

Predictable Unpredictability: The Surprising Administrability of Patent Subject Matter Eligibility

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ABSTRACT: More than a decade has passed since the Supreme Court established the current framework for evaluating patent subject matter eligibility. Despite widespread recognition that subject matter eligibility is one of the most important areas of patent law, the impact of the Supreme Court's decisions continues to draw sharp criticism and remains a hotly contested issue. As the law has developed over the past decade, a number of popular narratives have emerged. None have been more popular and polarizing than the often-repeated purported fatal flaw that the framework cannot be applied predictably. Too many critics to count—including academics, practitioners, legislators, and judges—have lambasted the patent eligibility framework as an unpredictable morass of confusion.

Yet, these claims that the doctrine is unpredictable stand on shaky empirical ground. Drawing on the most complete dataset of § 101 appellate cases collected to date, we examine the Federal Circuit's case law at a more comprehensive and granular level than any prior study to better understand how the sole patent appellate court has shaped and evolved this controversial doctrine. Using a multi-dimensional approach to assessing doctrinal predictability, including a novel metric that examines not just outcomes but judicial assessment,

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we assess whether patent subject matter eligibility doctrine is as unpredictable as the popular narrative claims.

Our findings reveal a patent eligible subject matter jurisprudence that looks remarkably like other patent law issues at the Federal Circuit, and one that lacks the kinds of empirical hallmarks that we would expect given the rhetoric. Specifically, we find that district courts and the U.S. Patent and Trademark Office are not only getting the right result nearly every time, they also make very few errors in applying the law. Moreover, in all but a few cases, Federal Circuit judges show remarkable agreement in deciding § 101 issues. In fact, Federal Circuit judges dissent less frequently in § 101 cases than they do in other types of patent cases. Ultimately, this systematic analysis of Federal Circuit § 101 decisions reveals that there is significant reason to think the popular narrative that § 101 and the Mayo/Alice framework cannot be predictably applied, particularly by judges, is more of a misconception than an accurate narrative.

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INTRODUCTION

“As the nation’s lone patent court, we are at a loss as to how to uniformly apply § 101.” – Hon. Kimberly Moore¹

“Efforts by judges of district courts and courts of appeals of the United States to apply the exceptions . . . have led to extensive confusion and a lack of consistency . . . throughout the judicial branch of the Federal Government and Federal agencies . . .” – Patent Eligibility Restoration Act of 2023²

More than a decade has passed since the Supreme Court established the current framework for evaluating patent subject matter eligibility through its trio of decisions in *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*,³ *Association for Molecular Pathology v. Myriad Genetics, Inc.*,⁴ and *Alice Corp. Pty. Ltd. v. CLS Bank International*.⁵ Despite widespread recognition that subject matter eligibility is one of the most important areas of patent law, the impact of the Supreme Court’s decisions continues to draw sharp criticism and remains a hotly contested issue.

As the law has developed over the past decade, a number of popular narratives have emerged. None have been more popular and polarizing than

1. *Am. Axle & Mfg., Inc. v. Neapco Holdings LLC*, 977 F.3d 1379, 1382 (Fed. Cir. 2020) (Moore, J., concurring).

2. Patent Eligibility Restoration Act of 2023, S. 2140, 118th Cong. § 2(3) (2023).

3. *See generally* *Mayo Collaborative Servs. v. Prometheus Lab’ys, Inc.*, 566 U.S. 66 (2012).

4. *See generally* *Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013).

5. *See generally* *Alice Corp. Pty. v. CLS Bank Int’l*, 573 U.S. 208 (2014).

the often-repeated purported fatal flaw that the framework cannot be applied predictably. Too many critics to count—including academics, practitioners, legislators, and judges—have lambasted the patent eligibility framework as an unpredictable morass of confusion. Judges on the Federal Circuit (the sole appellate court for reviewing patent cases) have described the law on subject matter eligibility as an “incoherent body of doctrine,”⁶ and the purported lack of judicial consistency and predictability has been relied upon as the driver for proposed legislation that would completely overhaul current patent eligibility law.⁷

Yet, these claims that the doctrine is unpredictable stand on shaky empirical ground. To be sure, patent eligibility has been discussed at great lengths, and there is no shortage of articles providing opinions on 35 U.S.C. § 101 (“§ 101”).⁸ However, detailed empirical work on the subject has been far more limited and incomplete, which has made it difficult to reliably determine if the framework has been predictably applied by judges.⁹

Drawing on the most complete dataset of § 101 appellate cases collected to date, we analyze the Federal Circuit’s entire body of case law following the *Mayo/Alice* decisions at a more granular level than any prior study to better understand how the sole patent appellate court has shaped and evolved this controversial doctrine. This study employs a multi-dimensional approach to assessing doctrinal predictability, including a novel metric that examines not just outcomes but judicial assessment. Our empirical examination of all 386 Federal Circuit patent eligibility decisions between March 2012 (after *Mayo* issued) and December 2023 reveals several significant disconnects between the data and the doctrinal, theoretical, and anecdotal assertions advanced by leading scholars, judges, and commentators.

Our findings reveal that district courts and the U.S. Patent and Trademark Office (“PTO”) are not only getting the right result nearly every time, but they also make very few errors in applying the law. Moreover, in all but a few cases, Federal Circuit judges show remarkable agreement in deciding § 101 issues. These findings on a question of law are all the more surprising and remarkable given the lack of deference owed to lower court decisions on appeal. Our core findings include the following:

- When reviewed by the Federal Circuit, district courts reached the wrong § 101 decision in only 14.7% of cases and further erred in their analysis in some other way only 4.2% of the time when reaching the right result. Thus, more than 81.1% of the time, the district court’s *Mayo/Alice* analysis was error-free.

6. Interval Licensing LLC v. AOL, Inc., 896 F.3d 1335, 1348 (Fed. Cir. 2018) (Plager, J., concurring in part and dissenting in part).

7. See *infra* note 104 and accompanying text.

8. For just a few examples, see *infra* notes 11, 12, 20–23, 37–41, 105.

9. See *infra* Section I.D.

- The PTO did even better: The Federal Circuit concluded that the PTO made the wrong § 101 decision 4.5% of the time and showed no additional errors in its analysis when it reached the right result. As such, 95.5% of the time, the PTO's *Mayo/Alice* analysis was error-free.
- Despite similar popular narratives, overwhelmingly, Federal Circuit judges show little disagreement on the application of § 101 law. There were only 25 dissenting opinions in 386 Federal Circuit § 101 decisions (6.5%) that demonstrated disagreement among the judges on the outcome of patent eligibility for that case. Stated differently, in 93.5% of Federal Circuit decisions, all panel members agreed on the outcome. Putting this into context, from 2012 to 2023, § 101 decisions showed a lower dissent rate (6.5%) than non-§ 101 patent cases (7.9%).

Through this work, we aim to enhance the understanding of several important empirical, policy, and doctrinal questions at the heart of § 101 law, including: (1) can the current law be applied predictably; (2) does Step 2 of the *Mayo/Alice* framework truly have a meaningful role to play in the determination of patent eligibility; and (3) should the same legal framework govern all three § 101 exceptions? In this Article, we focus on the first question and introduce our initial impressions regarding the latter two questions based on the Federal Circuit's case law.

After briefly providing an overview of the state of the law, the debate surrounding § 101, recent attempts to change the law, and prior empirical scholarship in Part I, Part II of this Article describes our methodology in collecting the decisions that underlie our analysis. To build a more complete picture of § 101 outcomes at the Federal Circuit, we analyzed the procedural stage, tribunal of origin, underlying § 101 exception, results of each step of the *Mayo/Alice* framework, eligibility decision, the Federal Circuit Rule 36 affirmance "shadow" docket, each district court judge's results, separate opinions, and each Federal Circuit judge's decision-making for all § 101 decisions at the Federal Circuit since *Mayo*. By systematically examining the court's decisions over the past decade, we identify a number of clear patterns that suggest there are some surprising considerations not just in terms of outcomes but also in *how* the court makes its decisions on patent eligible subject matter.

In Part III, we provide an overview of the Federal Circuit's patent eligible subject matter decisions since 2012, including a summary of the origins of those cases, the procedural posture from which they arise, patent outcomes at the Federal Circuit, and individual Federal Circuit judges' decisions on § 101 cases.

In Part IV, we consider the main criticisms that have been offered arguing that the current patent eligibility framework is unpredictable, address why those arguments do not rest on the best indicators of predictability, and suggest several better metrics for evaluating doctrinal predictability.

Part V analyzes more than a decade of Federal Circuit § 101 cases through multiple metrics to better understand if judges can predictably apply the *Mayo/Alice* framework. Specifically, we go beyond what earlier studies have done in evaluating only affirmance/reversal rates, which reveal how often

lower tribunals reach the right result but fail to teach anything about how the decision was made and whether there exists an error in *applying* the law even if not in the result. To accomplish this, we utilize a novel approach in empirical studies of judicial decisions: not just asking whether the lower tribunal got the right result but also whether it did so using the correct legal analysis. Finally, we also undertake a novel examination of uniformity and predictability on patent eligibility law within the Federal Circuit using established methods of measuring uniformity in appellate decisions.

Finally, in Part VI, we identify several other key questions and takeaways from our analysis of appellate § 101 decisions. In particular, we showcase the limited impact Step 2 of the *Mayo/Alice* framework has carried in patent outcomes at the Federal Circuit, examine whether *Berkheimer v. HP Inc.*¹⁰ impacted the Federal Circuit's decision-making, and present the important finding that appellate § 101 decisions are dominated by the abstract idea exception.

At the outset, we note that our goal in this Article is not to convince or persuade that the *Mayo/Alice* framework is an easy-to-apply test or that it cannot benefit from further clarity. Indeed, we do not view it as a simple test, and we certainly think there are parts that could benefit from clarification and refinement—a few of which we highlight here. Rather, our aim in this project is to better understand whether § 101 outcomes at the district courts, PTO, and Federal Circuit support the frequently repeated narratives that dominate the discussion and often serve as the driving force for proposed major legislative changes. Thus, the importance of our findings is perhaps most relevant to those who seek to better understand how § 101 has evolved since the Supreme Court introduced the current framework and particularly to those considering or advocating for sweeping changes in the law of patent eligibility.

