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Copying in Patent Law¹

Christopher A. Cotropia² & Mark A. Lemley³

Patent law is virtually alone in intellectual property ("IP") law in punishing independent development. To infringe a copyright or trade secret, defendants must copy the protected IP from the plaintiff, directly or indirectly.⁴ But patent infringement requires only that the defendant's product falls within the scope of the patent claims. Not only does the defendant not need to intend to infringe, but the defendant may be entirely unaware of the patent or the patentee and still face liability.

Nonetheless, copying does play a role in some subsidiary patent doctrines. For example, the question of whether patent damages should be set in order to deter infringement, rather than solely to compensate the patentee, depends critically on whether infringers are in fact aware they are infringing, or at least that they are using the plaintiff's technology. The definition of "willful infringement" turns on the question of culpability, at least in the popular understanding of that term. Copying – or at least intent

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⁴ The Copyright Act defines the rights as ones involving a "copy" of a protected work, 17 U.S.C. § 106, and courts are unanimous in requiring proof of copying, though that copying need not be intentional or even conscious. See **Robert P. Merges et al., Intellectual Property in the New Technological Age** 476-82 (Rev. 4th ed. 2007). Similarly, trade secret law requires that the secret be acquired from the plaintiff, and makes independent development a defense. Uniform Trade Secrets Act §1, cmt. 1 ("proper means include . . . discovery by independent invention"); Restatement (Third) of Unfair Competition § 43.

to infringe – is also an element of claims for indirect infringement. More significantly, the rhetoric of patent law (and of IP law more generally) often seems to presuppose that defendants in patent cases are in fact engaged in copying. Similarly, the outcome of public policy debates over patent reform may well turn on the perception of patent infringers as either bad actors or as innocent businesspeople who accidentally ran afoul of a patent.

Unfortunately, no one seems to know whether patent infringement defendants are in fact unscrupulous copyists or independent developers. In this paper, we seek to shed light on that question. Because copying is not an element of any patent cause of action, courts do not normally make explicit findings as to whether defendants have copied. Instead, we turn to a variety of proxies to try to identify the subset of cases in which copying is alleged or proven. We look both at the allegations made in a random sample of complaints and at the treatment of copying in recent reported decisions.

We find that a surprisingly small percentage of patent cases involve even allegations of copying, much less proof of copying. Only 10.9% of the complaints studied—21 of 193 complaints—contained even an allegation that the defendant copied the invention, either from the patent or from the plaintiff's commercial product. This percentage is even lower when looking at published decisions, with 6.89% of the cases—129 of 1871 cases—including an allegation of copying. Copying was found in 33 of these cases, meaning that copying was established in only 1.76% of all cases in our dataset. Copying seems to be the exception, not the rule in patent cases. And our data indicates that the exceptionalness of copying is greatest outside of the pharmaceutical and chemical arts. Pharmaceutical and chemical cases constitute more than half of the

allegations of copying in both complaints and decisions and two-thirds of the reported findings of copying. In other industries, such as computers and software, less than 3% of cases involve allegations of copying, and less than 1% involve proof of copying.

In Part I, we briefly discuss the legal significance of copying in patent law. In Part II, we identify the sources of our data and report our results. Finally, in Part III we discuss some policy implications of these results.

I. Copying's Current Place in Patent Doctrine

One of the most significant differences between patent law and other areas of intellectual property is that copying is irrelevant to the determination of infringement.⁵ It is axiomatic that patent infringement is a "strict liability offense."⁶ However, many components of patent law, patent theory, and even the rhetoric used in patent cases make the question of copying relevant. This dichotomy, and both adopted and proposed reforms to make copying relevant to the question of liability, are discussed below.

A. Copying is Not Required to Prove Liability

Courts assess patent infringement by comparing the allegedly infringing product or process to the patent's claims.⁷ An individual literally infringes if her technology

⁵ See Stephen M. Maurer & Suzanne Scotchmer, *The Independent Invention Defence in Intellectual Property*, 69 *Economica* 535, 535 (2002) ("Perhaps the most basic difference between patents and other intellectual property such as trade secrets and copyrights is that independent invention is not a defence to infringement.")

⁶ Mark A. Lemley, *Should Patent Infringement Require Proof of Copying?*, 105 *Mich. L. Rev.* 1525, 1525 (2007) [hereinafter – Lemley, *Proof of Copying*].

⁷ *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1351 (Fed. Cir. 2002) (explaining that copying plays no role in the claim to allegedly infringing product or process comparison); Roger E. Schechter & John R. Thomas, *Principles of Patent Law* 275 (2004).

practices each and every element of the claimed invention.⁸ Patent law requires nothing more. Questions of infringement do not focus on the alleged infringer's intent.⁹ Nor does infringement require evidence of copying the patent or commercial embodiments of the patented invention.¹⁰ For the initial liability determination in patent law, an "innocent" infringer is treated the same as an individual who copied the patented technology. Put simply, copying is irrelevant to the issue of liability.

Copying's lack of relevance extends to the determination of infringement under the doctrine of equivalents. Determining whether the alleged infringer's actions, while not falling within the literal scope of the claims, are equivalent to the claimed subject matter does not involve an inquiry into the infringer's state of mind or actions of copying.¹¹ The Supreme Court has specifically held that copying (or its absence) is irrelevant to infringement under the doctrine of equivalents.¹²

Accordingly, in patent law, an individual who develops an already patented technology without knowledge of the patent and the technology's prior creation—a true "independent inventor"—is still liable if what she independently created falls within the scope of the patent's claims. Liability of an independent inventor turns on the question of

⁸ 35 U.S.C. § 271(a); *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 374 (1996) ("Victory in an infringement suit requires a finding that the patent claim 'covers the alleged infringer's product or process" (quoting H. Schwartz, **Patent Law and Practice** 80 (2d ed. 1995)).

⁹ *Schechter & Thomas*, *supra* note __, at 275 ("A defendant's intent is irrelevant to the outcome of an infringement inquiry."); Robert P. Merges & John F. Duffy, **Patent Law and Policy: Cases and Materials** 781 (4th Ed. 2007) ("[T]he right to exclude does not depend upon the infringer's state of mind.").

¹⁰ *See Allen Eng'g*, 299 F.3d at 1351; Merges & Duffy, *supra* note __, at 781 (35 U.S.C. § 271 "does not require any proof of *access* to the inventor's work.").

¹¹ *Allen Eng'g*, 299 F.3d at 1351 (indicating that copying is irrelevant to the equivalents inquiry).

¹² *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 35-36 (1997) (concluding that "intent plays no role in the application of the doctrine of equivalents").

timing, not the independent nature of the second inventor's actions. As long as the patent's inventor was the first to invent the claimed technology, she can exclude anyone else who develops the claimed technology, even if they do so independent of the information contained in the patent.¹³ In fact, the first individual to conceive of the invention—that is, mentally visualize the complete invention¹⁴—has superior rights to all future developers as long as she is diligent in either bringing her invention to the patent office or actually reducing the invention to practice from the time of conception by another inventor.¹⁵ The second conceiver can even be the first to put the invention to actual use and still be considered an infringer.¹⁶

The lack of a copying requirement for liability places patent law in sharp contrast with copyright and trade secret law. Copyright law, as its name connotes, requires an individual to copy the protected work to be found liable.¹⁷ While doctrines such as

¹³ See *Merges & Duffy*, *supra* note __, at 781.

¹⁴ "Conception is the 'formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice.'" *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1376 (Fed. Cir. 1986) (quoting 1 *Robinson On Patents* 532 (1890)). "Conception is the touchstone of inventorship." *Burroughs Wellcome Co. v. Barr Labs., Inc.*, 40 F.3d 1223, 1227-28 (Fed. Cir. 1994).

¹⁵ 35 U.S.C. § 271(g) (defining the standard for determining priority between two inventors of the same technology); *Cooper v. Goldfarb*, 154 F.3d 1321, 1327 (Fed. Cir. 1998) (articulating the standard in reverse, noting that "priority of invention goes to the first party to reduce an invention to practice unless the other party can show that it was the first to conceive of the invention and that it exercised reasonable diligence in later reducing that invention to practice"); *Merges & Duffy*, *supra* note __, at 440-41. Reduction to practice is established by either actually implementing the invention or filing a patent application. See *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1169 (Fed. Cir. 2006). An actual reduction to practice that has been "abandoned, suppressed, or concealed" does not count for priority purposes. See 35 U.S.C. § 271(g).

¹⁶ Again, this holds true as long as the first conceiver is diligent from the "time prior to the conception by the other." 35 U.S.C. § 271(g).

¹⁷ See *Arnstein v. Porter*, 154 F.2d 464, 468-69 (2d Cir. 1946). Some circuits allow copying to be established by "striking similarity" between the protected work and infringing works, even if there is no evidence that the alleged infringer had any access to the copyrighted work. *Gaste v. Kaiserman*, 863 F.2d 1061, 1067-68 (2d Cir.1988). Under such a test, copying is arguably not required to establish copyright infringement. However, the rationale for relying solely on striking

subconscious copying potentially remove the state of mind from the copying requirement,¹⁸ actual copying is still a fundamental first step to determining copyright infringement.¹⁹

Trade secret law is similar, requiring an individual to misappropriate the trade secret to be held liable. Misappropriation occurs when the trade secret is obtained through improper means or through a breach of confidence.²⁰ Either trigger for liability entails a "copying" of the trade secret. The infringer obtains the information from someone else—in most cases the trade secret's creator.²¹ By contrast, independent creation of the information, through normal means or reverse engineering, is a complete defense against a trade secret allegation.²²

Trademark law occupies a middle ground. Trademark infringement is based upon a finding of likely consumer confusion, which can occur without copying of the mark by the defendant. But intent to copy or deceive is one of the factors courts use in deciding

similarity is that such evidence "preclude[s] the possibility of independent creation." *Ferguson v. NBC, Inc.*, 584 F.2d 111, 113 (5th Cir. 1978). Thus, copying is still established essentially by inference.

¹⁸ See *ABKCO Music, Inc. v. Harrisongs Music, Ltd.*, 722 F.2d 988, 998-99 & n. 12 (2d Cir. 1983) (finding liability even though the copying was subconscious and without intent); see also R. Anthony Reese, *Innocent Infringement in U.S. Copyright Law: A History*, 30 *Colum. J.L. & Arts* 133, 178-79 (2007) (detailing the irrelevance of intent in modern copyright law).

¹⁹ See *Ty, Inc. v. GMA Accessories, Inc.*, 132 F.3d 1167, 1169 (7th Cir. 1997) ("The Copyright Act forbids only copying; if independent creation results in an identical work, the creator of that work is free to sell it.").

²⁰ See Uniform Trade Secrets Act § 1; Restatement (Third) of Unfair Competition § 40.

²¹ See, e.g., *E.I. duPont deNemours & Co. v. Christopher*, 431 F.2d 1012, 1015-17 (5th Cir. 1970) (finding liability where the infringer obtained the trade secret by improper means by taking aerial photographs of a trade secret holder's chemical plant under construction); *Smith v. Dravo Corp.*, 203 F.2d 369, 375-77 (7th Cir. 1953) (finding liability via a breach of confidence where the infringer obtained the trade secret in confidential negotiations with the trade secret holder).

²² See Restatement (Third) of Unfair Competition § 43 ("Independent discovery and analysis of publicly available products or information are not improper means of acquisition."); Maurer & Scotchmer, *supra* note ___, at 535.

consumer confusion,²³ and recent work by Barton Beebe has found that in fact evidence of intent is the most significant factor predicting a finding of trademark infringement.²⁴ So as a practical matter trademark infringement usually involves copying, or at least awareness of the plaintiff's mark.

B. Copying Plays a Role in Other Patent Doctrines

While copying isn't necessary for infringement, the existence of copying is not completely irrelevant in patent law. Many doctrines outside of the initial determination of infringement consider whether the alleged infringer or a third party has copied the patented technology. Some patent theory assumes, as a precondition, that others will, in essence, copy the patented technology. Finally, much of the rhetoric used by courts and commentators when discussing patent infringement invokes the concepts of a copier and copying when identifying the infringer and describing her actions.

