bandolier/painres/download/whatis/cox_model.pdf.

[141]See, e.g., Spotswood L. Spruance, Julia E. Reid, Michael Grace & Matthew Samore, Hazard Ratio in Clinical Trials, 48 Antimicrobial Agents & Chemotherapy 2787 (2004).

Table 1: Survival in Days for 2010 Patent Lawsuits (Any Disposition)

	# *of Defs*	*25%*	*50%*	*75%*	*90%*
University	16	241	395	698	820
Individuals	817	206	397	1,043	1,148
Large Aggregator	278	202	362.5	674	827
Failed Operating Company	330	160	347.5	1,192	1,722
Patent Holding Company	1943	120	251	468	804
Operating Company	2899	147	326	693	1,118
Tech. Development Co.	56	231	515	766	1,020

voluntary dismissal of the complaint). The survival is quantified in terms of number of days the case is pending before termination. In Table 1, we report the survival quartiles for each entity type. The 50 percent column in Table 1 corresponds to the median duration of defendants, as shown in Figure 1.

Most entity types exhibited a similar distribution among the various quartiles. The range of durations in the first quartile was the most compact. In the first quartile (25 percent), all the entity types had resolution times between 120 and 241 days. The survival times spread out across the categories by the third quartile (75 percent), with resolution dates ranging from 468 days (Patent Holding Companies) to 1,192 days (Failed Operating Companies). Individuals and Failed Operating Companies both appear to pend longer in the later quartiles. Operating Companies exhibit a similar behavior, but not to the same extent.

To further investigate whether there are any statistically significant differences, we controlled for a variety of independent variables that may also influence the survival time of a case. These include the total number of defendants in a given case, the technology at issue, and the district court in which the case is pending. The results of the series of hazard model regressions are reported in Appendix A1, with the graphical output shown in Figure 3.[142]

The lines in Figure 3 illustrate the survival rate (the y-axis, between 0 and 1) over time (the x-axis, measured in years from lawsuit filing). Half the defendants will have settled at a survival of 0.5. Figure 3 plots the survival curves for Operating Companies and an aggregate NPE category including all Non-Operating Companies.[143] The general configuration for both entity types is strikingly similar. The NPE curve is lower than the Operating Company survival curve, showing that defendants sued by NPEs, in general, obtain quicker resolutions than defendants sued by Operating Companies.

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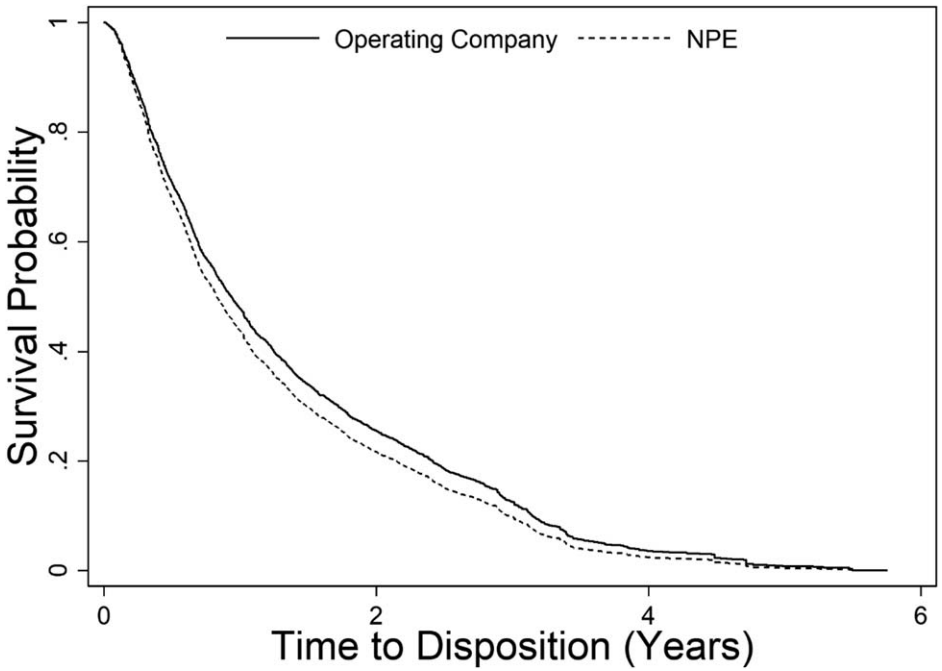
[142]In unreported hazard models and regressions, we performed the same analyses using uncollapsed defendants. The trends were identical to those reported in this article. The same variables were statistically significant and the coefficients were in the same direction.

[143]In the regressions, we chose a "base" category for entity type. The base category forms the baseline against which to compare the other categories, both in terms of testing for significance and the magnitude of difference. We chose to use Operating Companies as the base entity type because we are interested in differences in durations for various forms of NPEs in comparison to operating companies. In unreported hazard models and regressions, we performed the same analysis using Failed Operating Companies as the base category. The difference between this base and every other entity type was statistically significant. Because our core hypotheses deal with the difference between operating companies and various types of NPEs, we felt that operating companies were a more appropriate base category.

Figure 3: Hazard model (any disposition).

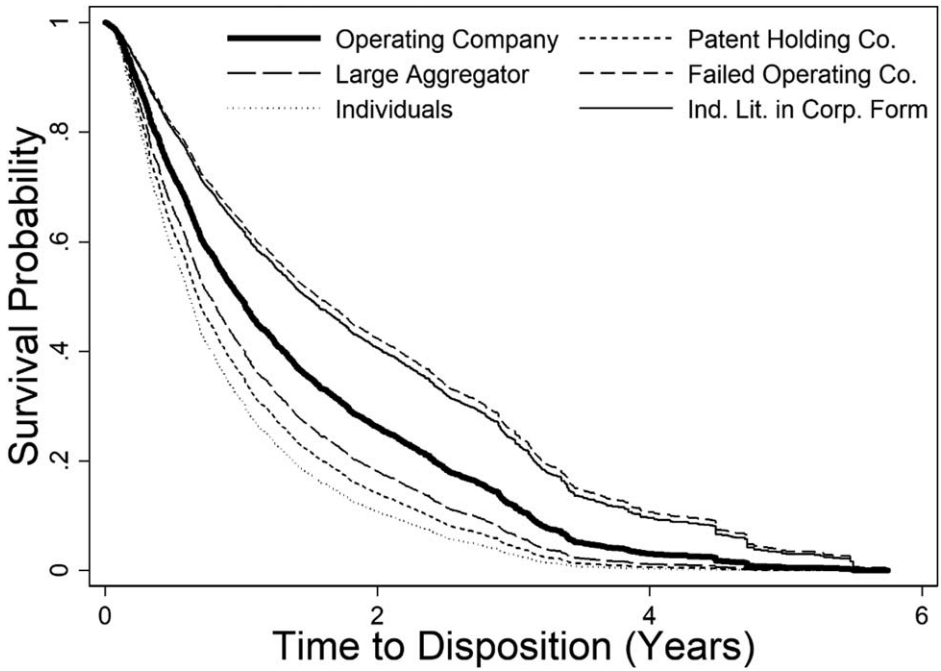


We also separate NPEs into various categories. In Figure 4, we plot the survival curves for entity types, separating these categories, and also separating true individual inventors from individuals litigating in a corporate form.

Patent Holding Companies and Large Aggregators survive at lower rates, both compared to Operating Companies. That means that Patent Holding Company cases are disposed of quicker. Defendants sued by Large Aggregators also obtain quicker resolutions. Individual Inventors who litigated in their personal capacity differed from Individual Inventors who formed a corporate vehicle before litigating. Individual Inventors who litigated in their personal capacity survived shorter—their cases were resolved faster. In contrast, Individual Inventors who litigated in corporate form survived longer than Operating Companies, meaning that their cases were resolved slower. Failed Operating Companies had their cases resolved slower.[144]

[144]These hazard curves could be compared to hazard curves for the duration of other types of civil litigation. However, the data that were readily available—information from the U.S. Administrative Office of the Courts (AO)—suffered from two limitations that prevented such a comparison. First, the AO data, while breaking the cases down by subject matter litigated, do not categorize the data by plaintiff type like our data. This lack of granularity inhibits a proper comparison between various other civil litigations and patent litigation. Second, the specific collection methodology and actual validity of the AO data are difficult to ascertain. This makes the ultimate integrity of a comparison between the AO data and our data questionable. These limitations prevent such a comparison in this study. However, one-to-one comparison, once the data are collected and coded for other types of civil litigation, is a fruitful future avenue of research.