Regardless of whether the future of patent eligibility law will be elucidated by the reduced likelihood of congressional action, the dimming prospect of Supreme Court intervention, or the more likely continued development of Federal Circuit decisions, a closer systematic examination of the Federal Circuit's patent eligibility jurisprudence for the current legal standard on eligibility is critical to better understand how the doctrine has evolved and what potential legislative or judicial fixes to § 101 might be appropriate in the future. Examination of the body of appellate case law for the past decade reveals that some of the narratives surrounding patent eligibility (such as the argument on judges' inability to predictably apply the law) might instead be misconceptions.

I. A PRIMER ON PATENT ELIGIBILITY

The conversation surrounding § 101 and the current patent eligibility threshold test is far from new. Although the *Mayo/Alice* framework has been in place for only about a decade, within the world of intellectual property law—patent law in particular—this is a sufficiently long enough time period to develop a (relatively) robust body of case law. Moreover, given the fierce criticism that

10. *Berkheimer v. HP Inc.*, 890 F.3d 1369, 1383 (Fed. Cir. 2018) (Reyna, J., dissenting) (“[T]he *Aatrix* and *Berkheimer* decisions upset established precedent and offer no guidance to the many questions they raise.”).

immediately sparked after the Supreme Court issued its *Mayo* and *Alice* decisions, debates on how (or whether) to “fix” § 101 have been frequent and thorough.

In light of the extensive literature in this space, it would serve little purpose to repeat much of what has been written by our colleagues regarding foundational background on § 101 and patent eligibility. We have previously written about it as well.¹¹ Instead, for those less familiar with this topic, we offer a brief primer on the applicable law and the contrasting views in the central debate surrounding § 101 and suggest some helpful scholarship for further reading as background on the issues.¹²

A. PATENT ELIGIBILITY STANDARD

35 U.S.C. § 101 provides the threshold requirement for anyone seeking a patent: “Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.”¹³ While on its face the statutory scope of eligibility is quite broad, for more than 170 years, the Supreme Court has held that there exist three exceptions ineligible for a patent: abstract ideas, laws of nature, and natural phenomena.¹⁴

Under the current two-step framework for determining whether a patent claim is eligible for a patent, as first set forth by the Supreme Court in *Mayo* and clarified by *Alice* two years later,¹⁵ the court must first, in Step 1, “determine whether the claims at issue are directed to one of those patent-ineligible concepts” listed above.¹⁶ If they are, Step 2 is to examine “the elements of each claim both individually and ‘as an ordered combination’ to determine whether the additional elements ‘transform the nature of the claim’ into a patent-eligible application.”¹⁷ Importantly, including generic technology in the claims or relying

11. See, e.g., Nikola L. Datzov, *The Role of Patent (In)Eligibility in Promoting Artificial Intelligence Innovation*, 92 UMKC L. REV. 1, 7–15 (2023) [hereinafter Datzov, *The Role of Patent (In)Eligibility*]; Nikola L. Datzov, Comment, *The Machine-or-Transformation Patentability Test: The Reinvention of Innovation*, 33 HAMLINE L. REV. 281, 286–95 (2010).

12. See, e.g., Mark A. Lemley, Michael Risch, Ted Sichelman & R. Polk Wagner, *Life After Bilski*, 63 STAN. L. REV. 1315, 1317–19 (2011); Mark A. Lemley, *Software Patents and the Return of Functional Claiming*, 2013 WIS. L. REV. 905, 906; Fabio E. Marino & Teri H.P. Nguyen, *From Alappat to Alice: The Evolution of Software Patents*, 9 HASTINGS SCI. & TECH. L.J. 1, 3–12 (2017); Joshua D. Sarnoff, *Patent-Eligible Inventions After Bilski: History and Theory*, 63 HASTINGS L.J. 53, 63–90 (2011); Michael Risch, *Everything Is Patentable*, 75 TENN. L. REV. 591, 657 (2008).

13. 35 U.S.C. § 101 (2018).

14. *Alice Corp. Pty. v. CLS Bank Int'l*, 573 U.S. 208, 216 (2014); see also *Le Roy v. Tatham*, 55 U.S. (14 How.) 156, 175 (1852) (explaining the exclusive rights cannot extend to truths, knowledge, or motives); *Wyeth v. Stone*, 30 F. Cas. 723, 730 (C.C.D. Mass. 1840).

15. *Voter Verified, Inc. v. Election Sys. & Software LLC*, 887 F.3d 1376, 1382 (Fed. Cir. 2018) (“*Alice* . . . did not alter the governing law of § 101. In *Alice*, the Court applied the same two-step framework it created in *Mayo* in its § 101 analysis.”).

16. *Alice*, 573 U.S. at 217; see also *Mayo Collaborative Servs. v. Prometheus Lab'ys, Inc.*, 566 U.S. 66, 77, 92 (2012) (explaining that a patent application regarding thiopurine compound dosages cannot be granted because the claims “effectively claim the underlying laws of nature themselves”).

17. *Alice*, 573 U.S. at 217–18 (quoting *Mayo*, 566 U.S. at 78–79).

on “well-understood, routine, conventional activities’ previously known to the industry” is not sufficient to satisfy the required “inventive concept.”¹⁸

Since the Supreme Court in *Alice* (its last § 101 case) did not “labor to delimit the precise contours of the ‘abstract ideas’ category” and left the term “abstract idea”¹⁹ undefined, the framework set off fireworks among the patent law community for how the standard should be applied—or whether it is even workable.

B. THE § 101 DEBATE

The Supreme Court’s *Mayo/Alice* jurisprudence has instigated vigorous debate across multiple underlying issues. Is the *Mayo/Alice* framework consistent with earlier Supreme Court patent eligibility precedent?²⁰ Does the framework promote or stifle innovation?²¹ Does the current law result in the invalidation

18. *Id.* at 223, 225 (quoting *Mayo*, 566 U.S. at 73); *see also id.* at 217–18 (“We have described step two of this analysis as a search for an ‘inventive concept’—*i.e.*, an element or combination of elements that is ‘sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.’” (quoting *Mayo*, 566 U.S. at 72–73)).

19. *Id.* at 221.

20. *See, e.g.*, Paul R. Michel & Matthew J. Dowd, *From a Strong Property Right to a Fickle Government Franchise: The Transformation of the U.S. Patent System in 15 Years*, 69 DRAKE L. REV. 1, 23 (2021) (“Moreover, the analysis set forth in the *Alice* and *Mayo* decisions appears to be unsupported by precedent and is inconsistent with *Diehr* . . .”); Richard Gruner, *Lost in Patent Wonderland with Alice: Finding the Way Out*, 72 SYRACUSE L. REV. 1053, 1060 (2022) (“The *Alice* opinion . . . swept away several prior standards . . .”); David O. Taylor, *Confusing Patent Eligibility*, 84 TENN. L. REV. 157, 229 n.383 (2016) (commenting on “[t]he attempt in *Alice* to reconcile *Flook*, *Diehr*, and *Mayo*”); Timothy R. Holbrook, *Is There a New Extraterritoriality in Intellectual Property?*, 44 COLUM. J.L. & ARTS 457, 509 (2021); *see also* Sarnoff, *supra* note 12, at 69–84 (tracing history of patent eligibility through precedent).

21. *See, e.g.*, Datzov, *The Role of Patent (In)Eligibility*, *supra* note 11, at 51–58 (analyzing whether the current patent eligibility framework hinders AI innovation by considering public AI research and development spending, private equity investment into AI, publications focused on AI, and the number of AI patent applications); David O. Taylor, *Patent Eligibility and Investment*, 41 CARDOZO L. REV. 2019, 2027–30 (2020) (studying how patent eligibility cases have impacted investment decisions in companies developing technology); Kevin Madigan & Adam Mossoff, *Turning Gold into Lead: How Patent Eligibility Doctrine Is Undermining U.S. Leadership in Innovation*, 24 GEO. MASON L. REV. 939, 952 (2017) (arguing that “the U.S. is losing its innovation leadership” due to narrower grounds for patent eligibility); Stephanie Bloss, *Taming the Monster: The 2019 Patent Eligibility Guidance Brings Stability Back to Patent Eligibility Doctrine*, 102 J. PAT. & TRADEMARK OFF. SOC’Y 545, 559 (2022) (“This dramatic increase in invalidation rates demonstrates that the Supreme Court’s overly narrow view of patentable subject matter is hindering technological innovation . . .”); Shahrokh Falati, *To Promote Innovation, Congress Should Abolish the Supreme Court Created Exceptions to 35 U.S. Code § 101*, 28 TEX. INTELL. PROP. L.J. 1, 33–34 (2019) (explaining that the Supreme Court’s analysis of *Alice* has resulted in an “all-out attack on software patent claims”); Kristen Osenga, *Changing the Story: Artificial Intelligence and Patent Eligibility*, JUST SEC. (Oct. 25, 2021), <https://www.justsecurity.org/78727/changing-the-story-artificial-intelligence-and-patent-eligibility> [<https://perma.cc/A6BC-XQQB>] (explaining how the use of the mental steps doctrine for AI is reducing the likelihood of obtaining a patent); Ryan Whalen & Raphael Zingg, *Innovating Under Uncertainty: The Patent-Eligibility of Artificial Intelligence After Alice Corp. v. CLS Bank International*, in 30 THE LAW AND ECONOMICS OF PRIVACY, PERSONAL DATA, ARTIFICIAL INTELLIGENCE, AND INCOMPLETE MONITORING 59, 59–81 (James Langenfeld, Frank Fagan & Samuel Clark eds., 2022) (finding that empirical analysis of AI patents showed “*Alice*’s impact on the certainty of a patent grant was relatively short-lived”).

of too many patents?²² Should patents on human genes or those modified in a lab be patentable?²³

These are important normative, doctrinal, and policy questions. Examining them, however, was not our focus with this study. Instead, we sought to bring more clarity to the other key debate regarding § 101: whether the *Mayo/Alice* framework is workable and can be predictably applied.²⁴ In other words, in this Article, we do not examine where the line *should be* drawn for determining what is eligible for a patent. We examine whether *judges* can tell where the line *has been* drawn.