1. Copying as an Element of Specific Patent Doctrines

Whether a finding of patent infringement was the result of copying is relevant to the question of willful infringement and the accompanying enhancement of damages.²⁵

²³ See *Univ. of Notre Dame du Lac v. J.C. Gourmet Foods Imports Co.*, 703 F.2d 1372, 1374 (Fed. Cir. 1983) (noting that intent is "pertinent to a determination of likelihood of confusion"); *Polaroid Corp. v. Polaroid Elecs. Corp.*, 287 F.2d 492, 495 (2d 1961) (identifying "the reciprocal of defendant's good faith in adopting its own mark" as one of the variables for determining likelihood of confusion).

²⁴ Barton Beebe, *An Empirical Study of the Multifactor Tests for Trademark Infringement*, 94 *Cal. L. Rev.* 1581, 1608 (2006) ("The court found an intent to confuse consumers in sixty-seven opinions. In sixty-five (97%) of these opinions, the court found an overall likelihood of confusion.")

²⁵ See *In re Seagate Techs., LLC*, 497 F.3d 1360, 1368 (Fed. Cir. 2007) (en banc) ("Because patent infringement is a strict liability offense, the nature of the offense is only relevant in determining whether enhanced damages are warranted."); *Knorr-Bremse Systeme Fuer*

"Willful infringement is . . . a measure of reasonable commercial behavior in the context of the tort of patent infringement."²⁶ The act of copying the patented technology evidences the infringer's "disregard [for] the property rights of the patentee" and "the deliberateness of the tortious acts."²⁷ Patent law views such copying as "reprehensible" and, in turn, worthy of punitive damages in the form of enhanced damages.²⁸ Courts have even justified raising a reasonable royalty award to compensate for copying, despite a finding that the infringement wasn't willful.²⁹ Notably, while copying is *evidence* of willful infringement, copying is not *required* to prove willful infringement.³⁰ Nor does evidence of copying, by itself, mean the infringement is willful.³¹

Copying is also relevant to the issue of patent validity as a secondary consideration of nonobviousness.³² Copying of the patented invention by the infringer or a third party is seen by patent law as an indicator that the invention is nonobvious.³³ The rationale is that a competitor engages in such copying only if they need a solution to the

Nutzfahrzeuge GmbH v. Dana Corp., 383 F.3d 1337, 1348-49 (Fed. Cir. 2004) (en banc). A finding of willfulness is required to enhance damages, but a finding of willfulness does not require such an enhancement. *Seagate*, 497 F.3d at 1368.

²⁶ *Hoechst Celanese Corp. v. BP Chems. Ltd.*, 78 F.3d 1575, 1583 (Fed. Cir. 1996).

²⁷ *Id.*

²⁸ *Knorr-Bremse*, 383 F.3d at 1348-49.

²⁹ *See, e.g., Monsanto Co. v. McFarling*, 488 F.3d 973, 980 (Fed. Cir. 2007) (expressing a concern that too low of a reasonable royalty would "create a windfall for infringers" that intentionally engage in unauthorized use of the patented technology).

³⁰ *See, e.g., Underwater Devices, Inc. v. Morrison-Knudsen Co.*, 717 F.2d 1380 (Fed. Cir. 1983) (setting out a multi-factor test to use in considering willfulness).

³¹ *Id.*

³² *See Apple Computer, Inc. v. Articulate Sys., Inc.*, 234 F.3d 14, 26 (Fed. Cir. 2000); *Specialty Composites v. Cabot Corp.*, 845 F.2d 981, 991 (Fed. Cir. 1988) (stating that the copying of the "claimed invention, rather than one in the public domain, is indicative of nonobviousness").

³³ *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1285-86 (Fed. Cir. 2000) (citing the infringer's copying of the patented invention as evidence of nonobviousness).

problem the invention addresses and they cannot come up with one on their own.³⁴ Patent law also assumes that others copy only those inventions of technical value.³⁵ Both of these assumption from the existence of copying are indicators that the invention meets the nonobviousness requirement and is worthy of patent protection.³⁶

Third, copying is relevant to some claims for indirect infringement. Specifically, the Federal Circuit has made it clear that a defendant is not liable for inducing infringement by another unless it intended that the conduct it induced infringe a known patent.³⁷ While this doesn't necessarily involve copying—a defendant might independently develop a technology, then learn of a patent covering it, and still encourage another to infringe that patent—the fact that inducement requires both knowledge of the patent and intent to encourage infringement means that inducement is more likely than ordinary infringement cases to involve allegations of copying.³⁸

³⁴ See *Dow Chem. Co. v. American Cyanamid Co.*, 816 F.2d 617, 622 (Fed. Cir. 1987); *Vandenberg v. Dairy Equip. Co.*, 740 F.2d 1560, 1567 (Fed. Cir. 1984) ("The copying of an invention may constitute evidence that the invention is not an obvious one. . . . This would be particularly true where the copyist had itself attempted for a substantial length of time to design a similar device, and had failed."); Christopher A. Cotropia, *Nonobviousness as an Exercise in Gap Measuring* 32, in *INTELLECTUAL PROPERTY AND INFORMATION WEALTH*, Vol. 2 (P. Yu ed., Praeger Publishers) (2007) ("A competitor only engages in copying if they need a solution to the problem the invention addresses and they cannot come up with a solution on their own.").

That rationale is open to question, however. A company may copy an invention not because it had no choice, but because it thought the invention was unpatented or unpatentable, and therefore free to be used without need for reinvention.

³⁵ See Cotropia, *supra* note __, at 32.

³⁶ See *id.* (concluding that copying provides second-order evidence that the technology gap between the prior art and the invention is such that patent protection is warranted).

³⁷ See *DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1305-06 (Fed. Cir. 2006).

³⁸ Contributory infringement, by contrast, requires knowledge of the existence of the patent but not specific intent to infringe. *Aro Mfg. Co. v. Convertible Top Replacement, Co.*, 377 U.S. 476, 488-89 (1964). These claims too must involve awareness of the patentee's technology, but are less likely to involve copying.

Finally, as an exception to the general rule that copying is irrelevant to the question of liability, an accusation of infringement under 35 U.S.C. § 271(e)(2)(A) necessarily involve acts of copying. Section 271(e)(2)(A) allows a patent holder to sue a generic drug manufacturer who files an abbreviated new drug application ("ANDA") that contains a paragraph 4 certification.³⁹ Such a certification alleges that the previously approved drug for which ANDA pertains is covered by patents that are invalid or will not be infringed by the generic drug.⁴⁰ In order to file a proper and successful ANDA, the generic drug manufacturer must "copy" the original drug—the generic's active ingredient must be the bioequivalent of the listed drug.⁴¹ These set of facts that give rise to a § 271(e)(2) allegation of infringement necessarily mean that the ANDA filer and generic drug producer have copied the patent holder's technology.⁴² It does not, however, necessarily mean that the patented invention was copied; the patent might cover something other than the active ingredient to which the generic is bioequivalent.⁴³

³⁹ See 35 U.S.C. § 271(e)(2)(A); Bayer AG v. Elan Pharms. Research Corp., 212 F.3d 1241, 1245 (Fed. Cir. 2000). "A charge of infringement under § 271(e)(2) is technical in nature" given that the ANDA filer has only sought FDA approval. Schechter & Thomas, *supra* note __, at 287.

⁴⁰ See 21 U.S.C. § 355(j)(2)(A)(vii)(IV) (describing the content of a paragraph IV certification).

⁴¹ An ANDA is proper only if the generic drug's active ingredient is the "bioequivalent" of the already approved drug. See 21 U.S.C. § 355(j)(2)(A)(iv). A generic drug is bioequivalent if the extent and rate of absorption of the drug are not significantly different from that of the already approved drug. See 21 U.S.C. § 355(j)(8)(B)(i).

⁴² See, e.g., Abbott Labs. v. Young, 920 F.2d 984, 991 (D.C. Cir. 1990) (Edwards, J., dissenting) (noting that the ANDA process "emerged from Congress' efforts to balance two conflicting policy objectives: to induce name brand pharmaceutical firms to make the investments necessary to research and develop new drug products, while simultaneously enabling competitors to bring cheaper, generic copies of those drugs to market."); Takeda Chem. Indus., Ltd. v. Mylan Labs., Inc., 459 F. Supp. 2d 227, 231 (S.D.N.Y. 2006) ("When filing the ANDA the applicant must make a certification regarding any patent protecting the drug that will be copied.").

⁴³ An ANDA could be filed by an independent drug developer who was second to invent and must therefore go through the ANDA process to produce and sell the new pharmaceutical. This ANDA filer must still, however, claim bioequivalence. And, as a practical matter, this is a very uncommon occurrence. See, e.g., Gerald D. Mossinghoff, *Overview of the Hatch-Waxman Act*

2. Copying as a Foundation for Particular Patent Theories

A number of patent theories also assume that others engage in some level of copying of the patent. The idea that a patent constitutes a bargain with the public, in which the patentee gets exclusivity for a limited time in exchange for giving the public information about the invention, presupposes that companies will read and learn from the patent in order to copy the invention (albeit after the patent has expired). The improvement and design-around theories assume that one of the patent law's benefits is that others reference the patent document and the technology it describes in order to either build upon the patented technology described or create competing, non-infringing alternatives. A level of copying is also assumed in the theory behind the doctrine of equivalents. One view of that doctrine is that it is meant to catch the "unscrupulous copyist" who has set out to copy the patented technology and makes a minor change in order to avoid infringement via a technicality.

a. The Disclosure Bargain and Improvement Theory

The improvement theory of patent law describes patenting as a mechanism to both assist and prompt others to develop improvements to the already patented technology.⁴⁴

The patent disclosure, which is required to be enabling, provides technical information

and Its Impact on the Drug Development Process, 54 **Food & Drug L.J.** 187 (1999) (noting that the main purpose behind the ANDA process is to encourage generic drug manufacturers to enter the market).

⁴⁴ *Aronson v. Quick Point Pencil Co.*, 440 U.S. 257, 262 (1979) (Patent law "promotes disclosure of inventions, to stimulate further innovation"); Craig A. Nard, *A Theory of Claim Interpretation*, 14 **Harv. J.L. & Tech.** 1, 36-37 (2000).

about the claimed invention.⁴⁵ This technical information is publicly available and readily accessible, allowing anyone to both learn about the patented technology and then use this information to copy the invention once the patent expires or to create an improvement during the patent term.⁴⁶ Building upon existing patented technology is a fundamental aspect of the patent system, and such improvements are crucial to technological advancement.⁴⁷

When such improvements are patented, another fundamental concept in patent law comes into play—blocking patents. The blocking patent's story begins with an inventor developing and patenting a base technology and then an improver builds upon that base technology and patents the improvement.⁴⁸ This situation gives rise to two patents—one covering the base technology and one covering the improvement. Any party wishing to practice the improvement must get licenses from both the original

⁴⁵ 35 U.S.C. § 112, para. 1 (setting forth the requirement that the patent disclosure enable the claimed invention); *Sitrick v. Dreamworks, LLC*, 516 F.3d 993, 999 (Fed. Cir. 2008) (describing the enablement requirement in patent law that requires "one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation").

⁴⁶ *See* *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 150-51 (1989) ("range of ideas available as the building blocks of further innovation"); Kenneth W. Dam, *The Economic Underpinnings of Patent Law*, 23 **J. Legal Stud.** 247, 267 (1994) ("On issuance, a patent communicates a considerable amount of information that can help other would-be inventors, including rival firms."); *but see* Timothy R. Holbrook, *Possession in Patent Law*, 59 **SMU L. Rev.** 123, 130-47 (2006) (questioning whether patent law truly promotes the disclosure of the invention); Note, *The Disclosure Function of the Patent System (or Lack Thereof)*, 118 **Harv. L. Rev.** 2007, 2007-08 (2005).

⁴⁷ Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 **Colum. L. Rev.** 839, 884-908 (1990) (detailing how various technology industries develop incrementally); Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 **J. Econ. Persp.** 29, 30-31 (1991).

