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## JUDGING EQUIVALENTS

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## JUDGING EQUIVALENTS

*By Daryl Lim*<sup>1</sup>

*Courts, patent attorneys, and legal scholars have wrestled with operationalizing the doctrine of equivalents for nearly 150 years. A venerable exception to normal patent infringement rules, the doctrine is deceptively simple to state—it enables patentees to reach beyond the literal wording of their claims, but it remains extremely controversial in its application. This Article traces the doctrine’s origins and explains the reasons for the doctrine’s incoherence, the tension between judges and juries, and the decline of the doctrine. This Article complements the doctrinal discussion with empirical findings of interest to academics and practitioners, including “equitable triggers” such as copying, design-arounds, and pioneer inventions. It also investigates limits such as prosecution history estoppel, the “all-elements” rule, the prior art bar and the public dedication rule.*

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## CONTENTS

INTRODUCTION.....	225
I. THE DOCTRINE OF EQUIVALENTS .....	233
A. <i>Origins &amp; Scope</i> .....	235
B. <i>Incoherence</i> .....	243
C. <i>Incompetence</i> .....	247
D. <i>Irrelevance</i> .....	254
II. EQUITABLE TRIGGERS .....	257
A. <i>Copying</i> .....	262
B. <i>Design-Arounds &amp; Independent Invention</i> .....	264
C. <i>Pioneer Inventions</i> .....	266
III. LIMITATIONS .....	270
A. <i>Prosecution History Estoppel</i> .....	273
B. <i>“All-elements” Rule</i> .....	277
C. <i>Prior Art Bar</i> .....	277
D. <i>Public Dedication Rule</i> .....	278
CONCLUSIONS.....	279

## INTRODUCTION

Courts, patent attorneys, and legal scholars have wrestled with operationalizing the doctrine of equivalents for nearly 150 years.<sup>2</sup> A venerable exception to normal patent infringement rules, the doctrine is deceptively simple to state—it enables patentees to reach beyond the literal wording of their claims, but it remains “extremely controversial” in its application.<sup>3</sup> The United States Supreme Court employed the doctrine to protect patentees from those seeking “to evade liability for infringement by making only insubstantial changes to a patented invention,”<sup>4</sup> warning that without it, patents would be “a hollow and useless thing” and “unscrupulous copyist[s]” would be “encourage[d].”<sup>5</sup> Unfortunately, no doctrine “has produced more angst, controversy, or expense than the doctrine of equivalents.”<sup>6</sup>

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<sup>2</sup> See, e.g., John R. Allison & Mark A. Lemley, *The (Unnoticed) Demise of the Doctrine of Equivalents*, 59 STAN. L. REV. 955, 956–57 (2007) (summarizing concerns that the doctrine “was swallowing the rule,” that it “lacks a coherent vision,” that “[t]wo of the three most important Supreme Court patent cases decided between 1981 and 2005 concerned the scope of a limitation on the doctrine of equivalents . . . [with one] attracting more amicus briefs than any other Supreme Court patent case up to that date.”). See also Mircea A. Tipescu, *Future Trends on the Doctrine of Equivalents?*, LEXOLOGY (May 15, 2019),

<https://www.lexology.com/library/detail.aspx?g=0d00b2b9-ac39-4a9a-85f8-4bbf36a2e5ef>;  
Dennis Crouch, *Federal Circuit: “The Doctrine of Equivalents Applies ONLY in Exceptional Cases”*, PATENTLY-O (May 8, 2019), <https://patentlyo.com/patent/2019/05/doctrine-equivalents-exceptional.html> (disagreeing on whether the 2019 Federal Circuit case of *Amgen Inc. v. Sandoz Inc.* was a “major step without precedential backing”). For significant scholarship on the doctrine, see Martin J. Adelman & Gary L. Francione, *The Doctrine of Equivalents in Patent Law: Questions that Pennwalt Did Not Answer*, 137 U. PA. L. REV. 673 (Jan. 1989); R. Polk Wagner, *Reconsidering Estoppel: Patent Administration and the Failure of Festo*, 151 U. PA. L. REV. 159 (2002); Matthew J. Conigliaro, Andrew C. Greenberg & Mark A. Lemley, *Foreseeability in Patent Law*, 16 BERKELEY TECH. L.J. 1045 (2001); Joshua D. Sarnoff, *Abolishing the Doctrine of Equivalents and Claiming the Future After Festo*, 19 BERKELEY TECH. L.J. 1157 (2004); David L. Schwartz, *Explaining the Demise of the Doctrine of Equivalents*, 26 BERKELEY TECH. L.J. 1157, 1177 (2011); Lee Petherbridge, *Patent Law Uniformity?*, 22 HARV. J.L. & TECH. 421, 428 (2009) [hereinafter Petherbridge, *Patent Law Uniformity?*]; Lee Petherbridge, *On the Decline of the Doctrine of Equivalents*, 31 CARDOZO L. REV. 1371 (2010) [hereinafter Petherbridge, *On the Decline*]; Michael Meurer & Craig Allen Nard, *Invention, Refinement and Patent Claim Scope: A New Perspective on the Doctrine of Equivalents*, 93 GEO. L.J. 1947 (2005); Doug Lichtman, *Substitutes for the Doctrine of Equivalents: A Response to Meurer and Nard*, 93 GEO. L.J. 2013 (2005); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839 (May 1990); S. Jay Plager, *Challenges for Intellectual Property Law in the Twenty-First Century: Indeterminacy and Other Problems*, 2001 U. ILL. L. REV. 69 (2001).

<sup>3</sup> See *infra* Part II. Petherbridge, *On the Decline*, *supra* note 2, at 1371 (“The doctrine of equivalents is a judicial creation that allows patentees to exclude others from the use of subject matter beyond the textual scope of a patent’s claims. This venerable—and extremely controversial—doctrine is tolerated (or promoted) on the theory that it is fundamentally necessary to protect the incentive structure of the patent system.”).

<sup>4</sup> *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 727 (2002).

<sup>5</sup> *Graver Tank & Mfg. Co. v. Linde Air Products Co.*, 339 U.S. 605, 607 (1950).

<sup>6</sup> Petherbridge, *On the Decline*, *supra* note 2, at 1372. See also Meurer & Nard, *supra* note 2, at

As with transactional lawyering, patent claim drafting relies on attorneys identifying relevant contingencies and crafting words to mitigate risk as best as foreseeable.<sup>7</sup> Patent attorneys refine their claims during prosecution and include alternative versions of the inventor's original embodiment.<sup>8</sup> The difficulty stems from the doctrine straddling an uneasy balance between giving patentees the full and fair scope of their rights and protecting public reliance on the express wording of patent claims, or what Professor Donald Chisum called the "Fair Protection-Certainty Conundrum."<sup>9</sup> As he explained:

There is clearly an interest in providing a clear definition of the scope of the patent right; lack of clarity can impede legitimate investment in technology-based products and services. On the other hand, strict and literal adherence to the written claim in determining the scope of protection can invite subversion of a valuable right and substantially diminish the economic value of patents.<sup>10</sup>

Precision, however, comes at the cost of administrability. Whether something is "equivalent" to a patented invention is fact-specific and elides rote application of formulaic and mechanistic rules.<sup>11</sup> Some commentators attribute its unruly scope to it being an "equitable" doctrine.<sup>12</sup> Others have observed that the doctrine's malleability makes it susceptible to biases.<sup>13</sup>

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1948 ("Perhaps no doctrine in patent law is as controversial as the Doctrine of Equivalents . . .").

<sup>7</sup> Meurer & Nard, *supra* note 2, at 1948–49 n.3.

<sup>8</sup> *Id.* at 1952 (by "identifying and claiming the broadest patentable set of embodiments enabled by the disclosure in the patent specification.").

<sup>9</sup> Donald S. Chisum, *The Scope of Protection for Patents After the Supreme Court's Warner-Jenkinson Decision: The Fair Protection—Certainty Conundrum*, 14 SANTA CLARA COMPUTER & HIGH TECH. L.J. 1, 6–7 (1998).

<sup>10</sup> *Id.* at 6–7. *See also* Meurer & Nard, *supra* note 2, at 1978 ("[C]ase law tries to strike an ad hoc balance between patent owners' interests and costs to the public, including the cost of uncertain property rights.").

<sup>11</sup> Jonathon Taylor Reavill, *Tipping the Balance: Hilton Davis and the Shape of Equity in the Doctrine of Equivalents*, 38 WM. & MARY L. REV. 319, 329 (1996).

<sup>12</sup> Gregory J. Smith, *The Federal Circuit's Modern Doctrine of Equivalents in Patent Infringement*, 29 SANTA CLARA L. REV. 901, 912 n.64 (1989) ("[C]ourts have justified the lack of usable guidelines for applying the doctrine by stating that it is an equitable doctrine, and to constrain it with rigid rules of application would compromise the court's equitable powers."). *See also* Reavill, *supra* note 11, at 358 ("Without intent, the doctrine of equivalents is no more than a second stab at proving infringement for the patentee, and the doctrine loses both its equitable nature and its justification.").

<sup>13</sup> *See* Reavill, *supra* note 11, at 365, 366 (describing juries as "pro-patent" and being prone to "idealize inventors."). *See also* Robert L. Harmon, *Seven New Rules of Thumb: How the Federal Circuit Has Changed the Way Patent Lawyers Advise Clients*, 14 GEO. MASON U. L. REV. 573, 582 (1992) ("Show the jury that beribboned patent document, and establish that the defendant is doing something pretty close to what is patented, and the question becomes not validity or infringement but simply how much?").

The state of the doctrine of equivalents has been tied to “the health of patents” generally in the United States.<sup>14</sup> At the same time, “no patent doctrine has been considered by the high Court more frequently than the doctrine of equivalents.”<sup>15</sup> Patentees routinely invoke it in patent infringement cases.<sup>16</sup> Nowhere in patent law is uniformity more critical.<sup>17</sup> It is uniformity that enables patentees and potential defendants to assess litigation outcomes in making investment decisions regarding research and development.<sup>18</sup> Yet, the Supreme Court recognized that “the doctrine of equivalents, when applied broadly, conflicts with the definitional and public-notice functions of the statutory claiming requirement.”<sup>19</sup> Some of the fiercest criticism of the doctrine came from the Supreme Court itself. For instance, in his dissent, Justice Black warned that the doctrine would result in claim wording becoming “like a nose of wax, which may be turned and twisted in any direction . . . so as to make it include something more than, or something different from, what its words express.”<sup>20</sup>

The doctrine’s unpredictability “frustrates and chills” attempts by rivals to legitimately design around patents fostering unnecessary litigation.<sup>21</sup> Those “attempting to determine today whether a device is equivalent to a patented invention may know how the arguments on either side will unfold, but he is unlikely to be able to predict with any real certainty which of those sides is likely to prevail, and why.”<sup>22</sup> This is problematic, not least because attorneys

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<sup>14</sup> *Litton Sys., Inc. v. Honeywell, Inc.*, 145 F.3d 1472, 1472 (Fed. Cir. 1998) (Plager, J., dissenting). See also James K. Folker, *A Legislative Proposal to Clarify and Simplify Patent Infringement Analysis under the Doctrine of Equivalents*, 6 FED. CIR. B.J. 211, 233 (1996) (“Both the lack of predictability and the inadequate public notice resulting from the current state of doctrine of equivalents jurisprudence have a number of serious repercussions on individual patentees and their competitors which, when considered industry-wide, may hinder innovation in the country as a whole.”).

<sup>15</sup> Petherbridge, *On the Decline*, *supra* note 2, at 1373. “Highly visible internal disputes and outcry from the bar have been paralleled by Supreme Court review in some of the Court’s most famous patent cases of the modern era [since the creation of the Federal Circuit].” *Id.* at 1372-73.

<sup>16</sup> See Allison & Lemley, *supra* note 2, at 977 (“[A] patentee is almost always arguing the doctrine of equivalents as an alternative to a theory of literal infringement.”). Kurt L. Glitzenstein, *A Normative and Positive Analysis of the Scope of the Doctrine of Equivalents*, 7 HARV. J.L. & TECH. 281, 290 (1994) (“The doctrine of equivalents is frequently raised, typically in the alternative to a charge of literal infringement, in patent infringement actions.”). Tipescu, *supra* note 2 (“Claims of infringement under the doctrine of equivalents routinely accompany literal infringement claims in patent infringement litigation.”).

<sup>17</sup> Timothy J. Douros, *Lending the Federal Circuit A Hand: An Economic Interpretation of the Doctrine of Equivalents*, 10 HIGH TECH. L.J. 321, 322 (1995) (“Nowhere in the patent law is such uniformity more needed than in application of the doctrine of equivalents.”).

<sup>18</sup> Adelman & Francione, *supra* note 2, at 682.

<sup>19</sup> *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 29 (1997).

<sup>20</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 614 (Black, J., dissenting) (internal quotation marks omitted).

<sup>21</sup> Adelman & Francione, *supra* note 2, at 683.

<sup>22</sup> Glitzenstein, *supra* note 16, at 309–10.

have to settle most patent disputes and rely heavily on at least tolerably predictable rules to counsel on litigation avoidance and case settlement.<sup>23</sup> Rivals risk infringement and must “forecast how far a court relatively unversed in a particular technological field will expand the claim's language after considering the testimony of technical experts in that field.”<sup>24</sup>

Congress created the U.S. Court of Appeals for the Federal Circuit to introduce uniformity and certainty into patent law.<sup>25</sup> Unfortunately the Federal Circuit, like the Supreme Court, has “failed to synthesize an articulable doctrine of equivalents jurisprudence,” notwithstanding many opportunities to do so.<sup>26</sup> Former Federal Circuit Chief Judge Paul Michel judged the doctrine “the most difficult and least predictable of all doctrines in patent law to apply”<sup>27</sup> and admitted the court’s decisions on the doctrine had done little to increase the predictability of outcomes of disputes “litigated to conclusion through appeal.”<sup>28</sup> His successor, former Chief Judge Randall Rader confessed that “[f]ew problems have vexed this court more than articulating discernible standards for non-textual infringement.”<sup>29</sup> Case law on the doctrine is in disarray, with courts “analyz[ing] the facts on a completely ad hoc basis.”<sup>30</sup>

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<sup>23</sup> Hon. Paul R. Michel, *The Role and Responsibility of Patent Attorneys in Improving the Doctrine of Equivalents*, 40 IDEA 123, 124 (2000) (“Predictability is key — because with courts overburdened, patent lawyers will have to settle most patent disputes.”). See also *Hilton Davis Chemical Co. v. Walter-Jenkinson Co.*, 62 F.3d 1512, 1534 (Fed. Cir. 1995), *rev'd* 520 U.S. 17 (1997) (Newman, J., concurring) (“[I]t will not serve that function if its application is so unpredictable that it cannot be relied upon. Indeed, the determination of technologic equivalency should be reasonably predictable by not only the innovator but also the competitor. When applied to a particular patented invention, it should be, reasonably predictable whether a specific device will be found “equivalent.”).

<sup>24</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 617.

<sup>25</sup> Daryl Lim, *I Dissent: The Federal Circuit's "Great Dissenter," Her Influence on the Patent Dialogue, and Why It Matters*, 19 VAND. J. ENT. & TECH. L. 873, 876 (2017).

<sup>26</sup> Glitzenstein, *supra* note 16, at 290 (“The extended doctrine of equivalents debate has, therefore, generated far more heat than light.”). *Id.* at 309. See e.g. Sean T. Moorhead, *The Doctrine of Equivalents: Rarely Actionable Non-Literal Infringement or the Second Prong of Patent Infringement Charges?*, 53 OHIO ST. L.J. 1421, 1438 (1992) (“The Federal Circuit has not uniformly addressed the pioneer/non-pioneer issue.”). Petherbridge, *Patent Law Uniformity?*, *supra* note 2, at 424, 428 (reporting that the law exhibits “noticeable heterogeneity,” with “court quite tolerant of jurisprudential diversity.”). As a normative matter, Petherbridge generally defends this heterogeneity, noting that it allows the court “the flexibility to reach what it sees as the ‘right’ result in most cases [but] could still promote uniformity of doctrinal development by utilizing a judiciary that is . . . highly skilled and capable of great nuance in interpreting patent law.” *Id.* at 429.

<sup>27</sup> Michel, *supra* note 23, at 123.

<sup>28</sup> *Id.* at 124 (“Today, as far as equivalent infringement goes, patent lawyers cannot with certainty predict dispute outcomes under the doctrine of equivalents.”).

<sup>29</sup> *Johnson & Johnston Assocs. v. R.E. Serv. Co.*, 285 F.3d 1046, 1056 (Fed. Cir. 2002) (en banc) (Rader, J., concurring).

<sup>30</sup> See Glitzenstein, *supra* note 16, at 309.

The doctrine survived calls for legislative abrogation and despite its frustrating vagueness, is here to stay.<sup>31</sup> What then can stakeholders do to mitigate its uncertainty while leveraging on its flexibility? According to some, “any effort to reconcile the myriad decisions into a coherent vision is Sisyphean.”<sup>32</sup> The more optimistic argue that the problem lies not with the doctrine but rather its application, with fixing inherently ambiguous operative terms such as “substantially different” and “interchangeable” as the proper way forward.<sup>33</sup>

The doctrine’s controversy and complexity allured many into attempting to unravel its mysteries. Most studies “simply catalog the various cases and highlight those facts that apparently were central to the finding, all in an effort to assist the attorney seeking a factual analogy.”<sup>34</sup> Some, however, have taken a bolder leap forward, employing various approaches: Law and Economics,<sup>35</sup> mathematical,<sup>36</sup> and empirical.<sup>37</sup> While each method has its own merits, the rapidly growing field of empirical research in intellectual fuels the kind of evidence-based decision-making that until recently was lacking.<sup>38</sup>

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<sup>31</sup> See Michel, *supra* note 23, at 124; see also D. Alan White, *The Doctrine of Equivalents: Fairness and Uncertainty in an Era of Biologic Pharmaceuticals*, 60 EMORY L.J. 751, 778 (2011) (“[A]bolishing the doctrine altogether would tilt the balance too far in the other direction, narrowing the scope of patent protection and reducing the incentives for firms to develop pioneer biologics in the first place.”). Craig Wallace, *A Proposed Standard Jury Instruction for a Patent Infringement Inquiry Under the Doctrine of Equivalents*, 10 COMPUTER & HIGH TECH. L.J. 425, 427 (1994) (“While there has been criticism of the equivalents doctrine, the doctrine still applies today and does not appear to be in danger of abandonment.”).

<sup>32</sup> See also Glitzenstein, *supra* note 16, at 309.

<sup>33</sup> *Hilton Davis Chemical Co.*, 62 F.3d at 1535 (Newman, J., concurring) (“It is not the doctrine of equivalents, but the uncertainty of its application, that causes the uncertainty in commercial relationships.”).

<sup>34</sup> Glitzenstein, *supra* note 16, at 309.

<sup>35</sup> See Douros, *supra* note 17, at 330.

<sup>36</sup> See Raj S. Davé, *A Mathematical Approach to Claim Elements and the Doctrine of Equivalents*, 16 HARV. J.L. & TECH. 507 (2003).

<sup>37</sup> See Petherbridge, *Patent Law Uniformity?*, *supra* note 2, at 1301 (covering Federal Circuit decisions over a “fifteen-year period spanning [January 1, 1992 to May 2, 2007.]”). See also Allison & Lemley, *supra* note 2, at 963 (covering “every district court and court of appeals decision on the doctrine of equivalents that appeared in Westlaw and was decided during three eighteen-month periods[.]” between 1999 and 2005); Schwartz, *supra* note 2, at 1183 (examining cases between 1991 and 2008). See generally Darcy August Paul, *The Judicial Doctrine of Equivalents*, 17 HARV. J.L. & TECH. 247, 248 (2003) (covering the period between 1999 to 2002).

<sup>38</sup> Hon. Ryan T. Holte & Ted M. Sichelman, *Cycles of Obviousness*, 105 IOWA L. REV. 107, 160 (2019) (describing how “empirical studies are typically more reliable than anecdote[.]”); Herbert Hovenkamp, *Antitrust and the Patent System: A Reexamination*, 76 OHIO ST. L.J. 467, 510 (2015) (“How do rules concerning such issues as patent duration, the requirement of nonobvious subject matter, enablement, or the doctrine of equivalents perform in the market? There is very little empirical study of how individual patent doctrines perform[.]”). For some examples of notable empirical studies in intellectual property law, see Lee Epstein & Gary King, *The Rules of Inference*, 69 U. CHI. L. REV. 1, 34–35 (2002). See also Allison & Lemley, *supra* note 2;



Against this backdrop, this Article provides an empirical basis for judges, scholars, policymakers, and patent attorneys to better understand the doctrine's nature in order to contextualize its evolution and chart its future. It surveys the law and literature on the doctrine from its inception over 150 years ago to the present day, and reports on contemporary results that will interest these stakeholders. It tests conventional wisdom against 10,373 observable datapoints gleaned from 316 Federal Circuit and district court cases between 2009 and 2018, including Rule 36 summary affirmances with no opinion.<sup>39</sup>

By coding the reasoning in each case, this Article reveals how district courts and the Federal Circuit employed the doctrine. Patent litigators would be interested in practical questions such as what arguments are most likely to win? What role do factors like litigation venue, industry, and posture have on outcomes? The descriptive statistics in this Article provide useful insights into these questions and more. In so doing, this Article differs from prior studies of the doctrine in three important ways.