It is important to distinguish between the Federal Circuit judges' views on what is sound patent policy and their ability (and willingness) to apply the law as it exists. Since the role of judges is rooted in the latter, that is the focus of our work: whether judges are *able* to apply the existing law—not whether they believe the law to determine eligibility should be different. The judges themselves have noted they are mindful of this critical distinction.²⁵

C. THE PUSH FOR § 101 OVERHAUL

Notwithstanding the fierce debate on § 101, the Supreme Court has been disinterested in revisiting the framework it laid down more than a decade ago and has not spoken on the issue since *Alice* in 2014. Over the past several years, it has invited the U.S. Solicitor General to file briefs in several § 101 cases only to reject the Solicitor General's recommendations that the Court grant certiorari

22. See, e.g., Ryan Davis, *Breaking Down the Proposal for a Patent Eligibility Revamp*, LAW360 (May 29, 2019, 5:55 PM), <https://www.law360.com/articles/1163764/breaking-down-the-proposal-for-a-patent-eligibility-revamp> (on file with the *Iowa Law Review*) (summarizing efforts to change patent eligibility law through proposed legislation “crafted by a group of lawmakers including two U.S. senators who have complained that the current law on which inventions are eligible for patents under Section 101 of the Patent Act has resulted in too many patents being invalidated”); see also Robert Sachs, *Alice: Benevolent Despot or Tyrant? Analyzing Five Years of Case Law Since Alice v. CLS Bank: Part II*, IP WATCHDOG (Sept. 3, 2019, 12:15 PM), <https://ipwatchdog.com/2019/09/03/alice-benevolent-despot-or-tyrant-analyzing-five-years-of-case-law-since-alice-v-cls-bank-part-ii> [<https://perma.cc/5DXT-V9M5>] (summarizing views on both sides of whether the volume of invalidated patents is “good” or “bad”).

23. See, e.g., JORGE L. CONTRERAS, *THE GENOME DEFENSE: INSIDE THE EPIC LEGAL BATTLE TO DETERMINE WHO OWNS YOUR DNA* 165–86 (2021) (detailing *Association for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013), the 2013 Supreme Court case deciding patent eligibility of human genes, and related policy implications); Jorge Contreras, *Another Legislative Attempt to Revive Gene Patenting*, HARV. L. PETRIE-FLOM CTR.: BILL HEALTH (Aug. 4, 2022), <https://blog.petrieflom.law.harvard.edu/2022/08/04/another-legislative-attempt-to-revive-gene-patenting> [<https://perma.cc/7W3D-PXBQ>] (discussing the conflicting positions on patenting human genes and explaining that the question implicates “provisions on access to healthcare, genetic self-knowledge, genetic epidemiology, and public health”); *Gene Patenting*, AMA, <https://www.ama-assn.org/delivering-care/precision-medicine/gene-patenting> [<https://perma.cc/E8E5-2EDH>] (explaining that the American Medical Association “has issued numerous statements regarding the need to avoid having gene patents interfere with appropriate medical care and the development of better medical treatments and technologies, and declaring unethical any limitations on the dissemination of medical knowledge”).

24. See *infra* Part V.

25. *Athena Diagnostics, Inc. v. Mayo Collaborative Servs., LLC*, 915 F.3d 743, 753 n.4 (Fed. Cir. 2019).

in each of those cases.²⁶ The Supreme Court's refusal to follow the advice of the "Tenth Justice" (repeatedly) was unprecedented in patent cases.²⁷

Even through several major reforms of the Patent Act of 1790, Congress has never disturbed the Supreme Court's limitation on § 101 since it was decided by the Supreme Court more than 170 years ago.²⁸ In the past four years, however, there has been significant legislative interest in overhauling patent eligibility law—perhaps, in part, because of the Supreme Court's refusal to wade back into these murky waters. The conversation on amending § 101 really picked up steam in May 2019 when U.S. Senators Thom Tillis and Chris Coons, along with others, released a bipartisan bill that would have abrogated the Supreme Court's jurisprudence relating to § 101 exceptions.²⁹ When that bill stalled, the battleground for legislative change remained mostly quiet until 2021. In March 2021, Senators Tillis, Coons, Mazie Hirono, and Tom Cotton requested that the PTO undertake a study "on the current state of patent eligibility jurisprudence" to assist the Senators as they "consider what legislative action should be taken to reform our eligibility laws,"³⁰ which ultimately led to a lengthy report.³¹ In November 2021, U.S. Representative Thomas Massie introduced legislation that would have similarly eliminated the judicial exceptions to § 101,³² but that bill also went nowhere.³³

In August 2022, however, Senator Tillis came forward with another bill that would have made sweeping changes to § 101.³⁴ When the bill suffered a similar fate, Senators Tillis and Coons returned with a new proposed bill

26. See Datzov, *The Role of Patent (In)Eligibility*, *supra* note 11, at 12–13.

27. See Paul R. Gugliuzza & Pyry P. Koivula, *Stepping Out of the Solicitor General's Shadow: The Federal Circuit and the Supreme Court in a New Era of Patent Law*, 64 B.C. L. REV. 459, 462–63, 477–78 (2023).

28. Some have argued that it might not be possible for Congress to do so if the exceptions set forth by the Supreme Court are moored on constitutional grounds. See, e.g., Max Stul Oppenheimer, *Patents 101: Patentable Subject Matter and Separation of Powers*, 15 VAND. J. ENT. & TECH. L. 1, 44 (2012).

29. See Press Release, Thom Tillis, U.S. Sen., U.S. Senate, Sens. Tillis and Coons and Reps. Collins, Johnson, and Stivers Release Draft Bill Text to Reform Section 101 of the Patent Act (May 22, 2019), <https://www.tillis.senate.gov/2019/5/sens-tillis-and-coons-and-reps-collins-johnson-and-stivers-release-draft-bill-text-to-reform-section-101-of-the-patent-act> [<https://perma.cc/D435-GH7E>].

30. Letter from Thom Tillis, Mazie K. Hirono, Tom Cotton, Christopher A. Coons, U.S. Sens., U.S. Senate, to Drew Hirshfeld, Comm'r for Pats., U.S. Pat. & Trademark Off. (Mar. 5, 2021), <https://www.tillis.senate.gov/services/files/04D9DCF2-B699-41AC-BE62-9DCA9460EDDA> [<https://perma.cc/7AE5-WXZ4>].

31. See U.S. PAT. & TRADEMARK OFF., DEP'T OF COM., PATENT ELIGIBLE SUBJECT MATTER: PUBLIC VIEWS ON THE CURRENT JURISPRUDENCE IN THE UNITED STATES 3 (2022), <https://www.uspto.gov/sites/default/files/documents/USPTO-SubjectMatterEligibility-PublicViews.pdf> [<https://perma.cc/7YQL-WD9V>] (discussing the USPTO's "comprehensive review of the public views on the impacts of the current jurisprudence on subject matter eligibility").

32. See Restoring America's Leadership in Innovation Act of 2021, H.R. 5874, 117th Cong. (2021).

33. See H.R. 5874 - Restoring America's Leadership in Innovation Act of 2021, CONGRESS.GOV, <https://www.congress.gov/bill/117th-congress/house-bill/5874/all-actions> [<https://perma.cc/MHQ3-VH82>].

34. See Press Release, Thom Tillis, U.S. Sen., U.S. Senate, Tillis Introduces Landmark Legislation to Restore American Innovation (Aug. 3, 2022), <https://www.tillis.senate.gov/2022/8/tillis-introduces-landmark-legislation-to-restore-american-innovation> [<https://perma.cc/VM9H-MQ5N>].

less than a year later in June 2023.³⁵ The driver identified in this currently pending legislation (the Patent Eligibility Restoration Act of 2023) for the need of such major changes was the lack of predictability in how judges are applying the law.³⁶

The question that still remains unanswered, however, is whether empirical data supports the assertions that underlie the movement to dismantle the current *Mayo/Alice* framework.

D. PRIOR FEDERAL CIRCUIT § 101 EMPIRICAL SCHOLARSHIP

Several prior empirical studies have analyzed various impacts of the current *Mayo/Alice* framework. Some of the work has focused on economic and innovation impacts.³⁷ Some has focused on patent prosecution outcomes at the PTO.³⁸ Some has surveyed practitioners' and judges' views and competencies in applying the legal standard.³⁹ Others' work has focused on litigation outcomes,⁴⁰ and some have examined § 101 at the Federal Circuit, albeit with a different and more limited focus.⁴¹ With regard to the last category, which is the focus of our work in this project, there exists a very limited understanding and empirical perspective on the *Mayo/Alice* framework's journey through the

35. See Press Release, Thom Tillis, U.S. Sen., U.S. Senate, Tillis, Coons Introduce Landmark Legislation to Restore American Innovation (June 22, 2023), <https://www.tillis.senate.gov/2023/6/tillis-coons-introduce-landmark-legislation-to-restore-american-innovation> [<https://perma.cc/RG4G-3VGU>]; Patent Eligibility Restoration Act of 2023, S. 2140, 118th Cong. (2023).

36. See *infra* notes 99–104 and accompanying text.

37. See, e.g., Taylor, *supra* note 21, at 2053–84; Colleen V. Chien & Arti K. Rai, PowerPoint Presentation USPTO Roundtable on Section 101, Dx Innovation in Decline? An Empirical Analysis Post-*Mayo*, at slide 19 (Dec. 5, 2016), <https://www.uspto.gov/sites/default/files/documents/RT2%206-2%20Colleen%20Chien.pdf> [<https://perma.cc/8EWL-W62A>]; Datzov, *The Role of Patent (In)Eligibility*, *supra* note 11, at 33–51.

38. See, e.g., Charles Duan, *Examining Patent Eligibility*, 97 ST. JOHN'S L. REV. 47, 85–108 (2023); Jay P. Kesan & Runhua Wang, *Eligible Subject Matter at the Patent Office: An Empirical Study of the Influence of Alice on Patent Examiners and Patent Applicants*, 105 MINN. L. REV. 527, 588–603 (2020); ANDREW A. TOOLE & NICHOLAS A. PAIROLERO, U.S. PAT. TRADEMARK OFF., ADJUSTING TO ALICE: USPTO PATENT EXAMINATION OUTCOMES AFTER ALICE CORP. V. CLS BANK INTERNATIONAL 3 (2020), https://www.uspto.gov/sites/default/files/documents/OCE-DH_AdjustingtoAlice.pdf [<https://perma.cc/GD7P-NBC9>]; Whalen & Zingg, *supra* note 21, at 62–65; Colleen Chien & Jiun Ying Wu, *Decoding Patentable Subject Matter*, 2018 PATENTLY-O PAT. L.J. 10, 15–17, <https://patentlyo.com/media/2018/10/Chien.Decoding101.2018.pdf> [<https://perma.cc/RRLg-U9YF>].