⁴⁸ Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 **Tex. L. Rev.** 989, 1009-1010 (1997) (noting that a "significant improvement" may be "itself protected by a patent") [hereinafter, Lemley, *Economics of Improvement*]; Merges & Nelson, *supra* note __, at 860-62.

developer and the improver.⁴⁹ The availability of patent protection for the improver, which creates the blocking patent, encourages the creation of the improvement because of the bargaining power patent exclusivity gives to the improving inventor.⁵⁰ In the end, patent law facilitates the creation of improvements by both communicating the existence and technical details of the base technology and then providing patent protection for any patentable improvements that are developed.

The theory that the patent system facilitates and encourages improvements assumes that potential improvers learn about the base technology from either the patent itself or a commercial embodiment of the patented invention. The improver is viewed as leveraging off of the earlier patent's technical description, and, in some instances, actually communicating and coordinating with the developer of the base technology. This all assumes some level of copying, or, at the very least, an awareness of the base technology and patent that sparks some modification to what has already been done. If there is no copying, then there is no improving from the viewpoint of the follow-on inventor. She is, from her perspective, starting from scratch.⁵¹ For the patent system to play a role in improving technology, the base technology the system encourages must be known and

⁴⁹ Lemley, *Economics of Improvements*, *supra* note __, at 1010 ("The original patent owner can prevent the improver from using his patented technology, but the improver can also prevent the original patent owner from using the improvement. Unless the parties bargain, no one gets the benefit of the improvement.").

⁵⁰ *See id.* at 1013. This power is by no means absolute, and a bargaining breakdown could nullify the benefit of the blocking patent. *See* Robert P. Merges, *Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents*, 62 *Tenn. L. Rev.* 75, 82-91 (1994) (detailing and providing real-world examples of the bargaining breakdown between the base and improvement patent holders).

⁵¹ This is not to say that a new technology is not an "improvement" unless the improver actually referenced and used an earlier technology in development her advancement of said technology. Even if she thinks she is "starting from scratch" the result is still objectively an improvement to the earlier technology. State of mind is irrelevant to the definition of improvement. However, patent law's improvement theory focuses on the earlier category of improvements—ones in which the improver actually uses the base technology as the starting point for the new technology.

used in some way by the improver. If she has not copied, her invention is not an improvement at all, but independent development of a better alternative (a “leapfrogging” invention).

b. Design-Around Theory

The design-around theory is a subset of the improvement theory. The theory is that the patent system sparks a specific type of an "improvement"—a substitute to the patented technology that does not infringe the patent.⁵² A competitor, faced with the possibility of infringing the patent in order to compete in a given industry, reads the patent in order to determine how they can "design-around" the boundaries of the patent's claims.⁵³ The patent, by promoting the creation of a commercial substitute through this design-around process, is socially beneficial.⁵⁴ The Federal Circuit has acknowledged that encouraging design-arounds is a goal of the patent system: "One of the benefits of a patent system is its so-called 'negative incentive' to 'design around' a competitor's products, even when they are patented, thus bringing a steady flow of innovations to the marketplace."⁵⁵

The design-around theory, like the improvement theory, assumes a level of copying by the competitor who chooses to design around. Here, the theory assumes that

⁵² See *Slimfold Mfg. Co. v. Kinkead Indus., Inc.*, 932 F.2d 1453, 1457 (Fed. Cir. 1991) (“Designing around patents is ... one of the ways in which the patent system works to the advantage of the public in promoting progress in the useful arts, its constitutional purpose.”).

⁵³ See *Nard*, *supra* note __, at 40-41 (“As the term 'design-around' suggests, a competitor of the patentee may purposefully circumvent the boundaries of the patent claim and create a competitive, non-infringing alternative to the claimed invention.”).

⁵⁴ *Id.*

⁵⁵ *State Indus., Inc. v. A.O. Smith Corp.*, 751 F.2d 1226, 1236 (Fed. Cir. 1985). For further discussion, see Matthew J. Conigliaro et al., *Foreseeability in Patent Law*, 16 **Berkeley Tech. L.J.** 1045 (2001).

the competitor references the patent's claims when designing a competing product. The patent claims are examined with the goal of making sure that the developed product does not fall within the patent's exclusivity. A successful design-around does not copy every element of the claimed technology. But one who designs around an invention necessarily refers to and uses the patented invention in developing the competing product or process.

c. Doctrine of Equivalents Theory

One justification for the doctrine of equivalents also assumes copying by potential infringers. As has already been mentioned, the Supreme Court specifically dismissed evidence of the infringer's copying of the patented invention (or alternatively, of the infringer's efforts to design around the invention) as irrelevant to the doctrine of equivalents inquiry.⁵⁶ But the early judicial rationale behind doctrine of equivalents built upon the concepts of fairness and equity to justify the doctrine's existence.⁵⁷ The Supreme Court concluded that limiting protection to the claim's literal scope allowed someone "to make unimportant and insubstantial changes and substitutions in the patent which, though adding nothing, would be enough to take the copied matter outside the claim, and hence outside the reach of law."⁵⁸ Denying the patentee access to the doctrine of equivalents "would leave room for—indeed encourage—the unscrupulous copyist."⁵⁹

⁵⁶ *Warner-Jenkinson*, 520 U.S. at 35-36.

⁵⁷ See Michael J. Meurer & Craig A. Nard, *Invention, Refinement and Patent Claim Scope: A New Perspective on the Doctrine of Equivalents*, 93 *Geo. L. J.* 1947, 1964-67 (2005) (noting that into the twentieth century, "fairness concerns continued to dominate thinking about the doctrine of equivalents."); Christopher A. Cotropia, *"After-Arising" Technologies and Tailoring Patent Scope*, 61 *N.Y.U. Ann. Surv. Am. L.* 151, 159-160 (2005) (detailing the doctrine's initial focus on "notions of fairness and equity").

⁵⁸ *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 607 (1950); *Warner-Jenkinson*, 520 U.S. at 36 ("[O]ne wonders how to distinguish between the intentional copyist making minor changes to lower the risk of legal action, and the incremental innovator designing

This reasoning assumes that there are individuals who target patented technologies, looking to appropriate the core value of the invention but avoid being found liable for patent infringement by making minor variations. While this is not the only rationale for the doctrine,⁶⁰ courts today, when discussing the rationale behind the doctrine of equivalents, still refer to the doctrine as a means to capture copiers.⁶¹

3. Copying as a Rhetorical Device

The concept of copying also plays a role in the rhetoric used by courts and commentators when discussing patent infringement. An infringer of a patent claim is often said to have "copied"⁶² the invention and, in turn, is labeled a "copier"⁶³ or "copyist."⁶⁴ This terminology is used even when the infringer actually independently developed the infringing product or process. Likewise, an independent invention is often

around the claims, yet seeking to capture as much as is permissible of the patented device." 17, 36, 117 S.Ct. 1040, 137 L.Ed.2d 146 (1997).

⁵⁹ *Id.*

⁶⁰ See Meurer & Nard, *supra* note __, at 1967-68 (describing the modern "friction theory" of the doctrine of equivalents); Cotropia, *supra* note __, at 160-62 (noting the current emphasis on a utilitarian theory of the doctrine and a focus on after-arising technologies).

⁶¹ See, e.g., Trading Techs. Int'l, Inc. v. eSpeed, Inc., 507 F. Supp. 2d 854, 860-61 (N.D. Ill. 2007) (quoting *Graver Tank's* copying discussion to describe the "import of the doctrine of equivalents").

⁶² See, e.g., SPX Corp. v. Bartec, USA, LLC, 530 F. Supp. 2d 914, 919 (E.D. Mich. 2008) (characterizing the allegation as one that "Bartec USA, LLC (Bartec) copied [the patented] design for a handheld tool used in servicing tires on motor vehicles equipped with remote tire monitoring systems," even though no actual allegation of copying was identified) (emphasis added).

⁶³ See, e.g., Payless Shoesource, Inc. v. Reebok Int'l, Inc., 998 F.3d 985, 981 (Fed. Cir. 1983) (referring to patent infringers in general as "copiers").

⁶⁴ See, e.g., Liquid Dynamics Corp. v. Vaughan Corp., No. 01 C 6934, 2004 WL 2260626, *12 (N.D. Ill. Oct. 1, 2004) (stating that "[a] patent holder is protected from efforts of copyists to evade liability for infringement by making only insubstantial changes to a patented invention") (emphasis added) (citing *Festo Corp.*, 535 U.S. at 726).

identified as a "copy"⁶⁵ of an earlier patent though technically it was independently created. Such rhetoric even rises to the level of labeling the infringer a "thief"⁶⁶ or their actions "stealing."⁶⁷

The use of the term copying and its derivatives to characterize infringement is notable. Initially, the use of such terms runs contrary to patent law's strict liability, copy-free view of infringement. Law places heavy weight on language; in turn, courts and commentators have an obligation to use language accurately. Second, terms such as copying come with heavy baggage. They are loaded—"carr[ing] an undercurrent of disapproval, of unfavorable practices, of 'it's just not on.'"⁶⁸ Allowing the use of the terms is particularly detrimental in jury cases because "a juror's everyday experience, stemming from earliest school days, generates the lay biases and pejorative flavor the word 'copy' carries."⁶⁹ Finally, this rhetoric needs to be identified because it may reflect reality or, if repeated enough, become reality. Scholars in the patent area have focused before on rhetoric as an indicator of what was⁷⁰ or of what is coming.⁷¹

⁶⁵ See, e.g., *Sanitary Refrigerator Co. v. Winters*, 280 U.S. 30, 41-41 (1929) ("There is a substantial identity, constituting infringement, where a device is a copy of the thing described by the patentee . . .") (emphasis added).

⁶⁶ See, e.g., Victoria E. Luxardo, *Towards a Solution to the Problem of Illegitimate Patent Enforcement Practices in the United States: An Equitable Affirmative Defense of 'Fair Use' in Patent*, 20 *Emory Int'l L. Rev.* 791, 825-26 (2006) (calling corporations who infringe individual inventor's patents "patent thieves") (emphasis added).

⁶⁷ See, e.g., *Royal Typewriter Co. v. Remington Rand, Inc.*, 168 F.2d 691, 692 (1948) (identifying the doctrine of equivalents as a vehicle to "prevent an infringer from stealing the benefit of the invention") (Hand, J.) (emphasis added).

⁶⁸ Kenneth R. Adamo, et. al., *The Curse of "Copying"*, 7 **J. Marshall Rev. Intell. P** 296, 296 (2008).

⁶⁹ *Id.*

⁷⁰ See, e.g., Adam Mossoff, *Who Cares What Thomas Jefferson Thought About Patents? Reevaluating the Patent "Privilege" in Historical Context*, 92 **Cornell L. Rev.** 953 (2007) (investigating the "Jefferson story of patent law" by focusing, in part, on Thomas Jefferson's words).

C. Reforms to Copying's Role in Patent Law

Finally, a number of commentators and legislators have proposed reforms that give copying a larger role patent law. These reforms target copying's role in determining infringement and take the form of various degrees of independent inventor defenses.

In its purest form, an independent inventor defense absolves any patent infringer of liability unless the infringement resulted from copying the claimed invention. That is, "independent conception of the invention and independent reduction of it to practice" would be a complete defense to infringement.⁷² Such an absolute defense does not exist in the United States.

Stephen Maurer and Suzanne Scotchmer articulate two advantages to an independent inventor defense.⁷³ First, the threat of market entry by an independent inventor forces the patent holder to license at a lower price, reducing deadweight loss.⁷⁴ In addition, the availability of an independent inventor defense also "reduces entry into the [patent] race, and thus reduces wasteful duplication."⁷⁵ One of their only concerns with such a defense is that "fraudulent claims of independence may be undetectable."⁷⁶

⁷¹ See, e.g., Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 **Tex. L. Rev.** 1031, 1033-1041 (2005) (relying on the rising rate of court usage of the terms "intellectual property" and "free riding" as evidence that courts are viewing intellectual property more and more as a species of real property).

⁷² Samson Vermont, *Independent Invention as a Defense to Patent Infringement*, 105 **Mich. L. Rev.** 475, 484 (2006).