First, earlier empirical studies examined factors leading to the doctrine's decline.<sup>40</sup> While this study investigates that decline, it also investigates allegations of juries parsing patent claims "based on emotion rather than reason,"<sup>41</sup> as well as a wealth of causal factors normally invisible when studying even landmark cases in isolation. These include litigation aspects such as venue, outcome, industry, and procedural posture, as well as doctrinal aspects such as the doctrine's scope, equitable triggers (such as copying, independent design, and pioneer inventions), and limits (such as prosecution history estoppel and the "all-elements" rule).

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Petherbridge, *On the Decline*, *supra* note 2; David L. Schwartz, *Practice Makes Perfect? An Empirical Study of Claim Construction Reversal Rates in Patent Cases*, 107 MICH. L. REV. 223 (2008); David L. Schwartz, *Courting Specialization: An Empirical Study of Claim Construction Comparing Patent Litigation Before Federal District Courts and the International Trade Commission*, 50 WM. & MARY L. REV. 1699 (2009); Lee Petherbridge & R. Polk Wagner, *The Federal Circuit and Patentability: An Empirical Assessment of the Law of Obviousness*, 85 TEX. L. REV. 2051 (2007); Petherbridge, *Patent Law Uniformity?*, *supra* note 2; Christopher A. Cotropia, *Nonobviousness and the Federal Circuit: An Empirical Analysis of Recent Case Law*, 82 NOTRE DAME L. REV. 911 (2007); Christian A. Chu, *Empirical Analysis of the Federal Circuit's Claim Construction Trends*, 16 BERKELEY TECH. L.J. 1075 (2001); Jay P. Kesan & Gwendolyn G. Ball, *How Are Patent Cases Resolved? An Empirical Examination of the Adjudication and Settlement of Patent Disputes*, 84 WASH. U. L. REV. 237 (2006); Kimberly A. Moore, *Forum Shopping in Patent Cases: Does Geographic Choice Affect Innovation?*, 79 N.C. L. REV. 889 (2001).

<sup>39</sup> Of the 110 Federal Circuit decisions, nineteen were Rule 36 decisions. *See* Holte & Sichelman, *supra* note 38, at 140 (indicating that Rule 36 decisions provide confidence in the comprehensiveness of the dataset).

<sup>40</sup> Schwartz, *supra* note 2, at 1158–59 (summarizing earlier studies either attributing the decline to trial courts displacing juries in construing patent claims or to the Supreme Court's *Festo* decision reducing the doctrine's applicability); *see also id.* (attributing the decline to "doctrinal reallocation" and "doctrinal displacement.").

<sup>41</sup> Peter K. Schalestock, *Equity for Whom? Defining the Reach of Non-Literal Patent Infringement*, 19 SEATTLE U. L. REV. 323, 347 (1996).

Second, this study is based on contemporary unbroken data. Past studies relied on cases decided between 1991 and 2008, meaning that as of 2019 they are between ten and twenty-eight years old.<sup>42</sup> By starting the period of study from cases decided in 2009, the Article also picks up where the most contemporaneous study (which capped off its dataset in 2008) left off. Supreme Court and Federal Circuit precedent have changed the law and earlier studies understandably capture only a sliver of its impact over time.<sup>43</sup> The Article covers ten years of district court and appeals cases. By using a large data set without gaps, this study can track the impact of important jurisprudential developments, and do so by building on the work done by earlier studies.<sup>44</sup> Some of these earlier studies also omitted jury decisions, district court decisions, non-precedential decisions, and unreported decisions creating gaps in their datasets.<sup>45</sup> Results from this Article therefore enable meaningful comparisons across time by isolating factors such as win rates,<sup>46</sup> the success of arguments related to the doctrines tests and limits,<sup>47</sup> as well as variations in technology sectors and outcomes.<sup>48</sup>

Third, the results and conclusions of this study have immediate application to patent law and beyond. Findings may be used to craft a standard jury instruction or assist in patent law reform.<sup>49</sup> Findings should be of interest to the patent system more generally. Moreover, the implications of the study go beyond patent law in at least three ways: first, the doctrine has roots in contract law and so may help analysis of contractual terms;<sup>50</sup> second, if it turns out that juries are incapable of properly applying the doctrine, current practice

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<sup>42</sup> See Schwartz, *supra* note 2, at 1182..

<sup>43</sup> See *id.* at 1188 (“Changes to one doctrine may cause substantive effects on the law in other doctrines.”).

<sup>44</sup> See Petherbridge, *On the Decline*, *supra* note 2, at 1378.

<sup>45</sup> Allison & Lemley, *supra* note 2, at 976 (published opinions were a representative subset of all opinions). See *id.* at 963–64 (omitting jury decisions to focus on written decisions “to parse the grounds for decisions and the reasoning of the opinions.”); Petherbridge, *On the Decline*, *supra* note 2, at 1378. See also Schwartz, *supra* note 2, at 1183 (focusing only on Federal Circuit cases); see also *id.* at 1186 (“[N]on-precedential opinions typically are not as well organized . . . present[ing] potential coding difficulties.”).

<sup>46</sup> See Allison & Lemley, *supra* note 2, at 966 (“By far the most dramatic finding of our study is that patentees rarely win doctrine of equivalents cases,” where the study reported that patentees won only 24% of decided cases over the eight-year period studied.).

<sup>47</sup> *Id.* at 974–75.

<sup>48</sup> *Id.* at 972–73 (noting that while mechanical devices made up 61.7% of the cases, pharmaceuticals only made up 6.5% of the cases). See also *id.* (finding no win-rate variation between industries).

<sup>49</sup> Michel, *supra* note 23, at 128 (noting the lack of clear “instruction or advice [that] courts give to lay juries when determining whether equivalence occurs[.]”).

<sup>50</sup> See Reavill, *supra* note 11, at 347 (“[M]any commentators point to the law of contracts as a basis for the pure equity nature of the doctrine.”).

may violate patentees' Fifth Amendment's rights to due process;<sup>51</sup> third, the doctrine's goals in tension with each other—protecting patentees from fraud on their patents and protecting accused infringers from unfair trials and liability without adequate notice of the law undergirds property law and may help inform debates there;<sup>52</sup> fourth, the results inform reconceptualizing the doctrine. For instance, the doctrine, while promoting fairness to the patentee, is not meant to be an equitable doctrine in the sense understood by lawyers.<sup>53</sup> However, that seems to be the way that juries have understood and applied it.<sup>54</sup>

Part I of the Article traces the doctrine's origins and delves into the heart of its policy tensions. It begins in 1853 when the doctrine emerged from the sheaves of a Supreme Court decision, and then traces the doctrine's evolution through the twentieth and twenty-first century to its modern incarnation. It sets out the reasons for the doctrine's incoherence and reveals that deep distrust by judges of juries. Commentators generally agree the judiciary have displaced the jury in employing the doctrine, but there is less consensus when it took place and how.

Part II presents the first empirical study ever done on how courts treat “equitable triggers” of the doctrine such as copying, the pioneer nature of the invention, as well as independent invention and attempts to design around the patented claims. It reveals that most cases between 2009 – 2018 neither mentioned equity in any form, nor did equity have any discernable effect on case outcomes. These suggest that the doctrine's “equitable” roots, while seared into conventional wisdom, has surprisingly little relevance in practice. To the extent equitable considerations exist, they manifested most strongly when parties were rivals and when the case involved allegations of copying. Similarly, defendants who were not rivals of the patentees-in-suit were more likely to prevail than if the parties were rivals in cases involving claims of design-arounds and independent invention. There was only one case that discussed pioneer inventions and no meaningful conclusion can be drawn there except that those cases are exceedingly rare.

Part III investigates the doctrine's well-known limits: the prior art bar, the “all-elements” rule, the public dedication rule, and the most controversial one of them all—prosecution history estoppel. It confirms conventional wisdom that patentees generally do worse than defendants, though patentee wins rallied in recent years under the prosecution history estoppel and the

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<sup>51</sup> *Id.* at 363 (“Allowing jurors to decide issues that lie beyond their full understanding thus violates due process under the Fifth Amendment.”).

<sup>52</sup> See Timothy R. Holbrook, *Equivalency and Patent Law's Possession Paradox*, 23 HARV. J.L. & TECH. 1, 48 (2009) (“In property law, constructive possession akin to the doctrine of equivalents is often justified on the basis of fairness.”).

<sup>53</sup> See *infra* Part II.

<sup>54</sup> See *infra* Section I.C.

public dedication rule. Additionally, the data revealed that patentees performed the best under the prior art bar, followed by the public dedication rule, prosecution history estoppel, and performed worst under the “all-elements” rule. Part IV concludes.

This Article has five associated Annexes devoted to comprehensively setting out the quantitative aspect of the study to aid future research on this important issue. Annex A presents this empirical study design and methodology. Annex B provides a table of figures. Annex C and D provide hyperlinks to the coding key and dataset respectively. All Annexes can be obtained from the author upon request.

## I. THE DOCTRINE OF EQUIVALENTS

Patentees can exclude others from making, using, or selling their inventions according to the scope of their patent claims.<sup>55</sup> It has become as much an aphorism in patent law as elections are to democracy. As Judge Giles Rich, whose name is synonymous with U.S. patent law, observed “[t]he name of the game is the claim.”<sup>56</sup> Ironically, early patent legislation did not require claims and infringement focused entirely instead on the “essence” of the patented device through an inquiry into equivalence.<sup>57</sup>

The requirement for claims appeared only in 1836 when Congress removed from courts the task of “ascertaining the exact invention of the patentee by inference and conjecture.”<sup>58</sup> From that point on, patents included claims that had to “particularly specify and point out the part, improvement, or combination, which he claims as his own invention or discovery.”<sup>59</sup>

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<sup>55</sup> 35 U.S.C. § 271(a) (2010). *See also* 35 U.S.C. § 112(b) (2012) (“The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the [applicant] regards as [his] invention.”).

<sup>56</sup> Giles S. Rich, *The Extent of the Protection and Interpretation of Claims—American Perspectives*, 21 INT’L REV. INDUS. PROP. & COPYRIGHT L. 497, 499 (1990); *see also* John Witherspoon, *Giles Sutherland Rich: The Patent Legacy that Started with a Failed Eye Exam*, IPWATCHDOG (Jan. 27, 2017), <https://www.ipwatchdog.com/2017/01/27/giles-sutherland-rich-patent-legacy/id=77628/>.

<sup>57</sup> *See* Patent Act of 1790, ch. 7, § 2, 1 Stat. 109–12 (repealed 1793); Patent Act of 1793, ch. 11, § 10, 1 Stat. 318–23 (repealed 1836). *See also* *Odiorne v. Winkley*, 18 F. Cas. 581, 582 (C.C.D. Mass. 1814) (No. 10,432); *see also* Joshua D. Sarnoff, *The Historic and Modern Doctrines of Equivalents and Claiming the Future, Part I (1790-1870)*, 87 J. PAT. & TRADEMARK OFF. SOC’Y 371, 385–86 (2005) [hereinafter Sarnoff, Part I] (“For the first two decades after the 1836 Patent Act, the Supreme Court did not definitively resolve whether the various forms of claim language employed after Evans might result in a disclaimer of patentable subject matter disclosed in the specification. During this period, “the whole patent document, including the claims as a guide, was to be viewed to ascertain the scope and nature of the invention and to determine whether the invention was embodied in the defendant’s practices or devices.”).

<sup>58</sup> Patent Act of 1836, ch. 357, 5 Stat. 117 (1836); *Keystone Bridge Co. v. Phoenix Iron Co.*, 95 U.S. 274, 278 (1877).

<sup>59</sup> Patent Act of 1836, ch. 357, 5 Stat. 119 (repealed 1870).

Claims at that time continued to focus on the invention's "essence," requiring courts to employ an equivalents-based approach to infringement.<sup>60</sup> The Supreme Court determined patent scope by reference to the "specification of claim" and not by reference to the disclosed invention in the specification.<sup>61</sup> This meant that juries had to discern "principles of the invention from the patent document's textual description and schematic representations."<sup>62</sup> The claims, not the specification, determine the invention's scope. Under this "central claiming" approach, patentees disclose the central features of their inventions and how they differ from the prior art.<sup>63</sup> Courts determined the scope of the patent claim by "looking at the prior art that cabins the invention, how important the patentee's invention was, and how different the accused device is."<sup>64</sup> The task often led jurors to "find no infringement because they see [so] many superficial differences between the defendant's machine and the description of the patented invention[.]"<sup>65</sup> For this reason, the doctrine of equivalents exists so patentees can expand the scope of their claim to cover accused products differing only in minor ways. Importantly, however, courts did not extend patent scope beyond the construed scope of the patent claims until 1950.<sup>66</sup>

By 1870, new patent legislation introduced "peripheral claims" defining the outer limits of the invention rather than the essence of the patent's coverage.<sup>67</sup> Claims provided jurors guidance and called "attention to what the inventor considered the salient features of his invention."<sup>68</sup> Infringement now focused on the literal language of the claims, with equivalents invoked only "when the equities of a particular case required an equivalency test."<sup>69</sup> With claims becoming central to the infringement analysis, courts developed a two-

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<sup>60</sup> See *Winans v. Denmead*, 56 U.S. 330, 344 (1853). See also Ronald D. Hantman, *Doctrine of Equivalents*, 70 J. PAT. & TRADEMARK OFF. SOC'Y 511, 516–17 (1988).

<sup>61</sup> See *Winans*, 56 U.S. at 338–39.

<sup>62</sup> *Meurer & Nard*, *supra* note 2, at 1962.

<sup>63</sup> Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction?*, 157 U. PA. L. REV. 1743, 1746 (2009).

<sup>64</sup> *Id.*

<sup>65</sup> John F. Duffy, *The Festo Decision and the Return of the Supreme Court to the Bar of Patents*, 2002 SUP. CT. REV. 273, 309 (2002).

<sup>66</sup> Joshua D. Sarnoff, Conference Presenter at the IPIL National Conference: Has There Been Patent Law Progress in the Progress of Patent Law? (June 3, 2017).

<sup>67</sup> Patent Act of 1870, ch. 230, 16 Stat. 198 (repealed 1952). See *Dolbear v. Am. Bell Tel. Co.*, 126 U.S. 1, 539 (1888). ("[A] patent . . . is not to be confined to the mere means [the patentee] improvised to prove the reality of his conception."); Joshua D. Sarnoff, *The Historic and Modern Doctrines of Equivalents and Claiming the Future: Part II (1870-1952)*, 87 J. PAT. & TRADEMARK OFF. SOC'Y 441, 454 (2005) [hereinafter Sarnoff, Part II] ("As a result of the Court's more permissive approach to functional claiming for pioneering processes, a patentee could patent all subsequent embodiments of a broadly claimed process even though the specification disclosed only a single embodiment.").

<sup>68</sup> *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 958 (Fed. Cir. 1987) (en banc).

<sup>69</sup> *Reavill*, *supra* note 11, at 330.

part process: (1) interpret the claims and look for literal infringement; and (2) expand patent rights when required by the principle of the invention.<sup>70</sup>

#### A. *Origins & Scope*

The Supreme Court formally recognized the doctrine of equivalents in 1853 when it held that patent scope should “allow inventors to retain to their own use what they themselves have created.”<sup>71</sup> The doctrine may have been rooted in Lockean theory—inventors should be justly rewarded for their labor, a remedy for rivals unjustly enriching themselves from a patented invention but does nothing to advance technology, or a safety net against Patent Office errors improperly limiting patent scope.<sup>72</sup> From its birth, however, the doctrine was met with fierce opposition. Four dissenters in the Court cited the Patent Act’s requirement to “specify and point out” their claimed invention.<sup>73</sup> Anything less would be “mischievous” and “productive of oppressive and costly litigation, of exorbitant and unjust pretensions and vexatious demands.”<sup>74</sup>

In 1950, the Court shifted its focus from exclusive rights over the inventive concept patentees were entitled to concern over defendants’ behavior.<sup>75</sup> Instead of the rationale where patentees are entitled to their

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<sup>70</sup> See, e.g., *Winans*, 56 U.S. at 343 (“The exclusive right to the thing patented is not secured if the public is at liberty to make substantial copies of it, varying its form or proportions. And, therefore, the patentee, having described his invention, and shown its principles, and claimed it in that form which most perfectly embodies it, is, in contemplation of law, deemed to claim every form in which his invention may be copied, unless he manifests an intention to disclaim some of those forms.”).

<sup>71</sup> *Id.* at 344 (finding infringement where the accused equivalent substantially embodied the patentee’s mode of operation to achieve “the same kind of result” as the patented invention); Sarnoff, Part I, *supra* note 57, at 375 (“In 1853, to assure a fair scope of protection, the Court in *Winans v. Denmead* adopted a liberal construction of a claim’s language so that the claim would apply to an equivalent technology that was known to be a substitute for the invention described in the patent specification. The application of patents to substituted technologies later became known as the ‘doctrine of equivalents.’ However, a doctrine of equivalents has existed since the beginning of American patent law, originating as a necessary comparison of the allegedly infringing product or process to the patented invention before formal claim language was required. For over a century after *Evans*, the Supreme Court was careful to limit this historic doctrine of equivalents to the direct application of construed claim language.”). See also *McCormick v. Talcott*, 61 U.S. 402, 405 (1857) (first using the phrase “doctrine of equivalents”).

<sup>72</sup> See, e.g., *Wagner*, *supra* note 2, at 201 (noting but not endorsing the view that the doctrine of equivalents “is justified on the grounds that it better reflects the intellectual contribution of the inventor”); *Nelson v. Batson*, 322 F.2d 132, 135 (9th Cir. 1963) (a more contemporary manifestation of Lockean theory, noting “the degree of protection afforded beyond the language of the claims will vary directly with the value of the inventor’s contribution to the art.”).

<sup>73</sup> *Winans*, 56 U.S. at 347.

<sup>74</sup> *Id.*

<sup>75</sup> See *Graver Tank & Mfg. Co.*, 339 U.S. at 605. However it is worth noting that cases involving pioneering inventions that influenced the Court’s decision took place earlier. For a discussion, see Sarnoff, Part II, *supra* note 67, at 452 (“From 1870 until 1950, the Court consistently held that

creations, it justified the doctrine as an equitable safeguard against “piracy,” “stealing,” and “fraud.”<sup>76</sup> The Court recognized that “[o]utright and forthright duplication is a . . . very rare type of infringement,” but was nonetheless concerned that rivals could make “unimportant and insubstantial changes” to the literal claims of a patent, rendering patents “hollow and useless.”<sup>77</sup> It instructed that “[t]o temper unsparing logic and prevent an infringer from stealing the benefit of an invention,” patentees may invoke the doctrine “if it performs substantially the same function in substantially the same way to obtain the same result.”<sup>78</sup>

Once again, a new generation of Supreme Court judges expressed discomfort with the doctrine. Writing for himself and Justice Douglas, Justice Black reiterated Justice Campbell’s earlier concern for requiring patentees to “particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery.”<sup>79</sup> He also criticized the majority in the present case for its “emasculat[ion]” of express claim wording, pointing to amendments and reissue patents as the proper alternative.<sup>80</sup> According to Justice Black, the doctrine became end-run around a “program for alleviation of such hardships which Congress itself has provided.”<sup>81</sup>

With the Federal Circuit’s emergence in 1982, the doctrine’s controversies migrated to that court. Congress created the Federal Circuit partially to resolve circuit splits of this sort in district courts and the circuit courts of appeals.<sup>82</sup> However, the same ideological divide soon infected Federal Circuit judges as it did their Supreme Court brethren.<sup>83</sup> The Federal Circuit, in two en banc decisions in 1985 and 1987 failed to provide a

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patent protection - including the doctrine of equivalents - was limited to the scope of application of construed claim language (although that scope had been dramatically expanded for pioneering patents.”). Sarnoff, Part I, *supra* note 57, at 375, 376 (“The modern doctrine of equivalents thus extends patent protection beyond the scope of physical embodiments (i.e., applications, whether or not enumerated in the specification) of a claim’s language. It extends the exclusionary patent law infringement right (and contributory liability) to additional products or processes that are considered to be factually equivalent to those embodiments.”).

<sup>76</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 607–08.