Figure 4: Hazard model (any disposition, separating types of NPEs).



As reported in Appendix A1, we performed a series of regression models with a range of control variables.[145] The results were completely consistent with the trends shown in Figure 4 and also consistent across models. The regression results provide more evidence that our findings are robust. The control variables we include in the models are consistent with several ex ante views on various factors that may relate to case duration. One control variable was the total number of defendants in the lawsuit. Although our unit of analysis is the individual defendant, we recognize that cases may proceed more slowly the greater the number of defendants in the case. There is more discovery to take and a greater chance of a disagreement that requires court intervention.

We controlled for technology because case complexity may be related to technology. Technology, especially the chemical/pharmaceutical category, may be an imperfect proxy for generic drug litigation. Those cases have a complex statutory framework that includes an automatic 30-month stay upon filing of an application for approval of the

[145]In the regression models, we only included unrelated defendants. As we previously discussed, we are concerned that some patentees sued multiple related defendants, which may result in some double counts. Removing related defendants avoids this possibility.

Table 2: Survival in Days (Voluntary Dispositions Only)

	# of Defs	*25%*	*50%*	*75%*	*90%*
University	16	241	395	698	820
Individuals	659	192	481	1,067	1,160
Large Aggregator	277	202	363	674	827
Failed Operating Company	286	160	324	1,259	1,722
Patent Holding Company	1844	117	237.5	449	747
Operating Company	2545	142	298	622	1,044
Tech. Development Company	44	220	388	739.5	931

generic formulation. In these cases, there is little incentive for the patent holder to quickly press for a ruling on the merits. We controlled for judicial district[146] as the districts across the country vary in backlog, speed, and the number of patent lawsuits filed in that district. We also controlled for the number of patents asserted. The thinking here was that more asserted patents means more work for the parties, which could mean longer duration. Finally, we controlled for whether the plaintiff was a declaratory judgment plaintiff as previous empirical work has found this related to duration.[147]

The regression results confirm that there are some statistically significant differences in the duration of cases by entity type and district. Notably, Failed Operating Company cases survived longer than Operating Company cases. Failed Operating Companies had the smallest coefficient in the most complete model. Individual Inventors who formed a corporate vehicle before litigation also survived longer than Operating Companies.

Two entity types survived shorter than Operating Company cases: Patent Holding Companies and Large Aggregators. Patent Holding Companies had the largest coefficient in the most complete model. The other entity types did not have statistically significant differences from the base. Cases involving Individual Inventors litigating in their individual capacity also survived for less time.

The second hazard model focused on a subset of the dispositions, only those cases that terminated voluntarily. These voluntary terminations are likely settlements, which may be useful to evaluate litigation strategies of entity types without formal court adjudication. To truncate the dataset, we excluded defendants that did not settle, but instead exited the case through a procedural or substantive determination. In Table 2, we report the survival quartiles for each entity type.

The distribution among entity types is very similar to that observed for all dispositions. Again, Individuals and Failed Operating Companies both appear to pend longer in the later quartiles. The difference between Operating Companies and other entities is not as pronounced as seen in Table 1.

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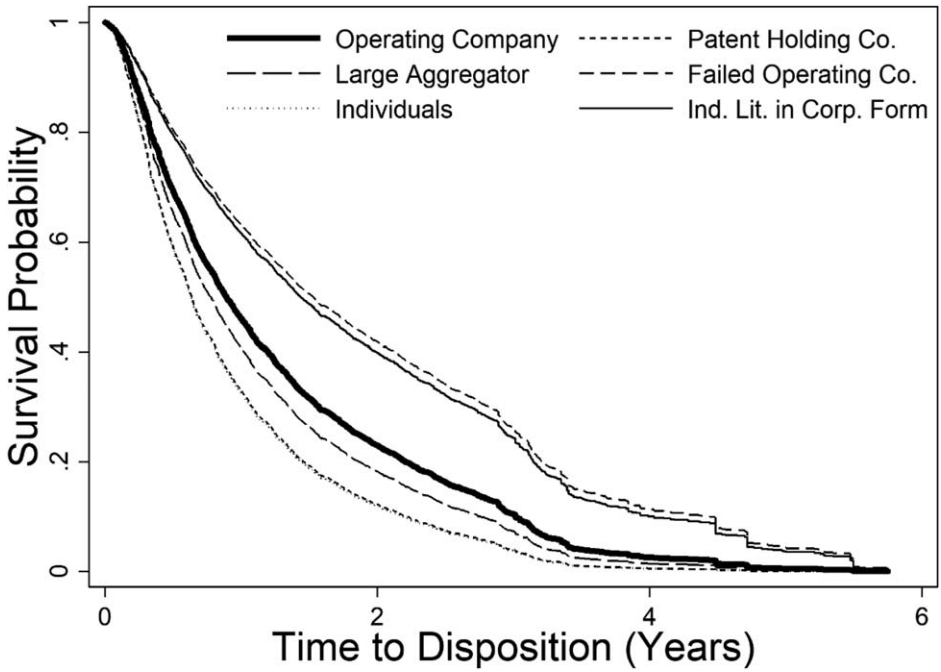
[146]For our district fixed effects, we included a separate dummy variable for each judicial district in which a patent case was filed in 2010.

[147]See Michael Risch, A Generation of Patent Litigation, 52 San Diego L. Rev. 67, 95–96 (2015).

Figure 5: Hazard model (voluntary dispositions only).



To further investigate whether there are any statistically significant differences, we controlled for the same independent variables listed above. The results of the hazard model regressions are reported in Appendix A2, with the graphical output shown in Figure 5.

As reported in Appendix A2, our basic results with respect to statistical significance of Patent Holding Companies and Individual Inventors litigating in corporate form—all relative to Operating Companies—were consistent across all models, and were the same for voluntary dispositions as they were for all dispositions. Failed Operating Companies had longer durations, but Individual Inventors litigating as individuals had shorter durations.

In addition to the hazard models, we also investigated the relationship between entity type and case duration using a series of linear regression models. As reported in Appendix A3, we find similar results in the linear regression models as we do in the hazard models. More specifically, we find that Patent Holding Companies litigate, on average, between 127 and 197 days less than Operating Companies, while Large Patent Aggregators litigate on average between 91 and 132 days less than Operating Companies.[148] True Individuals litigate on average between 91 and 195 days fewer than Operating Companies. Individual Inventors litigating in corporate form litigate on average between 149 days and 207 days longer than Operating Companies. We note that while

[148]To estimate the number of days, we converted the coefficients from the regressions from years to days.

these results are statistically significant, that does not mean that these relatively small differences are practically important.

In sum, in terms of raw durations, there are differences in durations based on the patentee entity type. This survivability is statistically significant among many entity types.

2. Disposition of the Cases

Moving beyond case duration, we now discuss case dispositions. Our data also allow us to observe the disposition of the 8,399 terminated defendants by patentee entity type. As previously mentioned, we grouped dispositions into three categories: voluntary, procedural, and substantive dispositions. Figure 6 reports these results for all the coded defendants for six categories of patentee types: Individuals litigating in their individual capacity, Individuals forming a corporate vehicle to litigate, Operating Companies, Patent Holding Companies, Failed Operating Companies, and Large Aggregators, after correcting for related defendants.[149]

As can be seen in Figure 6, the dominant disposition for all patentee entity types is voluntary, which are highly likely to be settlements. Over 80 percent of all defendants exit lawsuits because of voluntary settlements. A larger percentage of defendants sued by Large Aggregators are terminated by settlements compared to other categories of patentees.[150]

There are, as seen in Figure 6, differences in distribution among the different disposition categories depending on the patentee entity type. We have, however, concerns that certain aspects of the raw distribution are endogenous, including where the lawsuits are filed and the technology. To try to untangle these potential effects, we performed a series of linear regressions for each disposition—voluntary, procedural, and substantive—with the entity type.[151] In the full specification, we also controlled for the total number of defendants in each case, the number of patents asserted, whether the action was a declaratory judgment action, technology group fixed effects, district court fixed effects, judge fixed effects,[152] plaintiff attorney fixed effects,[153] most litigious patent holder fixed effects,[154]

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[149]In unreported results, we find essentially the same pattern without collapsing multiple, related defendants into a single defendant.