⁷³ Maurer & Scotchmer, *supra* note __, at 545. Vermont criticized Maurer & Scotchmer's analysis because it "assum[ed] a potential [independent inventor] can evaluate a patented invention and still invent *independently*." Vermont, *supra* note __, at 483.

⁷⁴ Maurer & Scotchmer, *supra* note __, at 545.

⁷⁵ *Id.*

⁷⁶ *Id.* at 544.

Samson Vermont argues for a modified independent inventor defense.⁷⁷ Vermont's major modification is to limit the defense to instances where there is no actual or constructive notice of the patent.⁷⁸ Actual notice entails the infringer seeing the invention before developing the infringing technology.⁷⁹ Constructive notice is satisfied by the publication of an enabling disclosure of the invention.⁸⁰ With the availability of constructive notice, a truly independent inventor who never sees the invention may still be denied the defense because of constructive notice. Vermont argues that such a defense reduces certain "system costs" while not detrimentally lowering the patent system's incentive to invent.⁸¹

Not all analysis of an independent inventor defense is positive. One of the authors of this article, while not completely disagreeing with the above analysis, articulated some concerns with the defense.⁸² First, the number of significant inventions that have occurred in a multiple, independent inventor setting means that a defense will likely have a significant impact.⁸³ There is a risk that the availability of the defense will

⁷⁷ Vermont, *supra* note ___, at 484-89 (detailing the contours of a such a defense).

Cecil Quillen advocates an independent-inventor defense as well, although in a different form. See Cecil D. Quillen, *Innovation and the U.S. Patent System*, 1 Va. L. & Bus. Rev. 207, 235 (2006) (proposing "an affirmative 'prior-independent-inventor' noninfringement defense that there is no infringement if the accused article or process (or the feature that causes it to be accused) was actually reduced to practice by the alleged infringer prior to the effective filing date of the asserted patent.").

⁷⁸ *Id.* at 485-87.

⁷⁹ *Id.* at 485-86.

⁸⁰ Vermont, *supra* note ___, at 486-87.

⁸¹ *Id.* at 493-500. The system costs saved include monopoly losses, rent dissipation, and other miscellaneous costs such as patent prosecution and litigation costs. *Id.* at 490-93.

⁸² Lemley, Proof of Copying, *supra* note ___.

⁸³ *Id.* at 1528 (citing such examples of simultaneous invention as the steamboat, airplane, and laser).

reduce the incentive to invest in important technologies. This is particularly true if the barrier to invention is cost, not the uncertainty of the results.⁸⁴ In addition, for certain industries, such as the pharmaceutical industry, "patent owners may need the power associated with a right of complete exclusion not just to encourage invention but to ensure that the inventor invests the resources to take the idea from invention through development to marketability."⁸⁵

An independent invention defense would focus the patent system on copying to some extent—absolutely in the case of a pure independent invention defense, and to a lesser extent if Vermont’s hybrid proposal were adopted.⁸⁶

II. The Scarcity of Copiers in Patent Cases

Because copying is not an element of patent cases, there is no specific requirement that plaintiffs plead or prove that the defendant has copied the invention, either from the patent itself or from the plaintiff’s commercial embodiment of the invention. Nonetheless, there is good reason to believe that plaintiffs will have strong incentives to plead and prove copying in cases where it exists. First, the fact that the defendant copied an invention from the plaintiff strongly suggests that the defendant’s product infringes the patent; while parties can and do fight about the meaning of patent claims, if the defendant actually derived its product from the plaintiff’s it is likely to fit within any reasonable interpretation of most patent claims. Second, if the defendant copied from the plaintiff, that fact is likely to provide strong evidence that the defendant

⁸⁴ *Id.* at 1529.

⁸⁵ *Id.* at 1530-31.

⁸⁶ See Samson Vermont, *The Angel is in the Big Picture: A Response to Lemley*, 105 **Mich. L. Rev.** 1537, 1544 (2007).

was a willful as opposed to an innocent infringer, and therefore to justify an award of enhanced damages for infringement. The correspondence is not exact: a defendant may legitimately copy from the plaintiff if he has good reason to believe the patent is invalid—what the Federal Circuit has recently referred to as an objectively reasonable position.⁸⁷ But copying by the defendant is certainly evidence of willfulness that patent owners will want to submit where available. Third, as we noted in Part I, there are specific advantages patent owners can get by proving copying, such as using that fact as evidence of nonobviousness. Finally, plaintiffs who face the prospect of a jury trial (as the overwhelming majority do)⁸⁸ naturally want a good story to tell, and the story of theft is much more attractive than the story of inadvertent infringement.

To evaluate whether plaintiffs made claims of copying in patent cases, we studied complaints for patent infringement. To determine how those allegations fared, we studied written decisions that involve copying. The combined data give us a useful window into the extent of copying in patent litigation.

A. Allegations of Copying

1. Data Collection

To measure allegations of copying, we collected a sample of 200 patent infringement complaints filed between January 1, 2000 and May 1, 2007, 100 each from

⁸⁷ *In re Seagate Technology LLC*, 497 F.3d 1360 (Fed. Cir. 2007) (en banc). For discussion of the standard for willfulness and its problems, see, e.g., Mark A. Lemley & Ragesh K. Tangri, *Ending Patent Law's Willfulness Game*, 18 **Berkeley Tech. L.J.** 1085 (2003). Doug Lichtman is the primary proponent of the objective standard the court adopted. *See id.* at 1115-16 (discussing Lichtman's proposal).

⁸⁸ By 1995, 70% of patent cases were tried to a jury. Federal Judicial Center, *Patent Law Handbook* (2005).

two districts, the District of Delaware and the Eastern District of Texas. Those districts have significantly different characteristics—Delaware is the corporate headquarters of a plurality of large companies and the base of operation of major chemical and pharmaceutical enterprises, while eastern Texas is mostly rural and has very little innovation, but has recently become the district with the most patent cases because of its plaintiff-friendly reputation.⁸⁹ Of those 200 cases, we excluded seven, four because the PACER data files were corrupted or unavailable, two because they in fact involved only trade secret claims or attempted to file suit on a not-yet-issued patent, and one that involved a design patent. As a result, our data set includes 193 useable cases.⁹⁰

For each of those 193 cases, we collected the initial complaint (if it was filed within our time frame) as well as any amended complaints. We focused on amended complaints because it is possible that plaintiffs did not have evidence of copying when they filed their lawsuit, but later acquired such evidence; if so, it is reasonable to expect

⁸⁹ These data are from the IPLC web site, <http://iplc2.stanford.edu>.

Because of the liberal patent venue statute, 28 U.S.C. § 1400, patent plaintiffs can usually choose any district in the country to file suit. As a result, the location of plaintiffs or defendants in the district is less important than it is in other types of litigation.

We selected these two districts because they are two of top five districts for patent litigation, and because the IPLC had data for those districts available at an early stage in its collection process. We acknowledge the possibility that different districts might produce different results, though our industry controls and the fact that the districts have such different characteristics should minimize that chance.

⁹⁰ We will be using this sample as a tool to describe the approximate characteristics of the larger population of patent complaints. Since we use only a sample of complaints, we cannot predict with perfect accuracy the characteristics of the population as a whole. Accordingly, we determined the "confidence intervals"—the range within which we can be 95% or 99% confident the actual number will fall—for all of the coding done.

While all of the confidence intervals are available upon request, we report the confidence intervals in this Article that are important to the conclusions we identify, identifying the interval as the upper and lower bound percentages around the observed sample percentage (defined as "p").

that some if not all of them would include that evidence in amended complaints. Our data set includes 179 initial complaints, 69 first amended complaints, 21 second amended complaints, and 8 third or more amended complaints.

2. Data on Allegations of Willfulness

Of the 193 cases, plaintiffs alleged willfulness in the overwhelming majority: 157, or 81.3%.⁹¹ This is roughly consistent with Kimberly Moore's finding that willfulness was alleged in the overwhelming majority of cases.⁹² While one might think that is evidence that at least plaintiffs believed copying was widespread, in fact we cannot draw that conclusion, because the legal definition of willfulness at the time these complaints were filed did not require proof of copying or even advance knowledge of the existence of the patent or the patent owner.⁹³ It was sufficient to show that the defendant didn't *stop* infringing once they found out about the patent and didn't have good reason to believe that the patent was invalid or not infringed.

In fact, there is good reason to believe that the allegations of willfulness do not in fact reflect evidence of widespread copying. Of the 193 cases, only 60 (or 31.1%) involved allegations that the defendant was even aware of the patent before the lawsuit.

⁹¹ The confidence interval for the percentage of complaints alleging willfulness is 86.85% > p > 75.85%.

⁹² See Kimberly A. Moore, *Empirical Statistics on Willful Patent Infringement*, 14 **Fed. Cir. B.J.** 227, 232 (2004). Judge Moore found that 92% of the complaints in cases that terminated in 1999 and 2000 alleged willfulness. *Id.* It is not clear what explains the discrepancy between her findings and ours; our data set is substantially more recent (involving cases *filed* after 2000, when her cases terminated), so it is possible that allegations of willfulness have been declining over time. But sampling error or district-specific effects may explain part of the discrepancy as well.

⁹³ See Lemley & Tangri, *supra* note __, at 1116-18. The Federal Circuit changed the standard in the last half of 2007, after these complaints were filed. In re Seagate Technology LLC, 497 F.3d 1360 (Fed. Cir. 2007) (en banc). But the new standard – “objective recklessness” – still does not require that the defendant copied the invention from the plaintiff; a weak argument coupled with a failure to make adequate investigation can still make even an independent developer a willful infringer.

It is common for patent plaintiffs to send a letter putting the defendant on notice of the existence of the patent; if the plaintiff did in fact send such a letter, we would expect them to allege it, because in most cases patent damages begin to accrue only once the defendant receives such notice.⁹⁴ The fact that nearly 70% of plaintiffs don't even allege that the defendant was on notice of the patent at the time the lawsuit was filed suggests that the plaintiffs had no evidence that the defendants in those cases had copied the patent.⁹⁵ Further, of the 98 amended complaints in our database, only three were amended to add allegations of willfulness, providing at least some inferential evidence that most claims of willfulness don't involve actual knowledge of the defendant's intent. Were it otherwise, we would expect to see willfulness pled later in the case rather than at the outset.

3. Data on Allegations of Copying

When we investigated allegations that might correspond to actual copying, the results were even more dramatic. Barely ten percent (21 of 193, or 10.9%) of the complaints we studied alleged that the defendant had copied the invention, either from

⁹⁴ If the patentee makes physical products and marks them, that marking may constitute constructive notice of infringement. 35 U.S.C. § 287(a). If they do not mark their products, they can recover damages only for sales that occurred after the patentee gave notice of the patent to the defendant. But marking does not apply to process patents or to those who don't sell products. *Cf.* Janice M. Mueller, **An Introduction to Patent Law** 410 (2d ed. 2006) ("The §287(a) marking statute does not apply to patents that claim only processes or methods . . ."). If there is no marking and no notice, damages are not available except for sales made after the suit is filed. *Id.* Thus, in each of those situations there is substantial incentive to give notice of infringement. For discussion of the marking and notice requirements, see Roger D. Blair & Thomas F. Cotter, *Strict Liability and Its Alternatives in Patent Law*, 17 **Berkeley Tech. L.J.** 799 (2002).

⁹⁵ That doesn't mean the defendants in those cases didn't actually copy, of course; just that the plaintiff had no basis on which to allege that they did, even as of the date of filing of the amended complaints.

the patent or from the plaintiff's commercial product.⁹⁶ And we might think of this in some respects as an upper bound, because these include bare allegations that the defendant copied the invention. For example, we included in this category an allegation that the defendant has "built their system on use of [plaintiff's] patents" and an allegation that defendant's product are "a substantial copy" of plaintiff's, both of which might be general uses of the term "copy" or "use" to refer to similarity rather than derivation.⁹⁷

Using this data, we can look at how related allegations of willfulness are to allegations of copying. In the 157 complaints alleging willfulness, 18 of those complaints also alleged copying (11.46%). Likewise, of the remaining 36 complaints not containing a willfulness allegation, 3 included an allegation of copying (8.33%). These two percentages are fairly similar, suggesting that there is no significant relationship relation between allegations of copying and allegations of willfulness. The result of a Fisher's Exact Test on the data confirms this finding, returning a p-value of .7077.⁹⁸

Also notable is the fact that 13 of the 21 cases alleging copying are pharmaceutical patents filed against generic ANDA filers; because of the Hatch-Waxman

⁹⁶ The confidence interval for the percentage of complaints alleging copying is 15.27% > p > 6.49%.