<sup>77</sup> *Id.* at 607 (stating the reason for the doctrine of equivalents is to protect patent holders from an “unscrupulous copyist”); *see also id.* at 608 (“The essence of the doctrine is that one may not practice a fraud on a patent.”).

<sup>78</sup> *Id.* at 608 (internal quotation marks omitted).

<sup>79</sup> *Id.* at 613.

<sup>80</sup> *Id.* at 614–15 (Black, J., dissenting).

<sup>81</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 614–15 (Black, J., dissenting).

<sup>82</sup> Federal Courts Improvement Act of 1982, Pub. L. No. 97–164, §127, 96 Stat. 25, 37–38 (codified as amended at 28 U.S.C. §1295); *see* S. Rep. No. 97–275, at 5 (1982), *reprinted in* 1982 U.S.C.C.A.N. 11, 15 (noting that the Federal Circuit would “increase doctrinal stability in the field of patent law”).

<sup>83</sup> Blaine Larson, Comment, *How Tangential Does It Have to Be?: Making Sense of Festo’s Tangential Limitations Doctrine*, 48 HOUS. L. REV. 959, 968 (2011) (summarizing case law).

definitive approach to applying the doctrine.<sup>84</sup> Similar to the current quandary with patent eligible subject matter, practitioners were left unable to predict how a court might treat precedent in any given case.<sup>85</sup> It was up to the Supreme Court to weigh in once again.

In 1997 the Supreme Court attempted to resolve this “significant disagreement” between how to balance between public notice and fairness to patentees.<sup>86</sup> It determined that the doctrine was administrable despite its imprecision if courts remained vigilant to its underlying policies and guard against patentees seeking to “eliminate completely” the technological substance behind claim limitations. In doing so, it set out two limitations to the doctrine: the “all-elements” rule and prosecution history estoppel.<sup>87</sup>

The “all-elements” rule requires patentees to show that the accused device contains elements identical or equivalent to each claimed element of the patented invention.<sup>88</sup> This rule prevents patentees from using the doctrine to broaden a claim element to vitiate the other claim elements, so claim limitations cannot be construed in ways that render them meaningless.<sup>89</sup> If an accused device does not contain at least an equivalent for each limitation of the claim, there is no infringement because a required part of the claimed invention is missing. As with the doctrine, courts have “no set formula for

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<sup>84</sup> See *SRI Int’l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107 (Fed. Cir. 1985) (en banc); *Pennwalt Corp.*, 833 F.2d at 931, cert. denied 485 U.S. 961 (1988).

<sup>85</sup> See *Athena Diagnostics, Inc. v. Mayo Collaborative Servs. LLC*, 927 F.3d 1333, 1335 (Fed. Cir. 2019) (producing eight separate opinions in a denial for rehearing en banc); see also Douglas A. Strawbridge, Daniel W. McDonald & R. Carl Moy, *Patent Law Developments in the United States Court of Appeals for the Federal Circuit During 1986*, 36 AM. U. L. REV. 861, 887–88 (1987).

<sup>86</sup> *Warner-Jenkinson Co.*, 520 U.S. at 21 (noting its goal was to “to clarify the proper scope” of the doctrine); see also Sarnoff, *supra* note 57, at 376–77 (noting that the Court “extended equivalents protection to later-arising equivalent technologies, and imperfectly reconciled the modern doctrine with the doctrine of prosecution history estoppel for amended claims.”). See also *id.* (describing how the Court “departed from its historic standards for strictly construing statements and amendments made by the applicant during prosecution and for determining whether they resulted in implied disclaimers of patentable subject matter.”).

<sup>87</sup> See *id.* at 17; see also Meurer & Nard, *supra* note 2, at 1979.

<sup>88</sup> *Id.* at 29. (“Each element contained in a patent claim is deemed material to defining the scope of the patented invention, and thus the doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole.”). Meurer & Nard, *supra* note 2, at 1979 n.161 (“Suppose a patent claims a process comprising step 1, followed by step 2, followed by step 3. Suppose an alleged infringer gets the process to work using step 1 followed by step 3 with step 2 omitted. Then there is no literal infringement because step 2 is omitted. Similarly, the all-elements rule of *Pennwalt* precludes application of the DOE because step 2 is omitted. Under the old rule, a finding of infringement under the DOE was possible when courts looked at the invention as a whole.”).

<sup>89</sup> *Warner-Jenkinson Co.*, 520 U.S. at 39 n.8 (“Vitiating” is not an exception to the doctrine of equivalents, but instead a legal determination that “the evidence is such that no reasonable jury could determine two elements to be equivalent[.]”).



determining whether a finding of equivalence would vitiate a claim limitation, and thereby violate the all [elements] rule.”<sup>90</sup>

The “all-elements rule” was a refinement to determining patent infringement by the looking at the patented invention’s “essence.” The Federal Circuit initially determined infringement by looking at the claimed invention holistically.<sup>91</sup> It later cabined this approach because it gave insufficient weight to claim limitations and too much leeway to juries, a theme that would run through the doctrine’s history to the present day.<sup>92</sup> Ostensibly, the rule encourages patentees to craft their claims carefully, and discourages “abstract, holistic arguments in favor of equivalency.”<sup>93</sup> Judges would employ the “all-elements” rule where applicants could have easily written claims to literally cover the defendant’s product and did not.<sup>94</sup> Courts also compare the accused device with the patent claim not simply the two devices.<sup>95</sup>

The Court’s second limitation to the doctrine, prosecution history estoppel, teaches that “any surrender of subject matter during patent prosecution, regardless of the reason for such surrender, precludes recapturing any part of that subject matter, even if it is equivalent to the matter expressly claimed.”<sup>96</sup> Prosecution history is the public record of the correspondence between patent applicants and examiners during the prosecution process.<sup>97</sup> Just as legislative history aids statutory interpretation, prosecution history illuminates the breadth of claims.<sup>98</sup> Patentees who disclaim embodiments during the prosecution process cannot recover those embodiments at trial

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<sup>90</sup> *Freedman Seating Co. v. Am. Seating Co.*, 420 F.3d 1350, 1359 (Fed. Cir. 2005).

<sup>91</sup> *See Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 1364. (Fed. Cir. 1983).

<sup>92</sup> *See Pennwalt Corp.*, 833 F.2d at 935 (“[E]ach limitation must be viewed in the context of the entire claim [.]”). *See also Meurer & Nard*, *supra* note 2, at 1979.

<sup>93</sup> Lee Petherbridge, *On the Development of Patent Law*, 43 *LOY. L.A. L. REV.* 893, 929 (2010) [hereinafter Petherbridge, *On the Development of Patent Law*].

<sup>94</sup> *Sage Prods. v. Devon Indus.*, 126 F.3d 1420, 1424 (Fed. Cir. 1997) (“Thus, for a patentee who has claimed an invention narrowly, there may not be infringement under the doctrine of equivalents in many cases, even though the patentee might have been able to claim more broadly. If it were otherwise, then claims would be reduced to functional abstracts, devoid of meaningful structural limitations on which the public could rely.”).

<sup>95</sup> *See Warner-Jenkinson Co.*, 520 U.S. at 29 (“[T]he doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole.”); *Read Corp. v. Portec, Inc.*, 970 F.2d 816, 822, n.2 (Fed. Cir. 1992) (“[C]laim limitations drawn to a pen would not under the doctrine of equivalents cover a pencil and *vice versa*.”) (emphasis in original).

<sup>96</sup> *Warner-Jenkinson Co.*, 520 U.S. at 30. *See also Sarnoff*, Part I, *supra* note 57, at 377 (“[T]he Court departed from its historic standards for strictly construing statements and amendments made by the applicant during prosecution and for determining whether they resulted in implied disclaimers of patentable subject matter.”).

<sup>97</sup> *See Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 987 (Fed. Cir. 1995) (en banc), *aff’d*, 517 U.S. 370 (1996).

<sup>98</sup> *See id.* (comparing prosecution history to legislative history); 37 C.F.R. § 1.11(a) (2005) (prosecution history becomes public post-issuance.).

through the doctrine.<sup>99</sup> The estoppel usually arises when applicants narrow claims in response to objections that the original wording is not enabled or is unpatentable in view of the prior art.<sup>100</sup>

As the Court explained, prosecution history estoppel is linked both to “the role of claims in defining an invention and providing public notice, and to the primacy of the U.S. Patent and Trademark Office (PTO) in ensuring that the claims allowed cover only subject matter that is properly patentable in a proffered patent application.”<sup>101</sup> Conventional wisdom teaches that the doctrine of equivalents is mostly used to correct errors made by applicants.<sup>102</sup> In this way, the prominence of prosecution history estoppel seems apt. However, the Court left two major issues unanswered. First, what types of claim amendments give rise to prosecution history estoppel? And second, does prosecution history estoppel completely bar the doctrine or simply limit the range of its application?

These issues divided the lower courts in what commentators described as a “tumultuous” period.<sup>103</sup> Some judges allowed a “flexible bar,” favoring broader protection for patent holders, while others preferred a strict rule favoring clear notice to the public and treating a narrowing amendment of as a complete surrender of subject matter.<sup>104</sup> The Federal Circuit attempted to resolve the issue en banc, holding that prosecution history estoppel arises from any amendment that narrows a claim to comply with the Patent Act, not only from amendments made to avoid the prior art.<sup>105</sup> It rejected the Supreme Court’s approach as “unworkable,” and brazenly declared that “prosecution history estoppel acts as a complete bar to the application of the doctrine of equivalents when an amendment has narrowed the scope of a claim[.]”<sup>106</sup> The Federal Circuit declared that when estoppel applies, it bars any claim of equivalence for the element that was amended.<sup>107</sup> Its approach, however, only served to stoke the divisions further, resulting in many calling for the Supreme Court to resolve the controversy.<sup>108</sup>

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<sup>99</sup> See *Exhibit Supply Co. v. Ace Patents Corp.*, 315 U.S. 126 (1942); Conigliaro, Greenberg & Lemley, *supra* note 2, at 1064–65 (explaining how it is “based on the equitable concept of an implied promise”).

<sup>100</sup> See *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1460 (Fed. Cir. 1998), *overruled on other grounds* (en banc) (illustrating how a narrowing argument leads to estoppel).

<sup>101</sup> *Warner-Jenkinson Co.*, 520 U.S. at 33–34.

<sup>102</sup> Adelman & Francione, *supra* note 2, at 716.

<sup>103</sup> See Chisum, *supra* note 9, at 14 (describing the state of the law at the time as “tumultuous”); see also Davé, *supra* note 36, at 511.

<sup>104</sup> See Larson, *supra* note 83, at 967 (summarizing relevant case law).

<sup>105</sup> *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 234 F.3d 558, 558 (Fed. Cir. 2000) (en banc).

<sup>106</sup> *Id.* at 574.

<sup>107</sup> *Id.*

<sup>108</sup> Allison & Lemley, *supra* note 2, at 960.

Against this backdrop, the Supreme Court turned to focus on the doctrine once more in 2002.<sup>109</sup> In what commentators have dubbed “the most important Supreme Court patent case since Congress created the Federal Circuit,” the Court unanimously reversed the Federal Circuit.<sup>110</sup> The Supreme Court chastised the Federal Circuit for “ignor[ing] [its] guidance” and disrupting “the settled expectations of the inventing community.”<sup>111</sup> While acknowledging the importance of certainty, the Court recognized that literalism would “greatly diminish” the value of patents, and opted for a “flexible” approach to allow patentees to overcome the presumption that prosecution history estoppel applied.<sup>112</sup> The Court justified its preference for favoring patentees because it was impossible to draft claims that perfectly covered their intended scope and diminish patent value.<sup>113</sup> This was, the Court wrote, “the price of ensuring the appropriate incentives for innovation[.]”<sup>114</sup>

As a general rule, the Court held that narrowing amendments “may be presumed to be a general disclaimer of the territory between the original claim and the amended claim.”<sup>115</sup> However, patentees may rebut that presumption by showing “at the time of the amendment one skilled in the art could not reasonably be expected to have drafted a claim that would have literally encompassed the alleged equivalent.”<sup>116</sup> This occurs when: (1) the equivalent was “unforeseeable at the time of the application”; (2) the rationale behind the amendment bore “no more than a tangential relation to the equivalent in question”; or (3) there was “some other reason” a patent applicant could not have been expected to describe “the insubstantial substitute in question.”<sup>117</sup>

An equivalent is foreseeable if a skilled artisan would know an alternative existed and the patentee should have claimed it.<sup>118</sup> Since the patentee did not claim the alternative, it cannot later use the doctrine to capture that variation.<sup>119</sup> Commentators observed that “by electing to emphasize the

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<sup>109</sup> *Festo Corp.*, 535 U.S. at 722.

<sup>110</sup> *Id.* at 742; Larson, *supra* note 83, at 971; *see also* Meurer & Nard, *supra* note 2, at 1981 (called *Festo* “one of the most significant patent law cases in recent history.”).

<sup>111</sup> *Festo Corp.*, 535 U.S. at 739.

<sup>112</sup> *Id.* at 738 (“We have considered what equivalents were surrendered during the prosecution of the patent, rather than imposing a complete bar that resorts to the very literalism the equivalents rule is designed to overcome.”).

<sup>113</sup> *Id.* at 731 (“The language in the patent claims may not capture every nuance of the invention or describe with complete precision the range of its novelty.”).

<sup>114</sup> *Id.* at 732.

<sup>115</sup> *Id.* at 740.

<sup>116</sup> *Id.* at 741.

<sup>117</sup> *Festo Corp.*, 535 U.S. at 740–41.

<sup>118</sup> *See Honeywell Int’l, Inc. v. Hamilton Sundstrand Corp.*, 523 F.3d 1304, 1312–13 (Fed. Cir. 2008).

<sup>119</sup> *See Sage Prods.*, 126 F.3d at 1425 (a “subsequent change in the state of the art, such as later-developed technology, obfuscated the significance of [the] limitation at the time of its incorporation into the claim.”).

policy of public notice, courts have challenged the legitimacy of the premise that the doctrine of equivalents is necessary to protect the incentive structure of the patent system.<sup>120</sup> Courts themselves have recognized that benefiting patentees through non-textual infringement comes at the expense of clarity and notice to the public.<sup>121</sup>

The second way patentees can rebut the prosecution history is to show that the amendment bears little to no relationship to the asserted equivalent. Here, commentators say the inquiry “focus[es] on the intent of the applicant in making the relevant amendment.”<sup>122</sup> The patentee could not have voluntarily surrendered the equivalent if subject matter related to a different aspect of the invention.<sup>123</sup>

The Federal Circuit articulated three principles on tangentiality: (1) “peripheral . . . to the alleged equivalent,”<sup>124</sup> (2) “discernable from the prosecution history,”<sup>125</sup> (3) whatever they surrender to obtain a patent, even if the final scope of the claims is narrower than necessary to avoid prior art.<sup>126</sup> There remains “still no consistent definition for when a narrowing amendment is tangential.”<sup>127</sup> The third and final way patentees can rebut prosecution history estoppel is to show that there is “some other reason” for the narrowing amendment.<sup>128</sup>

To this day, the Supreme Court has not spoken on the doctrine of equivalents. However, the doctrine has not remained dormant. The Federal Circuit and district courts continue to struggle with its ad hoc and amorphous boundaries. For instance, in 2019 the Federal Circuit attempted to cabin the doctrine to “exceptional cases” to prevent it from becoming “simply the second prong of every infringement charge, regularly available to extend protection beyond the scope of the claims.”<sup>129</sup> In a recent blog post response,

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<sup>120</sup> Petherbridge, *On the Decline*, *supra* note 2, at 1404.

<sup>121</sup> Thomas K. Landry, *Certainty and Discretion in Patent Law: The On Sale Bar, The Doctrine of Equivalents, and Judicial Power in the Federal Circuit*, 67 S. CAL. L. REV. 1151, 1202 (1994) (concluding that “[n]o one should expect the court to achieve certainty in the doctrine of equivalents.”).

<sup>122</sup> Holbrook, *supra* note 52, at 26.

<sup>123</sup> *See Biagro W. Sales, Inc. v. Grow More, Inc.*, 423 F.3d 1296, 1306 (Fed. Cir. 2005).

<sup>124</sup> *Id.*

<sup>125</sup> *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1364 (Fed. Cir. 2008).

<sup>126</sup> *See, e.g., Norian Corp. v. Stryker Corp.*, 432 F.3d 1356, 1361–62 (Fed. Cir. 2005).

<sup>127</sup> Larson, *supra* note 83, at 961; Nicholas Pumfrey et al., *The Doctrine of Equivalents in Various Patent Regimes—Does Anybody Have It Right?*, 11 YALE J.L. & TECH. 261, 268 (2009) (arguing the term “tangential” is “totally devoid of linguistic content as applied to patent law”).

<sup>128</sup> *See generally* Erin Conway, Note, *The Aftermath of Festo v. SMC: Is There “Some Other Reason” for Justifying the Third Festo Rebuttal Criterion?*, 82 CHI.-KENT L. REV. 1655, 1672–73, 1677–87 (2007) (analyzing the third Festo II criterion).

<sup>129</sup> *Amgen Inc. v. Sandoz Inc.*, 923 F.3d 1023, 1029 (Fed. Cir. 2019) (internal citations and quotations omitted).

Professor Dennis Crouch pushed back, criticizing the Federal Circuit's limitation as "a major step without precedential backing."<sup>130</sup>

According to Professors Michael Meurer and Craig Nard, "[t]o the extent that a modern justification for the doctrine can be inferred, it apparently starts with the belief that the patent system generally works to give inventors patent claims with the proper breadth, but sometimes frictions in the system cause patent claims to be too narrow."<sup>131</sup> They explain that courts use the doctrine as an "efficient response to frictions present in the claims drafting process . . . to restore proper patent scope and provide the appropriate incentive to create and disclose inventions."<sup>132</sup> They identify three sources of "friction": (1) mistakes committed when drafting and prosecuting a patent,<sup>133</sup> (2) limitations of language,<sup>134</sup> and (3) the difficulty in foreseeing technical developments relevant to the patented technology.<sup>135</sup>

The corollary to a malleable standard is that determining the scope of equivalents becomes a fact-intensive endeavor. Minor, inconsequential changes enable rivals avoiding literal infringement and allowing them to avoid infringement in this manner diminishes the value of patents and harms innovation incentives.<sup>136</sup> The other policy encourages rivals to innovate with clear notice of what patents embrace so they can read and design around them.<sup>137</sup> A skilled person in the art reading claims should understand the scope of the patent and avoid infringement.<sup>138</sup>

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<sup>130</sup> Crouch, *supra* note 2.

<sup>131</sup> Meurer & Nard, *supra* note 2, at 1950.

<sup>132</sup> *Id.* at 1968.

<sup>133</sup> Adelman & Francione, *supra* note 2, at 711 ("Most frequently, patent holders use the doctrine of equivalents to rectify what is effectively a 'mistake' in the process of drafting and prosecuting the application in the PTO. The patent holder argues that the failure to include something in the claim was an oversight."); *In re Wilder*, 736 F.2d 1516, 1519 (Fed. Cir. 1984) ("An attorney's failure to appreciate the full scope of the invention is one of the most common sources of defects in patents.").

<sup>134</sup> *Autogiro Co. of Am. v. United States*, 384 F.2d 391, 397 (Ct. Cl. 1967) ("An invention exists most importantly as a tangible structure or a series of drawings. A verbal portrayal is usually an afterthought written to satisfy the requirements of patent law. This conversion of machine to words allows for unintended idea gaps which cannot be satisfactorily filled. Often the invention is novel and words do not exist to describe it. The dictionary does not always keep abreast of the inventor. It cannot. Things are not made for the sake of words, but words for things.").

<sup>135</sup> *Festo Corp.*, 535 U.S. at 740–41; Meurer & Nard, *supra* note 2, at 1970.

<sup>136</sup> Chisum, *supra* note 9, at 7 ("[S]trict and literal adherence to the written claim in determining the scope of protection can invite subversion of a valuable right and substantially diminish the economic value of patents.").

<sup>137</sup> Min-Chiuan Wang, *Nuisance Law and the Doctrine of Equivalents in Patent Law*, 34 SANTA CLARA HIGH TECH. L.J. 110, 146 (2017) ("[T]hese tests are all designed to determine whether the accused infringer took the use of the inventive concept of the patent in question. Purely taking the inventive concept of a patent without making a substantial change falls under 'moving along the Pareto frontier,' rather than 'shifting the frontier outward.'").

<sup>138</sup> *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (noting the "bedrock principle" of patent law that claims define the scope of a patent).

In sum, the doctrine remains unruly and challenging to properly administer. To many, the doctrine of equivalents “lacks a coherent vision” and is the most controversial doctrine in patent law,<sup>139</sup> with some observing that “[t]he patent community continues to struggle to develop an analysis that is both equitable and predictable.”<sup>140</sup> Why has it been so difficult to articulate a coherent doctrine? What have courts done to bridle this unruly doctrine? And does the doctrine even matter today? This Article offers empirical evidence from which to understand the doctrine’s past and to chart its future. These are the issues which the next parts will explore.