[150]The differences are not statistically significant.

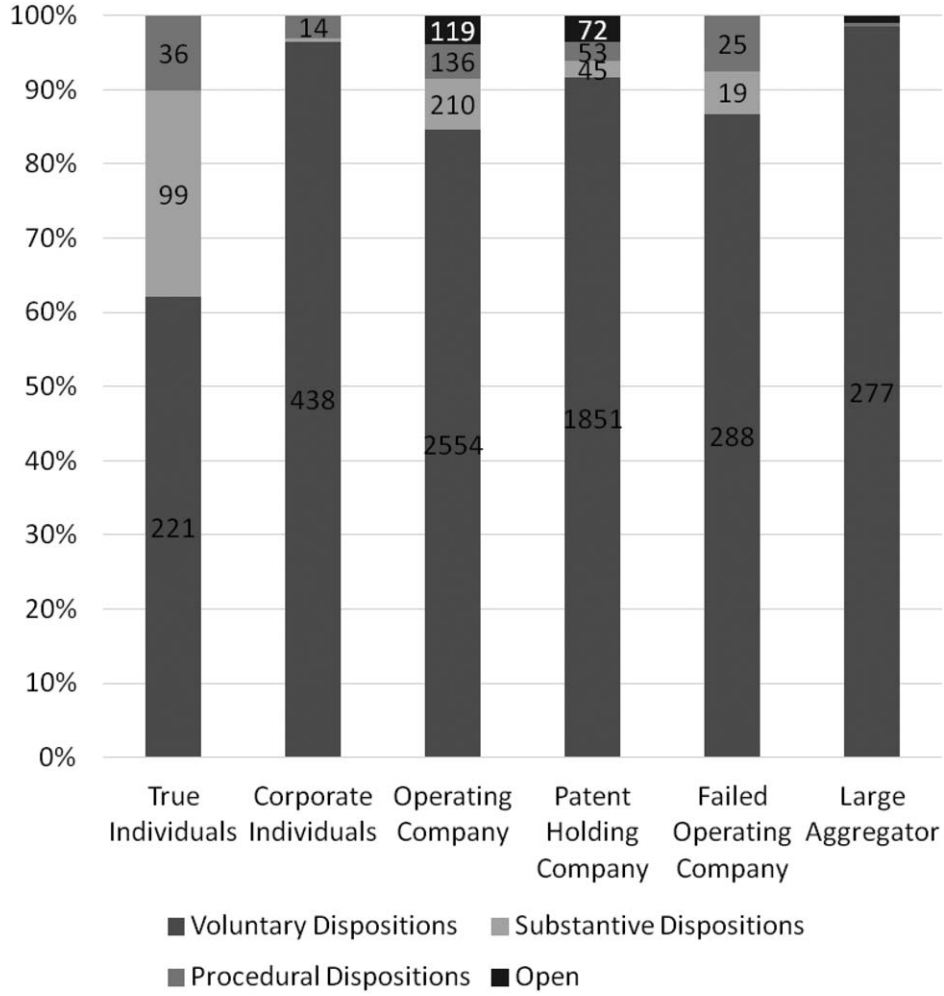
[151]We separately ran logit, probit, and linear regression models. The results were consistent. For ease of interpretation of the coefficients, we report in this article the results from the linear regression models.

[152]For judge fixed effects, we included a separate dummy variable for each judge who presided over five or more defendants in 2010. The remaining judges were included in a residual dummy variable.

[153]We included a separate fixed effect for each attorney appearing in more than 25 cases, which included 36 lawyers.

[154]We included a separate fixed effect for each of the most litigious patent holders in 2010. For the most litigious patent holders, we used any patent holder who sued 50 or more companies in 2010. These were Geotag, Parallel Networks, Condatis, PACid Group, Uniloc, Adjustacam, ArrivalStar, Gharb, Lexmark, Lottotron, Patent Harbor, Tripharma, Wolf Run Hollow, and Wordcheck Tech.

Figure 6: Number of dispositions by patentee entity type (collapsing related defendants).



and a pro se representation dummy.[155] We ran separate regressions for each disposition, in part as a robustness test, since the cases that reach each phase may be different. We clustered standard errors at the district level.[156] As reported in full in Appendices B1, B2,

[155]For these models, we performed the analysis only on the collapsed defendants. The unreported results for all defendants showed the same variables as statistically significant and in the same direction.

[156]As a robustness check, we also reran the regressions with standard errors clustered at the case level. The results reported in the appendices cluster at the district level, but results from clustering at the case level are materially the same in terms of statistical significance.

and B3, there is statistical significance between some entity types.[157] For comparison purposes, we used Operating Company as the base category. An *F* test for joint entity type effects was statistically significant in all models, further supporting our finding that there are statistically significant differences among the entity types. The judge fixed effects model controlled for the identity of the judge. Including judge fixed effects increased the explanatory power of some of our models from about 13.5 percent to over 38 percent, a large increase. The increase in the power of predicting durations when the judge is controlled for makes sense since the judge has substantial power over the case schedule.

Individual Inventors are statistically significant in many models. Individual Inventors litigating as true individuals are positively correlated with substantive dispositions.[158] They are across our models about 88 percent and 213 percent (7–24 percentage points, with lower percentage points in models with more controls) more likely to result in substantive dispositions than are Operating Companies. They are negatively correlated with voluntary dispositions (settlements) by about 13 percent and 29 percent (between 5–25 percentage points, with 25 percentage points in the model with least controls). That means that Individual Inventors were more likely than Operating Companies, on average, to have their cases proceed to a resolution by the courts, and less likely to settle. Fewer settlements and more adjudications is in accord with our findings on Individual Inventor case duration. Typically, settlements occur quicker than adjudications.

Consistent with the descriptive data presented in Figure 6, Large Aggregators were much more likely to settle their cases than Operating Companies. They are, depending on the model, about 7 percent and 18 percent (between 6–16 percentage points, with 16 percentage points in the model with least controls) more likely to settle. Large Aggregators are between 97 percent and 213 percent (between 6 and 10 percentage points) less likely to have their cases reach a substantive disposition.

Patent Holding Companies were different in a statistical sense from Operating Companies on substantive dispositions but not on voluntary dispositions or procedural dispositions. With respect to settlements (voluntary dispositions), only the least complete model showed statistically significant differences between Patent Holding Companies and Operating Companies. Patent Holding Companies were between 56.7 percent and 86.7 percent (between 3 and 5 percentage points) less likely to reach a substantive disposition relative to Operating Companies. However, the differences between Patent Holding Companies and Operating Companies was smaller than the differences between Individual Inventors and Operating Companies.

Further, Patent Holding Companies and Large Aggregators displayed the opposite behavior from Individual Inventors. Large Aggregators settled more than Operating Companies while Individual Inventors settled less. Patent Holding Companies and Large Aggregators were less likely to adjudicate to a substantive disposition than were

[157]In the appendices, we report the *F* statistic for joint entity type effects in all models.

[158]One individual inventor patentee, Dr. Pieczenik, sued over 40 defendants in 2010. In unreported results, we excluded the doctor from our regressions and found the same variables statistically significant in the same direction. Thus, our results are robust regardless of whether he is included in the dataset.

Operating Companies, while Individual Inventors went to a substantive judgment more often than Operating Companies.

We pause here to briefly talk about selection concerns. Lawsuits are not randomly distributed among entity types, technologies, judicial districts, declaratory judgment actions, numbers of asserted patents, or a whole range of other variables. In fact, these attributes themselves may be correlated with our variable of interest, patentee entity status: PAEs may select patents in certain technologies such as software and file lawsuits in particular districts such as the Eastern District of Texas. Each of these separately or together may influence the propensity of a given lawsuit to settle. While we control for variables such as judicial district, judge, and law firm, our regression models cannot account for any of these intrinsic characteristics, and our results should be understood with this important caveat.