39. See, e.g., Jason D. Reinecke, *Is the Supreme Court's Patentable Subject Matter Test Overly Ambiguous? An Empirical Test*, 2019 UTAH L. REV. 581, 603–05; Matthew Sipe, *Patent Law 101: The View from the Bench*, 88 GEO. WASH. L. REV. ARGUENDO 21, 27–30 (2020).

40. See, e.g., Mark A. Lemley & Samantha Zyontz, *Does Alice Target Patent Trolls?*, 18 J. EMPIRICAL LEGAL STUDS. 47, 58–87 (2021); see also Robert Sachs, *Alice: Benevolent Despot or Tyrant? Analyzing Five Years of Case Law Since Alice v. CLS Bank: Part I*, IPWATCHDOG (Aug. 29, 2019, 5:15 PM), <http://ipwatchdog.com/2019/08/29/alice-benevolent-despot-or-tyrant-analyzing-five-years-of-case-law-since-alice-v-cls-bank-part-i/id=112722> [<https://perma.cc/KL6D-WMRP>] (describing the “massive growth in ineligible outcomes”).

41. See, e.g., Paul R. Gugliuzza & Mark A. Lemley, *Can a Court Change the Law by Saying Nothing?*, 71 VAND. L. REV. 765, 778–91 (2018); Lemley & Zyontz, *supra* note 40, at 73–77; Sachs, *supra* note 40; Matthew B. Hershkowitz, Note, *Patently Insane for Patents: A Judge-by-Judge Analysis of the Federal Circuit's Post-Alice Patentable Subject Matter Eligibility of Abstract Ideas Jurisprudence*, 28 FORDHAM INTEL. PROP. MEDIA & ENT. L.J. 109, 130–32 (2017).

Federal Circuit over the past ten years. Specifically, despite the broad and often repeated narrative that the *Mayo/Alice* framework is unpredictable, no study has empirically analyzed its predictability using the established legal predictability metrics relied upon in studies of other areas of the law. Nor has any study sought to put § 101 into context by comparing its predictability to the other areas of patent law.

A study by Professors Paul Gugliuzza and Mark Lemley was one of the first comprehensive empirical examinations of § 101 outcomes at the Federal Circuit. Through their work, Gugliuzza and Lemley sought to understand whether the Federal Circuit's Rule 36⁴² "shadow docket"—opinions that provide no reasoning or explanation for the appellate court's decision—skewed the rate of invalidity regarding § 101, and thus, whether the Federal Circuit could "change the law by saying nothing."⁴³ After examining 104 post-*Alice* decisions on § 101 through June 19, 2017, they concluded that "the Federal Circuit's precedential opinions provide an inaccurate picture of how disputes over patentable subject matter are actually resolved" and that "the actual practice in the Federal Circuit looks rather different than what one would glean from simply reading the court's precedent on patentable subject matter."⁴⁴ In addition to analyzing the Federal Circuit's utilization of precedential, nonprecedential, and Rule 36 opinions, the authors also examined the patent validity outcomes, patent technology group, and affirmance results for each decision.⁴⁵

A later study by Professors Lemley and Samantha Zyontz examined 646 district court and 162 Federal Circuit post-*Alice* decisions between July 2014 and June 2019 to determine whether the *Mayo/Alice* framework posed the biggest threat to patent trolls.⁴⁶ In addition to categorizing the patent asserters in each § 101 case, the authors studied the invalidity outcomes and the industry of each patent involved in each decision, among other variables.⁴⁷ They found that "biotech/life science innovations are more likely to survive patentable subject matter challenges than are software/IT innovations" and that "the

42. Federal Circuit Rule 36 allows the court to enter a judgment of affirmance without opinion when an opinion would have no precedential value and specified circumstances exist, such as that the evidence supporting the jury's verdict is sufficient. *See* FED. CIR. R. 36.

43. Gugliuzza & Lemley, *supra* note 41, at 791–809.

44. *Id.* at 765, 782 n.84, 790.

45. *Id.* at 783–95.

46. Lemley & Zyontz, *supra* note 40, at 47, 58. Although there is no universal definition of what constitutes a "patent troll," the term is often used a reference for entities that do not manufacture, produce, practice or otherwise use their patented invention and primarily seek to extract profit from their patent by filing lawsuits—often with questionable grounds or in bad faith. *See, e.g., Patent Troll*, CORNELL L. SCH., LEGAL INFO. INST., https://www.law.cornell.edu/wex/patent_troll [<https://perma.cc/4RK9-WN7N>]; *see also* Jason Rantanen, *Slaying the Troll: Litigation as an Effective Strategy Against Patent Threats*, 23 SANTA CLARA COMPUT. & HIGH TECH. L.J. 159, 163–69 (2006) (providing in-depth examination of the term).

47. Lemley & Zyontz, *supra* note 40, at 55–58.

entities most likely to lose their patents at this stage are not patent trolls but individual inventors and inventor-started companies.”⁴⁸

Patent attorney Robert Sachs undertook a similar study as part of which he analyzed 682 district court and 156 Federal Circuit decisions at *Alice*'s five-year mark.⁴⁹ His research and analysis focused on validity outcomes, the timing and type of § 101 motion practice in federal courts, and patent technology group.⁵⁰ Another study provided a limited analysis of Federal Circuit outcomes,⁵¹ although it appears it omitted Rule 36 decisions, which, as Gugliuzza and Lemley explained,⁵² significantly affects the validity of the analysis.

More recently, contemporaneously with (but entirely separately from) our study, Professor Matthew Sipe examined the Federal Circuit case law to determine whether § 101 outcomes at the Federal Circuit depend on which judges are assigned to the panel making the decision.⁵³ Using the Federal Circuit Dataset Project as a starting point—the same underlying database we began with—Sipe coded the technology classes of the patents at issue, the lower tribunal eligibility outcome, the posture of the finding, the Federal Circuit eligibility outcome, and the eligibility decision of each Federal Circuit panel member for each case.⁵⁴ He then used the data to determine the eligibility rate of each Federal Circuit judge and concluded that the assignment of judges with higher rates of ineligibility determinations increased the likelihood that the panel would find the patent claiming ineligible subject matter.⁵⁵ Importantly, while Sipe's novel study relied on much of the same cases we examined—although structured differently, as explained below—the question Sipe explored (“panel effects” in the Federal Circuit § 101 decisions) was fundamentally different from the question of predictability our study analyzed.⁵⁶

48. *Id.* at 48.

49. Sachs, *supra* note 40.

50. *See id.*

51. C. Graham Gerst & Paul Choi, *Lessons from a Quantitative Analysis of the Federal Circuit's Section 101 Decisions Since Alice*, IPWATCHDOG (Sept. 2, 2020, 7:15 AM), <https://ipwatchdog.com/2020/09/02/lessons-quantitative-analysis-federal-circuits-section-101-decisions-since-alice/id=124790> [<https://perma.cc/52SN-L8PX>].

52. Gugliuzza & Lemley, *supra* note 41, at 767 n.2 (“Including Rule 36 affirmances is essential to providing an accurate empirical analysis of the Federal Circuit's decision-making practices.”); *see also* Kimberly A. Moore, Markman *Eight Years Later: Is Claim Construction More Predictable?*, 9 LEWIS & CLARK L. REV. 231, 234 (2005) (“The other empirical literature on this subject suffers from several serious flaws. The most substantial of which is the failure to review the Federal Circuit's Rule 36 summary affirmances.”).

53. Matthew G. Sipe, *Patent Law 101: I Know It When I See It*, 37 HARV. J.L. & TECH. 447, 458 (2024).

54. *Id.*

55. *Id.* at 462, 467–68.

56. *See id.* at 482–83. While Sipe noted the established debate on § 101 predictability and offered a viewpoint that § 101 law is currently unpredictable, his analysis was not focused on the question of predictability, and the study did not examine commonly used metrics of legal predictability, such as affirmation rates or dissent rates. And for the reasons explained below, we do not think mere eligibility rates can be used as a reliable indicator to answer the question of predictability.

Several additional publications provide review and commentary regarding outcomes at the Federal Circuit. Importantly, however, those sources reviewed a small subset of Federal Circuit decisions and cannot provide a complete perspective on the full body of case law that has developed at the Federal Circuit.⁵⁷

Because none of these studies sought to specifically examine the judicial predictability for § 101 decisions—and most are now significantly outdated, did not include a complete set of all Federal Circuit decisions or did not analyze the Federal Circuit decisions with the same granular detail (or all of the above)—they do not answer the question whether the case law supports the legislative push to overhaul the current law. To help answer that question, we created a novel dataset of all Federal Circuit decisions since *Mayo* and closely examined key criteria relating to the judges' work in § 101 law. We have shared our underlying data so that others can continue to build on our work to further and better understand this important—yet frequently debated—area of law.⁵⁸

II. STUDY METHODOLOGY

A central goal of this project was to identify every Federal Circuit decision addressing a patent eligible subject matter issue since 2012. Beginning from a publicly available dataset of all Federal Circuit decisions, we identified all patent eligible subject matter decisions and coded new information about those decisions. We also generated indicator variables to provide a more nuanced look at the Federal Circuit's decisions. Our final dataset, coding instructions, and computer code will be publicly archived on the Harvard Dataverse upon publication. Below, we describe the core elements of our methodology and provide statistics.