### B. Incoherence

Anyone who makes, uses, offers to sell, or sells a patented invention, within the United States, or imports into the United States a patented invention during the term of the patent without the patentee’s permission is guilty of patent infringement.<sup>141</sup> To determine infringement, courts may look at the substantial identity of the accused product or process to the claimed invention.<sup>142</sup> This measures the degree to which the alleged infringer appropriated the patentee’s inventive concept.<sup>143</sup>

In 1950, the Supreme Court underscored that its “function-way-result” test was not a “prisoner of a formula.”<sup>144</sup> In 1997, it endorsed the “insubstantial differences” test as a possible alternative but declined to choose one.<sup>145</sup> Lower courts continued to determine equivalence in an ad hoc fashion, with no guidance from the Federal Circuit.<sup>146</sup> Describing the “insubstantial differences test” as “elusive and frustrating,” commentators note that “the Federal Circuit has not, and probably will never, set out a definitive formula for determining whether an element of an accused device is a “substantial equivalent” of a

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<sup>139</sup> Meurer & Nard, *supra* note 2, at 1948 (“[N]o doctrine in patent law is as controversial as the Doctrine of Equivalents.”).

<sup>140</sup> Rudolph P. Hofmann, Jr., *The Doctrine of Equivalents: Twelve Years of Federal Circuit Precedent Still Leaves Practitioners Wondering*, 20 WM. MITCHELL L. REV. 1033, 1034 (1994); Moorhead, *supra* note 26, at 1429 (“This difficulty is enhanced by the fact that even the members of the United States Court of Appeals for the Federal Circuit cannot agree on its application.”).

<sup>141</sup> 35 U.S.C. § 271(a).

<sup>142</sup> *Sanitary Refrigerator Co. v. Winters*, 280 U.S. 30, 41–42 (1929).

<sup>143</sup> *Hilton Davis*, 62 F.3d at 1526 (“[W]here a device is a copy of the thing described by the patentee, ‘either without variation, or with such variations as are consistent with its being in substance the same thing.’”).

<sup>144</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 609; *see also Festo Corp.*, 535 U.S. at 727 (“[B]y extending protection beyond the literal terms in a patent the doctrine of equivalents can create substantial uncertainty about where the patent monopoly ends.”).

<sup>145</sup> *Warner-Jenkinson Co.*, 520 U.S. at 39 (“[T]he particular linguistic framework used is less important than whether the test is probative of the essential inquiry[.]”).

<sup>146</sup> *See Malta v. Schulmerich Carillons, Inc.*, 952 F.2d 1320, 1326 (Fed. Cir. 1991) (stating that equivalency must be determined on a case-by-case basis).

claim limitation pertaining to a claim element.”<sup>147</sup> Whether under the “function-way-result” test or the “insubstantial differences” test, there are several reasons fueling the perennial struggle for clarity.

First, courts must decipher the substance and nature of the invention. The “function-way-result test” demands a single result and a single function. Sometimes each invention may produce many results and have many functions. At other times, “function” and “result” may be essentially the same thing,<sup>148</sup> and “[b]ecause the accused infringers are often competitors of the patentees, the accused device and the patented device normally have the same function and result, and thus the determination normally turns on the “way” component.”<sup>149</sup>

One Federal Circuit case illustrates the arbitrariness in which courts can interpret “way” despite clear and narrow claim language.<sup>150</sup> The court found equivalence even though an element of the claim was missing in the accused device and where another performed in the opposite direction in the accused device.<sup>151</sup> The opinion suggests that meeting the “function” and “result” prongs satisfies the “way” prong too.<sup>152</sup> Moreover, the “function-way-result” test may result in a broader range than the “insubstantial differences” test. Ibuprofen could infringe a claim for aspirin despite their distinct chemical structures, because the drugs performed the same function in the same way to give the same results.<sup>153</sup>

Similarly, the particularized analysis of the “all-elements” rule was meant to better serve the notice function.<sup>154</sup> In practice, courts have difficulty matching language and meaning. While the “all-elements” rule constrains the doctrine by requiring a mapping of elements, it does not prevent uncertainty springing from how courts choose to define the elements of a claim.<sup>155</sup>

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<sup>147</sup> Moorhead, *supra* note 26, at 1433.

<sup>148</sup> See Donald R. Dunner & J. Michael Jakes, *The Equitable Doctrine of Equivalents*, 75 J. PAT. & TRADEMARK OFF. SOC’Y 857, 864 n.42 (1993).

<sup>149</sup> Perkin-Elmer Corp. v. Westinghouse Elec. Corp., 822 F.2d 1528, 1531 n.6 (Fed. Cir. 1987).

<sup>150</sup> See *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251 (Fed. Cir. 1989).

<sup>151</sup> See *id.* at 1258–61.

<sup>152</sup> Folker, *supra* note 14, at 230.

<sup>153</sup> *Hilton Davis*, 62 F.3d at 1546 (Lourie, J., dissenting).

<sup>154</sup> *Warner-Jenkinson Co.*, 520 U.S. at 29–30. (“Each element contained in a patent claim is deemed material to defining the scope of the patented invention, and thus the doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole. It is important to ensure that the application of the doctrine, even as to an individual element, is not allowed such broad play as to effectively eliminate that element in its entirety. So long as the doctrine of equivalents does not encroach beyond the limits just described, or beyond related limits . . . we are confident that the doctrine will not vitiate the central functions of the patent claims themselves.”).

<sup>155</sup> Matthew C. Phillips, *Taking a Step Beyond Maxwell To Tame the Doctrine of Equivalents*, 11 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 155, 162 (2000) (“The definition of an ‘element’ is

According to Former Chief Judge Michel, it is unclear to the Federal Circuit when an equivalence “vitiates” or “effectively eliminates” a claim limitation.<sup>156</sup> Some cases focus on the combination as a whole,<sup>157</sup> while others indicate that an equivalent of every claim limitation must be found in the accused device.<sup>158</sup> The distinction seems to depend on whether the patent covers a “pioneer invention.”<sup>159</sup> If so, the claims enjoy broad protection, which commentators attribute to the lack of relevant prior art rather than an expansive interpretation of the claims themselves.<sup>160</sup> The rule thus preserves the narrow scope of patents in a crowded field, and in so doing, complements the doctrine’s favoring of pioneer inventors.<sup>161</sup>

Second, the “function-way-result” test merely gives the purpose and goal of claim elements, but does not define the invention. The “way” an element operates only supplies “the means or mechanism by which it operates, but does not reliably tell what the invention is”<sup>162</sup> because this “is what structural terms in the claims are for.”<sup>163</sup> Additionally, while claims may also use “means plus function” language, which does not explicitly define structure in the claim itself, structure is implicitly defined because interpretation of such “means plus function” language is “construed to cover the corresponding structure, material, or acts defined in the specification and equivalents thereof.”<sup>164</sup>

In both these aspects, the “insubstantial differences test” does not fare well either. Indeed, the Supreme Court noted that “the insubstantial differences test offers little additional guidance as to what might render any given difference ‘insubstantial.’”<sup>165</sup> While the Court saw “no purpose in going further and micromanaging the Federal Circuit’s particular word choice for analyzing equivalence,” it reiterated the application of its “function-way-

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slippery and probably cannot be settled without some resort to arbitrariness. Presently, an element seems to be more than just a single word, but potentially less than an entire step in a method or an entire constituent part of an apparatus (as is typically demarcated by semicolons).”

<sup>156</sup> Michel, *supra* note 23, at 127 (“The Federal Circuit has struggled for a more precise definition.”).

<sup>157</sup> *Tex. Instruments, Inc. v. United States ITC*, 805 F.2d 1558, 1568–70 (Fed. Cir. 1986), *reh’g denied*, 846 F.2d 1369 (Fed. Cir. 1988).

<sup>158</sup> *Pennwalt Corp.*, 833 F.2d at 934–36.

<sup>159</sup> *Tex. Instruments Inc.*, 805 F.2d at 1572.

<sup>160</sup> Douros, *supra* note 17, at 329.

<sup>161</sup> *Cimiotti Unhairing Co. v. Am. Fur Ref. Co.*, 198 U.S. 399, 406 (1905) (“It is well settled that a greater degree of liberality and a wider range of equivalents are permitted where the patent is of a pioneer character than when the invention is simply an improvement, may be the last and successful step, in the art theretofore partially developed by other inventors in the same field.”).

<sup>162</sup> *Hilton Davis*, 62 F.3d at 1546.

<sup>163</sup> *Id.*

<sup>164</sup> See 35 U.S.C. § 112.

<sup>165</sup> *Warner-Jenkinson Co.*, 520 U.S. at 40.



result” test and left it to the Federal Circuit to “refine the formulation of the test for equivalence in the orderly course of case-by-case determinations.”<sup>166</sup>

Third, courts must also conceptualize and compare each claimed element and has nearly unfettered discretion in deciding how broadly or narrowly to define each operative term.<sup>167</sup> As Section II.C discusses, this discretion raises the concern that incompetent and biased juries would reach erroneous and potentially unreviewable results. It can be a dicey business for courts to avoid aggregating two or more claimed elements into a single element, since the latter impermissibly treats the “invention as a whole.”<sup>168</sup>

Construing construction is inherently ambiguous. Words cannot be mapped nearly to inventions.<sup>169</sup> Commentators noted that “courts define the scope of legal rights not by reference to the invention but by reference to semantic debates over the meaning of words chosen by lawyers.”<sup>170</sup>

Despite being based on factual evidence such as the patent’s prosecution history and expert testimony, what the claims mean to a person of ordinary skill in the art is a legal question. Once properly construed, applying the claims to the accused device is a factual question: does the accused device fall within the scope of the properly interpreted claim, either literally or under the doctrine of equivalents? Infringement is a question of fact and jury verdicts of infringement must be supported by substantial evidence.<sup>171</sup> Patentees must explain why a given element of the accused device is equivalent to the corresponding claim limitation.<sup>172</sup> Mere assertions will not suffice, and conventional wisdom teaches that courts will “hastily” rule against patentees in summary judgment motions if they fail to produce evidence establishing equivalence.<sup>173</sup> They need to isolate the proof for each element of the claim and show juries “substantial identity” as to each of the function, way, and result prongs of the doctrine.<sup>174</sup> This takes the form of particularized testimony and linked arguments to prevent the jury from being “put to sea without guiding charts.”<sup>175</sup> It also guards against juries determining infringement by comparing the claimed invention and the accused device using an “overall

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<sup>166</sup> *Id.*

<sup>167</sup> See *Genentech Inc. v. Wellcome Found. Ltd.*, 29 F.3d 1555, 1567 (Fed. Cir. 1994) (“[W]hether the ‘way’ or ‘result’ prongs are met is highly dependent upon how broadly one defines the ‘function’ of [a claimed element.]”).

<sup>168</sup> *Hughes*, 717 F.2d at 1364.

<sup>169</sup> *Festo Corp.*, 535 U.S. at 731. (“Unfortunately, the nature of language makes it impossible to capture the essence of a thing in a patent application.”).

<sup>170</sup> Burk & Lemley, *supra* note 63, at 1746.

<sup>171</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 609; see also *Wahpeton Canvas Co. v. Frontier, Inc.*, 870 F.2d 1546, 1552 (Fed. Cir. 1989).

<sup>172</sup> *Malta*, 952 F.2d at 1327.

<sup>173</sup> *Moorhead*, *supra* note 26, at 1432.

<sup>174</sup> *Lear Siegler, Inc. v. Sealy Mattress Co.*, 873 F.2d 1422, 1425 (Fed. Cir. 1989).

<sup>175</sup> *Id.* at 1426.

similarity” approach.<sup>176</sup> Skepticism over the jury’s competence has marked the doctrine’s history and would come to play a formative role in shaping its present incarnation.

### C. Incompetence

From the moment the doctrine was born, the judges who watched its birth were concerned that the doctrine would substitute the judgement of the Patent Office with the court’s view on the breadth of patent rights.<sup>177</sup> That concern continues to the present day with courts and commentators worrying that the uncertainty and risk of false positives caused by the unruly doctrine would be exacerbated by having juries apply it.<sup>178</sup> Federal Circuit Judge Plager even mooted declaring the doctrine of equivalents “a judge-made rule in the first place—to have its roots firmly in equity, and to acknowledge that when and in what circumstances it applies is a question of equitable law, a question for which judges bear responsibility.”<sup>179</sup>

Part of the concern is one of competence. To determine patent infringement, courts construe claims as a matter of law and juries then compare the construed claims to the accused device.<sup>180</sup> Juries must decide, as a matter of fact, whether the accused device infringes the claims, either literally or under the doctrine of equivalents.<sup>181</sup> The problem is that jurors “frequently” have difficulty understanding legal jargon in complex litigation,<sup>182</sup> “and [are] easily misled by expert testimony”<sup>183</sup> dealing with “technologies at the forefront of innovation . . . where issues may hinge upon legal and scientific concepts that even experts can have difficulty understanding.”<sup>184</sup> Biotechnology is an area where the doctrine may be particularly difficult to apply. This is because of the

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<sup>176</sup> *Id.* at 1427.

<sup>177</sup> *See, e.g., Winans*, 56 U.S. at 344 (Campbell, J., dissenting); *Graver Tank & Mfg. Co.*, 339 U.S. at 615 (Black, J., dissenting).

<sup>178</sup> *See Folker, supra* note 14, at 225 (“The confusion surrounding the doctrine of equivalents, which results in its unpredictability in application, is compounded by permitting juries — as opposed to judges or technical experts — to make the determination of whether a device infringes under the doctrine of equivalents.”). Michel, *supra* note 23, at 123 (“[The doctrine] has proven to be the most difficult and least predictable of all doctrines in patent law to apply. Even judges cannot agree on its contours. Imagine the dilemma for lawyers! Pity lay jurors!”). *See also White, supra* note 31, at 769 (“[I]n cases involving the doctrine of equivalents, ultimate questions of fact are often decided by juries that are poorly equipped to deal with complex scientific issues.”).

<sup>179</sup> *Festo Corp.*, 234 F.3d at 593 (Plager, J., concurring).

<sup>180</sup> *See Markman*, 52 F.3d at 967.

<sup>181</sup> *Id.*

<sup>182</sup> Christopher B. Seaman, *Willful Patent Infringement and Enhanced Damages After in Re Seagate: An Empirical Study*, 97 IOWA L. REV. 417, 446 (2012).

<sup>183</sup> *See White, supra* note 31, at 768–70.

<sup>184</sup> *Id.* at 769.

complex panoply of nucleotide sequences, proteins, antibodies, engineered cell lines, vaccines, and viruses that constitute the current array of biologic pharmaceuticals, a class of therapies that will almost certainly become more numerous and complex in the future. The analysis is further complicated by the fact that simple changes, even single changes at the DNA or protein level, can lead to drastic consequences for the biologic in question.<sup>185</sup>

No less than three Federal Circuit judges argued that determining equivalence by jury is “operationally unsatisfactory and jurisprudentially unjustified.”<sup>186</sup>

In 1996 the Supreme Court held that judges could be entrusted to “give a proper interpretation to such instruments patents than a jury; and he is, therefore, more likely to be right, in performing such a duty, than a jury can be expected to be.”<sup>187</sup> Borrowing contract law as an analogy, a patent is a contract between the patentee and government.<sup>188</sup> Courts reform claims the same way they would reform contractual terms when literal analysis fails to produce a “fair” result.<sup>189</sup> Further, because the doctrine involves issues of both law and fact, a case may be made for judges to decide the legal issue alone.<sup>190</sup> This “logic,” commentators say, “readily carries over to equivalency analysis,”<sup>191</sup> because juries lack “the necessary technical or legal sophistication to make the fine-line determinations required by a doctrine of equivalents analysis.”<sup>192</sup> Incompetence in the face of complexity leads to the second problem—bias.

Substitution bias is a well-known behavioral quirk which manifests when people need to decide a complex issue and subconsciously substitutes a more easily heuristic.<sup>193</sup> Commentators raised the specter of juries favoring patentees due to their high regard for the PTO and the patent system in general, even though they understand little about the actual workings of either.<sup>194</sup> Juries asked to determine infringement as a matter of patent law may instead decide which side they think is the “good guy.”<sup>195</sup> In this regard, conventional wisdom tells us jury bias favors patentees and may cause them to substitute

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<sup>185</sup> *Id.* at 763.

<sup>186</sup> *Hilton Davis*, 62 F.3d at 1542 (Plager, J., dissenting). *See also id.* at 1549 (Lourie, J., dissenting).

<sup>187</sup> *Markman*, 517 U.S. at 388-89 (internal citation omitted).

<sup>188</sup> Wegner, *supra* note 69, at 18–21.

<sup>189</sup> *Id.* at 19.

<sup>190</sup> Reavill, *supra* note 11, at 348.

<sup>191</sup> *Id.* at 364.

<sup>192</sup> Folker, *supra* note 14, at 225–26.

<sup>193</sup> BENJAMIN R. NEWELL ET AL., STRAIGHT CHOICES: THE PSYCHOLOGY OF DECISION MAKING 71–74 (2007).

<sup>194</sup> Daniel Akst, *Patent Suit Jury Trails Are the Rage*, L.A. TIMES, April 20, 1994, at D8.

<sup>195</sup> Daryl Lim, *Retooling the Patent-Antitrust Intersection: Insights from Behavioral Economics*, 69 BAYLOR L. REV. 124, 134 (2017).

substantiality for the notion that of the two devices, the patentee's is better. Juries tend to view the U.S. PTO and its scrutiny of patent applications with high regard despite evidence indicating otherwise.<sup>196</sup> The perception is that the government has "at least validated that invention and honored the patentee for her contribution to technological progress."<sup>197</sup>

Juries also "tend to idealize inventors" as individuals with the "talent, skills, and effort to invent something [that] has received the recognition of the United States of America."<sup>198</sup> They may therefore rely on patentees' investments to determine the "worthiness" of their cause or conversely, the lack of alleged infringer's investments in determining the "unworthiness" of their defense against infringement.<sup>199</sup> This notion is encouraged by the Supreme Court's suggestion, that absence of the alleged infringer's research investment gives rise to an inference of "practicing 'a fraud on a patent.'"<sup>200</sup>

Juries instead may view infringement under the doctrine of equivalents as whether the defendant was "wrong" in infringing the patent and should be punished for "stealing" the patentee's invention.<sup>201</sup> Indeed, courts expressly recognized evidence of copying as relevant evidence even though a technical, rational reading of patent claims and prosecution history should strictly speaking be the only determinants.<sup>202</sup> The alleged infringer's copying may also be a proxy of its lack of investment. Conversely, where there is evidence that the alleged infringer sought to design around the patented invention, the doctrine of equivalents is less appropriate.

Infected by substitution bias, jurors "focus on the actions of the people involved in a trial and not on specific exhibits (like models of the invention and the accused device) or documents (like a claim chart)."<sup>203</sup> This extraneous evidence prevents juries from "mak[ing] the objective determination required

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<sup>196</sup> Reavill, *supra* note 11, at 366 ("[J]uries assume that an invention undergoes the highest level of scrutiny before a patent issues."). See also *id.* ("The PTO does make mistakes, and often the patents-in-suit lack the degree of integrity that jurors attribute to them.").

<sup>197</sup> *Id.*

<sup>198</sup> *Id.* ("Such a person may inspire awe and therefore bias jurors in her favor.").

<sup>199</sup> Douros, *supra* note 17, at 340 ("The idea of incorporating research investment into the determination of equivalency was intimated in *Graver Tank*.").

<sup>200</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 618 (Douglas, J., dissenting). *Id.* at 612 ("[The trial court could properly infer that the accused flux is the result of imitation rather than experimentation or invention.").

<sup>201</sup> Kimberly A. Moore, *Judges, Juries, and Patent Cases – An Empirical Peek Inside the Black Box*, 99 MICH. L. REV. 365, 393 (Nov. 2000) ("Juries may perceive the patentee who brings an infringement action as a victim and an infringer accused of stealing patented technology, a villain. To find willfulness, the factfinder must conclude that the infringer intentionally or flagrantly disregarded the patentee's rights. The outcome data indicate that juries are more easily persuaded than judges by 'bad guy' evidence.").

<sup>202</sup> *Hilton Davis*, 62 F.3d at 1519 (asserting that evidence of copying is relevant to a determination of equivalence).