⁹⁷ This demonstrates how broad of a definition of an "allegation of copying" we used in our study—both when looking at complaints and opinions. Essentially, an allegation of any use of the patent or a commercial embodiment of the patented technology in the development of the allegedly infringing product or process was considered an allegation of copying.

⁹⁸ This is the two-tail p-value. For the distribution to be statistically significant, a p-value must be less than .05. See David Freedman et al., *Statistics* 484 (3d ed. 1998). A p-value less than .01 is considered highly statistically significant. *Id.*

We selected the Fisher's Exact Test over the Pearson's Chi-Squared Test to measure statistical significance because of the small population size of the results being compared here. See B.S. Everitt, *The Analysis of Contingency Tables* 7, 15-16 (2d. ed 1992); George W. Snedecor & William G. Cochran, *Statistical Methods* 126-27 (8th ed. 1989) (explaining that the Fisher's Exact Test is favored over the Chi-Squared Test for smaller expected frequencies).

Act generic pharmaceutical defendants necessarily must copy the plaintiff's active ingredient to achieve bioequivalence, though this doesn't necessarily mean they copied the patented component of the invention.

The prevalence of ANDA cases in the small subset of cases that allege copying also points up another fact: whether patent plaintiffs allege copying depends on particular industries. In Table 1, we report not only the overall data on copying but also the industry-specific data.⁹⁹

⁹⁹ We use the fourteen industry categories created and defined in John R. Allison & Mark A. Lemley, *Who's Patenting What? An Empirical Exploration of Patent Prosecution*, 53 **Vand. L. Rev.** 2099, 2110-12 (2000).

Table 1

Copying Allegations By Industry

| Industry | District Totals | Number | Initial Complaints | 1st Amended | 2d Amended | 3d Amended | + Willfulness Alleged? |
|------------------|-----------------|--------|--------------------|-------------|------------|------------|------------------------|
| Pharmaceutical | 19,0 | 20 | 19 | 3 | 0 | 0 | 17 |
| Medical Devices | 4,4 | 8 | 8 | 3 | 0 | 0 | 6 |
| Biotechnology | 8,1 | 10 | 8 | 2 | 2 | 2 | 6 |
| Computer-related | 31,45 | 76 | 69 | 32 | 10 | 3 | 62 |
| Software | 28,39 | 67 | 61 | 28 | 10 | 3 | 54 |
| Semiconductor | 5,6 | 11 | 11 | 4 | 1 | 0 | 9 |
| Electronics | 9,22 | 31 | 31 | 17 | 3 | 1 | 27 |
| Chemistry | 21,4 | 25 | 22 | 2 | 2 | 1 | 22 |
| Mechanics | 22,15 | 38 | 36 | 11 | 4 | 1 | 30 |
| Acoustics | 1,2 | 3 | 3 | 1 | 0 | 0 | 3 |
| Optics | 10,4 | 14 | 11 | 5 | 2 | 2 | 12 |
| Automotive | 1,2 | 3 | 3 | 1 | 0 | 0 | 2 |
| Energy | 0,1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Communications | 12,19 | 31 | 27 | 14 | 0 | 0 | 23 |
| TOTALS | | 193 | 179 | 69 | 21 | 8 | 157 |

| Industry | Actual Notice Prior to Threat Alleged? | Copying Alleged? | Prior Business Dealings Alleged? | Trade Secrets Alleged? | Departing Ees Alleged? | Change in Allegations? |
|------------------|----------------------------------------|------------------|----------------------------------|------------------------|------------------------|------------------------|
| Pharmaceutical | 12 | 13 | 0 | 0 | 1 | 0 |
| Medical Devices | 2 | 0 | 1 | 1 | 1 | 0 |
| Biotechnology | 2 | 0 | 0 | 0 | 0 | 0 |
| Computer-related | 21 | 2 | 4 | 0 | 0 | 2 |
| Software | 21 | 2 | 2 | 0 | 0 | 1 |
| Semiconductor | 2 | 0 | 0 | 0 | 0 | 0 |
| Electronics | 9 | 2 | 3 | 2 | 1 | 0 |
| Chemistry | 16 | 14 | 1 | 1 | 1 | 0 |
| Mechanics | 12 | 3 | 2 | 1 | 0 | 0 |
| Acoustics | 1 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | |
|-----------------------|----|----|----|---|---|---|
| Optics | 2 | 0 | 1 | 1 | 0 | 0 |
| Automotive | 1 | 1 | 1 | 0 | 0 | 0 |
| Energy | 0 | 0 | 0 | 0 | 0 | 0 |
| Communications | 12 | 1 | 0 | 0 | 0 | 2 |
| TOTALS | 60 | 21 | 10 | 5 | 2 | 2 |

As noted above, 10.9% of the cases overall allege copying. But the percentage of cases that allege copying by industry range from a low of 0% in optics and semiconductors to a high of 65% in pharmaceuticals and 56% in chemistry.¹⁰⁰ It is also worth noting that the two largest classes in our sample, computer-related inventions and software, have extremely low levels of alleged copying (2.6% and 3.0%, respectively).¹⁰¹ From this data, we observe a highly statistically significant difference between allegations of copying in pharmaceutical and chemical cases and similar allegations in computer-related and software cases.¹⁰² Allegations of copying are more likely in the chemical than in the IT industries.

To try further to parse these allegations of copying, we reviewed the complaints to determine what particular facts were alleged that might support an inference of copying.

We found that ten of the 193 complaints, or 5.2%, involved allegations of a prior business relationship between the firms, something that might plausibly have led to copying. Only five of the 193 complaints, or 2.6%, include an allegation of misappropriation of trade secrets, which necessarily requires an allegation of copying.

¹⁰⁰ To avoid meaningless results, we report in text only the results for those industries with more than ten cases in our sample.

The confidence interval for the percentage of pharmaceutical complaints alleging copying is 85.9% > p > 44.1%. The confidence interval for the percentage of chemical complaints alleging copying is 75.46% > p > 36.54%.

¹⁰¹ The confidence interval for the percentage of computer-related complaints alleging copying is 6.23% > p > 0%. The confidence interval for the percentage of software complaints alleging copying is 7.07% > p > 0%.

¹⁰² A Fisher's Exact Test gives a p-value < .0001. Since these industries commonly appear in pairs for a given invention—with pharmaceutical and chemical appearing together and computer-related and software appearing together—the observations of alleged copying were similarly paired and placed in a 2x2 table when performing the Fisher's Exact Test.

And only two cases involve allegations of infringement by departing employees.¹⁰³ None of these taken alone is particularly strong evidence; it is certainly possible that a defendant copied the plaintiff's invention in the marketplace or read the patent and used it to design its product, though the latter in particular would seem an odd business decision. And trade secret claims exist in some tension with patent claims, since one requires secrecy and the other requires disclosure.¹⁰⁴ But these data points reinforce the idea that not merely express allegations of copying, but allegations of facts that might involve copying, are surprisingly rare.

Finally, it is possible that even where defendants are engaged in copying, the plaintiffs may not know of that copying at the time they file their complaints. To try to assess this, we evaluate changes in allegations to see whether amended complaints add allegations of willfulness or copying. Only two amended complaints add allegations of copying, and only three add allegations of willfulness. While it is of course possible that plaintiffs discovered evidence of copying too late to amend the complaint, or discovered it but decided not to amend the complaint, for the reasons we suggested above we think plaintiffs would likely have been motivated to amend the complaint to add those allegations if possible.

Patent infringement, like most causes of action in the federal system, is governed by the relatively lax rules of notice pleading.¹⁰⁵ As a result, it is possible that plaintiffs

¹⁰³ These numbers can't merely be added together; the two departing employee cases, for example, are also two of the cases that involve trade secret claims.

¹⁰⁴ See *Ferroline Corp. v. General Aniline & Film Corp.*, 207 F.2d 912 (7th Cir. 1954) (requiring election between patenting and secrecy). For complications of this general rule, compare *Rhone-Poulenc Agro v. DeKalb Genetics Corp.*, 272 F.3d 1335 (Fed. Cir. 2001) with *Evans v. General Motors*, 125 F.3d 1448 (Fed. Cir. 1997).

¹⁰⁵ Fed. R. Civ. P. 8.

simply do not include allegations either of copying or of the facts that might give rise to copying, opting instead for a simple complaint that merely identifies the patent and the defendant's product. As noted above, we think there are substantial reasons to allege copying when the plaintiff has evidence of it. Nonetheless, we acknowledge that the data in this section may undercount the number of cases in which plaintiffs believe defendants have copied their invention, because some of those plaintiffs may simply not have mentioned that fact in their complaints. To guard against this possibility, we collected 102 actual reported decisions that litigate issues that involve evidence of copying.¹⁰⁶ For each of those decisions, we then collected the associated complaints from the Stanford IP Litigation Clearinghouse and ran the same analysis we ran on the randomly selected complaints. This should provide a useful check on the problem of underpleading; if copying is not alleged in these complaints, which ultimately involve litigation of copying issues, it would suggest that our approach might be missing some substantial evidence of copying.

We report the aggregate results in Table 2.

Table 2
Copying Allegations in Complaints Where the Copying Allegation Appears in the Corresponding Decision

| | | |
|------------------------------------|-----|---------|
| Total Cases | 102 | |
| Initial Complaints | 88 | (86.3%) |
| 1 st Amended Complaints | 34 | (33.3%) |
| 2d Amended Complaints | 5 | (4.9%) |
| 3d + Amended Complaints | 2 | (2.0%) |
| Willfulness Alleged | 68 | (66.7%) |
| Actual Notice Prior to Threat | 44 | (43.1%) |
| Copying Alleged | 96 | (94.1%) |
| Prior Business Dealings | 9 | (8.8%) |

¹⁰⁶ There were 107 cases collected, but in two cases the files were corrupted and in three cases the complaints were unavailable. We discuss the results of those decisions in the next section.

| | | |
|------------------------|---|--------|
| Trade Secrets | 4 | (3.9%) |
| Departing Employees | 1 | (1.0%) |
| Changes in Allegations | 6 | (5.9%) |

These results confirm that, for allegations of copying, complaints are nearly as good a metric as written opinions. Of those cases where allegations of copying appeared in an opinion, almost a 100% of the complaints also included such allegations—94.1% to be exact.¹⁰⁷ This means that in only 5.9% of the cases, an allegation of copying appeared in a district court opinion but not in the corresponding complaint for the case. There is, therefore, good reason to believe that if a patent case involves questions of copying that are mentioned in a decision, these allegations also appear in the complaint.

To make sure this cross-check is not skewed by the certainty of copying in ANDA cases pursuant to our coding methodology, ANDA cases were backed out of the analysis. The percentage changes slightly, but not much, if ANDA cases are removed. Of the 102 cases where the complaints were examined, 55 were ANDA cases—which are coded as cases alleging copying. Of the remaining 47 cases, 41 included allegations of copying both in the complaint and the written opinion—87.23%.¹⁰⁸

B. Court Findings of Copying

To get further evidence of copying in patent cases, we turn from complaints to decided cases.

1. Data Collection

¹⁰⁷ It is worth noting that a Fisher's Exact Test looking at the difference between allegations of copying appearing in the complaint dataset compared to the opinion dataset produces a two-tailed p-value of .0290.

¹⁰⁸ Fisher's Exact Test produces a two-tailed p-value of .0264.