The record unit of this study is a Federal Circuit decision. We define a decision as a Federal Circuit opinion or summary affirmance under Rule 36.⁵⁹ A “decision” is thus a single document. In analyzing the case law, we considered

57. See, e.g., Jasper L. Tran & J. Sean Benevento, *Alice at Five*, 2019 PATENTLY-O PAT. L.J. 25, 32; Jasper L. Tran, *Alice at Seven*, 101 J. PAT. & TRADEMARK OFF. SOC'Y 454, 455 (2021) (reviewing thirty decisions); see also Hershkowitz, *supra* note 41, at 132–62 (identifying Federal Circuit decisions by judge); Nikola Datzov & Jason Rantanen, Fed. Circ. Dataset with Source Check (Sept. 19, 2022) (unpublished dataset) (on file with the *Iowa Law Review*) (identifying Westlaw (79 decisions), Docket Navigator (102 decisions), Bitlaw Listing (86 decisions), Gibson Dunn Summary Chart (51 decisions), Fish & Richardson Summary Chart (67 decisions), and Fenwick Post-Alice Eligibility Case Analysis Tool (66 decisions)).

58. Nikola L. Datzov & Jason Rantanen, *Replication Data for Predictable Unpredictability*, HARV. DATAVERSE (Nov. 25, 2024) [hereinafter *Predictable Unpredictability Dataset*], <https://doi.org/10.7910/DVN/MOJOQN> [<https://perma.cc/5SM5-GURX>].

59. Although there are some complexities in exactly what constitutes a judicial “decision,” such as dismissals or transfers, see Merritt E. McAlister, *Missing Decisions*, 169 U. PA. L. REV. 1101, 1105–08 (2021), this definition of “decision” is widely used in research on the Federal Circuit. See Jason Rantanen, Response, *Missing Decisions and the United States Court of Appeals for the Federal Circuit*, 170 U. PA. L. REV. ONLINE 73, 83–84 (2021) (describing the composition of Federal Circuit terminations); Gugliuzza & Lemley, *supra* note 41, at 791–96 (studying opinions and Rule 36 summary affirmances); Moore, *supra* note 52, at 234.

whether to code the results based on decision, analysis, patent, or claim.⁶⁰ Overall, we identified and analyzed 386 decisions. In the vast majority of cases (93%), the fate of all claims at issue—sometimes spanning across multiple patents—was decided the same way through a single legal analysis, with one or a few representative claims. Only in 27 out of 386 decisions did the Federal Circuit do more than one separate § 101 analysis.⁶¹ Since in most cases each claim or patent was not separately analyzed, it would not be possible to reliably code independent results for each of those markers. Rather than attempting the somewhat subjective task of defining individual units of analysis, we opted to code decisions that included multiple § 101 analyses as “multiple” in the outcomes field. Our review of those opinions, however, indicates that it did not make much of a difference, as most cases with multiple analyses (20 out of 27) led to the same outcome for all claims (2 valid and 18 invalid). In other words, when the Federal Circuit found one claim ineligible under § 101, it almost always found all asserted claims ineligible.

To identify all decisions addressing a patent eligible subject matter issue, we began with the Federal Circuit Dataset Project, which provides a publicly accessible dataset of all opinions and Rule 36 summary affirmances issued by the Federal Circuit since 2008.⁶² The construction of the dataset is described in a series of articles,⁶³ and a detailed dataset codebook is also publicly available.⁶⁴ We used the Federal Circuit Dataset Project instead of sources such as Westlaw or Lexis because it provides complete transparency into the contents and structure of the dataset, does not impose contractual restrictions on use, and allows for replication of this project by others.⁶⁵ A comparison against all

60. See Jason Rantanen, *Empirical Analyses of Judicial Opinions: Methodology, Metrics, and the Federal Circuit*, 49 CONN. L. REV. 227, 253 (2016) (discussing different ways to define a record unit in a judicial decision and concluding that for patent infringement cases the specific choice of record unit (decision, analysis, or patent) did not make much difference in terms of outcomes).

61. In some instances, the Federal Circuit provided a sentence or two for why a claim differed from the representative claim without changing the outcome for that claim. We did not treat such cursory mentions as a “separate analysis.” Predictable Unpredictability Dataset, *supra* note 58.

62. *The Compendium of Federal Circuit Decisions*, UNIV. IOWA FED. CIR. DATASET PROJECT [hereinafter *Compendium of Federal Circuit Decisions*], <https://empirical.law.uiowa.edu/compendium-federal-circuit-decisions> [<https://perma.cc/6FSL-DWHU>]. For this project, we used the December 31, 2023, release (Version 5.0) of the dataset, available on the Harvard Dataverse at Jason Rantanen, *Federal Circuit Document Dataset*, HARV. DATAVERSE (Feb. 16, 2024, 5:32 PM), <https://doi.org/10.7910/DVN/UQ2SF7> [<https://perma.cc/H3W2-NMY2>].

63. See generally Rantanen, *supra* note 60; Jason Rantanen, *The Landscape of Modern Patent Appeals*, 67 AM. U. L. REV. 985 (2018); Jason Rantanen, Charles Neff, Eweosa Owenaze & Allison Williamson, *Who Appeals (and Wins) Patent Infringement Cases?*, 60 HOUS. L. REV. 289 (2022).

64. Jason Rantanen, *Codebook for the Compendium of Federal Circuit Decisions*, HARV. DATAVERSE (Jan. 6, 2023), <https://dataverse.harvard.edu/file.xhtml?fileId=6907843&version=4.0> [<https://perma.cc/2YB9-U5V5>].

65. See generally Abigail Matthews & Jason Rantanen, *Legal Research as a Collective Enterprise: An Examination of Data Availability in Empirical Legal Scholarship*, J.L. ECON. & ORG. (Feb. 13, 2024), <https://academic.oup.com/jleo/advance-article/doi/10.1093/jleo/ewae001/7607263> [<https://perma.cc/9NHX-UUEK>].

docketed appeals at the Federal Circuit indicates that it is complete with respect to Federal Circuit opinions and Rule 36 summary affirmances.⁶⁶

In addition to records of each decision, the Federal Circuit Dataset Project includes basic information about each document. Fields include the document type, panel judges, date of decision, opinion authors, outcomes, patent numbers, dispute type, appellant type, and more.⁶⁷ Because the focus of this study is on decisions involving the substance of patent eligible subject matter, we did not include orders on petitions for writs of mandamus and permission to appeal.⁶⁸ We also did not include en banc decisions (of which there was only one) or decisions on en banc petitions because they did not fit within the structure of tracking panel opinions in our dataset, nor—given their minuscule number—would they have meaningfully impacted the results. In the event that the court issued multiple versions of a single decision, such as a corrected opinion, we kept the later one.

In order to ensure that we identified all Federal Circuit opinions and Rule 36 summary affirmances deciding the issue of patent eligible subject matter, we employed several approaches. We began with decisions that the coding in the Federal Circuit Dataset Project identified as involving patent eligible subject matter.⁶⁹ We also reviewed lists of patent eligible subject matter cases from a number of other sources.⁷⁰ Determinations of whether a decision met our inclusion criteria were made by two research assistants and independently by one of the authors, an experienced patent litigator and former federal appellate judicial law clerk.

A decision was included in the final dataset if it decided the issue of patent eligible subject matter. A few opinions discussing patent eligible subject matter did not meet this definition, however. Decisions in which patent eligible subject matter was a collateral issue, such as the exceptional case or attorneys' fees determinations in which the court discussed a patent eligible subject matter decision as part of its determination on the exceptional case/attorneys' fees decision, were not classified as a case in which the court decides the issue of patent eligible subject matter. Similarly, we did not include decisions in which the court resolved the appeal on purely procedural grounds or on an alternate ground and explicitly did not address patent eligible subject matter. Because Rule 36 summary affirmances contain no discussion of the appeal, it was necessary to review the parties' briefs for these decisions. We included a Rule 36

66. See Rantanen, *supra* note 59, at 80.

67. For a list of fields in the *Compendium*, see *Compendium of Federal Circuit Decisions*, *supra* note 62.

68. For a discussion of these petitions, see generally J. Jonas Anderson, Paul R. Gugliuzza & Jason A. Rantanen, *Extraordinary Writ or Ordinary Remedy? Mandamus at the Federal Circuit*, 100 WASH. U. L. REV. 327 (2022).

69. Based on comparisons with other sources, we observed that generally this field was relatively accurate but tended to be overinclusive due to our requirement that the issue of patent eligible subject matter had to actually be decided.

70. See Datzov & Rantanen, *supra* note 57.

summary affirmance if patent eligible subject matter was raised as an issue in the appellant or cross-appellant's opening brief.⁷¹

Once the decisions to include were identified, research assistants reviewed the decisions (and briefs for Rule 36 summary affirmances) to code additional fields. Each new field was independently coded by two research assistants and then reviewed by an author experienced in patent litigation.

Analyses of the dataset were conducted using STATA. In addition, we wrote a Python script in Jupyter Notebook to create binary variables that indicated whether a judge was a member of a panel and the judge's vote on patent eligible subject matter on each decision.

III. QUANTITATIVE OVERVIEW OF § 101 APPEALS IN THE PAST DECADE

In this Part, we provide an overview of the Federal Circuit's patent eligible subject matter decisions between March 2012 and December 2023. In addition to incorporating more recent decisions, these statistics build upon prior work by introducing some new metrics.

A. ORIGINS

We begin with some raw numbers of Federal Circuit subject matter eligibility decisions. Figure 1 shows the number of decisions since 2008.⁷² As has been covered previously, prior to 2010, § 101 was rarely the subject of litigation.⁷³ However, these decisions began to gradually rise following the Supreme Court's four decisions addressing patent eligible subject matter between 2010 and 2014, before sharply jumping in 2016. Decisions in appeals from the district courts peaked in 2017 and have declined since, and decisions in appeals from the PTO peaked in 2019. While there was a downward trend in the number of Federal Circuit decisions overall after 2021,⁷⁴ the drop in § 101 decisions has been much steeper. It is important to note, however, that Figure 1 represents the date of the appellate decision, and it typically takes one to three years from the time a case is initially filed until an appeal is filed.⁷⁵ In addition to the period at the district court, it typically takes about a year from the filing of an appeal to the issuance of a panel decision. So, our data offers a timely view of

71. This is a standard approach to issue identification for Rule 36 summary affirmances. See Moore, *supra* note 52, at 234; see also Ryan T. Holte & Ted M. Sichelman, *Cycles of Obviousness*, 105 IOWA L. REV. 107, 136 (2019) (discussing search techniques to identify Federal Circuit obviousness decisions and Rule 36 summary affirmances).