B. Relationship Between Patentee Entity Type and Early Settlement and the Merits

We now turn back to the policy-relevant questions of whether PAEs bring mainly frivolous charges of infringement, seeking nuisance fee settlements. We cannot directly answer these questions since we do not have any information on the amount of settlements. However, we can analyze how frequently different types of PAEs quickly settle their cases, perhaps with an eye to avoiding adjudication of their claims on the merits. In other words, it may be that cases that settle very early are settling for very small amounts of money, the so-called hit-and-run phenomenon.[159] We analyzed the amount of time it took for various defendants to have their cases disposed. We divided voluntary dispositions among various patentee entity types and looked at whether it took less than 60 days, less than 120 days, or more than 120 days to reach voluntary disposition. We also observed, by patentee entity type category, the number of defendants that had their cases terminated by the court or that still had their cases pending. We report the results in Figure 7.

For the patentee entity type cases identified above, a large percentage of defendants were dismissed voluntarily, but after 120 days. In fact, over half the defendants were dismissed voluntarily after 120 days.

Just as we did with dispositions, we examined whether the difference in distribution of these times to voluntary dismissal was explainable by various control variables. We performed similar linear regressions as we did with the dispositions. However, this time, voluntary dismissal within 60 and within 120 days were the dependent variables with the wide range of control variables used in the earlier models.

As reported in full in Appendices C1 and C2, when using all the patentee category types shown in Figure 7, the difference between some entity types and other independent variables is statistically significant, and the length of time to voluntary disposition

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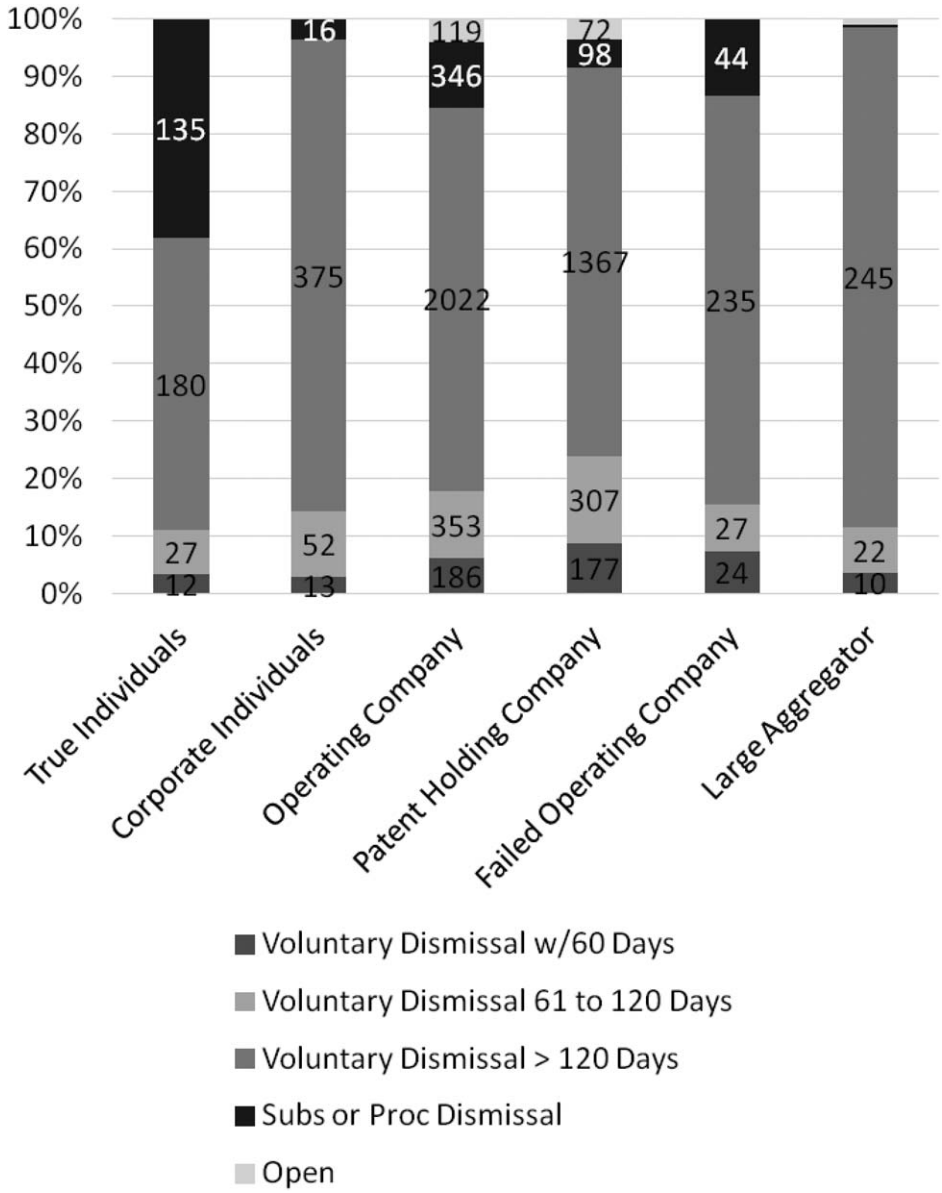
[159]We recognize that the opposite may also be true. The early settlements may represent cases in which the parties agree that the patent is valid and infringed, and early settlement reduces both parties' litigation fees. We are skeptical that many defendants settle for large sums of money very early in litigation. Patent litigation is quite unpredictable, in our experience, and defendants are frequently unwilling to settle for significant amounts before serious litigation.

Figure 7: Time to disposition by patentee entity type.



when using Operating Companies, mechanical technology, and district courts other than those identified as the base categories. Of note, Patent Holding Companies are more likely to settle in every different time period.

Table 3: Outcomes by Patentee Entity Type

	Patentee Wins	*Alleged Infringer Wins*
University	0	0
Individuals	3 (6%)	47 (94%)
Large Aggregator	0	0
Failed Operating Company	8 (40%)	12 (60%)
Patent Holding Company	11 (20.4%)	43 (79.6%)
Operating Company	182 (47.1%)	204 (52.9%)
IP Holding Company	1 (14.3%)	6 (85.7%)
Technology Development Company	0 (0%)	15 (100%)

The regression models show statistically significant results for some of the entity types compared to the base category of Operating Company. Patent Holding Companies were more likely than Operating Companies to voluntarily settle a case within 60 days from the date the defendant was sued. Our regression models estimate that the rate of such an early settlement increases 62 percent and 82 percent (between 4–5 percentage points) compared to an Operating Company, although the differences are not statistically significant in our most complete model (which includes lawyer fixed effects) and at the low end (62 percent) for the next most complete model.

Voluntary dispositions within 120 days tells a different story. Only Patent Holding Companies are statistically significant in each of our regression models. Thus, there is robust evidence that in the patent lawsuits filed in 2010, Patent Holding Companies were more likely to settle early—within 60 or 120 days of suing a defendant—than were Operating Companies. Individual Inventors are significant, but only in one of our six models.

We also observed the ultimate result in those cases that were not voluntarily disposed. That is, we coded for whether the patentee or alleged infringer received a winning judgment in those cases with substantive or procedural dispositions. These are a very small percentage of all filed lawsuits, representing only 640 defendants out of 6,468 defendants sued (9.89 percent). The outcomes, by patentee entity type, are reported in Table 3.

When just looking at outcomes, the differences between Operating Companies and PAEs are quite stark. Operating Companies won just under half their cases. PAE entity types lost more cases than they won. Patent Holding Companies prevailed at adjudication on just over 20 percent of defendants. Individual inventors do extremely poorly in adjudicated cases, winning just 6 percent of those decisions. Unlike our data on case duration and settlement where Individuals and Patent Holding Companies were on opposite sides of Operating Companies, both types of PAEs lose much more in adjudications than do Operating Companies. This is consistent with the narrative that patent holding companies prosecute weaker cases or have fewer resources to prevail at trial. It is also generally consistent with findings from another study conducted by one of the present authors that analyzed lawsuits filed in other years, 2008 and 2009.[160]

[160]Allison et al., supra note 25.