<sup>203</sup> Folker, *supra* note 14, at 226.

in a doctrine of equivalents analysis,”<sup>204</sup> and “improperly allowing the patent holder to expand the patent protection by encouraging patent holders to initiate (or threaten to initiate) abusive infringement lawsuits that not only cost the defendants time, money, and aggravation, but may also serve to artificially inflate license fees for patented technology.”<sup>205</sup>

In contrast, conventional wisdom teaches that judges have a comparative advantage because “[f]ederal judges typically have decades of legal experience before being appointed to the bench and are sensitive to the meaning of legal words and phrases.”<sup>206</sup> As the Federal Circuit itself noted, “[u]nlike a jury in a district court case, the [International Trade] Commission resolves disputes involving patent infringement matters with some regularity and thus is aware of doctrine of equivalents jurisprudence.”<sup>207</sup> Moreover, “patent cases are concentrated in a relatively small number of districts, and judges—unlike jurors—are often ‘repeat players’ in patent litigation.”<sup>208</sup>

Proponents of using juries regard their disparagement as “arrogant and paternalistic.”<sup>209</sup> Some have said “performing a function/way/result analysis involves the same level of juror competence and discretion as gauging ordinary negligence.”<sup>210</sup> But if true, placing equivalents in the hands of jurors incompetent to decide those issues may violate due process under the Fifth Amendment.<sup>211</sup>

The other part of the problem stems from the legal system itself. Juries must answer the question of patent infringement in a binary fashion—simply a “yes” or “no”—with no opportunity to offer the basis for their conclusions.<sup>212</sup> On appeal, jury verdicts provide no meaningful way for the Federal Circuit to assess whether “the jury understood the technology, understood the law of patents and the policies that underlie it, understood the function, way, and result of the matter, and arrived at a considered decision.”<sup>213</sup> Moreover, “because the reviewing court normally has little to go

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<sup>204</sup> *Id.*

<sup>205</sup> *Id.* at 232.

<sup>206</sup> *Seaman*, *supra* note 182, at 446.

<sup>207</sup> *Intel Corp. v. U.S. Int'l Trade Comm'n*, 946 F.2d 821, 832–33 (Fed. Cir. 1991).

<sup>208</sup> *Seaman*, *supra* note 182, at 446.

<sup>209</sup> *White*, *supra* note 31, at 786.

<sup>210</sup> AMER. BAR ASS'N, *Brief for Amicus Curiae in Support of Appellant*, Hilton Davis (No. 93–1088), reprinted in 3 FED. CIR. B.J. 375, 379–80 (1993).

<sup>211</sup> See Patrick Devlin, *Equity, Due Process and the Seventh Amendment: A Commentary on the Zenith Case*, 81 MICH. L. REV. 1571, 1594–605 (1983).

<sup>212</sup> *Hilton Davis*, 62 F.3d at 1538, n.3. (Plager, J., dissenting) (“[T]he reality is that the doctrine of equivalents is a virtually uncontrolled and unreviewable license to juries to find infringement if they so choose.”). See also Folker, *supra* note 14, at 226 (“[T]he broad manner in which responses to questions of infringement under the doctrine of equivalents are presented by the jury and the standard of review on appeal also serve to perpetuate the unpredictable results”).

<sup>213</sup> *Hilton Davis*, 62 F.3d at 1538 (Plager, J., dissenting).

by except for the final determination concerning infringement, there is generally something somewhere in the record that the winning party can argue is substantial enough to uphold the jury verdict.”<sup>214</sup>

The Federal Circuit’s ability to review the lower court’s decision is further limited because infringement is a question of fact, reversible for prejudicial error in the jury instructions or for lack of substantial evidence supporting the verdict.<sup>215</sup> In most cases, jury determinations will be upheld “even if they did not actually understand the technology or if they performed the doctrine of equivalents analysis improperly.”<sup>216</sup> In describing judicial frustration with the doctrine of equivalents, Judge Plager noted that “[f]ederal district judges, perhaps understandably, by and large make little pretense of liking these patent infringement cases, and are quite content to give them, and all the issues in them, to juries to decide. The cases typically come to us on appeal with nothing more than a general verdict finding infringement. There is no explanation by the jury of the rationale behind their verdict, if any exists.”<sup>217</sup>

The Supreme Court acknowledged “unreviewability” of “black-box jury verdicts,” and suggested that “where the evidence is such that no reasonable jury could determine two elements to be equivalent, district courts are obliged to grant partial or complete summary judgments.”<sup>218</sup> Conventional wisdom notes that “more and more patent litigators attempt to avoid the jury ‘black box’ by filing for summary judgment.”<sup>219</sup> Previously both judge and jury had a role in determining the outcome of a doctrine of equivalents case as “an issue of fact to be submitted to the jury in a jury trial with proper instructions, and to be decided by the judge in a bench trial.”<sup>220</sup> However, the incoherence of the doctrine combined with the risk that an incompetent, inscrutable, and almost unreviewable jury verdict creates a rational incentive for judges to seek to cabin it wherever they can. For if this unruly exception to infringement swallowed the rule, the result could be disastrous.<sup>221</sup> It would be up to the judges to prevent this result, even if they had to do so through displacing the jury’s function.

Federal Rule of Civil Procedure 50(a) provides that district courts may grant a motion for a judgment as a matter of law (JMOL) “at any time before the case is submitted to the jury” “[i]f a party has been fully heard on an issue during a jury trial and the court finds that a reasonable jury would not have a

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<sup>214</sup> Folker, *supra* note 14, at 227.

<sup>215</sup> *Hilton Davis*, 62 F.3d at 1522.

<sup>216</sup> Folker, *supra* note 14, at 227.

<sup>217</sup> *Hilton Davis*, 62 F.3d at 1538 (Plager, J., dissenting).

<sup>218</sup> *Warner-Jenkinson Co.*, 520 U.S. at 39 n.8.

<sup>219</sup> White, *supra* note 31, at 786.

<sup>220</sup> *Hilton Davis*, 62 F.3d at 1522, *supplemented*, 64 F.3d 675 (Fed. Cir. 1995).

<sup>221</sup> *See, e.g.*, Meurer & Nard, *supra* note 2.

legally sufficient evidentiary basis to find for the party on that issue.”<sup>222</sup> Following an earlier study, “a court’s decision to grant JMOL before verdict at trial was classified as a judicial decision—because the judge determined there was no willfulness—even though the rest of the issues in the case may have been decided by a jury.”<sup>223</sup>

This begs the question of whether equivalence findings varied depending on whether it was a bench or jury trial. The coding differentiated between bench trials and those jury trials that also involved a JMOL by the patentee or defendant. Figures 1 and 2 below show both types of trials strongly favor the defendant. They appear to mirror each other, both in terms of relative wins and the trends over time. The fact that there is no discernible difference between bench trials and jury trials shows that whatever concern there might have been to incompetent juries may have little factual basis.

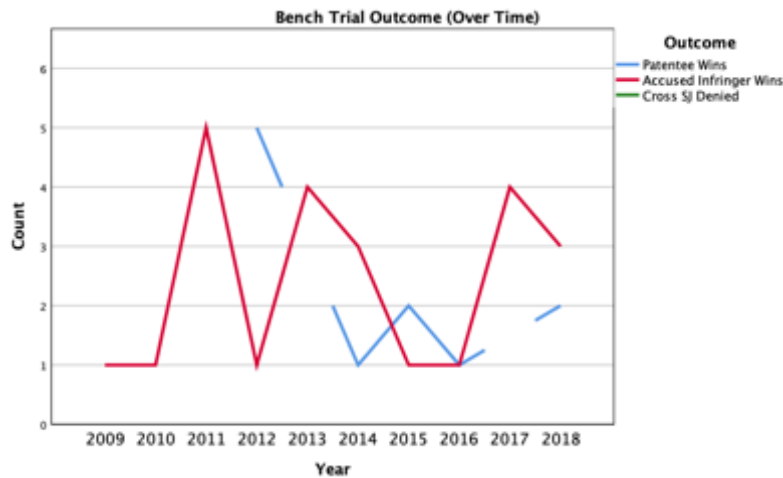


Figure 1: Bench Trial

<sup>222</sup> Fed. R. Civ. P. 50(a).

<sup>223</sup> Seaman, *supra* note 182, at 445.

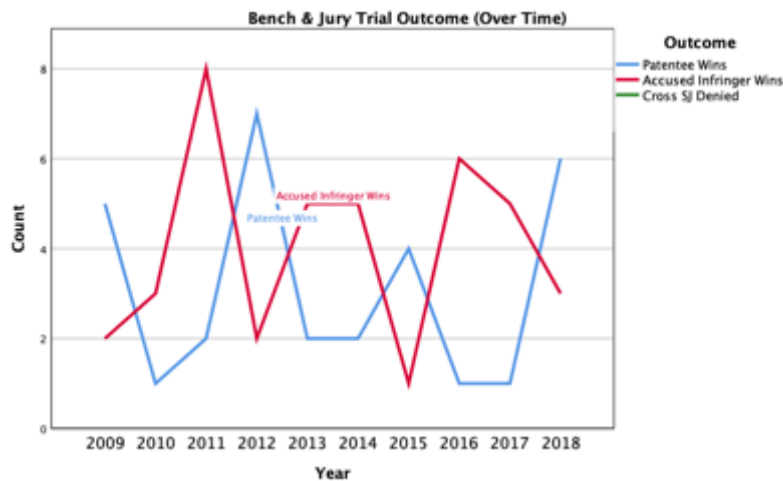


Figure 2: Bench & Jury Trial (Outcome)

Conventional wisdom thus teaches that less successful patentees invoking the doctrine after *Markman* hearings became important.<sup>224</sup> Earlier studies do indeed bear this finding out. The Allison-Lemley study found patentees had a relatively low win rate of twenty-four percent of cases compared to overall win rates of fifty-eight percent.<sup>225</sup> This result tracks conventional wisdom that “summary judgment is now the most likely method of disposition for patent cases.”<sup>226</sup>

Patentees won 33.5% of the cases involving the function-way-result test, and 29.5% of the cases involving the insubstantial differences test.<sup>227</sup> Within those numbers, more than two-thirds of the wins simply involved defeating a defendant’s motion for summary judgment rather than winning on the merits.<sup>228</sup> Patentees won on the merits less than ten percent of cases.<sup>229</sup> The Allison-Lemley study indicates that by the late 1990s, patentees almost never prevailed at trial or on appeal.<sup>230</sup>

<sup>224</sup> *Id.* at 977–98.

<sup>225</sup> Allison & Lemley, *supra* note 2, at 966 (“This finding is robust across each of the three datasets—patentees won 27.6% of the cases before *Festo*, 21.7% of the cases in the mid-*Festo* period, and 22.2% post-*Festo*.”).

<sup>226</sup> White, *supra* note 31, at 751.

<sup>227</sup> Allison & Lemley, *supra* note 2, at 967, 975.

<sup>228</sup> *Id.* at 967 (“While a significant victory, it is hardly the same as actually winning the case on equivalents grounds.”).

<sup>229</sup> *Id.*

<sup>230</sup> *Id.* at 970–71.



*D. Irrelevance*

The move to peripheral claiming has disadvantaged patentees in two important ways. First, peripheral claiming enabled clever defendants to interpret claim terms so as to render them invalid or not infringed. Professors Lemley and Burk noted that

[i]f a defendant makes ten such claim-construction arguments, the patentee may have to win every one in order for the claim to survive. So the more terms a court construes, the more bites at the apple defendants get. And because claim drafting is, as we have seen, inherently imprecise, any one mistake can be fatal.<sup>231</sup>

Second, the doctrine of equivalents is effectively a form of central claiming. Here, Professors Burk and Lemley explain that the doctrine “asks whether the accused device appropriates the ‘gist’ of the literal claims by adopting a substitution known in the art.”<sup>232</sup> However, in an age of peripheral claiming, “[c]ourts are aware that the text of the claims is supposed to represent the outermost boundaries of the inventor’s rights, and they are anxious not to expand the claims through the doctrine of equivalents.”<sup>233</sup> As a result, this “leads to expansion of the patent claims under the rubric of literal interpretation; rather than finding infringement by equivalents, interpretive sleight of hand is used to stretch the claims text to cover similar accused devices.”<sup>234</sup>

Earlier empirical studies indicate that courts applied it consistently until between the mid-1990s and mid-2000s.<sup>235</sup> The Allison-Lemley study was less sanguine, reporting that “[t]he doctrine of equivalents was largely dead by 1998.”<sup>236</sup> The cause of its purported death was the Supreme Court’s 1996 decision that claim interpretation, or a *Markman* hearing, as it would be called, was an issue for the judge, not the jury.<sup>237</sup> The study premised this shift on the technical complexity of modern claims which judges were better suited to handle. Claim construction could also be determined based on records developed during summary judgment briefings which was again the province

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<sup>231</sup> Burk & Lemley, *supra* note 63, at 1763.

<sup>232</sup> *Id.*

<sup>233</sup> *Id.*

<sup>234</sup> *Id.*

<sup>235</sup> Allison & Lemley, *supra* note 2, at 958 (2007); Petherbridge, *On the Decline*, *supra* note 2, at 1378–79 (2010); Lee Petherbridge, *The Claim Construction Effect*, 15 MICH. TELECOMM. & TECH. L. REV. 215, 233 (2008) [hereinafter Petherbridge, *Claim Construction Effect*].

<sup>236</sup> Allison & Lemley, *supra* note 2, at 976–78.

<sup>237</sup> *Markman*, 517 U.S. at 390–91. *See also* Schwartz, *supra* note 2 at 1179 (“[T]he displacement of the doctrine of equivalents, which led to its decreasing importance, occurred after *Markman I*, well before any direct assaults on the doctrine in these cases.”).

for the judge, not the jury.<sup>238</sup> Literal infringement became the rule and the doctrine became its exception.<sup>239</sup>

The effect has been a substantial reduction in cases where the doctrine applied.<sup>240</sup> Post-*Markman*, the Federal Circuit would discuss it “in the same breath as claim construction.”<sup>241</sup>

The reasoning is as follows: the doctrine of equivalents and claim construction both determine patent scope. Claim construction demarcates its literal reach. The doctrine of equivalents stretches that notional limit where differences between the literal claim scope and the accused product are insubstantial.<sup>242</sup> Claim construction is relatively easier to use and reduces the unpredictability of jury trials by shifting the determination to judges. Moreover, once judges have ruled on claim construction, they want to resolve the entire dispute since judges constructing claims know the accused products’ structures.<sup>243</sup> This allows them to settle on a broader construction to avoid having the jury contend with the doctrine.<sup>244</sup>

*Markman* caused district court judges to grant summary judgment of non-infringement<sup>245</sup> since judges “will be doubly inclined to hold for the accused infringer” to dispose of the case.<sup>246</sup> As the Federal Circuit put it

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<sup>238</sup> See, e.g., *SanDisk Corp. v. Memorex Prods., Inc.*, 415 F.3d 1278, 1291 (Fed. Cir. 2005) (“After discovery the court expects the parties to refine the disputed issues and learn more about the claim terms and technology, at which point a more accurate claim construction can be attempted.”).

<sup>239</sup> Allison & Lemley, *supra* note 2, at 978.

<sup>240</sup> Daniel H. Shulman & Donald W. Rupert, “Vitiating” the Doctrine of Equivalents: A New Patent Law Doctrine, 12 FED. CIR. B.J. 457, 459 (2003) (“These other decisions, which have become more and more frequent in the last few years, limit the DOE by effectively creating a per se rule as to what constitutes an equivalent.”). In 2001, the Federal Circuit continued narrowing the reach of the doctrine of equivalents. The Federal Circuit en banc eliminated the doctrine of equivalents for a different type of claim element—no equivalents are available for subject matter disclosed in a patent specification but not literally claimed. See *Johnson & Johnston Assocs.*, 285 F.3d at 1046. Schwartz, *supra* note 2, at 1203 (the Federal Circuit often discussed the doctrine of equivalents in robust detail). *Id.* at 1204 (noting that claim construction appears in less than fifty percent of appellate decisions pre-*Markman*, increasing to seventy percent of decisions by 2000 while the doctrine declined).

<sup>241</sup> Schwartz, *supra* note 2, at 1203.

<sup>242</sup> See e.g. Allison & Lemley, *supra* note 2, at 958; Petherbridge, *On the Decline*, *supra* note 2, at 1378–79 (2010).

<sup>243</sup> Allison & Lemley, *supra* note 2, at 958.

<sup>244</sup> Schwartz, *supra* note 2, at 1181 (“[C]ourts may have found these doctrines to be substitutes for each other”; “claim construction has arguably expanded to encompass the doctrine of equivalents.”); *Id.* (“[J]udges quickly decided the doctrine of equivalents under the guise of summary judgment to keep the case from the jury.”); *Id.* at 1182 (“Judges who held separate hearings may have been more likely to learn the technology and have a greater desire to dispose of the case in its entirety after claim construction.”); Allison & Lemley, *supra* note 2, at 958 (“That dataset bears out our hypothesis. The doctrine of equivalents was alive and well before *Markman* but has been in decline ever since.”).

<sup>245</sup> Allison & Lemley, *supra* note 2, at 977.

<sup>246</sup> *Id.*

“[w]here the parties do not dispute any relevant facts regarding the accused product . . . but disagree over possible claim interpretations, the question of literal infringement collapses into claim construction and is amenable to summary judgment.”<sup>247</sup>

Claim construction, however, is just one means by which judges took control of the doctrine. Another means of doing so is by granting summary judgment based on one or more of the judicial limits set on the doctrine such as prosecution history estoppel.<sup>248</sup> This is because “[j]udges have wide latitude in almost any patent suit to foreclose the doctrine of equivalents as a matter of law, thus preventing juries from applying the doctrine of equivalents to find infringement” through tests like “function-way-result” and limits like prosecution history estoppel.<sup>249</sup>

The Petherbridge study observed that “the decline of the doctrine is the natural evolution of judicial efforts to emphasize the policy that the public should have reliable notice of the scope of a patentee’s right to exclude.”<sup>250</sup> It noted that “while the courts were killing the doctrine of equivalents, patent applicants were increasing the rate at which they filed applications for new inventions,” leading them to conclude “that innovators might not need the encouragement of the doctrine of equivalents to innovate and disclose,”<sup>251</sup> or “pushed innovators to invent and disclose more, perhaps to ensure that commercial innovations (which may embody many inventions) find adequate protection.”<sup>252</sup> Moreover, patentees are suing on more patents, suggesting patents remain valuable despite its decline.<sup>253</sup>

The Allison-Lemley study reported 413 equivalents cases between 1999 and 2005, giving an average of 91.8 cases per year.<sup>254</sup> The Article reports 316 cases over ten years between 2009 and 2018, giving an average of 31.6 cases a year. This precipitous drop of two-thirds shows the parties are far less likely to assert the doctrine than they were a decade ago. Figures 3 and 4 below show the breakdown over each of the ten years. Other than a spike in 2010, the number of district court cases has remained both consistently and markedly lower. The graph presenting Federal Circuit cases shows that 2010 district

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<sup>247</sup> *General Mills, Inc. v. Hunt-Wesson, Inc.*, 103 F.3d 978, 983 (Fed. Cir. 1997).

<sup>248</sup> See Paul, *supra* note 37, at 248 (“This discretion can operate through several mechanisms, including function-way-result analysis, prosecution history estoppel, and the all-elements rule. Judges can also foreclose the doctrine of equivalents through their application of other areas of patent law, such as claim construction.”).

<sup>249</sup> Paul, *supra* note 37, at 248.

<sup>250</sup> Petherbridge, *On the Decline*, *supra* note 2, at 1404.

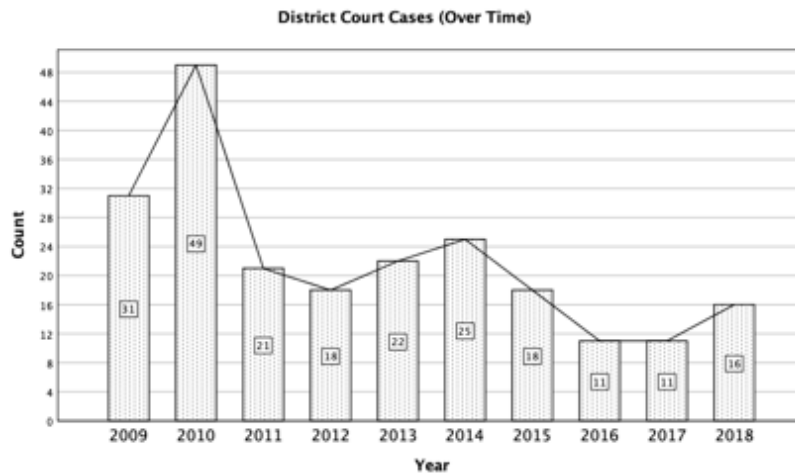
<sup>251</sup> *Id.*

<sup>252</sup> *Id.* at n.97.