72. The Federal Circuit Dataset Project does not include the U.S. Court of Federal Claims ("CFC") within the category of district court decisions, so we do not either in this paper. There were two CFC decisions (one from 2017 and one from 2018) in our dataset. See Predictable Unpredictability Dataset, *supra* note 58.

73. Gugliuzza & Lemley, *supra* note 41, at 771 (explaining that the Supreme Court's 1980s decisions on patent eligibility along with the Federal Circuit's jurisprudence through the early 2000s "render[ed] the patentable subject matter requirement effectively a dead letter").

74. Jason Rantanen, *Federal Circuit Dataset & Stats: January 2023 Update*, PATENTLY-O (Jan. 31, 2023), <https://patentlyo.com/patent/2023/01/federal-circuit-dataset.html> (on file with the *Iowa Law Review*).

75. Rantanen et al., *supra* note 63, at 305.

appellate § 101 outcomes but shows a delayed perspective with regard to trial court outcomes.

Figure 1

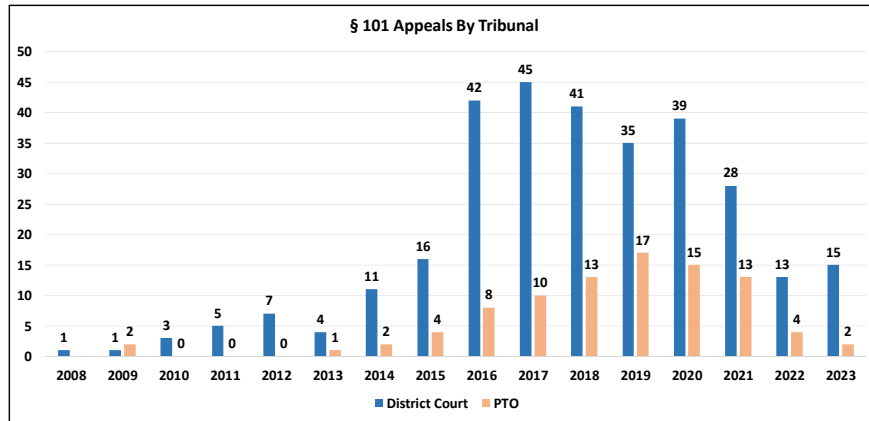
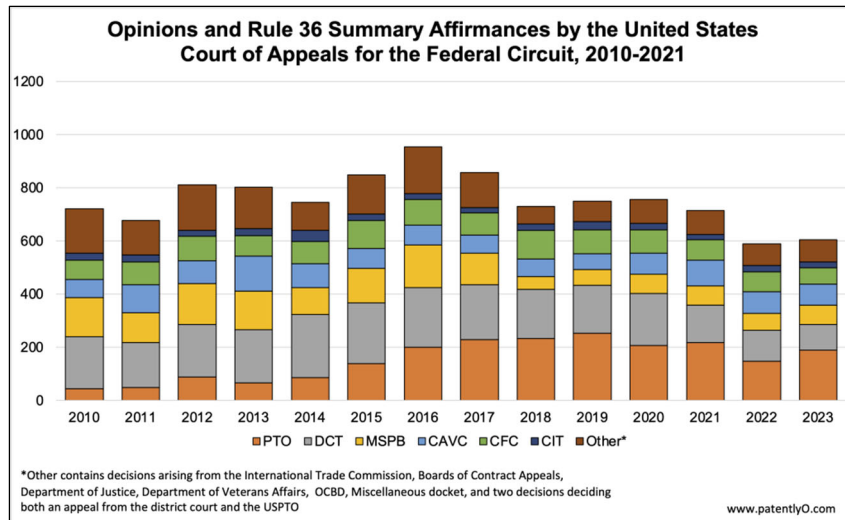


Figure 2



Given the PTO’s issuance of additional guidance regarding § 101 in 2019, which resulted in a lower probability of rejection based on § 101,⁷⁶ it is not particularly surprising to see that there are fewer PTO cases being litigated on appeal. The reason for the reduction in district court appeals, however, is less intuitive, particularly because the other major way to challenge patents on § 101

76. See TOOLE & PAIROLERO, *supra* note 38, at 5–6.

grounds through covered business method (“CBM”) review was no longer available after September 2020.⁷⁷ As such, although one might have expected to see a rise in § 101 appeals from district courts, that has not been the case. This could be an indication that after 2019 there are fewer patents subject to § 101 attacks, more recent patents are less likely to be the subject of § 101 attacks, or the patents that continue to be litigated on § 101 grounds are “easier” cases that do not merit pursuing to an appellate decision.

In terms of origins, most Federal Circuit decisions on patent eligible subject matter arise from the district courts, with the number of decisions from PTO appeals peaking in 2018 to 2021. To put this into context, in 2019, the Federal Circuit issued 221 decisions in appeals arising from the district courts and 275 decisions in appeals arising from the PTO.⁷⁸

The specific sources of § 101 appellate decisions are not particularly surprising, with the expected patent-heavy district courts factoring heavily in the Federal Circuit’s docket. What may be a bit surprising is the low rank of the Western District of Texas, which, in 2019, began to see a significant increase in patent filings⁷⁹ and now accounts for a substantial portion of all patent cases.⁸⁰ In our dataset, there were only six § 101 appellate decisions from the Western District of Texas—and only one after 2019. While this could be due to the low volume of patent cases before 2019 and the timeline it takes to reach an appellate decision, at least some of it may be due to the unlikelihood of success on such a motion in that district, especially on a motion to dismiss.⁸¹ Indeed, the Western District of Texas was the only district court with an affirmance rate (100%) higher than the PTO, and all of its decisions were invalidity decisions, which could be an indication that invalidity decisions from that court are granted only when it is particularly clear that the patent claims ineligible subject matter.

77. Leahy–Smith America Invents Act, Pub. L. No. 112-29, §18(a)(3), 125 Stat. 284, 330–31 (2011).

78. This figure is drawn from the Federal Circuit Dataset Project data. See *Compendium of Federal Circuit Decisions*, *supra* note 62.

79. See J. Jonas Anderson & Paul R. Gugliuzza, *Federal Judge Seeks Patent Cases*, 71 DUKE L.J. 419, 447 (2021).

80. Ryan Davis, *After Rules Shake-Up, Albright Remains the Top Patent Judge*, LAW360 (Feb. 15, 2023, 12:14 AM), <https://www.law360.com/articles/1573848/after-rules-shake-up-albright-remains-the-top-patent-judge> (on file with the *Iowa Law Review*).

81. See *infra* notes 130–37; Anderson & Gugliuzza, *supra* note 79, at 469 (noting that Judge Alan Albright ruled for the patentee in all twelve motions to dismiss he decided).

Figure 3

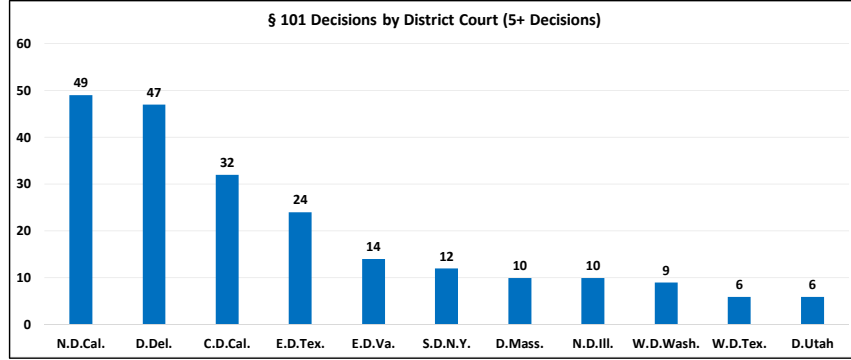
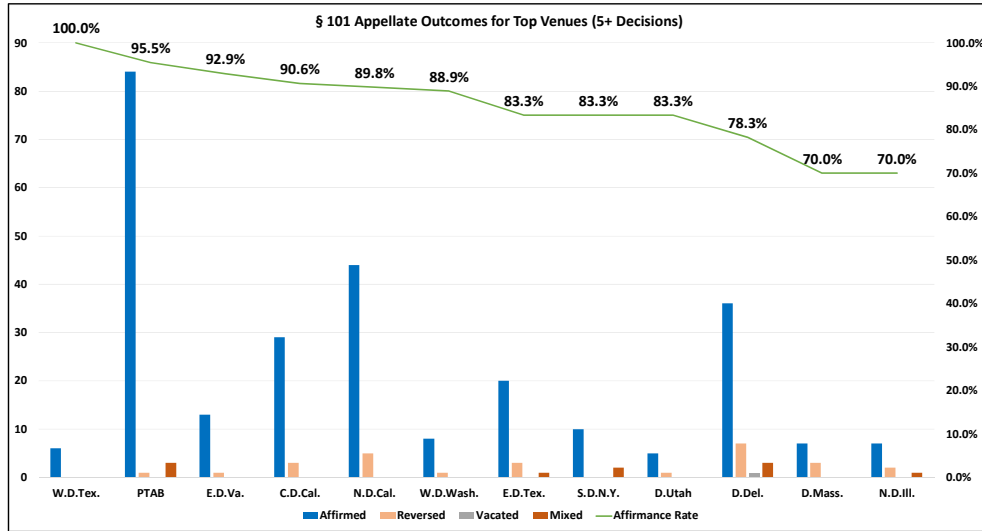


Figure 4



B. PROCEDURAL POSTURE

Most of the decisions on appeals arising from the district courts arise in the context of an appeal from the grant of a motion under Federal Rule of Civil Procedure 12(b)(6) or Rule 12(c).⁸² As discussed in greater detail below,⁸³ due to the procedural mechanics, the overwhelming majority of these are instances in which the accused infringer has prevailed in arguing that the claim was not directed to patent eligible subject matter. The other large portion of decisions arising from the district courts are in the context of appeals from

82. See FED. R. CIV. P. 12(b)(6), 12(c).

83. See *infra* Figure 5, notes 188–90 and accompanying text.

summary judgment.⁸⁴ There were merely four decisions that arose from district court bench trials.⁸⁵