In order to measure actual findings of copying in patent cases, we looked at district court opinions available on WESTLAW.¹⁰⁹ We collected an initial set of opinions that included all opinions in cases involving an allegation of patent infringement issued on January 1, 2006 to February 29, 2008.¹¹⁰ We then searched the resulting set of opinions to identify situations where there were multiple opinions issued during the defined time period for a single case. Multiple opinions for a single case were collapsed to one "case" entry.¹¹¹ As a result, we had a final dataset that included 1871 patent infringement cases in which opinions were published on WESTLAW during a twenty-six month period.¹¹²

¹⁰⁹ The search was done on WESTLAW's DCT database. The DCT database includes "U.S. District Court Cases has all available federal district court cases with coverage beginning in 1945." See WESTLAW Summary & Contents of DCT database. The "all available" is misleading—the database includes all those available that WESTLAW wishes to make electronically available. This includes all opinions found in the Federal Supplement series published by WESTLAW and other opinions that WESTLAW chooses to publish.

¹¹⁰ The specific search to capture this set of data was "PATENT /3 INFRING! & da(aft 12/31/2005 & bef 3/1/2008). The results from this search were then reviewed to remove those opinions that did not involve actual allegations of patent infringement.

An allegation of patent infringement included both claims of patent infringement appearing in the complaint and counterclaims of the same. An opinion contained an allegation of patent infringement even if the patent infringement claim had been dismissed or adjudicated prior to the opinion's issuance. Claims of infringement based solely on design patents or plant variety patents were not considered "patent infringement cases" for the purposes of this study.

¹¹¹ Weighting by cases rather than opinions makes sense so as to not overweight those cases where there are multiple opinions.

¹¹² In comparison to the sampling study used to examine complaints, we used a population study when looking at opinions. As one author has previously noted, it is difficult if not near impossible to generate a random, representative sample with report cases. See John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 *AIPLA Q.J.* 185, 194 n.20 (1998) ("When using reported cases as data sources, there are intractable problems with treating the grouping of cases as a representative random sample, regardless of how carefully one has defined the grouping. Although it is self-evident that any grouping of cases represents a subset of something larger, i.e., a population of something, it is practically impossible to assure that the grouping is a representative sample, much less a random one.").

A population study can both be used to generate descriptive data and predictions—the predictions coming from "treating the population as a subset of a 'superpopulation'—in this case

We then coded the patent infringement opinions for these cases in the following three ways. Opinions mentioning allegations of copying were identified first.¹¹³ We used the same liberal approach for identifying allegations of copying as used when coding complaints.¹¹⁴ We further investigated opinions that included allegations of copying to determine whether copying was actually proven.¹¹⁵ A finding of copying for

the hypothetical population of all past and future . . . decisions--without pretense that the data set is a representative sample of that superpopulation." *Id.* (citing M.E. Thompson, Superpopulation Models, 9 Encyclopedia of Statistical Science 93 (1988)).

Accordingly, with a population study, there is no need to generate confidence intervals for the results. But, just to be sure, we undertook a similar analysis as Christian Chu in his empirical patent claim construction article. See Christian Chu, *Empirical Analysis of the Federal Circuit's Claim Construction Trends*, 16 **Berkeley Tech. L.J.** 1075, 1094-95. In order to get a 95% confidence level with a margin of error at 5% for determinations of whether the population includes instances of allegations of copying or findings of copying, we would need a sample size, N, of at least 384. See *id.*; Susan F. Wagner, Introduction to Statistics 201-02 (1992) (defining $N = [(Za)^2(PQ)]/B^2$, where Za is the z-score for the confidence interval, P is the sample proportion, Q is (1-P), and B stands for the margin of error). The population includes 1871 cases, well above N we would need to reach a 95% confidence level.

¹¹³ We did this in a two-step process. The dataset was searched on WESTLAW multiple times to identify discussions of copying. For example, the dataset was searched for the presence of the words "copying," "copied," "copy," "duplicat!," "imitat!," "counterfeit!," "forger!," "steal!," and "stole!" within the same paragraph as the word "patent". Then the results of that search, and others, were examined by hand to gain a full understanding of whether the copying of the patented technology, if any, was alleged. In the end, while the initial searches were quite broad as to what "trigger" words would find discussion of copying, the word itself—"copy" and its derivatives—found almost all copying discussions in the dataset. This is not to say that other copying-related words did not also appear in the same opinion; merely that adding those words did not bring in many additional cases.

¹¹⁴ See *supra* note 99 and accompanying text (describing the definition of "allegation of copying" used in this study).

¹¹⁵ A finding of copying took many forms, including the result of a bench trial to an admission by the defendant. See, e.g., *Erico Int'l Corp. v. Doc's Marketing, Inc.*, No. 1:05cv2924, 2006 WL 1174259, *5 (N.D. Ohio May 3, 2006) ("Here, Defendant openly has admitted that it engaged in direct copying of the Plaintiff's patented products."). In an ANDA case, copying was considered "found" if infringement was found.

the purposes of this study included only those findings that the patented invention was copied.¹¹⁶

We made a separate pass on the dataset of patent infringement cases to identify cases that involved allegations of willful infringement.¹¹⁷ For those cases containing allegations of willful infringement, we determined whether the allegation was decided, and if so, whether willful infringement was found or not.¹¹⁸ We also coded the willfulness cases by industry.¹¹⁹

A final search of the patent infringement dataset was done to identify all opinions mentioning allegations of infringement based on filings of an ANDA—that is infringement under 35 U.S.C. § 271(e)(2)(A).¹²⁰

2. Data on Claims of Copying

¹¹⁶ By contrast, an opinion that found copying of non-patented aspects of the plaintiff's technology, while coded as an allegation of copying, was not coded as a finding of copying for the purposes of this study. *See, e.g.,* Asyst Techs., Inc. v. Empak, Inc., No. C 98-20451 JF, 2006 WL 3302476, *3 (N.D. Cal. Nov. 14, 2006) (noting that copying of a non-claimed feature was irrelevant to the question of willful infringement). Our definition of copying narrowed in that a finding of copying did not include findings that an alleged infringer successfully designed-around a patent claim or copied an element that was not covered by the asserted patent claims.

¹¹⁷ This was done in a two-step process such as the approach taking with the copying coding. The dataset was searched on WESTLAW to identify discussions of willful infringement. For example, the dataset was searched for the presence of any derivative of the string "willful" with three words of the string "infring!". Then, the results of that search, and others, were examined by hand to gain a full understanding of the willful infringement, if any, that was actually alleged.

¹¹⁸ For example, an allegation of willfulness was deemed "decided" if the opinion reported a jury verdict, bench trial determination, ruling on a judgment as a matter of law, or decision on summary judgment.

¹¹⁹ The same categories used in the early part of this article were used here. *See supra* note 94.

¹²⁰ Again, the process was initially done by searching on WESTLAW—for example searching for the strings "ANDA" or "abbreviated new drug application"—and then, processing those results by hand.

Out of the 1871 patent infringement opinions in the dataset, 129 of them (6.89%) included an allegation of copying that was mentioned in an opinion. Of these 129 cases, the allegation of copying was based on the filing of an ANDA in a little over half of the cases—78 (60.47%) of the cases.¹²¹ Copying was actually found in 33 cases (25.58%), with the finding occurring in 22 of the ANDA cases and 11 of the non-ANDA cases. When placed in the context of all of the patent infringement cases in the study, copying was established in only 1.76% of all cases in the dataset.

A couple of observations can be made. First, the percentage of cases where copying was alleged dropped from 10.9% when we looked at the complaints to 6.89% when we looked at opinions. Looking at the descriptive data, there appears to higher likelihood that an allegation of copying will appear in a complaint as opposed to a written decision.¹²² The most obvious explanation for this discrepancy is that allegations are just that –allegations – and not all will be proven in court. The difference may also reflect the fact that a district court has little reason in many cases to mention copying in a written opinion. For example, some decisions that involve claims of copying may not need to resolve the copying issue, and therefore may not discuss it. It is also worth noting that the 6.89% finding of allegations of copying in court decisions falls within the

¹²¹ All ANDA cases were coded as cases alleging copying due to the nature of the § 271(e)(2)(A) claim. However, it is worth repeating, the copying necessary for filing an ANDA may not be copying of the patented technology.

¹²² We performed a Pearson's Chi-Squared Test for statistical significance. See generally Michael O. Finkelstein & Bruce Levin, *Statistics for Lawyers* 157-62 (2d ed. 2001) (describing the Pearson's Chi-Squared Test). The data size was too large for a Fisher's Exact Test. A Pearson's Chi-Squared Test produces a p-value of 0.04238, which means that the difference is statistically significant, but just barely.

confidence interval (margin of error) of the complaint data's finding of similar allegations.¹²³

Second, the fact that a little over half of the copying allegations and two-thirds of the findings of copying occurred in ANDA cases is explained by the nature of the ANDA patent litigation. This falls in line with the data from complaints, with around 60% of cases alleging copying both in complaints and opinions being ANDA cases. As previously explained, ANDA cases inherently involve copying of the patentee's product by the alleged infringer, and in most such cases the copying is of the patented technology.¹²⁴ And when infringement is found, that infringement generally means that the patented invention was copied in the ANDA.

Finally, and most noteworthy, is the very small number of cases where copying is actually found. Such findings make up just over one percent of the cases included in this part of our study. And if the ANDA cases are removed because of their unique linkage to copying, findings of copying drop to less than half a percent. The percentage of actual findings of copying may be low, but there is also a real possibility of underreporting. As much as patentees want to allege copying, and it is in their interest to do so, there is typically no reason for a court to mention copying in a patent infringement opinion because copying is irrelevant to the core issue in these cases—liability. In fact, district courts are encouraged to ignore copying in their opinions given that the Federal Circuit admonished courts before for discussing copying in the context of patent infringement.¹²⁵

¹²³ See *supra* note 96 (noting that the confidence interval for the complaint incidents of alleged copying is 15.27% > p > 6.49%).

¹²⁴ In other cases the patent may cover an inactive ingredient or a dissolution profile.

¹²⁵ See *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1351 (Fed. Cir. 2002); *cf.* *Hayes Lemmerz Int'l, Inc. v. Epilogics Group*, No. 03-CV-70181-DT, 2008 WL 183546, *1 (E.D. Mich.

3. Data on Willful Infringement Findings

An alternative way to determine the amount of copying that actually takes place in patent infringement cases is to focus on those patent infringement cases where copying is explicitly relevant to the opinion being written. In opinions discussing patent issues where copying is relevant—in willfulness, inducement, or nonobviousness decisions for example—a court is more likely to be presented with evidence of copying and, in turn, more likely to mention and decide the question of copying the patent. The law makes copying relevant in these contexts and therefore a litigant's push to make copying an issue is more likely to be reflected in a written opinion (and extremely likely that plaintiffs who can allege or argue copying will do so). At the same time, just considering these cases would overstate the amount of copying, since copying is by definition far more likely to be raised in those cases than in the litigation population at large.

As a result, we focused on cases involving allegations of willful infringement—an area of patent law where copying is highly relevant and very likely to be alleged if the facts make copying available. In the dataset, there were 226 cases (12.08%) where an allegation of willful infringement was mentioned.¹²⁶ An allegation of copying was

Jan 10, 2008) (labeling the patentee's argument that copying is relevant to the question of liability as "disingenuous").