Intriguingly, Large Aggregators took no cases to a final adjudication. There were no defendants who either won or lost, meaning that all their cases either settled or resulted in a procedural disposition. Figure 6 shows that procedural dispositions account for almost none of the distribution of Large Aggregator cases; Large Aggregators settle with almost every single defendant. The reasons for and amounts of the settlements, of course, are unknown to us. It is possible that these entities, with large portfolios of patents, have sizable bargaining power with defendants. Alternatively, these entities may settle for small cost-of-defense amounts, making settlement quite enticing to defendants. We note that there were no intellectual ventures lawsuits filed in 2010, but that Acacia Research Corporation was very active and its affiliates make up over half our Large Aggregator patent holders. Wi-Lan was also a frequent Large Aggregator litigant in 2010.

However, the adjudicated defendants represent a very small percentage, about 5 percent, of all the defendants sued. The settlement rates, while all high, differ by entity type. Unfortunately, we do not know the amount in dispute in these cases nor the settlement amounts. It is possible that the additional cases settled by Patent Holding Companies, for instance, were lawsuits they would have won if they reached a final ruling. If this is true (and we have no evidence, either way, on this point), it could explain the differences in win rates. Classic law and economics theory argues that the cases that reach judgment should be the closest cases, the 50–50 cases.[161] Our results for Operating Companies fit this theory, but our results for other patentee types do not. The Priest-Klein theory of litigation also asserts that when the parties have asymmetric stakes, the win rate will vary from 50–50. Here, Operating Companies can obtain injunctive relief in lawsuits while most PAEs cannot.[162] Injunctive relief may result in asymmetric stakes.[163] Priest-Klein predict that having more to gain will result in higher trial win rates,[164] which is consistent with what we observe. The long and the short is that because it is unlikely that the litigated to judgment cases are representative of the settled cases, we urge caution in drawing conclusions from them.

V. Implications

Our analyses of case progression, settlement, and adjudication, taken together, reveal a complicated settlement picture of litigation by different entity types. Some of this may be expected. For instance, cases where an Operating Company is the patentee plaintiff

[161]Priest & Klein, supra note 36. Others have criticized parts of the Priest-Klein theory. See, e.g., Lee & Klerman, supra note 36.

[162]Seaman, supra note 50 at 1988, Fig. 3 (2016).

[163]Id. at 1980 ("The selection effect is compounded by the asymmetric stakes of injunctive relief, which typically 'harms the infringer more than it benefits the patentee.' These factors may result in underrepresentation of certain types of patent cases. For instance, injunction decisions involving PAEs appear to be underrepresented in the Decisions Dataset.").

[164]Priest & Klein, supra note 161.

may be more likely to have patent counterclaims, which increase the complexity and length of the litigation. Perhaps most interesting and counterintuitive is that the data suggest that not all PAEs are equal. When compared to Operating Companies, some PAE cases exhibit higher survivability—Individuals—and others lower survivability—Patent Holding Companies and Large Aggregators. Thus, different types of PAEs are on opposite sides of Operating Companies in terms of how long their cases last.

Individual Inventors are much less likely to settle overall. Large Aggregators are much more likely to settle overall, but there is no evidence that Large Aggregators settle early. Patent Holding Companies settle early and later. It may be that these early settlements represent nuisance value settlements. However, we offer two observations. First, while the common cost estimates of patent litigation are that it costs millions of dollars in attorney fees, cases that settle within a few months cost only a fraction of that amount. Second, the fact that we only observe early settlements for Individuals, but not for the later ones may relate to the selection of disputes for litigation. Although competitors may resolve some disputes before commencing formal litigation, non-competitors may not have that opportunity. It may be that the only way that large defendants, or at least their lawyers and corporate decisionmakers, will take a license from companies with whom they are not familiar is if the matter progresses to litigation.

Perhaps Large Aggregators want to settle, but seek larger sums. Perhaps they are well schooled in finding the optimal point to settle lawsuits, as repeat players in the business, and do not settle too early. Rather, they wait until they receive information during discovery or wait for important court rulings. Then they settle before trial to avoid uncertainty. Hence, we need to carefully consider various policy recommendations to make sure they will have the intended effect. For instance, because Large Aggregators are more likely to settle than other types of patentees, fee shifting upon an unsuccessful lawsuit will have less bite.

Individual inventors who have formed a corporate vehicle to enforce tend to litigate for a substantial duration. These individual inventors may be more sophisticated than the individual inventors who litigate without forming a corporate entity. They may be guided by more sophisticated counsel, which results in more strategic litigation. For instance, these patent holders may embark on a "war chest" model of litigation.[165] True individual inventors may be making small technical contributions to the field. Thus, they may be entitled to small compensation. Furthermore, as for trial win rates, perhaps this is explained by resources at trial. Large corporate defendants and plaintiffs have the financial resources to pay well-credentialed experts and prepare polished graphical presentations. One expects that this matters in terms of jury perception and outcomes.

Individual Inventors settle less frequently, and reach merits rulings more often, but have a shorter duration. At first glance, the shorter duration and more substantive rulings seem in direct conflict. However, many of the Individual Inventor lawsuits were

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[165]David L. Schwartz, The Rise of Contingent Fee Representation in Patent Litigation, 64 Ala. L. Rev. 335, 368–69 (2012) (describing the "war chest" model of enforcing a patent against multiple alleged infringers, which entails using settlement money from early defendants to build a "war chest" to pay experts and lawyers in subsequent cases. This permits the later cases to be litigated more aggressively).

resolved quickly, some even by motions to dismiss. Thus, even when the court resolved the case, it often occurred quickly (frequently finding against the Individual Inventor on the merits).

It is possible that true individual patent holders may be less sophisticated and reject reasonable settlement offers. Alternatively, perhaps there are differences in their litigation counsel, the underlying patents, or some other characteristic of the litigation system that may explain these results.

Why are true individuals different from individuals who chose to incorporate before litigating? It may be that true individuals lack sophistication if they bring a lawsuit without forming a corporate entity. As a litigant, they are subject to potential fee shifting as well as responsibility for litigation costs if they fail on the merits. If the individual incorporates, then the corporate entity will be liable for any award, not the individual. Thus, lack of incorporation may signal less sophistication. Alternatively, patents owned by an individual may be purchased by a Large Aggregator or Patent Holding Company. If these entities decline to purchase a patent from an individual, the individual may assert it herself in litigation. We would expect these patents to be weaker, however, since PAEs declined to purchase and enforce them.

VI. Conclusion

The actual litigation behavior of PAEs is much more complicated than the simple narratives portrayed in the media. Within the broad category of PAEs, there is tremendous heterogeneity. Entity types, particularly individual inventors and patent holding companies, behave differently than operating companies. However, individual inventors litigate longer, while patent holding companies litigate more quickly. The differences in litigation behavior, while contrary to the common narrative, are not altogether unexpected. The differences are indeed consistent with economic intuition. Different entity types likely have different risk profiles and different incentives, for instance, which drive settlement and litigation strategy. Our robust empirical study confirms that not all PAEs are alike.

Cries that PAEs are universally different from other types of patentee plaintiffs appear to be overstated with respect to case progression and settlement. Using granular data on a per-defendant basis, we analyzed the relationship between entity type in settlement behavior and litigation outcomes. The relationship is more complex than previously understood. Individual inventors play a larger role in the patent system than others have recognized, as do failed operating companies. Surprisingly, individual inventors and failed operating companies appear to be quite different from operating companies and even from other PAEs. Their cases pend longer, indicating that they litigate more, and they settle at lower rates. Why individual inventors and failed operating companies may be behaving differently is an important question, and one that we cannot fully answer with our data. That said, our analysis indicates that some of the "hit-and-run" complaints about patent trolls do not seem to apply to individual inventors or failed operating companies.

Turning to PAEs, we examine whether they settle cases more quickly compared to operating companies. We find that certain venues, technologies, and types of PAEs are correlated with early settlement, but other types of PAEs exhibited the opposite behavior. We cannot, unfortunately, analyze the amount of money included in settlement agreements, as that information is not publicly available and typically treated as confidential. Thus, we cannot directly confront the story that PAEs seek nuisance fee settlements, especially in ways that are meaningfully different from operating company patent holders. The duration data indirectly contradict this story, but further study is recommended. Finally, further study of the underlying patents in the disputes, including the origination of patents asserted by PAEs, will be useful.