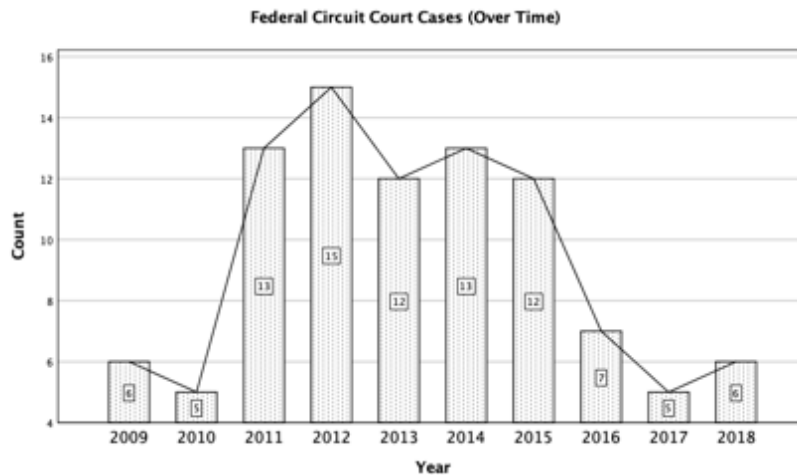
<sup>253</sup> See R. Polk Wagner, *Understanding Patent-Quality Mechanisms*, 157 U. PA. L. REV. 2135 (2009) (documenting the increase in patent litigation intensity); Petherbridge, *On the Decline*, *supra* note 2, at 1405.

<sup>254</sup> Allison & Lemley, *supra* note 2, at 980.

court spike percolating upwards starting in 2011 and 2012, before leveling off through 2015 and declining sharply thereafter. While lower than before, the doctrine remains alive and a trap for the unwary. What role do equitable triggers and limitations to the doctrine play in courts applying the doctrine today? These are discussed next in Parts II and III.



*Figure 3: District Court Cases (Over Time)*



*Figure 4: Federal Circuit Court Cases (Over Time)*

## II. EQUITABLE TRIGGERS

Known as “equitable triggers,” evidence of copying, independent development, and the pioneer status of the invention, may affect how liberally

or narrowly courts apply the doctrine of equivalents. Courts and commentators agree that the doctrine seeks to ensure patentees get fair protection in their claims, there is less consensus on what extent “equitable” principles animate the doctrine.<sup>255</sup> As a policy lever for courts to achieve a fair outcome for patentees, one might think the doctrine of equivalents is an equitable doctrine like the contract law doctrine of promissory estoppel.<sup>256</sup> They could be forgiven for doing so.

Courts have noted that the doctrine is “designed to do equity” and “to relieve an inventor from a semantic strait jacket.”<sup>257</sup> In its own jurisprudence, the Supreme Court focused on both the inventor’s merit and the defendants’ bad motives.<sup>258</sup> The law, was, and remains, vague about the nature and extent “merit” and “bad motives” played, and when they outweigh the need to provide the public clear notice of the patent’s scope.

The jurisprudence, however, seems to tilt toward a general notion of fair play rather than judges being empowered to intervene when the strict legal result causes injustice.<sup>259</sup> First, courts have no discretion to invoke the doctrine to remedy a seemingly unjust result.<sup>260</sup> In contrast, patentees may generally do so whether or not they show any merit in an equitable sense.<sup>261</sup> Second, judges never employed the doctrine independently of juries.<sup>262</sup> Indeed, the Supreme Court forbade a “judicial exploration of the equities of a case before allowing application of the doctrine of equivalents.”<sup>263</sup> At the same time, as seen in Part

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<sup>255</sup> Moorhead, *supra* note 26, at 1428 (noting that “the doctrine of equivalents is an equitable doctrine.”). *But see* Reavill, *supra* note 11, at 320 (“Recent debate, however, has questioned the way in which the doctrine approaches the principles of equity.”); *see also* *Hilton Davis*, 62 F.3d at 1539–43 (Plager, J., dissenting) (“[W]hen there is a wrong for which there is no adequate remedy at law, equity courts have traditionally gone beyond the law to impose a just and equitable result. Thus in those special cases in which the competitor’s product is literally different but the difference is so insubstantial as to constitute a ‘fraud on the patent,’ a court in the exercise of its extraordinary equity power may extend the remedy of infringement in order to protect the rights of the patentee granted by law.”). *See also id.* at 1545 (Lourie, J., dissenting) (arguing that the doctrine’s weighing various factors is an equitable determination for a judge.).

<sup>256</sup> *See* Jay M. Feinman, *Promissory Estoppel and Judicial Method*, 97 HARV. L. REV. 678 (1984).

<sup>257</sup> *Perkin–Elmer Corp.*, 822 F.2d at 1532.

<sup>258</sup> *Meurer & Nard*, *supra* note 2, at 1966.

<sup>259</sup> *Hilton Davis*, 62 F.3d at 1521 (“[I]n doctrine of equivalents cases, this court’s allusions to equity invoke equity in its broadest sense—equity as general fairness. While recognizing the equity, or fairness, promoted by the doctrine of equivalents[.]”). *Holbrook*, *supra* note 52, at 5 (“The express purpose of [the doctrine of equivalents] is to ensure fair and adequate protection to the patentee and to solidify the patent incentive.”).

<sup>260</sup> *Id.* “By referring to the doctrine as a doctrine of fairness, neither the Supreme Court nor this court has invoked the myriad implications of an alternative to legal remedies. In addition, neither the Supreme Court nor this court has invoked equity in the technical sense of a set of principles originating in England to compensate for the historically harsh rules of common law.” *Hilton Davis*, 62 F.3d at 1521.

<sup>261</sup> *Hilton Davis*, 62 F.3d at 1521; *Holbrook*, *supra* note 52, at 5.

<sup>262</sup> *See id.*

<sup>263</sup> *Warner–Jenkinson Co.*, 520 U.S. at 34.

II, courts are generally uncomfortable with giving juries more leeway than necessary to determine patent infringement.<sup>264</sup> Some commentators have even expressed discomfort with juries adjudicating even on the lesser “fair play” interpretation of the doctrine.<sup>265</sup>

Third, intent generally plays little role in the doctrine’s application. Infringement does not turn on defendants’ desire to infringe nor their knowledge of the patent.<sup>266</sup> Commentators have expressed that equitable triggers like copying and design-arounds provides juries “with a facade behind which it can factor in evidence of intent.”<sup>267</sup>

However, others have argued that intent may be the only distinction between copying per se and copying to design around even though in both instances, the differences may be equally insubstantial (or substantial) in a technical sense. Copying steals the patented idea directly, and necessarily requires intent.<sup>268</sup> Evidence of copying may suggest that differences between the claimed and accused device are insubstantial.<sup>269</sup> Conversely, evidence of defendants’ attempts to “design around” patented claims may be exculpatory “because there is a presumption that one of ordinary skill in the art would design substantial changes into the new product to avoid infringement.”<sup>270</sup>

Moreover, intent to copy and its absence were of substantial importance to the Supreme Court. It taught that “[w]ithout some explanation or indication that [the accused device] was developed by independent research, the trial court could properly infer that the accused [device] is the result of imitation rather than experimentation or invention.”<sup>271</sup> That statement has not been expressly overruled and cases continue to teach that intent remains an important consideration, particularly where they take the form of copying, designing around, pioneer inventions, and independent development.<sup>272</sup> Defendants’ intent can thus help courts filter patentees who genuinely deserve a second stab at proving infringement, and the doctrine loses both its equitable

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<sup>264</sup> Reavill, *supra* note 11, at 320 (indicating that “[d]iscontent with the focus of equivalency analysis, and especially with the roles that juries and intent play in that analysis, has divided the patent community.”).

<sup>265</sup> Schwartz, *supra* note 2, at 1178 (“a fairness doctrine juries apply, is arguably inconsistent with a patent system premised on predictability and on clear prior notice of the scope of rights.”).

<sup>266</sup> *Warner-Jenkinson Co.*, 520 U.S. at 35 (stating that “[a]pplication of the doctrine of equivalents, therefore, is akin to determining literal infringement, and neither requires proof of intent.”).

<sup>267</sup> Reavill, *supra* note 11, at 357.

<sup>268</sup> See e.g. Keith A. Robb, Note, *Hilton Davis and the Doctrine of Equivalents—An Insubstantial Difference*, 4 TEX. INTELL. PROP. L.J. 275, 282 (1996).

<sup>269</sup> *Hilton Davis*, 62 F.3d at 1519.

<sup>270</sup> Folker, *supra* note 14, at 218.

<sup>271</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 612.

<sup>272</sup> Reavill, *supra* note 11, at 355–56.

nature and its justification.<sup>273</sup> For instance, if copying were the sole basis for invoking the doctrine, it would prevent it from “becoming the second prong of every patent infringement charge.”<sup>274</sup> The better view then is that intent, like any other probative evidence, should go to the weight and not to admissibility.

Of the 316 cases in the dataset, most (72.7%) did not mention equity in any form (Figure 5). Of the cases that did, those that found for patentees and defendants were about evenly split (Figure 6), with 45.3% finding for patentees and 51.1% finding for infringers. This suggests that the equitable nature of the case as such did not dominate the outcome of cases in the dataset. Similarly, of the 27.2% that discussed equitable triggers, half found for the defendant, and the other half for the patentee (Figure 7). Any correlation is therefore equivocal at best. Within each type of equitable trigger, however, patentees did best with copying (60.0%) compared with design-around and independent inventions (40.0%). Over time, both copying and design-arounds/independent invention were present and took turns to dominate as the most common equitable trigger (Figure 8). There was only one case that discussed pioneer inventions and no meaningful conclusion can be drawn there except that those cases are exceedingly rare.

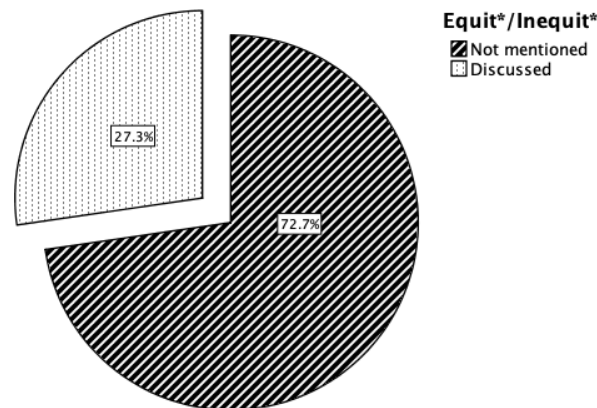


Figure 5: Prominence of DOE as an Equitable Doctrine

<sup>273</sup> *Id.* at 358 (“Consideration of intent should take into account whether the accused device is the result of independent development (involving no copying), copying in order to design around the patented device (involving a constructive employment of copying and respect for the patent system), or copying in order to pirate the patented device (involving a subversive employment of copying in an effort to circumvent the patent system).”).

<sup>274</sup> Moorhead, *supra* note 26, at 1447.

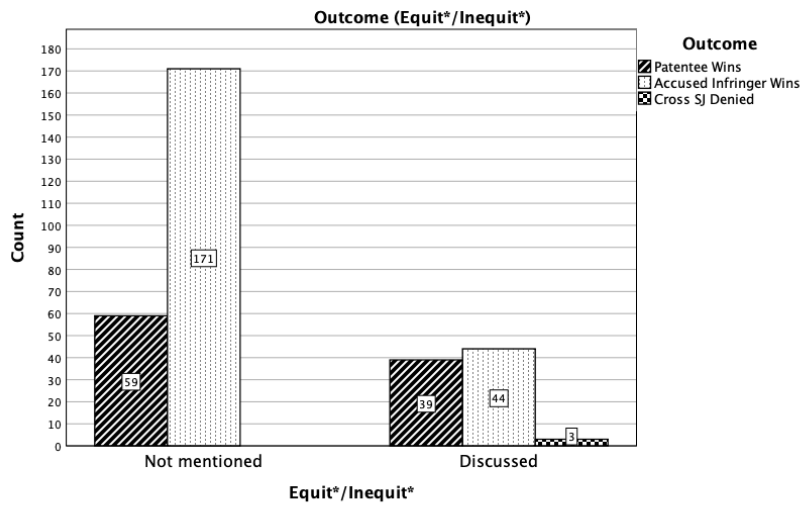


Figure 6: Whether Discussion on Equity Affected Outcome

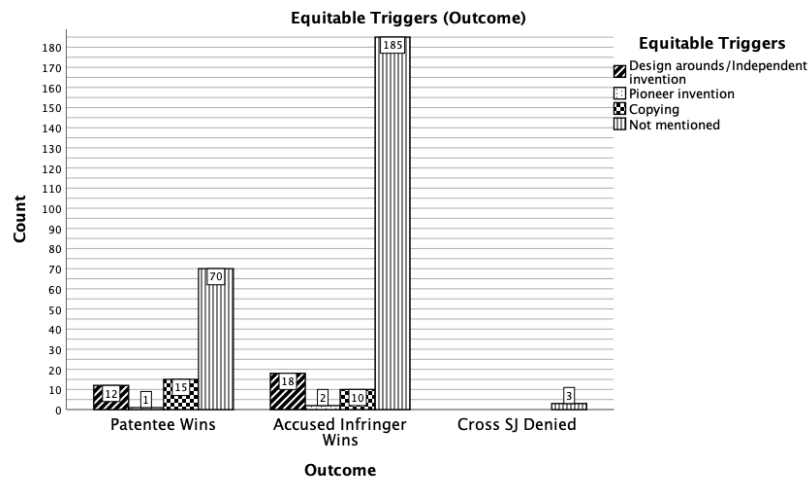


Figure 7: Outcome (By Equitable Triggers)



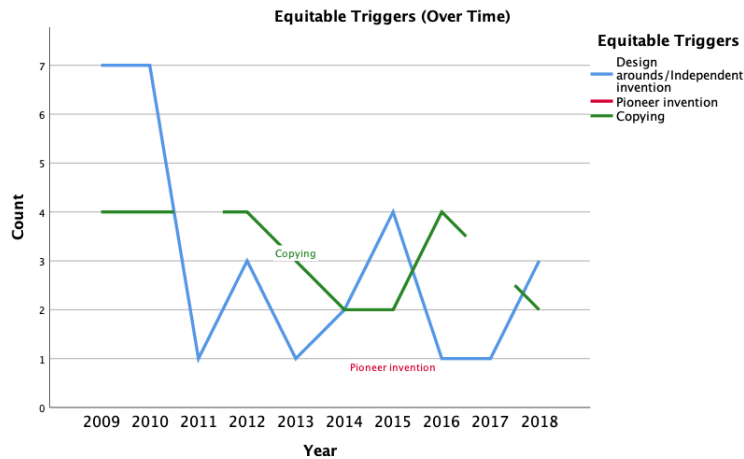


Figure 8: Equitable Triggers (Over Time)

#### A. Copying

The Supreme Court intended the doctrine to protect patentees from “piracy,” “fraud,” and “stealing.”<sup>275</sup> Evidence of copying suggested that the differences were insubstantial.<sup>276</sup> The doctrine tolerates copying as an intermediate step to designing around the patent.<sup>277</sup> However the defendant must ensure that the new device does more than just narrowly escape the claim.<sup>278</sup> Rather, the necessary difference approximates what defendants show to avoid infringement.<sup>279</sup> One empirical study found most infringers did not copy the patented invention and some even did not have knowledge of the patent. This suggests that courts’ use of claim construction coupled with literal infringement was the better basis for reflecting the reality of this “no-fault” infringement.<sup>280</sup>

<sup>275</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 612 (Black, J., dissenting).

<sup>276</sup> *Hilton Davis*, 62 F.3d at 1519.

<sup>277</sup> *Id.* at 1520.

<sup>278</sup> See Paul N. Katz, *The Doctrine of Equivalents and Its Impact on “Designing Around,”* 4 FED. CIR. B.J. 315, 315–16, 320–21 (1994).

<sup>279</sup> Robb, *supra* note 268, at 282.

<sup>280</sup> See Mark A. Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19 (2008).

The issue of copying was most prominent in 2009, with patentees sweeping all wins that year (Figure 9). Patentees won 63.6% of cases involving copying. Overall, copying has not been prominent, comprising 7.9% of all cases compared with design-arounds (9.49%), and surpassing only the pioneer invention cases (0.6%). It appears that rivalry plays an important role in copying cases, with patentees twice as likely to win against a rival than against a non-rival (Figure 10).



Figure 9: Outcome Over Time (Copying Only)

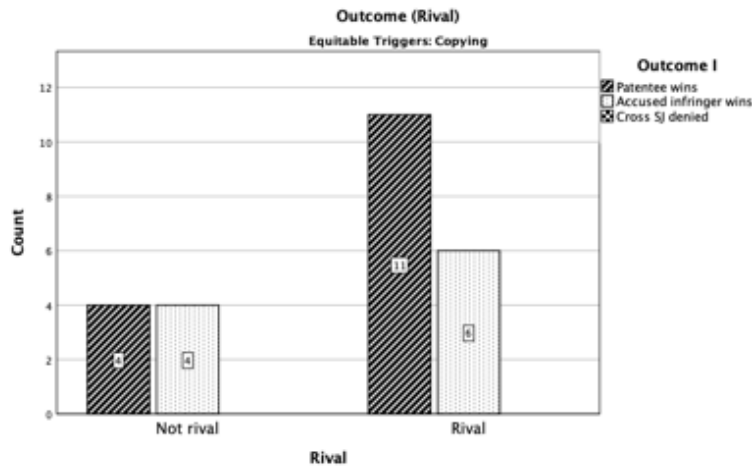


Figure 10: Whether defendant's identity as rival affected outcome (Copying only)

One reason for the connection between outcomes for rivals versus non-rivals may be the “known interchangeability” factor. Supreme Court jurisprudence teaches that an “important factor” to consider in any equivalents analysis is “whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.”<sup>281</sup> Where “known interchangeability” was an issue in the case, patentees prevailed 43.5% of the time (Figure 11), which is significantly higher than the average patentee win rate in doctrine of equivalents cases studied (32.6%).

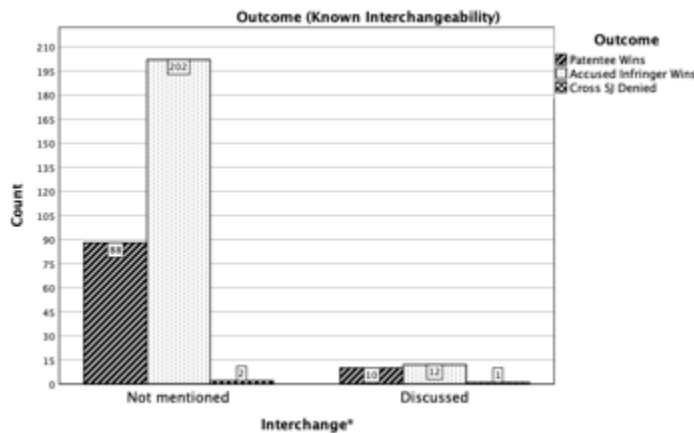


Figure 11: “Known Interchangeability” (Outcome)

### B. Design-Arounds & Independent Invention

Leapfrogging is the basis for design-arounds and independent invention being exculpatory factors courts consider when looking into the substantiality of differences.<sup>282</sup> Rivals may consciously attempt to avoid the patented invention to advance the state-of-the-art and fuel the kind of dynamic competition that characterizes the patent system.<sup>283</sup> Independent development occurs when rivals produce their devices without knowledge or notice of the patented device.<sup>284</sup> The Supreme Court regards both favorably, with the former creating a suggestion that the differences may in fact be substantial.<sup>285</sup>

<sup>281</sup> *Warner-Jenkinson Co.*, 520 U.S. at 25 (internal quotation marks omitted).

<sup>282</sup> See *Hilton Davis*, 62 F.3d at 1532 (Newman, J., concurring) (“If minor improvements are likely to be captured by the doctrine of equivalents, this might cause the would-be competitor to move to diverging areas instead of simply tagging along at the periphery of the patentee’s claims.”); see also *id.* at 1532-33 (Newman, J., concurring) (encouraging “leapfrogging” advances as opposed to substantial imitation).

<sup>283</sup> *Id.* at 1520.

<sup>284</sup> See Robb, *supra* note 268, at 282.

<sup>285</sup> *Hilton Davis*, 62 F.3d at 1520 (noting that designing around will affect the substantiality of differences while independent development will have no such effect).

However, since independent does not exonerate invention infringement, commentators guess that the exculpation was dictated by the doctrine's purpose of discouraging "theft."<sup>286</sup> Conversely, the absence of independent research meant courts could "infer that the accused flux is the result of imitation rather than experimentation or invention."<sup>287</sup> Like copying, patentees were very successful in 2009 before dipping precipitously in 2010 and never really recovered relative to defendants (Figure 12).