¹²⁶ The difference between this result and that observed with allegations of willfulness in complaints is highly statistically significant, with a Pearson's Chi-Square test producing a p-value < .0001. That is, it is significantly more likely that a complaint will contain an allegation of willfulness than an opinion. This observation is explained by the fact that a district court has no reason to mention an allegation of willful infringement unless the allegation is being decided. And the issue of willfulness is not addressed until most of the other issues in a given case are resolved in the patentee's favor. Therefore, in the opinion data, there is likely significant underreporting of willfulness allegations.

mentioned or implied in 40 (17.70%) of these cases.¹²⁷ A decision on willfulness was reported in 77 cases (34.07%) of the 226 cases. The split in results on willfulness was almost exactly 50-50—with willful infringement being found in 42 cases (54.55%) and not found in 35 cases (45.45%). Copying was alleged in 20 (25.97%) and found in 8 (10.39%) of the 77 cases deciding willfulness. A finding of copying resulted in a finding of willful infringement in seven out of eight cases (87.5%) where willfulness was actually decided. The remaining case finding copying had yet to decide the willfulness issue.¹²⁸

Mentions of copying, both allegations and actual findings, were more prevalent in willfulness decisions (17.70%) than in the published decisions more generally (6.89%). And this difference is highly statistically significant.¹²⁹ This is not surprising given that copying is relevant to such an inquiry, but does vary from our complaint results, where there was no significant relationship between allegations of willfulness and allegations of copying.¹³⁰

But even here the existence of copying allegations in published decisions did not rise dramatically, moving from 6.89% in the context of all of the cases to 17.70% in the context of only willfulness cases. The amount of copying found also did not jump significantly, rising from 1.76% in the context of all cases to 4.87% in the context of cases mentioning an allegation of willfulness. This view of the dataset may give us a

¹²⁷ As before, patent infringement claims based on the filing of ANDAs are treated as allegations of copying of the patented technology.

¹²⁸ For example, in one case, copying was admitted, but the court had yet to decide the issue of willfulness. *See* *Erico Int'l Corp. v. Doc's Marketing, Inc.*, No. 1:05cv2924, 2006 WL 1174259, *5 (N.D. Ohio May 3, 2006).

¹²⁹ The existence of copying allegations in willfulness cases is highly statistically significant, with a Pearson's Chi-Square test producing a p-value < .0001.

¹³⁰ The difference in statistical results between complaints and opinions is likely a continuation of the higher incident of willfulness allegations in complaints as compared to opinions. *See supra* note 130.

better understanding of the amount of copying actually occurring in patent infringement cases given that courts have a reason to mention and decide the issue. The low percentages, however, still tell the same story as our earlier analysis—surprisingly little copying has occurred in these litigated cases.

It is also worth noting that when a court decides the willfulness issue and also finds copying, the court deems the infringement willful. This data suggests that actual copying is good evidence of willful infringement. The one case in which copying did not support a finding of willfulness was an ANDA case.¹³¹ This is not surprising, given that there is Federal Circuit case law that the action of filing an ANDA, by itself, is not evidence of willful infringement.¹³² District courts have repeatedly found no willful infringement even in light of the copying that accompanies an ANDA.¹³³ The fact that – at least outside of ANDA cases – successful proof of copying overwhelmingly leads to a finding of willfulness bolsters our assumption that patentees have a strong incentive to allege and prove copying where they can.

The cases alleging willfulness can also be broken down by industry. Table 3 below depicts the industries involved in cases alleging willfulness. Table 3 provides the number of cases for a given industry that involved allegations of copying and then actual

¹³¹ See *Janssen, L.P. v. Barr Labs., Inc.*, No. 07-1515 (JAP), 2008 WL 323558, *3 (D.N.J. Feb. 4, 2008).

¹³² See *Yamanouchi Pharm. Co. v. Danbury Pharmacal, Inc.*, 231 F.3d 1339, 1346 (Fed Cir.2000) ("An ANDA filing by its very nature is a 'highly artificial act of infringement,' therefore, the trial court need not have elevated the ANDA certification into a finding of willful infringement.") (quoting *Eli Lilly & Co. v. Medtronic, Inc.*, 496 U.S. 661, 678 (1990)).

¹³³ See *Janssen, L.P. v. Barr Labs., Inc.*, No. 07-1515 (JAP), 2008 WL 323558, *3 n.1 (Feb. 4, 2008) (citing eight district court opinions where an allegation of willful infringement was dismissed because it was based solely on the act of filing the ANDA).

findings of copying.¹³⁴ For a given industry, percentages are provided that indicate the percentage of cases where willfulness was alleged, willfulness was found, copying was alleged, and copying was found.

Table 3
Copying by Industry in Cases Including Willfulness Allegations

| Industry | Willfulness Alleged | Willfulness Found | Copying Alleged | Copying Found |
|-----------------|---------------------|-------------------|-----------------|---------------|
| Pharmaceutical | 15 | 0 (0%) | 15 (100%) | 3 (20%) |
| Medical Devices | 23 | 3 (13.04%) | 6 (26.08%) | 2 (8.7%) |
| Biotechnology | 15 | 4 (26.67%) | 3 (20%) | 0 (0%) |
| Computer- | 67 | 14 (20.90%) | 4 (5.97%) | 1 (1.49%) |
| Software | 46 | 9 (19.57%) | 3 (6.52%) | 1 (2.17%) |
| Semiconductor | 8 | 1 (12.5%) | 1 (12.5%) | 0 (0%) |
| Electronics | 24 | 5 (20.83%) | 2 (8.33%) | 0 (0%) |
| Chemistry | 30 | 1 (3.33%) | 18 (60%) | 3 (10%) |
| Mechanics | 93 | 20 (21.51) | 13 (13.98%) | 7 (7.53%) |
| Acoustics | 1 | 0 (0%) | 0 (0%) | 0 (0%) |
| Optics | 9 | 1 (11.11%) | 0 (0%) | 0 (0%) |
| Automotive | 8 | 2 (25%) | 2 (25%) | 1 (12.5%) |
| Energy | 5 | 2 (40%) | 1 (20%) | 0 (0%) |
| Communication | 9 | 3 (33.33%) | 1 (11.11%) | 1 (11.11%) |

This data mimics the results from complaint data in most respects. As with complaints, pharmaceutical and chemical cases make up a large portion of those cases mentioning allegations of copying and finding actual copying. On the other end of the spectrum are computer-related and software, where there was a large number of cases alleging willful infringement, but a small number of allegations and findings of copying. As with our findings with respect to complaints, there is a highly statistically significant difference between allegations of copying in pharmaceutical and chemical cases as

¹³⁴ The numbers are bigger than the total number of cases observed because of the fact that the invention in one case can involve across multiple industries.

compared to computer-related and software cases.¹³⁵ Again, allegations are more likely to exist in pharmaceutical and chemical cases.

C. Interpreting the Data

None of these measures is perfect. Data based on complaints are in one sense likely to overstate the amount of copying, since it merely requires that the plaintiff allege something even in general terms, not that it be proven. On the other hand, it may well understate the amount of copying, because some plaintiffs may not include an allegation of copying even if they believe it to have occurred, or may find out about copying too late in the litigation to amend their complaints. It is also possible that there is information flow that doesn't rise to the level of copying, but still represents some sort of "free riding" on the patentee's product,¹³⁶ though the incentives of plaintiffs to argue copying when they can should mean that most such cases get included within the broad definition we use of copying. The specific fact situations we associate with copying are similarly both under- and over-inclusive; not every case of a departing employee or a business deal gone bad will involve copying, and not every case of copying will involve one of those facts.

Data based on actual litigation of willfulness in written decisions reflects a different set of biases; it solves the undercounting and mistaken allegations problems with complaints, but it overcounts bench as opposed to jury trials, since the former are more likely to result in a written opinion, and it may be subject to selection bias if obvious cases of copying are disproportionately likely to settle before resolution.

¹³⁵ A Pearson's Chi-Square test producing a p-value of .0002.

¹³⁶ We thank Ted Sichelman for this point.

If each of these measures produced significantly different results, we might conclude that those results reflected imperfections in the proxies we used for copying. But the fact that *all* these diverse methodologies produce largely consistent results gives us substantial confidence that copying is indeed rare in patent litigation.

III. Implications of the Data

A. Understanding Policy Debates and Reform Proposals

The rarity of copying in modern patent law has several implications for understanding current rhetorical debates, public policy discussions, and proposals for reform.

First, it should be evident that patent infringement can rarely, if ever, be equated with “theft” of physical property or even “piracy” of other types of IP. Public policy debates around patent reform often involve claims that any weakening of the patent right will destroy the patent system by encouraging widespread “theft” of patent rights.¹³⁷ But our data suggest that there is very little “theft” of patent rights going on right now—at least as it is represented in patent cases. Virtually every case filed – and even the overwhelming majority of those in which the plaintiffs win and claim that the defendant was a willful infringer – involve not theft or even copying with a legitimate effort to design around but independent development by the defendant. That doesn’t mean that

¹³⁷ See, e.g., Edward M. Roche, *Internet and Computer-Related Crime: Economic and Other Harms to Organizational Entities*, 76 **Miss. L.J.** 639 (2007) (referring to “stealing of patents”); Christine Hlavica, *Patent Bandits: Preventing the Government from Avoiding 28 U.S.C. § 1498 Liability for Its Contractors’ Unauthorized Use of Patented Material by Outsourcing One or More Steps of the Process Abroad*, 37 **Pub. Cont. L.J.** 321 (2008) (infringers are “patent bandits”); Marian Uhlman, *Pushing Drug Patents*, *Phila. Inquirer*, Nov. 7, 1993, at D1 (quoting patent owners referring to “patent pirates,” comparing them to termites, and analogizing infringement to stealing a car).

they are not infringing, or that they shouldn't be held liable. Nor does it resolve the underlying debates over patent reform; just because no one is copying patented inventions now doesn't mean they wouldn't do so under a different legal regime. But it is simply inaccurate to speak of patent defendants as a whole as "unscrupulous copyists" or "thieves."¹³⁸

The second implication for existing policy debates flows from the exception to what we just said. There are a few industries in which the defendants do in fact copy the invention from the plaintiffs – the pharmaceutical and chemical industries. In those industries, the majority of cases involve allegations of copying. Indeed, in the pharmaceutical industry most patent infringement suits are filed against generic companies that file an ANDA application with the FDA in which they effectively admit that they have copied the plaintiff's drug (though not necessarily the plaintiff's patent) in order to show bioequivalence between the two products.

The contrast between the pharmaceutical-chemical industries and the rest of the patent world, and particularly the information technology industries, will be a familiar one to those who have been following the years-long debate over patent reform. On issue after issue, the biopharmaceutical and the IT industries have lined up on opposite sides of the debate, effectively stifling legislative patent reform. Dan Burk and Mark Lemley have argued that this split results from fundamentally different industry characteristics.¹³⁹ Our data provides a significant new piece of evidence to support that view. The IT industries, which faced a majority of the lawsuits in our samples, were virtually never

¹³⁸ *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 607 (1950).

¹³⁹ **Dan L. Burk & Mark A. Lemley, *The Patent Crisis and How Courts Can Solve It*** (Univ. of Chicago Press forthcoming 2009).

accused of actually copying their products from the patent owner. Their perspective on strong patent enforcement rules will accordingly be quite different than that of companies in an industry in which copying is the norm in infringement suits.

Finally, our data shed some light on the growing chorus of calls for an independent development defense. A number of scholars have argued that patent law should exempt independent development and instead target only copying, just as copyright and trade secret law do.¹⁴⁰ One of us has expressed some skepticism over that proposal.¹⁴¹ Our data demonstrates precisely how much is at stake in this debate. A patent infringement system that punished only copying would look dramatically different than current law. Ninety percent of patent lawsuits would go away, and most patent litigation would be in the chemical and pharmaceutical industries. Some will suggest this would be a good idea.¹⁴² We express no opinion on that issue here, other than to point out precisely how different such a patent system would be from the one we have today.

B. Calibrating Patent Damages

Our findings bear on one significant set of judicial and policy debates – those over the appropriate measure of damages in patent infringement cases. Unlike copyright and trade secret law, which provide that prevailing plaintiffs can recover not only for their

¹⁴⁰ See, e.g., Samson Vermont, *Independent Invention as a Defense to Patent Infringement*, 105 **Mich. L. Rev.** 475 (2006); Carl Shapiro, *Prior User Rights*, 96 **Am. Econ. Rev.** 92 (2006); Stephen M. Maurer & Suzanne Scotchmer, *The Independent Invention Defense in Intellectual Property*, 69 **Economica** 535 (2002); John S. Liebovitz, Note, *Inventing a Nonexclusive Patent System*, 111 **Yale L.J.** 2251 (2002).

¹⁴¹ Mark A. Lemley, *Should Patent Infringement Require Proof of Copying?*, 105 **Mich. L. Rev.** 1525 (2007).