Figure 5

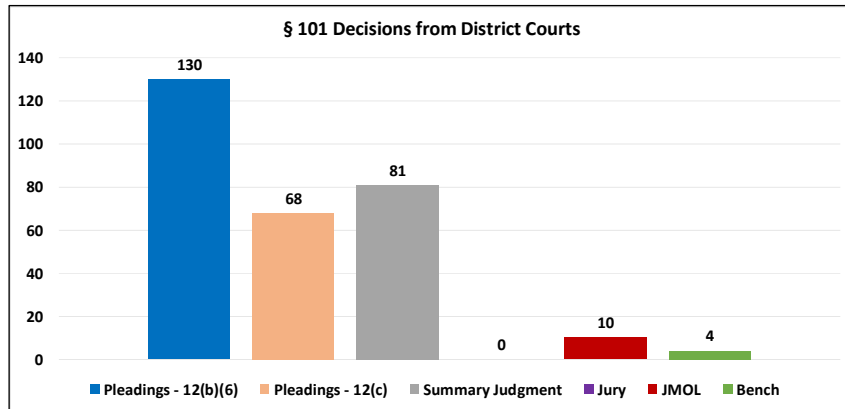
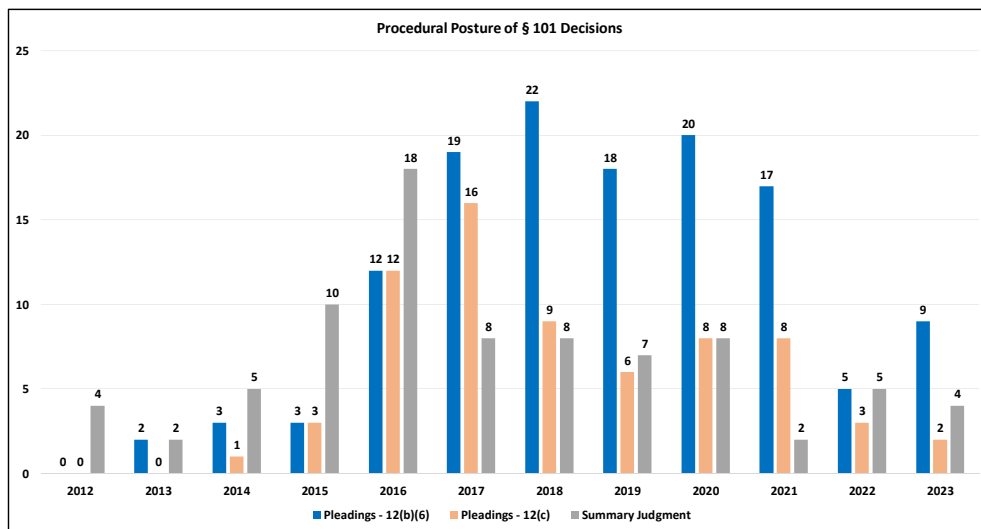


Figure 6



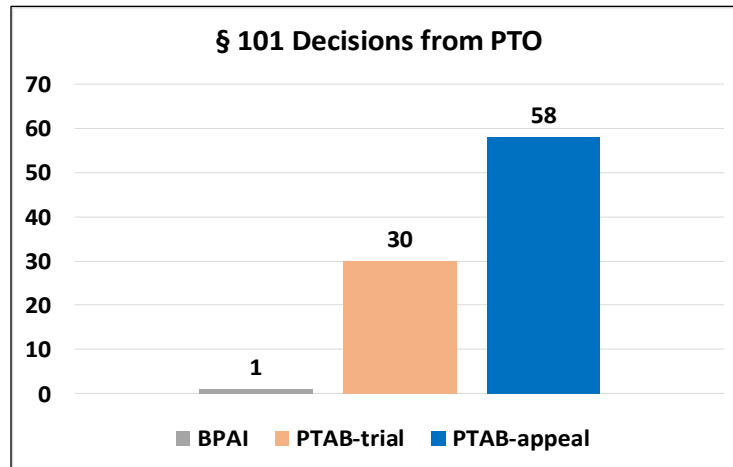
Appeals from the PTO are primarily a mixture of appeals from the Patent Trial and Appeal Board (“PTAB”) sitting as a trial court and appeals from the PTAB as an appellate body. Most of the PTAB appellate decisions arise from

84. See FED. R. CIV. P. 56.

85. Although our study is based on analyzing the appellate records, for all decisions that were not based on Rule 12 or Rule 56, we examined the district court record to determine whether the § 101 issue had been presented to the jury or tried by the judge.

an examiner's rejection based on § 101, and most PTAB trial decisions are based on a decision through CBM review. There was one decision from the Board of Patent Appeals ("BPAI")—the PTAB's predecessor.⁸⁶ Because CBM review ended in 2020, unless those challenges under § 101 migrate to district court, we can expect the lack of such appeals to reduce the overall number of § 101 appellate decisions in the future.

Figure 7



C. PATENT OUTCOMES

One early theory about what would happen to patent eligible subject matter invalidations at the Federal Circuit was that they would decline over time. The initial over 90% invalidation rates at the Federal Circuit appeared to many to be unsustainable. As Gugliuzza and Lemley noted, “[o]nce those easy invalidations [‘obviously invalid’] are finished (and once patentees are deterred from asserting patents similar to the ones invalidated), patentee win rates might begin to increase.”⁸⁷ Lemley and Zyontz also highlighted that “[a] number of early post-*Alice* cases arguably reflected low-hanging fruit, so it makes sense that cases from the earlier part of our study were more likely to invalidate patents.”⁸⁸ However, they also reasoned that “[a]s the low-hanging fruit is cleared, as more defendants discover *Alice* and start arguing patentable subject matter, and as weaker cases possibly settle sooner, it makes sense that the invalidation rate will decline.”⁸⁹

86. *About PTAB*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/patents/ptab/about-ptab> [<https://perma.cc/5F6T-UTMD>].

87. Gugliuzza & Lemley, *supra* note 41, at 795–96.

88. Lemley & Zyontz, *supra* note 40, at 63.

89. *Id.* at 63–64.

Overall, this does not appear to be happening, as patentee win rates have not meaningfully increased. As Figure 8 shows, the rate at which the Federal Circuit reaches an ultimate outcome that the patent claims are not directed to eligible subject matter has remained fairly consistently around 90% since 2014.

Figure 8

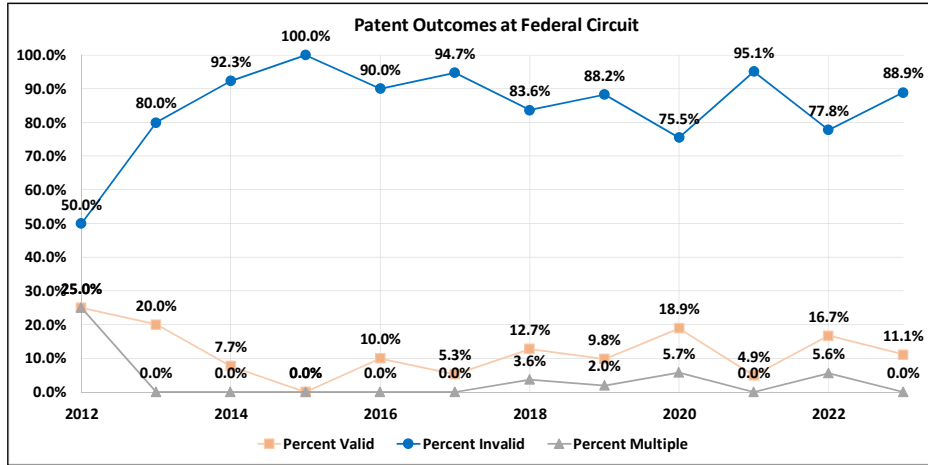
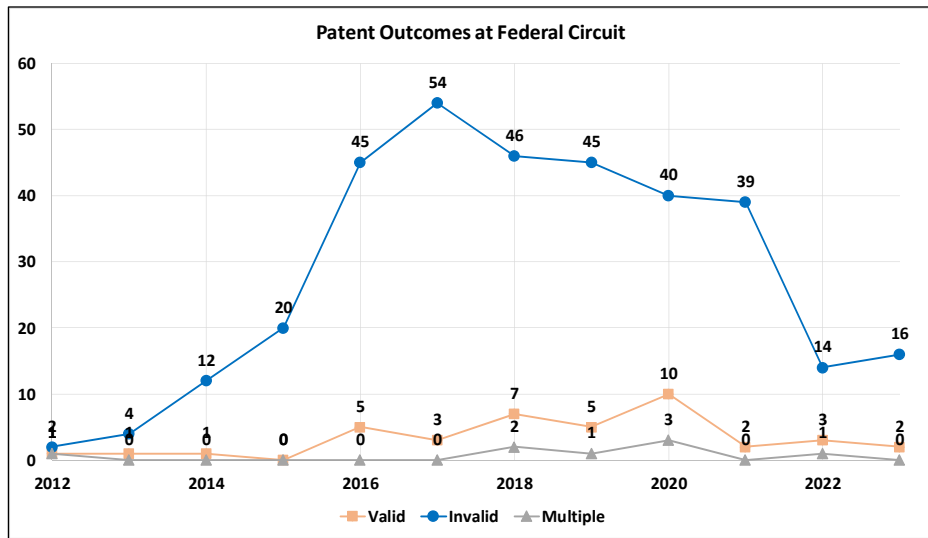


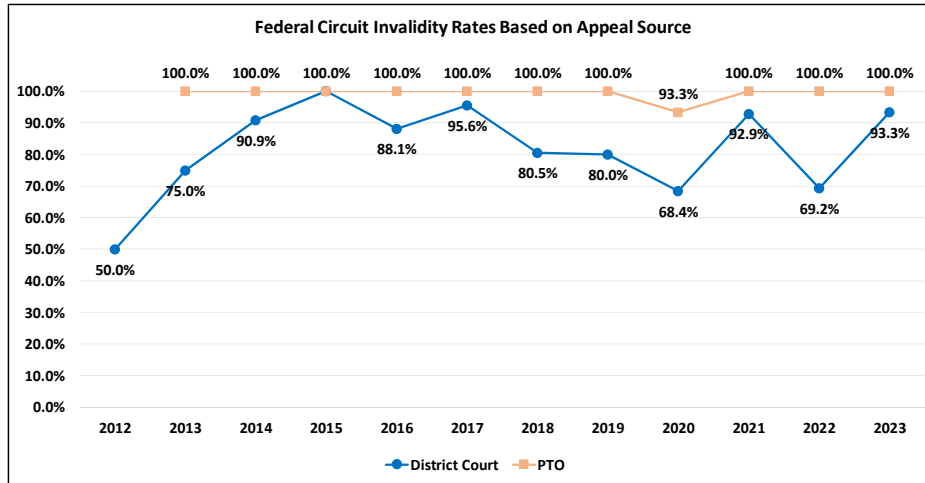
Figure 9



However, invalidation rates from district court appeals are lower, so if the trend of fewer appeals from the PTO continues, this may also reduce the overall

invalidity rate in future years.⁹⁰ Additionally, if the percentage of appeals shifts away from early Rule 12 challenges—and results in more district court decisions finding validity—the Federal Circuit’s invalidity rate could further decline.