Our study establishes that there is significant heterogeneity in litigation behavior and in litigation outcomes among various types of patent plaintiffs. As a result, any patent policy reform that targets specific patent plaintiff types or categories of patent plaintiffs (such as practicing entity vs. non-practicing entity) should be analyzed carefully to understand the disparate impacts that the proposed legislation might have on different categories of patent plaintiffs, for the proposed reform might well fail to meet its intended objectives.

Appendix

Appendix A1: Hazard Model Regression (All Dispositions)[a]

	Duration (Years)				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
University	0.065	0.041	−0.036	0.132	0.161
	(0.149)	(0.186)	(0.194)	(0.330)	(0.338)
Large Aggregator	0.303***	0.308***	0.337***	0.384***	0.599***
	(0.108)	(0.117)	(0.123)	(0.129)	(0.165)
Failed Operating Co.	−0.232	−0.484**	−0.420**	−0.767***	0.199
	(0.198)	(0.204)	(0.205)	(0.260)	(0.220)
Patent Holding Co.	0.436***	0.475***	0.507***	0.554***	0.543***
	(0.076)	(0.081)	(0.087)	(0.100)	(0.108)
Technology Development Co.	−0.101	−0.048	−0.019	0.069	0.121
	(0.159)	(0.157)	(0.165)	(0.252)	(0.215)
Individual	0.503***	0.371***	0.349***	0.398**	0.363**
	(0.090)	(0.110)	(0.119)	(0.172)	(0.178)
Ind. Lit. in Corp. Form	−0.221**	−0.371***	−0.311***	−0.379**	0.002
	(0.112)	(0.118)	(0.120)	(0.176)	(0.160)
Pro se Plaintiff					1.567**
					(0.764)
Controls					
Attorney FE	No	No	No	No	Yes
Litigious FIÎ	No	No	No	No	Yes
Court FE	No	Yes	Yes	No	No
Judge FE	No	No	No	Yes	Yes
Dec Judge.	Yes	Yes	Yes	Yes	Yes

Appendix A1 *Continued*

	Duration (Years)				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
No. Def.	Yes	Yes	Yes	Yes	Yes
Technology	No	No	Yes	Yes	Yes
No. Patents	Yes	Yes	Yes	Yes	Yes
Obs	6,127	6,127	6,105	6,105	6,105

NOTE: Standard errors in parentheses. * $p<0.$, ** $p<0.05$, *** $p<0.01$.
[a]The table in Appendix A1 reports five separate Cox hazard models that predict the hazard of case disposition for each defendant. The omitted patentee type is operating company. The various controls are attorney fixed effects (Attorney FE), fixed effects for the most litigious patentees in 2010 (Litigious FE), court fixed effects (Court FE), judge fixed effects (Judge FE), declaratory judgment (Dec. Judge.), number of defendants (No. Def.), NBER technology category (Technology), and the number of patents in the lawsuit (No. Patents). "Obs" provides the number of observations present in the model. The models were created using Stata.

Appendix A2: Hazards Regression (Voluntary Dispositions Only)[a]

	Duration (Years)				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
University	−0.030	−0.108	−0.174	−0.268	−0.264
	(0.161)	(0.191)	(0.189)	(0.407)	(0.447)
Large Aggregator	0.226**	0.258**	0.274**	0.275**	0.349**
	(0.113)	(0.124)	(0.132)	(0.139)	(0.174)
Failed Operating Co.	−0.246	−0.480**	−0.417*	−0.853***	0.477**
	(0.230)	(0.238)	(0.239)	(0.308)	(0.227)
Patent Holding Co.	0.440***	0.495***	0.523***	0.527***	0.438"*
	(0.078)	(0.087)	(0.092)	(0.106)	(0.117)
Technology Development Co.	−0.137	0.004	0.043	0.033	0.159
	(0.201)	(0.204)	(0.213)	(0.263)	(0.252)
Individual	0.354***	0.163	0.142	0.112	0.060
	(0.113)	(0.137)	(0.145)	(0.169)	(0.164)
Ind. Lit. in Corp. Form	−0.244**	−0.373***	−0.320**	−0.368*	0.182
	(0.121)	(0.130)	(0.133)	(0.203)	(0.178)
Pro se Plaintiff					2.159***
					(0.557)
Controls					
Attorney FE	No	No	No	No	Yes
Litigious FE	No	No	No	No	Yes
Court EE	No	Yes	Yes	No	No
Judge FE	No	No	No	Yes	Yes
Dec. Judge.	Yes	Yes	Yes	Yes	Yes
No. Def.	Yes	Yes	Yes	Yes	Yes
Technology	No	No	Yes	Yes	Yes
No. Patents	Yes	Yes	Yes	Yes	Yes
Obs	5,456	5,456	5,452	5,452	5,452

NOTE: Standard errors in parentheses.* $p<0.1$, ** $p<0.05$, *** $p<0.01$.
[a]The table in Appendix A2 reports five separate Cox hazard models that predict the hazard of voluntary case disposition for each defendant. The omitted patentee type is operating company. The various controls are attorney fixed effects (Attorney FE), fixed effects for the most litigious patentees in 2010 (Litigious FE), court fixed effects (Court FE), judge fixed effects (Judge FE), declaratory judgment (Dec. Judge.), number of defendants (No. Def.), NBER technology category (Technology), and the number of patents in the lawsuit (No. Patents). "Obs" provides the number of observations present in the model. The models were created using Stata.

Appendix A3: Linear Regression on Duration[a]

	Duration (Years)				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
University	–0.027	–0.053	–0.005	–0.257	–0.247
	(0.153)	(0.220)	(0.244)	(0.270)	(0.304)
Large Aggregator	–0.354***	–0.327***	–0.342**	–0.248**	–0.363***
	(0.117)	(0.114)	(0.137)	(0.110)	(0.135)
Failed Operating Co.	0.243	0.572*	0.521*	0.674**	–0.077
	(0.432)	(0.290)	(0.309)	(0.262)	(0.218)
Patent Holding Co.	–0.522***	–0.506***	–0.539***	–0.419***	–0.347***
	(0.061)	(0.063)	(0.079)	(0.107)	(0.085)
Technology Development Co.	0.131	0.065	0.025	0.011	0.003
	(0.195)	(0.182)	(0.201)	(0.293)	(0.203)
Individual	–0.534***	–0.393***	–0.397***	–0.337**	–0.249**
	(0.101)	(0.103)	(0.111)	(0.155)	(0.113)
Ind. Lit. in Corp. Form	0.408	0.550**	0.504**	0.566**	0.055
	(0.253)	(0.233)	(0.241)	(0.227)	(0.152)
Pro se Plaintiff					–0.725***
					(0.278)
F statistic	15.49***	21.71***	40.58***	55.67***	3.01***
Controls					
Attorney FE	No	No	No	No	Yes
Litigious FE	No	No	No	No	Yes
Court FE	No	Yes	Yes	No	No
Judge FE	No	No	No	Yes	Yes
Dec. Judge.	Yes	Yes	Yes	Yes	Yes
No. Def.	Yes	Yes	Yes	Yes	Yes
Technology	No	No	Yes	Yes	Yes
No. Patents	Yes	Yes	Yes	Yes	Yes
Obs	6,127	6,127	6,105	6,105	6,105
R^2	0.116	0.183	0.186	0.384	0.430
Dep Var Mean	1.29	1.29	1.29	1.29	1.29

NOTE: Standard errors in parentheses. *$p<0.1$; **$p<0.0$; ***$p<0.01$.

[a]The table in Appendix A3 reports five linear regression models that predict the duration a particular defendant remains in a lawsuit. The omitted patentee type is Operating Company. Standard errors were clustered at the district court level. The various controls are attorney fixed effects (Attorney FE), fixed effects for the most litigious patentees in 2010 (Litigious FE), court fixed effects (Court FE), judge fixed effects (Judge FE), declaratory judgment (Dec. Judge.), number of defendants (No. Def.), NBER technology category (Technology), and the number of patents in the lawsuit (No. Patents). "Obs" provides the number of observations present in the model. "*F* statistic" reports the results of an *F* test for joint entity type effects. The models were created using Stata.