¹⁴² Jim Bessen and Mike Meurer, for example, present data suggesting that the patent system is only working in those industries. James Bessen & Michael J. Meurer, **Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovators at Risk** 15 (2008).

own losses but also the defendant's gains,¹⁴³ and in some cases far more than that,¹⁴⁴ patent law since at least 1946 has limited the award of damages to those adequate to compensate the plaintiff for its losses.¹⁴⁵ Compensatory patent damages take one of two forms – lost profits, if the plaintiff can prove she lost profits, and a reasonable royalty in all other cases.¹⁴⁶

In recent years, courts have awarded greater and greater damages under the reasonable royalty theory, in part because they have ignored mechanisms designed to avoid overcompensation in complex industries¹⁴⁷ but in part also because they were influenced by the perceived need to deter infringement. In *Monsanto v. McFarling*,¹⁴⁸ for example, the court affirmed an award of “reasonable” royalties more than six times the actual royalty charged for use of patented seeds, in part to avoid a “windfall” to the infringer and in part because “*of the savings Mr. McFarling achieved by his infringement, the benefits to Monsanto from requiring farmers to adhere to the terms of its standard licensing agreement, and the benefits conferred by the patented technology over the use*

¹⁴³ Uniform Trade Secrets Act § 3(a); 17 U.S.C. § 504(a)(1).

¹⁴⁴ 17 U.S.C. § 504(c) (providing for statutory damages that can exceed actual damages by a factor of thousands in extreme cases).

¹⁴⁵ 35 U.S.C. § 284 was amended in 1946 to eliminate the disgorgement remedy.

¹⁴⁶ See *Panduit Corp. v. Stahl Bros. Fibre Works, Inc.*, 575 F.2d 1152 (6th Cir. 1978) (“When actual damages, e.g., lost profits, cannot be proved, the patent owner is entitled to a reasonable royalty.”).

¹⁴⁷ See, e.g., Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 **Tex. L. Rev.** 1991 (2007); Mark A. Lemley, *Distinguishing Lost Profits From Reasonable Royalties* (working paper 2008), Brian J. Love, *Patentee Overcompensation and the Entire Market Value Rule*, 60 **Stan. L. Rev.** 263 (2007).

¹⁴⁸ 488 F.3d 973 (Fed. Cir. 2007). One of the authors represented McFarling in this case.

of conventional seeds.”¹⁴⁹ In so doing, the court imported the concept of unjust enrichment into the damages calculation. And in other cases the Federal Circuit has similarly granted reasonable royalty awards that significantly exceed the amount required to compensate patent owners.¹⁵⁰ At least in part, those decisions too have done so to deter patent infringement, as in *Monsanto v. Ralph*.¹⁵¹ But even where deterrence is not an explicit rationale, the court seems increasingly to consider the profit the defendant makes from infringement to be fair game in the reasonable royalty calculus, as in *McFarling* and *Golight*.¹⁵²

Our data suggest that the incorporation of unjust enrichment and deterrence concepts into reasonable royalty law is a mistake. With very few exceptions, defendants are not making a calculated decision whether to infringe a patent. The overwhelming majority of defendants are independent developers who were unaware of the existence of the patent when they made their product design decisions. And those who were aware of the patent and made a decision to infringe are mostly generic pharmaceutical companies subject to a special set of rules that make the application of reasonable royalty law

¹⁴⁹ *Id.* at 981 (emphasis added).

¹⁵⁰ *Monsanto Co. v. Ralph*, 382 F.3d 1374, 1384 (Fed. Cir. 2004) (approving a royalty which far exceeded the defendant’s profit from infringement); *Golight, Inc. v. Wal-Mart Stores*, 355 F.3d 1327, 1338 (Fed. Cir. 2004) (the court upheld a reasonable royalty that exceeded the infringer’s profits from the product). For a discussion of this issue, see, e.g., Amy Landers, *Let the Games Begin: Incentives to Innovation in the New Economy of Intellectual Property Law*, 46 **Santa Clara L. Rev.** 307 (2006).

¹⁵¹ 382 F.3d at 1384. To be sure, there was substantial reason to believe that Ralph was a bad actor.

¹⁵² Some scholars have expressly argued for this approach, suggesting that because an “option to infringe” is valuable to the defendant, that value needs to be conveyed to the patentee. Jerry A. Hausman et al., *Patent Damages and Real Options: How Judicial Characterization of Noninfringing Alternatives Reduces Incentives to Innovate*, 22 **Berkeley Tech. L.J.** 825 (2007).

implausible in the extreme.¹⁵³ Less than 4% of complaints in our database involve even allegations of copying that might justify a deterrence-related “kicker”¹⁵⁴ of the sort that is increasingly showing up in Federal Circuit case law. For the same reason, the scholarship that suggests treating the “choice” to infringe as a real option for which the infringer should have to pay¹⁵⁵ misses the point: overwhelmingly, infringers are not *choosing* to infringe, but are designing products in ways that are later found to infringe.¹⁵⁶

We aren’t suggesting that damages aren’t appropriate for patent infringement; far from it. But deterrence and unjust enrichment are concepts designed to punish and therefore discourage infringement; they have no place in a patent regime where virtually all infringement is unintentional.

¹⁵³ In pharmaceutical patent cases, the generic must notify the patentee before selling a generic product, and the patentee is entitled to an automatic 30-month stay of those sales pending its infringement suit. 21 U.S.C. § 355(j)(B)(iv); § 355(j)(5)(B)(iii). If that 30-month period expires, courts can enter preliminary injunctions, and even if they don’t generic companies are often afraid to enter the market “at risk.” As a result, most pharmaceutical patent cases never involve claims of damages at all. And if they do, those damages will almost certainly be the patent owner’s lost profits, not a reasonable royalty, since by hypothesis the generic has copied a drug the patent owner is currently selling on the market.

¹⁵⁴ *Panduit Corp. v. Stahl Bros. Fibre Works, Inc.*, 575 F.2d 1152 (6th Cir. 1978) established the concept of a “kicker” to account for otherwise-uncompensated losses. The Federal Circuit rejected the kicker idea in *Mahurkar v. C.R. Bard co.*, 79 F.3d 1572, 1580 (Fed. Cir. 1996) (no “kicker” is permissible on top of the reasonable royalty to compensate for attorney’s fees or litigation expenses; patentee must prove case is exceptional to recover such expenses), but has reimported it under other names. *See, e.g., King Instruments Corp. v. Perego*, 65 F.3d 941, 951 n.6 (Fed. Cir. 1995) (“discretionary increases”); *Stickle v. Heublein, Inc.*, 716 F.2d 1550, 1563 (Fed. Cir. 1983) (allowing for “an increase in the reasonable royalty determined by the court”).

¹⁵⁵ Hausman et al., *supra* note __; J. Gregory Sidak, *Holdup, Royalty Stacking, and the Presumption of Injunctive Relief for Patent Infringement*, 92 **Minn. L. Rev.** 714 (2008).

¹⁵⁶ To be sure, one could envision a market in which patents were easy to identify, interpret, and license, and in such a hypothetical world it might make sense to require all companies to search for and license patents before beginning any research or production product. But we do not live in that world. *See* Mark A. Lemley, *Ignoring Patents*, 2008 **Mich. St. L. Rev.** 19.

In the rare cases where infringement *is* intentional, patent law provides for treble damages for willful infringement.¹⁵⁷ A second finding in our data, though, is that “willfulness” as the term is used in patent law bears little resemblance to intentional copying. To begin, we note that 157 of 193 plaintiffs (81.3%) in our complaint database alleged willfulness even though only 21 alleged copying—establishing no statistically significant relationship between allegations of willfulness and copying.¹⁵⁸ And while we did find a statistically significant relationship between these two allegations in the opinion dataset,¹⁵⁹ the percentage of cases where there was such a correlation was still very low (17.70%). The percentage stayed low when looking at cases where willfulness was actually decided, with only 20 (25.97%) of the cases deciding the willfulness issue mentioning an allegation of copying. And when willfulness was found, an allegation or finding of copying did not necessarily follow. In the 42 cases finding willful infringement, only 11 (26.19%) contained an allegation of copying and 7 (16.67%) found copying.¹⁶⁰ In fact, two cases found willful infringement while explicitly finding no copying.¹⁶¹

¹⁵⁷ In re Seagate Technology LLC, 497 F.3d 1360 (Fed. Cir. 2007) (en banc).

¹⁵⁸ See *supra* note 100 (finding a p-value of .7077).

¹⁵⁹ See *supra* note 135 (finding a p-value of < .0001).

¹⁶⁰ As a point of contrast, James Bessen and Michael Meurer found that 44% (30 of 68) of cases finding willfulness included a finding of copying. See James Bessen & Michael Meurer, *Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovation at Risk* 277 n. 5 (2008). Bessen and Meurer's data comes from a much older data—compiled in 2000 by now Judge Kimberly Moore. *Id.*

¹⁶¹ *Baden Sports, Inc. v. Kabushiki Kaisha Molten*, No. C06-210MJP, 2007 WL2790777, *4-5 (W.D.Wash. Sept. 25, 2007) (choosing not to enhance damages even though willful infringement was found); *Floe Intern., Inc. v. Newmans' Mfg. Inc.*, No. 04-5120(DWF/RLE), 2006 WL 2472112, *2-3 (D. Minn. Aug. 23, 2006) (choosing to enhance damages).

This data suggests a mismatch between the goals of willfulness law – to deter intentional conduct – and its application in the courts. The Federal Circuit changed the standard for willfulness in 2007 and now requires proof of “objective recklessness”¹⁶² – a standard still less than intentional conduct but more stringent than the duty of due care that preceded it. It remains to be seen whether this new standard will bring claims of willfulness more in line with the subset of cases involving claims of intentional conduct.

C. Patents and Technology Transfer

Our data may also shed some light on the role of the patent system in encouraging technology transfer. The patent cases we studied were not, by and large, cases about a defendant learning the invention from the plaintiff. That doesn’t mean that technology transfer from patentees to others doesn’t happen in the patent system, of course. We expect that patent licensing involves technology transfer (as opposed to merely an agreement to forebear from suit) in a wide variety of contexts, from university licenses to start-ups to joint ventures to international outsourcing of production.¹⁶³ But it does suggest that *patent litigation* today is not about policing failed efforts at technology transfer, but rather about efforts by patent owners to enforce their right of exclusivity or to collect revenue from independent creators. As a corollary, it may well be that judicial or legislative efforts to curb abuse of patent litigation will have no significant adverse effect on the technology transfer function of the patent system, though it is important to

¹⁶² *In re Seagate Technology LLC*, 497 F.3d 1360 (Fed. Cir. 2007) (en banc).

¹⁶³ *See, e.g.*, Ashish Arora et al., **Markets for Technology** (2001) (investigating and documenting IP-related technology transfer).

make sure that efforts to limit the very real problem of litigation abuse don't spill over into attacks on patent rights more generally.

Our data do provide some inferential support for those who have argued that the disclosure function of the patent system isn't working terribly well. A variety of evidence already suggests that scientists in most industries rarely read patents, and that even if they did those patents aren't a particularly good means of conveying technical information.¹⁶⁴ The fact that few if any people appear to be copying technology from patent owners is consistent with this argument, though it is not proof that people aren't copying inventions after the expiration of their patents.

IV. Conclusion

Patents are fundamentally different from other types of IP rights. The patent litigation system does not appear to operate to prevent copying, instead giving patent owners control primarily over independent invention by third parties. There may be good reasons to give patent owners this control, whether to give inventors extra incentives or perhaps to create more certain rights that more easily can be licensed. But debates over the patent system – and legal rules that set remedies for infringement – should not be based on the assumption that patent infringers are “thieves” or “copiers.” The evidence we offer in that paper suggests that that assumption is wrong.

¹⁶⁴ Mark A. Lemley, *Ignoring Patents*, 2008 **Mich. St. L. Rev.** 19; Roin, *supra* note __, at __; Jeanne Fromer, *Patent Disclosure*, 94 **Iowa L. Rev.** __ (forthcoming 2009).