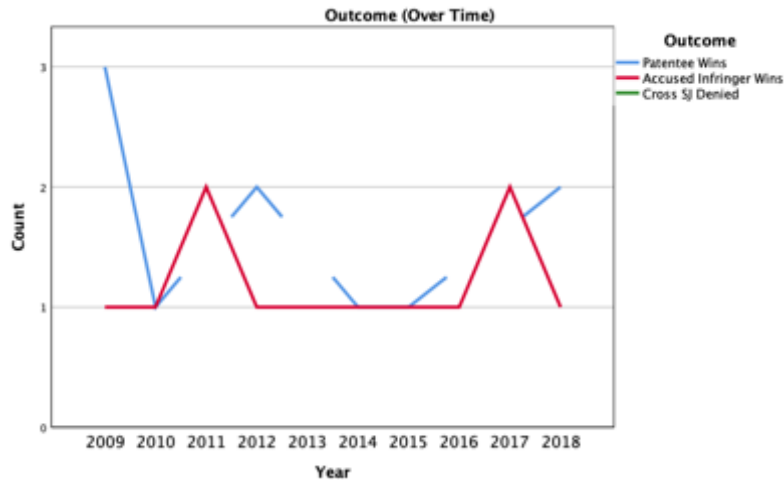


Figure 12: Outcome Over Time (Design-Around Independent Invention Only)

Figure 12 shows that patentees do comparatively better than defendants in cases involving design-arounds and independent invention compared to copying cases. Patentees win 40.0% of these cases here compared with copying cases (63.2%) seen earlier. Within the design-arounds and independent invention, however, the defendants performed consistently better than patentees (40.0% for patentees compared to 60.0% for defendants). Moreover, Figure 13 shows that the accused infringer, who was not a rival, was significantly more likely to prevail against a patentee than if the parties were rivals (75.0% versus 54.5%). This is consistent with the view that the doctrine's purpose is to protect the patentee from copyists, and not innovators.

<sup>286</sup> Glitzenstein, *supra* note 16, at 289 (stating that "[t]here could have been no theft in fact if the accused product was the fruit of independent research and development.").

<sup>287</sup> *Graver Tank & Mfg. Co.*, 339 U.S. at 612.

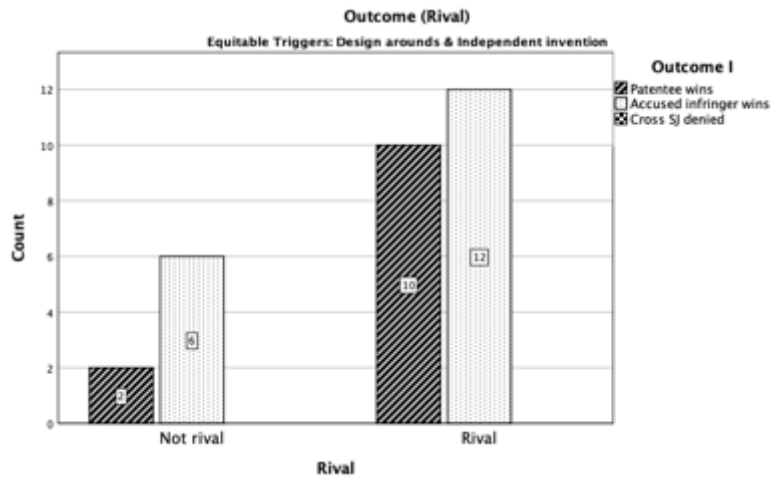


Figure 13: Whether defendant's identity as rival affected outcome (Design-Around Independent Invention only)

### C. Pioneer Inventions

Courts may look at whether the invention was a pioneer in its field. The Supreme Court authorized the use of broad claiming language for pioneering inventions that applied to later-arising technologies when courts apply the doctrine of equivalents.<sup>288</sup> "Pioneer status" depends on whether the invention makes a significant technological advance in the field.<sup>289</sup> If so, the invention would in theory enjoy a broader range of equivalents than non-pioneer inventions and because the invention inherently has greater potential embodiment scope.<sup>290</sup> This is because in a new field with little prior art, the gap between the claimed invention and the prior art will be significant without any expansion potentially ensnaring the prior art.<sup>291</sup> This privilege may stem from the principle that the inventor who has enabled a vast improvement in the useful arts should be rewarded commensurately. In contrast, non-pioneer inventions improve existing inventions, usually in a crowded field.<sup>292</sup> Pioneer

<sup>288</sup> See e.g. *Miller v. Eagle Mfg. Co.*, 151 U.S. 186, 207 (1894) ("If the invention is broad or primary in its character, the range of equivalents will be correspondingly broad, under the liberal construction which the courts give to such inventions."); *Perkin-Elmer Corp.*, 822 F.2d at 1532 ("A pioneer invention is entitled to a broad range of equivalents.")

<sup>289</sup> See *Westinghouse v. Boyden Power Brake Co.*, 170 U.S. 537, 561-62 (1898) ("To what liberality of construction these claims are entitled depends to a certain extent upon the character of the invention, and whether it is what is termed, in ordinary parlance a 'pioneer.' This word, although used somewhat loosely, is commonly understood to denote a patent covering a function never before performed, a wholly novel device, or one of such novelty and importance as to mark a distinct step in the progress of the art, as distinguished from a mere improvement or perfection of what had gone before.")

<sup>290</sup> *Computing Scale Co. v. Automatic Scale Co.*, 204 U.S. 609 (1907).

<sup>291</sup> *Tex. Instruments, Inc.*, 805 F.2d at 1572.

<sup>292</sup> *Pennwalt Corp.*, 833 F.2d at 963.

inventions are also often commercialized more slowly, so the doctrine “may be socially desirable because it avoids high-cost refinement that might otherwise occur.”<sup>293</sup> Finally, pioneer status protects inventors “when the invention is in a field that is changing rapidly in a way that creates high refinement costs because of the high cost of predicting imitative strategies that might be used by competitors.”<sup>294</sup> The doctrine pegs patent scope to technological advancement since equivalents are evaluated at the time of infringement, not the time of invention, filing, or issuance.<sup>295</sup>

In practice, determining whether an invention deserved a “pioneer” status was done on an ad hoc basis. Every invention was unique, diluting the value of precedent.<sup>296</sup> Even when a court accepted that the invention was a pioneering one, determining an appropriate range of equivalents proved to be another hurdle. Some judges treat pioneer inventors more generously,<sup>297</sup> while others rejected the contention that invention was a pioneer entitled to a broad range of equivalents.<sup>298</sup> This makes it difficult to design operable jury instructions.<sup>299</sup>

Commentators have observed “[t]he role of the status of the invention in doctrine of equivalents analysis is uncertain, if any role exists at all.”<sup>300</sup> The Federal Circuit has not uniformly addressed the issue. Some opinions are still written under the principle that a pioneer invention is “entitled to a broad range of equivalents.”<sup>301</sup> Recent Federal Circuit decisions have downplayed that benefit pioneer status brings to patentees invoking the doctrine.<sup>302</sup> When the

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<sup>293</sup> Meurer & Nard, *supra* note 2, at 1995.

<sup>294</sup> *Id.*

<sup>295</sup> *See Warner-Jenkinson Co.*, 520 U.S. at 37 (1997) (“Insofar as the question under the doctrine of equivalents is whether an accused element is equivalent to claimed element, the proper time for evaluating equivalency--and thus knowledge of interchangeability between elements--is at the time of infringement, not at the time the patent was issued.”).

<sup>296</sup> Ted Baker, *Pioneers in Technology: A Proposed System for Classifying and Rewarding Extraordinary Inventions*, 45 ARIZ. L. REV. 445, 449 (2003).

<sup>297</sup> *Corning Glass Works*, 868 F.2d at 1257–61. *See also* Meurer & Nard, *supra* note 2, at 2001 n.254 (“Critics of *Corning* read this case as ignoring the all-elements rule in favor of the holistic approach to the [doctrine].”).

<sup>298</sup> *Universal Gym Equip. Inc. v. ERWA Exercise Equip. Ltd.*, 827 F.2d 1542, 1548 (Fed. Cir. 1987).

<sup>299</sup> *See* Baker, *supra* note 296, at 453–54 (“Even the classification of an invention as a pioneer is a challenge within the current system. The standards that serve as the basis for this classification are inconsistent and vague.”); *see also id.* at 453 (“Perhaps the most logical approach is to define ‘substantially the same’ more liberally when the range of equivalents is expanded, but since the jury has no way to know where the baseline for substantial similarity exists, a modification of that baseline is likely to be meaningless.”).

<sup>300</sup> Hofmann, Jr., *supra* note 140, at 1058.

<sup>301</sup> *Perkin-Elmer Corp.*, 822 F.2d at 1532 (Fed. Cir. 1987).

<sup>302</sup> *See, e.g., Sun Studs, Inc. v. ATA Equip. Leasing, Inc.*, 872 F.2d 978, 987 (Fed. Cir. 1989). *See also* *Laitram Corp. v. Cambridge Wire Cloth Co.*, 863 F.2d 855, 861 (Fed. Cir. 1988), *cert. denied*, 490 U.S. 1068 (1989) (“It is not necessary, of course, that an inventor be entitled to a broad claim

patentee's assertion that its patent was a pioneering technology, the Federal Circuit responded that classification was irrelevant to its infringement analysis.<sup>303</sup> The court explained that if earlier cases treated inventions at issue differently, those differences stemmed from the sparseness of relevant prior art rather than a "manifestation of a different legal standard based on an abstract legal concept."<sup>304</sup> Trial courts have also disregarded the invention pioneer status altogether, with one dismissing it as "ancient jurisprudence."<sup>305</sup>

In looking at trends over time, cases involving design-arounds and independent invention dominated the first two years, with cases involving copying playing a significantly more prominent role between 2012 – 2018. Despite having memorable policy justifications, cases involving pioneer inventions were in fact rare, with only one case out of 316 over the 10-year period. This shows that the prominence of a doctrine might not translate into it being prominent in real life, validating the view by one commentator that

[t]he practical difficulties of classifying pioneer inventions and providing them with expanded protection, combined with the Federal Circuit's reluctance to apply a different standard to pioneer inventions, leave little incentive for modern patent holders to argue for pioneer status. Therefore, it is not surprising that the merits of patented inventions are rarely assessed in modern case law.<sup>306</sup>

That revelation is one of many reasons why evidence-based studies are valuable.

Means-plus-function claims allow patentees to describe devices whose components could have many embodiments, by pointing to what the device does and which covers all the similar structures.<sup>307</sup> Literal infringement occurs when the accused device has the same structure and performs the same function recited in the limitation using the structure disclosed in the specification.<sup>308</sup> It allows courts to look at the allegedly infringing device to see if its elements are equivalent to the patented structure, even if not identical. For example, a claim may call for parts A and B to be secured, and that parts A and B are made of wood secured by nails. An accused device that uses screws or adhesive would perform the identical specified function and would literally infringe as long as it performs exactly the same function.

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covering all possible products in a line of products before a court may award an invention pioneer status, or a range of equivalents sufficient to encompass a particular accused product.”).

<sup>303</sup> *Tex. Instruments, Inc.*, 846 F.2d at 1370.

<sup>304</sup> *Id.*

<sup>305</sup> *Sun Studs, Inc.*, 872 F.2d at 987. *See also Corning Glass Works*, 868 F.2d at n.7.

<sup>306</sup> Baker, *supra* note 296, at 454.

<sup>307</sup> 35 U.S.C. § 112(f) (2007).

<sup>308</sup> *Carroll Touch, Inc. v. Electro Mechanical Mech. Sys., Inc.*, 15 F.3d 1573, 1578 (Fed. Cir. 1993).

In contrast, infringement under the doctrine includes equivalents not detailed in the specification as well. However, it limits equivalence to technologies developed after the patent is granted.<sup>309</sup> This is because doctrines like prosecution history estoppel and the public dedication doctrine prevent patentees from asserting equivalence if it could have been included in the patent, unless the element in the accused device is the result of a technological advance. This is because that variant “may be developed after the patent is granted . . . [and] based on after-developed technology, could not have been disclosed in the patent.”<sup>310</sup> Like other inquiries under the doctrine, the applicable range also depends on “the pioneer or non-pioneer status of the invention, the prosecution history and the prior art.”<sup>311</sup>

In the context of the doctrine of equivalents, the Federal Circuit read Section 112(f) to impose a temporal restriction on the meaning and application of functional claim terms, restricting them from after-arising technologies.<sup>312</sup> Courts limit claims to structural technologies embodying the identically claimed function known at the time of filing to perform the function and to be equivalent to structural embodiments of that function disclosed in the specification.<sup>313</sup>

The Allison-Lemley study found 18.2% of all cases involved the “means-plus-function” claims.<sup>314</sup> Patentees won in 5.3% cases, which they attribute to “a smaller role for the doctrine of equivalents.”<sup>315</sup> The dataset reveals that 10.9% of all cases involved the “means-plus-function” claims, a fall of about one-half. This may have been due to more patentees relying on literal infringement rather than the doctrine. The dataset also reveals that patentees won in 24.5% of the cases, perhaps reflecting that patentees are choosing to invoke the doctrine in more meritorious cases (Figure 14).

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<sup>309</sup> *Al-Site Corp. v. VSI Int'l, Inc.*, 174 F.3d 1308, 1320 (Fed. Cir. 1999).

<sup>310</sup> *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1310 (Fed. Cir. 1998).

<sup>311</sup> *D.M.I., Inc. v. Deere & Co.*, 755 F.2d 1570, 1575 (Fed. Cir. 1985).

<sup>312</sup> *Chiuminatta Concrete Concepts, Inc.*, 145 F.3d at 1310 (“The doctrine of equivalents is necessary because one cannot predict the future. Due to technological advances, a variant of an invention may be developed after the patent is granted, and that variant may constitute so insubstantial a change from what is claimed in the patent that it should be held to be an infringement. Such a variant, based on after-developed technology, could not have been disclosed in the patent. Even if such an element is found not to be a § 112, ¶ 6, equivalent because it is not equivalent to the structure disclosed in the patent, this analysis should not foreclose it from being an equivalent under the doctrine of equivalents.”).

<sup>313</sup> *Al-Site Corp.*, 174 F.3d at 1320 (“[E]quivalent structure or act under § 112 cannot embrace technology developed after the issuance of the patent because the literal meaning of a claim is fixed upon its issuance. An ‘after arising equivalent’ infringes, if at all, under the doctrine of equivalents.”).

<sup>314</sup> Allison & Lemley, *supra* note 2, at 975.

<sup>315</sup> *Id.* at 976.



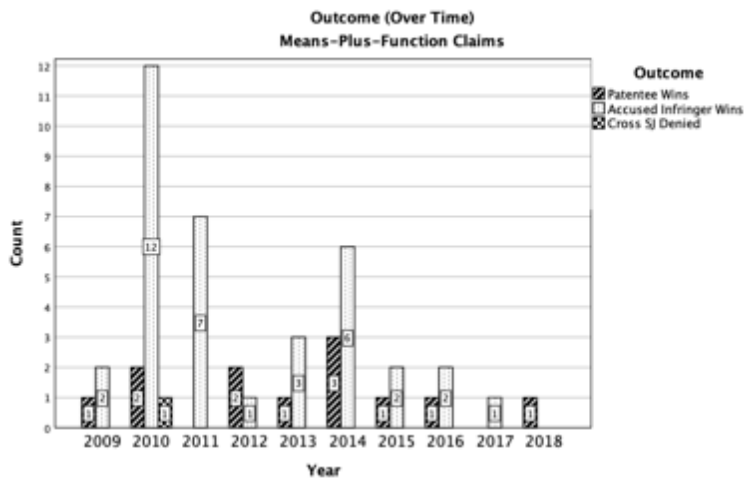


Figure 14: Outcome (Over Time, MPF claims only)

### III. LIMITATIONS

Courts erected four bars to the doctrine of equivalents: prosecution history estoppel, the “all-elements” rule, the prior art bar, and the public dedication rule.<sup>316</sup> Like prosecution history estoppel, each penalizes patentees “for sloppy or overly aggressive patent drafting and for strategic behaviors that shift the cost of information about the legal scope of an invention from an inventor to the Patent Office and the public.”<sup>317</sup> Former Chief Judge Michel remarked that “lawyers often overlook these potential bars.”<sup>318</sup>

Figure 15 shows the distribution of judicial limitations to the doctrine, with prosecution history estoppel dominating (49.2%) of cases discussing limitations, followed by the “all-elements” rule (31.5%), prior art bar (10.9%), and public dedication rule (8.5%). About half of the cases did not mention any limitations to the doctrine, which is surprising considering their prominence in the literature but consistent with former Chief Judge Michael’s observation. By comparison the Allison-Lemley study’s breakdown was as follows: prosecution history estoppel (37.8%), the “all-elements” rule (36.6%), and the public dedication rule (2.9%).<sup>319</sup>

<sup>316</sup> MARTIN J. ADELMAN ET AL., CASES AND MATERIALS ON PATENT LAW 783 (5th ed. 2019).

<sup>317</sup> Petherbridge, *On the Development of Patent Law*, *supra* note 93, at 927.

<sup>318</sup> Michel, *supra* note 23, at 127.

<sup>319</sup> Allison & Lemley, *supra* note 2, at 982. Most cases do not distinguish between amendment-based estoppel and argument-based estoppel in prosecution history estoppel cases. Neither does the dataset. For a list of cases in the dataset discussing one or both these forms of estoppel, see *Pharma Tech Solutions Inc. v. LifeScan Inc.*, 348 F.Supp.3d 1076 (2018), *Alfred E. Mann Found. for Sci. Research v. Cochlear Corp.*, 96 F. Supp. 3d 1028 (C.D. Cal. 2015), *Medtronic Navigation*,

Figure 16 shows the continued dominance of prosecution history estoppel over time, with the “all-elements” rule surpassing it only briefly in 2013. The prior art bar and publication dedication bar have remained consistently low over time.

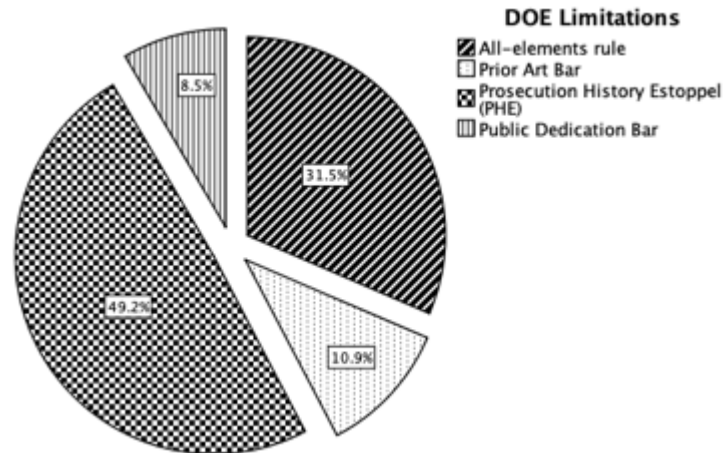


Figure 15: Distribution of Limitations to DOE

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Inc. v. BrainLAB Medizinische Computersysteme GmbH, 603 F.3d 943 (Fed. Cir. 2010), LG Electronics U.S.A., Inc. v. Whirlpool Corp., 798 F.Supp.2d 541 (2011), MarcTec, LLC v. Johnson & Johnson, 638 F.Supp.2d 987 (2009), Paone v. Microsoft Corp., 881 F.Supp.2d 386 (2012), Zircon Corp. v. Stanley Works, 713 F.Supp.2d 881 (2010), Intendis GMBH v. Glenmark Pharmaceuticals Inc., USA, 822 F.3d 1355 (2016). This Article also treats “all-elements” and claim vitiation cases identically for coding purposes. See *Warner-Jenkinson Co.*, 520 U.S., at 39 n.8 (1997) (“Vitiation” is not an exception to the doctrine of equivalents, but instead a legal determination that “the evidence is such that no reasonable jury could determine two elements to be equivalent.”).

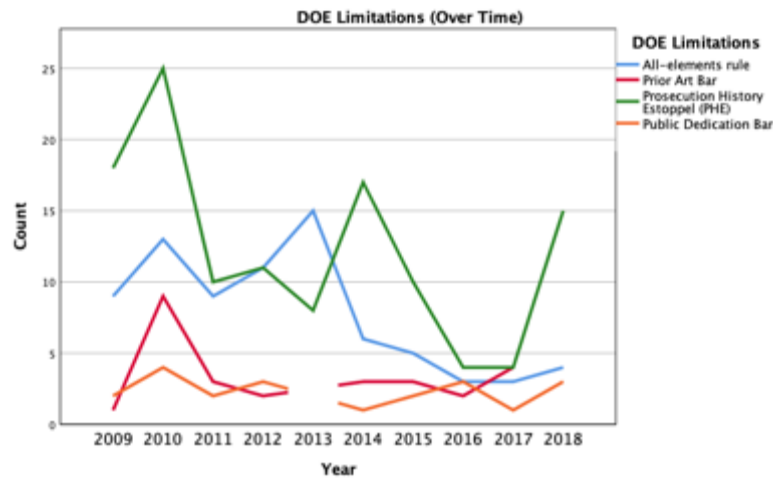


Figure 16: DOE Limitations (Over Time)

The dataset showed that patentees fared best with the prior art bar (51.9%) compared to the public dedication rule (38.1%), prosecution history estoppel (36.9%) the “all-elements” rule (30.8%) (Figure 17). By comparison the Allison-Lemley study’s breakdown was as follows: prosecution history estoppel (26.9%), the public dedication rule (25.0%), and the “all-elements” rule (17.9%).<sup>320</sup> Compared with the 1999 – 2005 period, patentees in the 2009 – 2018 period fared better with the prior art bar, but worse in all other categories. This result may have been due to the interaction of validity and other doctrines, the precise correlation of which would be a rich subject for future study.