Appendix B1: Voluntary Dispositions[a]

	Voluntary Dispositions				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
University	0.112*	0.163**	0.158**	0.157	0.154
	(0.059)	(0.072)	(0.069)	(0.114)	(0.119)
Large Aggregator	0.158***	0.100***	0.094**	0.057***	0.132***
	(0.035)	(0.035)	(0.041)	(0.017)	(0.043)
Failed Operating Co.	0.035	0.002	0.014	–0.063*	–0.024
	(0.056)	(0.063)	(0.071)	(0.038)	(0.055)
Patent Holding Co.	0.067**	0.036	0.041	0.010	0.041*
	(0.033)	(0.029)	(0.033)	(0.026)	(0.025)
Technology Development Co.	–0.062	–0.044	–0.033	0.084	0.017
	(0.079)	(0.081)	(0.083)	(0.059)	(0.068)
Individual	–0.249**	–0.193*	–0.171	–0.114	–0.053
	(0.105)	(0.104)	(0.104)	(0.078)	(0.043)
Ind. Lit. in Corp. Form	0.138**	0.102	0.108	0.080***	–0.073
	(0.069)	(0.069)	(0.068)	(0.029)	(0.102)
Pro se Plaintiff					–0.118
					(0.103)
F statistic	25.38***	6.4***	5.27***	32.4***	2.12**
Controls					
Attorney FE	No	No	No	No	Yes
Litigious FE	No	No	No	No	Yes
Court FE	No	Yes	Yes	No	No
Judge FE	No	No	No	Yes	Yes
Dec. Judge.	Yes	Yes	Yes	Yes	Yes
No. Def.	Yes	Yes	Yes	Yes	Yes
Technology	No	No	Yes	Yes	Yes
No. Patents	Yes	Yes	Yes	Yes	Yes
Obs	6,343	6,343	6,321	6,321	6,321
R^2	0.054	0.143	0.135	0.382	0.426
Dep Var Mean	0.86	0.86	0.87	0.87	0.87

NOTE: Standard errors in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

[a]The table in Appendix B1 reports five linear regression models that predict that a particular defendant exited the lawsuit because of a voluntary disposition. The omitted patentee type is Operating Company. Standard errors were clustered at the district court level. The various controls are attorney fixed effects (Attorney FE), fixed effects for the most litigious patentees in 2010 (Litigious FE), court fixed effects (Court FE), judge fixed effects (Judge FE), declaratory judgment (Dec. Judge.), number of defendants (No. Def.), NBER technology category (Technology), and the number of patents in the lawsuit (No. Patents). "Obs" provides the number of observations present in the model. "*F* statistic" reports the results of an *F* test for joint entity type effects. The models were created using Stata.

Appendix B2: Substantive Dispositions[a]

	Substantive Dispositions				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
University	–0.082***	–0.061***	–0.053**	–0.128***	–0.124**
	(0.015)	(0.021)	(0.026)	(0.034)	(0.051)
Large Aggregator	–0.075***	–0.073***	–0.070***	–0.058***	–0.102***
	(0.014)	(0.017)	(0.023)	(0.018)	(0.029)
Failed Operating Co.	–0.008	0.008	–0.005	0.004	0.070
	(0.020)	(0.022)	(0.024)	(0.024)	(0.056)
Patent Holding Co.	–0.049***	–0.047***	–0.052***	–0.034*	–0.044**
	(0.013)	(0.012)	(0.017)	(0.019)	(0.020)
Technology Development Co.	0.091	0.081	0.072	0.041	0.036
	(0.088)	(0.093)	(0.094)	(0.080)	(0.059)
Individual	0.225*	0.237*	0.204	0.122	0.065*
	(0.117)	(0.124)	(0.125)	(0.087)	(0.034)
Ind. Lit. in Corp. Form	–0.063***	–0.047**	–0.056**	–0.071**	–0.017
	(0.022)	(0.020)	(0.024)	(0.031)	(0.032)
Pro se Plaintiff					0.151
					(0.125)
F statistic	32.82***	22.5***	22.1***	24.23***	3.43***
Controls					
Attorney FE	No	No	No	No	Yes
Litigious FE	No	No	No	No	Yes
Court FE	No	Yes	Yes	No	No
Judge FE	No	No	No	Yes	Yes
Dec. Judge.	Yes	Yes	Yes	Yes	Yes
No. Def.	Yes	Yes	Yes	Yes	Yes
Technology	No	No	Yes	Yes	Yes
No. Patents	Yes	Yes	Yes	Yes	Yes
Obs	6,343	6,343	6,321	6,321	6,321
R^2	0.073	0.127	0.108	0.337	0.380
Dep Var Mean	0.06	0.06	0.06	0.06	0.06

NOTE: Standard errors in parentheses. *$p<0.1$; **$p<0.05$; ***$p<0.01$.

[a]The table in Appendix B2 reports five linear regression models that predict that a particular defendant exited the lawsuit because of a substantive disposition. The omitted patentee type is Operating Company. Standard errors were clustered at the district court level. The various controls are attorney fixed effects (Attorney FE), fixed effects for the most litigious patentees in 2010 (Litigious FE), court fixed effects (Court FE), judge fixed effects (Judge FE), declaratory judgment (Dec. Judge.), number of defendants (No. Def.), NBER technology category (Technology), and the number of patents in the lawsuit (No. Patents). "Obs" provides the number of observations present in the model. "*F* statistic" reports the results of an *F* test for joint entity type effects. The models were created using Stata.

Appendix B3: Procedural Dispositions[a]

	Procedural Dispositions				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
University	–0.054***	–0.072**	–0.073**	–0.076**	–0.072
	(0.009)	(0.031)	(0.033)	(0.036)	(0.057)
Large Aggregator	–0.034**	–0.015	–0.024	–0.021*	–0.038**
	(0.014)	(0.014)	(0.017)	(0.013)	(0.019)
Failed Operating Co.	0.047*	0.052*	0.053*	0.074***	–0.038
	(0.026)	(0.029)	(0.031)	(0.025)	(0.026)
Patent Holding Co.	–0.004	0.004	–0.002	0.002	–0.007
	(0.015)	(0.019)	(0.019)	(0.016)	(0.017)
Technology Development Co.	0.003	0.003	0.008	–0.029	–0.028
	(0.029)	(0.032)	(0.035)	(0.054)	(0.036)
Individual	0.065	0.009	0.010	0.025	0.026
	(0.067)	(0.031)	(0.030)	(0.022)	(0.028)
Ind. Lit. in Corp. Form	0.001	0.010	0.007	0.025	0.117
	(0.022)	(0.023)	(0.030)	(0.021)	(0.106)
Pro se Plaintiff					–0.039
					(0.038)
F statistic	11.2***	8.21***	10.57***	25.46***	1.17
Controls					
Attorney FE	No	No	No	No	Yes
Litigious FE	No	No	No	No	Yes
Court FE	No	Yes	Yes	No	No
Judge FE	No	No	No	Yes	Yes
Dec. Judge.	Yes	Yes	Yes	Yes	Yes
No. Def.	Yes	Yes	Yes	Yes	Yes
Technology	No	No	Yes	Yes	Yes
No. Patents	Yes	Yes	Yes	Yes	Yes
Obs	6,343	6,343	6,321	6,321	6,321
R^2	0.016	0.103	0.112	0.364	0.386
Dep Var Mean	0.04	0.04	0.04	0.04	0.04

NOTE: Standard errors in parentheses. *$p < 0.$; **$p < 0.05$; ***$p < 0.0$.

[a]The table in Appendix B3 reports five linear regression models that predict that a particular defendant exited the lawsuit because of a procedural disposition. The omitted patentee type is Operating Company. Standard errors were clustered at the district court level. The various controls are attorney fixed effects (Attorney FE), fixed effects for the most litigious patentees in 200 (Litigious FE), court fixed effects (Court FE), judge fixed effects (Judge FE), declaratory judgment (Dec. Judge.), number of defendants (No. Def.), NBER technology category (Technology), and the number of patents in the lawsuit (No. Patents). "Obs" provides the number of observations present in the model. "*F* statistic" reports the results of an *F* test for joint entity type effects. The models were created using Stata.