As a question of law, these limitations enable judges to enter summary judgments of non-infringement in favor of defendants, protecting them from baseless patent infringement claims.<sup>321</sup> The data reveals that summary judgments did indeed dominate all other procedural postures (Figure 18).

<sup>320</sup> Allison & Lemley, *supra* note 2, at 982.

<sup>321</sup> Meurer & Nard, *supra* note 2, at 1999.

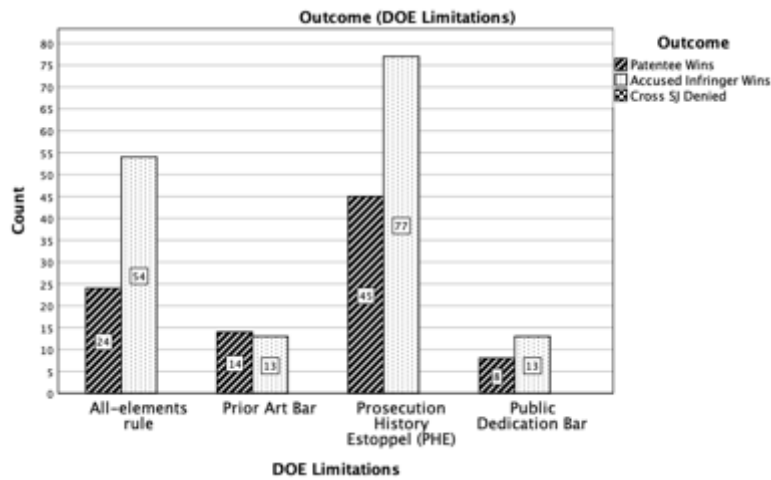


Figure 17: DOE Limitations (Outcome)

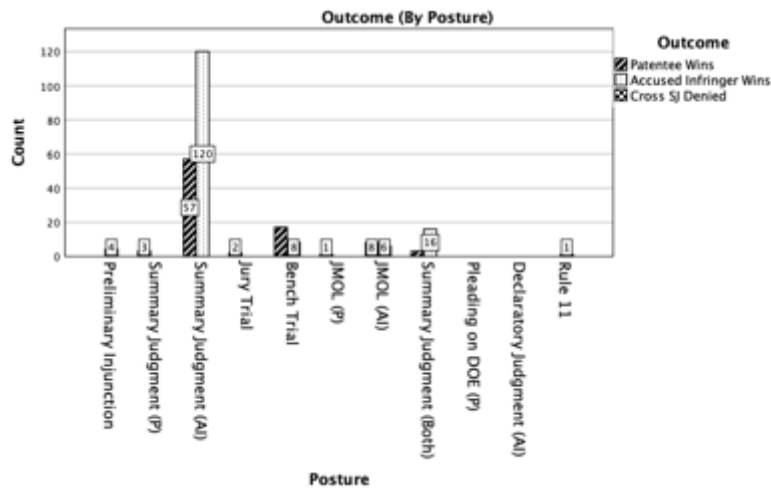


Figure 18: Procedural Posture (Outcome, “Not Mentioned” Filtered Out)

#### A. Prosecution History Estoppel

Commentators call the Federal Circuit’s inability to articulate a workable standard for prosecution history estoppel its “single largest failing.”<sup>322</sup> While the Supreme Court appeared to have settled on a position favoring patentees, who have the opportunity to rebut a presumptive surrender of claim scope, commentators noted that in reality, the burden “has been very

<sup>322</sup> Strawbridge, McDonald & Moy, *supra* note 85, at 888–89.

difficult for patentees to overcome.”<sup>323</sup> According to them, the key obstacle patentees face is showing that the equivalent was “unforeseeable.” Equivalents are “foreseeable” even if one of ordinary skill in the art would not recognize that it was an equivalent or view it as acceptable for use in the invention at the time the application is filed so long as the variant *existed* at the time of the application.<sup>324</sup> This requires patentees to “reach beyond conventional knowledge when filing an application or amendment to anticipate all potential uses of extant technologies that may be relevant to the claimed invention.”<sup>325</sup> The problem, as Judge Newman has argued, is that patentees may not fully appreciate extant technology until a later date.<sup>326</sup> One commentator noted “[t]his in itself would be rare, and it would be rarer still that the applicant, aware of such an alternative, would have failed to claim it in the first instance. An alternative would be foreseeable only in the limited circumstances where the alternative was inadvertently omitted and was a candidate for a reissue patent.”<sup>327</sup>

The Article reported on outcomes over time. Figure 19 shows defendants performing significantly better than patentees across the almost entire 10-year period, with two notable peaks between 2009 – 2011, and 2014 – 2015. Patentees finally managed to turn things around toward 2017 – 2018, but whether they can sustain that trend remains to be seen.

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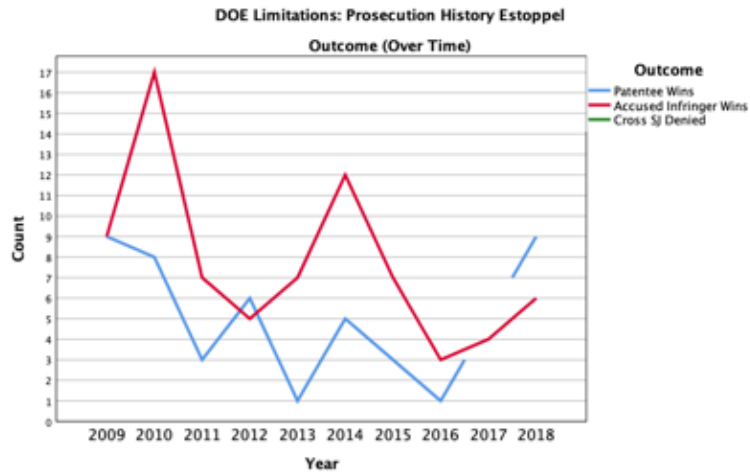
<sup>323</sup> Schwartz, *supra* note 2, at 1177.

<sup>324</sup> Holbrook, *supra* note 52, at 23 (“The Federal Circuit has since made foreseeability an even more stringent standard, rendering rebuttal of the Festo presumption effectively impossible unless the asserted equivalent is solely the result of later-developed technology.”).

<sup>325</sup> *Id.* at 24.

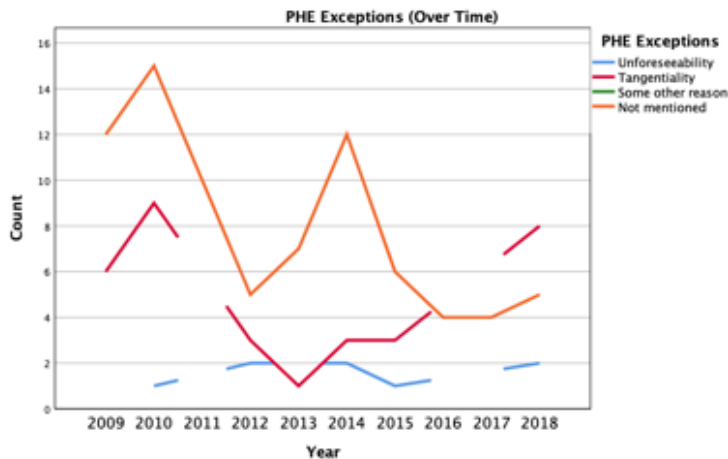
<sup>326</sup> *Festo Corp.*, 493 F.3d at 1384 (Newman, J., dissenting).

<sup>327</sup> Holbrook, *supra* note 52, at 25.



*Figure 19: Outcome Over Time (PHE Only)*

The Article also reported on the exceptions to the application of prosecution history estoppel. Figure 20 reveals why patentees lost during those years. It turns out that all three exceptions to prosecution history estoppel had little to do with the outcome. Surprisingly, most of the cases did not even discuss any of the exceptions. One explanation for this is that defendants invoking the prosecution history estoppel during those periods simply survived having their motions quashed by summary judgement. Indeed, the graph showing a trend of procedural posture over time confirms this, with summary judgments by defendants being the dominant procedural posture over most of the period studied (Figure 21).



*Figure 20: Outcome over time (PHE Exceptions)*

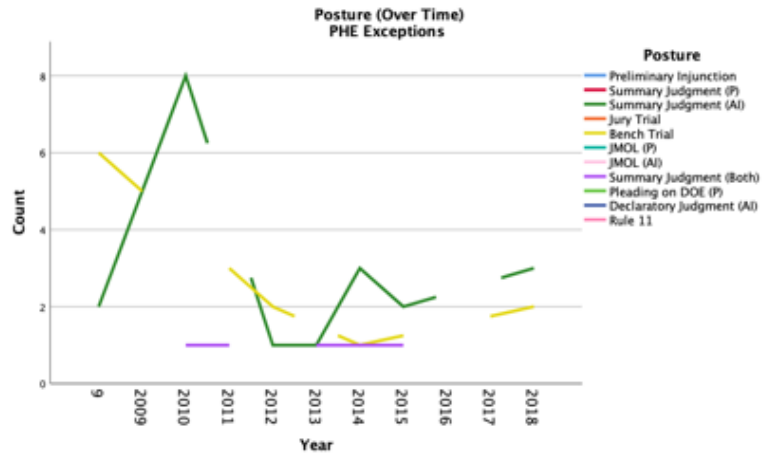


Figure 21: Posture over time (PHE Exceptions)

Two-thirds of the cases that discussed prosecution history estoppel did not consider any of the exceptions (Figure 22). About a quarter (27.3%) discussed tangentiality, only about a sixteenth (6.6%) discussed foreseeability, and no cases discussed “some other reason.” Given that patentees routinely amend claims to avoid prior art during prosecution, it is unsurprising that tangentiality, a rebuttal mapped to precisely that activity, should dominate the three exceptions to prosecution history estoppel. It is also unsurprising that unforeseeability is rarely invoked to rebut prosecution history estoppel, since as noted earlier, conventional wisdom already teaches that it is an uphill battle. No other empirical study has reported on these results, so there is no basis for intemporal comparison.

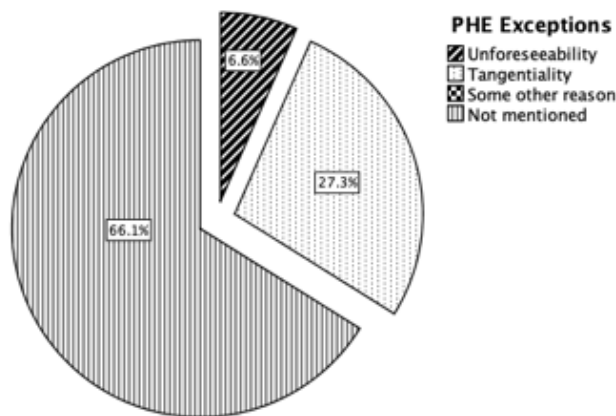


Figure 22: Outcome over time (PHE Exceptions)

### B. “All-elements” Rule

The Allison-Lemley study found patentees won 17.9% of the cases involving the all-elements rule between 1999 – 2004.<sup>328</sup> The Article reveals that between 2009 – 2018 patentees won in 30.4% of cases, doing significantly better in showing that every limitation of the patent was found on the accused device. However, as with prosecution history estoppel, patentees generally fared worse than defendants. Intriguingly the 2009 – 2011 peak for defendant wins manifest again, with another peak in 2013 (Figure 23).

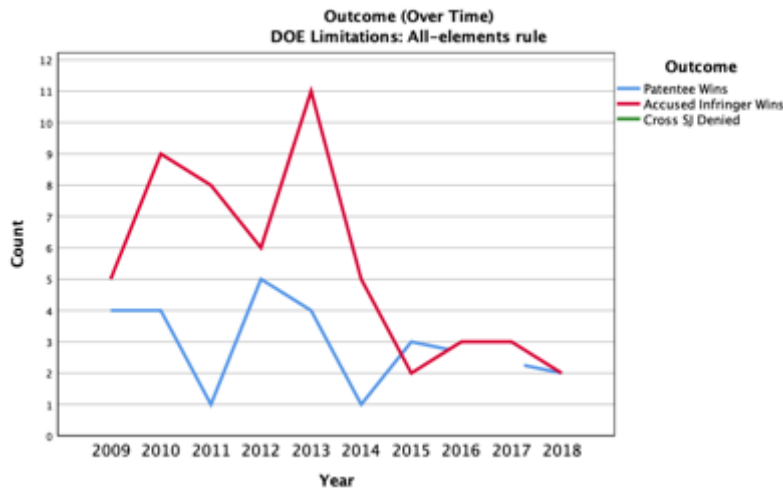


Figure 23: Outcome (Over Time, “all-elements” rule only)

### C. Prior Art Bar

The prior art limits patentees to a scope that avoids prior art.<sup>329</sup> The test is whether the Patent Office would have allowed the equivalent in a hypothetical claim over the prior art.<sup>330</sup> It applies whether a single piece of prior art anticipates the equivalent or whether one or more pieces of prior art would together render that equivalent obvious.<sup>331</sup> As with prosecution history

<sup>328</sup> Allison & Lemley, *supra* note 2, at 975.

<sup>329</sup> *Wilson Sporting Goods Co. v. David Geoffrey & Assocs.*, 904 F.2d 677, 683 (Fed. Cir. 1990) (“[A] patentee should not be able to obtain, under the doctrine of equivalents, coverage which he could not lawfully have obtained from the PTO by literal claims.”).

<sup>330</sup> *Id.* at 684; *Streamfeeder, LLC v. Sure-Feed Sys.*, 175 F.3d 974, 982 (Fed. Cir. 1999) (excluding equivalents “obvious to one of ordinary skill in the art” at the time of invention).

<sup>331</sup> *Key Mfg. Group, Inc. v. Microdot, Inc.*, 925 F.2d 1444, 1449 (Fed. Cir. 1991) (prior art would make the accused product obvious).



estoppel and the all-elements rule, the prior art rule is a legal question for the trial judge, and reviewed de novo.<sup>332</sup>

While the Allison-Lemley study omitted the prior art bar inexplicably, this study reports that patentees prevailed in 51.9% of cases, by far the best among the limitations. One reason for this is that patent applicants must navigate prior art arguments as a matter of course and are comparatively more skilled at surviving defendant summary judgment motions seeking to stop them from advancing their cause using the doctrine. Figure 24 shows that a picture of patentee markedly higher wins over time compared with the earlier two limitations to the doctrine, with patentee dominating at about half the period studied, a result consistent with the percent-win figure.

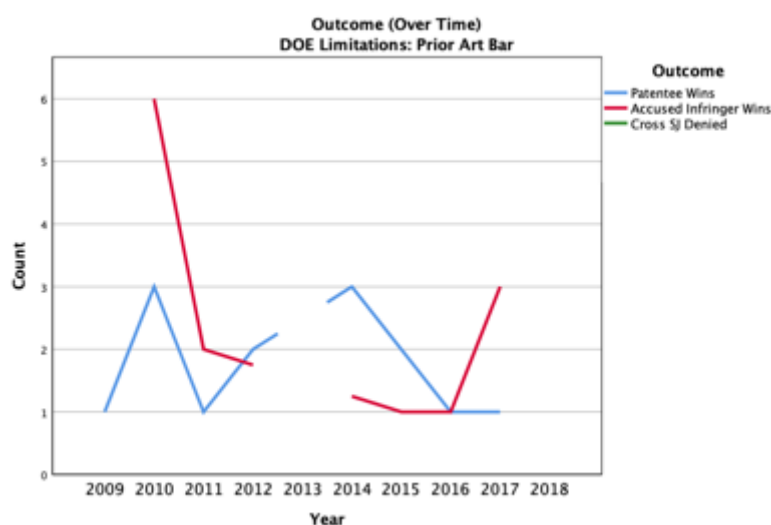


Figure 24: Outcome (Over Time, Prior art rule only)

#### D. Public Dedication Rule

The Federal Circuit articulated the public dedication rule in 2002. It teaches that “when a patent drafter discloses but declines to claim subject matter, as in this case, this action dedicates that unclaimed subject matter to the public.”<sup>333</sup> Like prosecution history estoppel, the rule protects public reliance on patentees surrendering its patent scope during patent prosecution either gratuitously or so that they would obtain the patents.<sup>334</sup>

The Patent Office does not look at equivalents of a claimed invention when determining patentability, so narrow claims attract a more limited

<sup>332</sup> *Wilson Sporting Goods Co.*, 904 F.2d at 683.

<sup>333</sup> *Johnson & Johnston Assocs.*, 285 F.3d at 1054.

<sup>334</sup> Petherbridge, *On the Development of Patent Law*, *supra* note 93, at 927.

universe of potentially invalidating prior art.<sup>335</sup> Thus if a patentee possessed a variation of the claimed invention, or if a skilled person in the art would understand that variation from the patent, then the patentee’s failure to claim it would cause it to fall into the public domain.<sup>336</sup> This rule discourages patentees from filing broad disclosures and attempting to then circumvent examination by presenting only narrow claims and resorting to the doctrine of equivalents to capture the broader disclosure.

The Allison-Lemley study showed the public dedication rule played a much more minor role compared to the other three limitations. It was raised only twelve times, and the patentee won 25% of those cases.<sup>337</sup> The Article reports eighteen instances, with the patentee faring better, winning 38.1% of those cases. As with prosecution history estoppel and the “all-elements” rule, patentee wins rallied in the later period of the dataset (Figure 25).

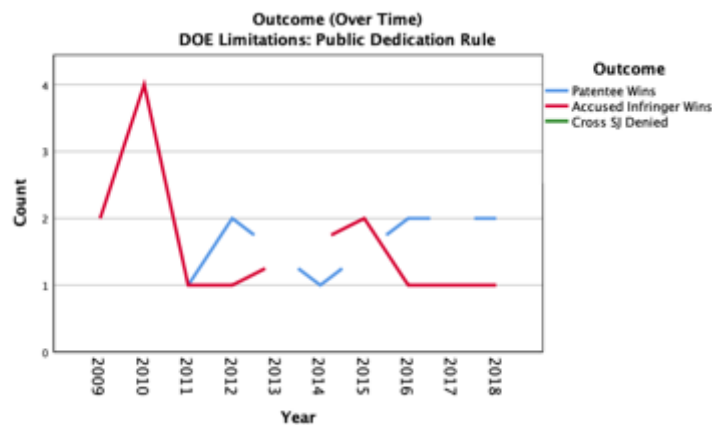


Figure 25: Outcome (Over Time, Public Dedication rule only)

## CONCLUSIONS

Patent law is designed to promote the progress of the “useful Arts.”<sup>338</sup> The doctrine of equivalents achieves this constitutional end by providing both effective protection to inventors and adequate notice to the public. It enhances the scope of patent claims by giving courts flexibility to expand them at the cost of undermining the notice function of patent claims. Over the past century, few patent issues have been considered so often by the Supreme Court

<sup>335</sup> *Id.*

<sup>336</sup> *PSC Computer Prods., Inc. v. Foxconn Int'l, Inc.*, 355 F.3d 1353, 1360 (Fed. Cir. 2004) (“This [public dedication] rule does not mean that any generic reference in a written specification necessarily dedicates all members of that particular genus to the public. The disclosure must be of such specificity that one of ordinary skill in the art could identify the subject matter that had been disclosed and not claimed.”).

<sup>337</sup> Allison & Lemley, *supra* note 2, at 975.

<sup>338</sup> U.S. CONST. art. I, § 8, cl. 8.

as the doctrine of equivalents. Courts, patent attorneys, and legal scholars have wrestled with operationalizing the doctrine of equivalents for nearly 150 years.

This Article provides both a doctrinal and an empirical basis for judges, scholars, policymakers, and patent attorneys to better understand the doctrine's nature in order to contextualize its evolution and chart its future. This Article also traces the doctrine's origins and delves into the heart of its policy tensions, including the reasons for the doctrine's incoherence as well as tension between judges and juries. Furthermore, this Article presents the first empirical study on "equitable triggers" such as copying and pioneer inventions and investigates limits such as prosecution history estoppel. In doing so, this study contributes to evidence-based decision in patent law and policy by filling a significant gap in the literature.