Appendix C1: Voluntary Dispositions 60 Days or Less[a]

	Voluntary Dispositions 60 Days or Less				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
University	–0.018	–0.031	–0.036	0.015	0.018
	(0.067)	(0.063)	(0.066)	(0.073)	(0.059)
Large Aggregator	0.003	0.008	0.013	0.004	–0.011
	(0.024)	(0.025)	(0.026)	(0.015)	(0.029)
Failed Operating Co.	0.053	0.045	0.044	0.017	0.005
	(0.055)	(0.049)	(0.051)	(0.029)	(0.032)
Patent Holding Co.	0.046***	0.049***	0.048***	0.037*	0.022
	(0.017)	(0.018)	(0.018)	(0.020)	(0.021)
Technology Development Co.	–0.010	–0.005	–0.003	–0.010	–0.002
	(0.024)	(0.020)	(0.026)	(0.055)	(0.045)
Individual	–0.012	–0.013	–0.015	0.001	0.003
	(0.018)	(0.020)	(0.022)	(0.016)	(0.023)
Ind. Lit. in Corp. Form	0.016	0.019	0.019	0.017	0.031
	(0.018)	(0.021)	(0.022)	(0.032)	(0.049)
Pro se Plaintiff					0.010
					(0.070)
F statistic	2.06*	2.68**	2.32**	1.6	0.63
Controls					
Attorney FE	No	No	No	No	Yes
Litigious FE	No	No	No	No	Yes
Court FE	No	Yes	Yes	No	No
Judge FE	No	No	No	Yes	Yes
Dec. Judge.	Yes	Yes	Yes	Yes	Yes
No. Def.	Yes	Yes	Yes	Yes	Yes
Technology	No	No	Yes	Yes	Yes
No. Patents	Yes	Yes	Yes	Yes	Yes
Obs	6,343	6,343	6,321	6,321	6,321
R^2	0.021	0.049	0.052	0.234	0.243
Dep Var Mean	0.06	0.06	0.06	0.06	0.06

NOTE: Standard errors in parentheses. *$p < 0.$; **$p < 0.05$; ***$p < 0.01$.

[a]The table in Appendix C reports five linear regression models that predict that a particular defendant exited the lawsuit within 60 days because of a voluntary disposition. The omitted patentee type is Operating Company. Standard errors were clustered at the district court level. The various controls are attorney fixed effects (Attorney FE), fixed effects for the most litigious patentees in 2010 (Litigious FE), court fixed effects (Court FE), judge fixed effects (Judge FE), declaratory judgment (Dec. Judge.), number of defendants (No. Def.), NBER technology category (Technology), and the number of patents in the lawsuit (No. Patents). "Obs" provides the number of observations present in the model. "*F* statistic" reports the results of an *F* test for joint entity type effects. The models were created using Stata.

Appendix C2: Voluntary Dispositions 120 Days or Less[a]

	Voluntary Dispositions 120 Days or Less				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
University	–0.087	–0.096	–0.128	–0.098*	–0.104
	(0.087)	(0.075)	(0.092)	(0.051)	(0.065)
Large Aggregator	–0.018	–0.020	–0.008	–0.044	–0.053
	(0.038)	(0.039)	(0.042)	(0.034)	(0.048)
Failed Operating Co.	0.056	0.044	0.061	0.014	0.009
	(0.064)	(0.057)	(0.057)	(0.032)	(0.044)
Patent Holding Co.	0.111***	0.112***	0.119***	0.077**	0.054*
	(0.025)	(0.029)	(0.030)	(0.031)	(0.031)
Technology Development Co.	–0.104**	–0.092**	–0.077	–0.061	–0.041
	(0.043)	(0.044)	(0.053)	(0.076)	(0.061)
Individual	–0.040	–0.052*	–0.040	–0.048	–0.059
	(0.027)	(0.028)	(0.031)	(0.044)	(0.042)
Ind. Lit. in Corp. Form	0.060	0.050	0.065	0.066	0.103
	(0.042)	(0.045)	(0.040)	(0.047)	(0.068)
Pro se Plaintiff					0.040
					(0.063)
F statistic	11.07***	12.93***	12.01***	22.41***	2.26**
Controls					
Attorney FE	No	No	No	No	Yes
Litigious FE	No	No	No	No	Yes
Court FE	No	Yes	Yes	No	No
Judge FE	No	No	No	Yes	Yes
Dec. Judge.	Yes	Yes	Yes	Yes	Yes
No. Def.	Yes	Yes	Yes	Yes	Yes
Technology	No	No	Yes	Yes	Yes
No. Patents	Yes	Yes	Yes	Yes	Yes
Obs	6,343	6,343	6,321	6,321	6,321
R^2	0.034	0.075	0.082	0.257	0.276
Dep Var Mean	0.18	0.18	0.18	0.18	0.18

NOTE: Standard errors in parentheses. *$p < 0.$; **$p < 0.0$; ***$p < 0.01$.

[a]The table in Appendix C2 reports five linear regression models that predict that a particular defendant exited the lawsuit within 120 days because of a voluntary disposition. The omitted patentee type is Operating Company. Standard errors were clustered at the district court level. The various controls are attorney fixed effects (Attorney FE), fixed effects for the most litigious patentees in 2010 (Litigious FE), court fixed effects (Court FE), judge fixed effects (Judge FE), declaratory judgment (Dec. Judge.), number of defendants (No. Def.), NBER technology category (Technology), and the number of patents in the lawsuit (No. Patents). "Obs" provides the number of observations present in the model. "*F* statistic" reports the results of an *F* test for joint entity type effects. The models were created using Stata.

Appendix C3: Dispositions 121 Days or More[a]

	Dispositions 121 Days or More				
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
University	0.096	0.098	0.131	0.089*	0.097
	–0.087	–0.077	–0.094	–0.052	–0.066
Large Aggregator	0.024	0.021	0.005	0.044	0.058
	–0.038	–0.038	–0.04	–0.031	–0.048
Failed Operating Co.	–0.052	–0.045	–0.061	–0.014	–0.009
	–0.063	–0.056	–0.055	–0.029	–0.045
Patent Holding Co.	–0.107***	–0.110***	–0.117***	–0.076***	–0.052*
	–0.025	–0.028	–0.027	–0.027	–0.031
Technology Development Co.	0.112**	0.098**	0.085	0.063	0.05
	–0.043	–0.043	–0.053	–0.073	–0.06
Individual	–0.031	–0.016	–0.035	–0.012	0.009
	–0.064	–0.078	–0.082	–0.079	–0.053
Ind. Lit. in Corp. Form	–0.056	–0.051	–0.066*	–0.065	–0.105
	–0.041	–0.046	–0.04	–0.046	–0.068
Pro se Plaintiff					–0.27
					–0.208
F statistic	10.22***	13.42***	12.32***	18.63***	1.86**
Controls					
Attorney FE	No	No	No	No	Yes
Litigious FE	No	No	No	No	Yes
Court FE	No	Yes	Yes	No	No
Judge FE	No	No	No	Yes	Yes
Dec. Judge.	Yes	Yes	Yes	Yes	Yes
No. Def.	Yes	Yes	Yes	Yes	Yes
Technology	No	No	Yes	Yes	Yes
No. Patents	Yes	Yes	Yes	Yes	Yes
Obs	6343	6343	6321	6321	6321
R^2	0.033	0.074	0.082	0.265	0.284
Dep Var Mean	0.81	0.81	0.81	0.81	0.81

NOTE: Standard errors in parentheses. *$p < 0.$; **$p < 0.05$; ***$p < 0.01$.

[a]The table in Appendix C3 reports five linear regression models that predict that a particular defendant exited the lawsuit after 120 days. The omitted patentee type is Operating Company. Standard errors were clustered at the district court level. The various controls are attorney fixed effects (Attorney FE), fixed effects for the most litigious patentees in 2010 (Litigious FE), court fixed effects (Court FE), judge fixed effects (Judge FE), declaratory judgment (Dec. Judge.), number of defendants (No. Def.), NBER technology category (Technology), and the number of patents in the lawsuit (No. Patents). "Obs" provides the number of observations present in the model. "*F* statistic" reports the results of an *F* test for joint entity type effects. The models were created using Stata.