Figure 10

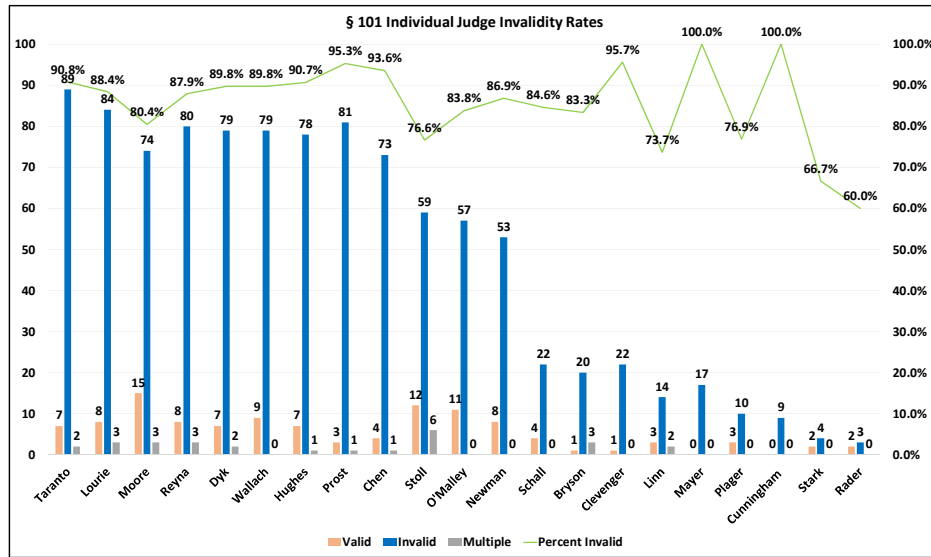


D. WORKLOAD AT THE FEDERAL CIRCUIT

In terms of decision-makers at the Federal Circuit, it appears that the § 101 workload has been divided fairly evenly among the active judges, with twelve judges having participated in more than fifty § 101 decisions. Regarding each judge’s inclination to find a patent invalid under § 101, as detailed further below, every judge who has decided more than six cases has found the patents on appeal invalid at least 73% of the time. In fact, sixteen of the nineteen judges have found the patents invalid 80% or more of the time.

90. Figure 10 and other figures identifying “district court” decisions exclude two decisions from the CFC and two from the U.S. International Trade Commission (“ITC”), as those are not labeled as “district court” decisions in the *Compendium of Federal Circuit Decisions*, *supra* note 62. All of which found the patent valid.

Figure 11



IV. JUDGING § 101 PREDICTABILITY

Few would disagree with Justice Stevens’s remark that “[i]n the area of patents, it is especially important that the law remain stable and clear.”⁹¹ Predictability in patent law has been argued to play a significant role in impacting innovation, investment, and research.⁹² Indeed, the importance of predictability and stability in patent law has been universally emphasized.⁹³ In fact, ensuring predictability in patent law was the core reason for creating a specialized appellate court that would have sole jurisdiction over patent appeals.⁹⁴ Not surprisingly, then, much of the criticism regarding the negative impact of the *Mayo/Alice* framework on innovation has been focused on its purported lack of predictability. Critics of the framework have advanced an often-repeated narrative that neither judges, patent examiners, nor practitioners can predictably apply the current law to determine the “correct” outcome for claims challenged under § 101.

Our analysis of more than a decade’s worth of § 101 appellate outcomes indicates that there is significant room to question the assertion that the *Mayo/Alice* framework cannot be predictably applied—particularly with regard to

91. *Bilski v. Kappos*, 561 U.S. 593, 613 (2010) (Stevens, J., concurring).

92. See, e.g., Kesan & Wang, *supra* note 38, at 530–31.

93. See, e.g., U.S. PAT. & TRADEMARK OFF., *supra* note 31, at ii, 16.

94. See, e.g., Ryan Vacca, *Revisiting the Federal Circuit En Banc*, 37 HARV. J.L. & TECH. 501, 504–06 (2024); Jason Rantanen & Lee Petherbridge, *Disuniformity*, 66 FLA. L. REV. 2007, 2039 (2014) (“The purpose of vesting exclusive jurisdiction for patent appeals in the Federal Circuit was to permit that court to develop patent law in the direction of greater clarity, uniformity, and predictability in application.”).

judges' ability to do so. The Federal Circuit's § 101 decisions since *Mayo* show that district courts and the PTO are consistently reaching the correct outcomes *and* correctly applying the law.⁹⁵ Moreover, there is very little disagreement among Federal Circuit judges on § 101 outcomes or reasoning. Thus, despite what some judges may say,⁹⁶ and even though there may be differences of opinion on what the law *should be*, federal judges and PTO administrative judges appear to be quite capable of applying the law as it currently exists.

A. THE LOUD CHORUS OF CRITICISM

While many have maintained that the flexibility of the *Mayo/Alice* framework can be predictably applied,⁹⁷ particularly in light of the development of the doctrine through the courts and the PTO's guidance over the past decade,⁹⁸ a seemingly larger majority has been vocally skeptical about the framework's administrability and predictability.

Several Federal Circuit judges have openly and emphatically asserted that § 101 cannot be applied predictably:

“In the current state of Section 101 jurisprudence, inconsistency and *unpredictability of adjudication* have destabilized technologic development in important fields of commerce.”⁹⁹

“As the nation's lone patent court, we are at a loss as to how to uniformly apply § 101.”¹⁰⁰

“Because [the § 101] exceptions are complex and their application is reviewed de novo, district courts might be tempted to opt for *an effective coin toss* rather than a reasoned analysis when faced with a

95. In referring to “correct” outcomes, we merely mean as judged by the appellate judges on the Federal Circuit. If the Federal Circuit judges determined the lower tribunal's result and reasoning to be correct, for purposes of this paper, so do we. We do not make qualitative assertions that the decision was decided as we believe it should have been decided, nor do we overlook the possibility that some might disagree with the decisions, reasoning, or analyses. As already detailed, there are many who disagree with the underlying framework and will inevitably disagree with at least some of the outcomes. In determining the predictability of applying the doctrine, however, our evaluation of correctness is premised on the decisions and outcomes of those charged with making the decisions in each case: judges.

96. Sipe, *supra* note 39, at 30–31; *see also infra* text accompanying notes 99–103 (providing comments from Federal Circuit judges regarding state of the law).

97. *See, e.g.*, U.S. PAT. & TRADEMARK OFF., *supra* note 31, at 16 (“Numerous respondents claimed that the current law is sufficiently clear, predictable, and consistent.”); *see also* Reinecke, *supra* note 39, at 584 (“[T]he two-step test is clearly not impossible to administer coherently.”); *In re Killian*, 45 F.4th 1373, 1380–81 (Fed. Cir. 2022), *cert. denied sub nom.* Killian v. Vidal, 144 S. Ct. 100 (2023) (rejecting an argument that “the *Alice/Mayo* standard [is so indefinite to be] arbitrary and capricious under the Administrative Procedure Act (APA)”).

98. TOOLE & PAIROLERO, *supra* note 38, at 6–7; U.S. PAT. & TRADEMARK OFF., *supra* note 31, at 11–12.

99. Yu v. Apple Inc., 1 F.4th 1040, 1049 (Fed. Cir. 2021) (Newman, J., dissenting) (emphasis added).

100. Am. Axle & Mfg., Inc. v. Neapco Holdings LLC, 977 F.3d 1379, 1382 (Fed. Cir. 2020) (Moore, J., concurring).

challenge under § 101. This is especially so where the abstract idea exception is invoked.”¹⁰¹

“The law, as I shall explain, renders it near impossible to know with any certainty whether the invention is or is not patent eligible. Accordingly, I also respectfully dissent from our court’s continued application of this incoherent body of doctrine.”¹⁰²

“The problem with this test, however, is that it is indeterminate and often leads to arbitrary results.”¹⁰³

The current proposed bill (the fourth of its kind) by Senators Tillis and Coons expressly identifies the lack of predictability as the *sole* driver for overhauling the current law: “Efforts by judges of district courts and courts of appeals of the United States to apply the exceptions . . . have led to extensive confusion and a lack of consistency . . . throughout the judicial branch of the Federal Government and Federal agencies”¹⁰⁴

Those judges and legislators are joined by a loud chorus of scholars, practitioners, policy drivers, and business leaders who echo the sentiment.¹⁰⁵ Even the Solicitor General recently took the position that the Federal Circuit and PTO have struggled to predictably apply the law—though the Solicitor General notably left out district courts from that list.¹⁰⁶

Of course, this is not the first time that a patent law issue has been characterized to be in crisis and in need of major reform. The distress calls on patent eligibility sound all too familiar to the purported dire state of claim construction in the early 2000s, as summarized by Professor Jeffrey A. Lefstin:

101. *Realtime Data LLC v. Reduxio Sys., Inc.*, 831 F. App’x 492, 493 (Fed. Cir. 2020) (emphasis added).

102. *Interval Licensing LLC v. AOL, Inc.*, 896 F.3d 1335, 1348 (Fed. Cir. 2018) (Plager, J., concurring in part and dissenting in part).

103. *Smart Sys. Innovations, LLC v. Chi. Transit Auth.*, 873 F.3d 1364, 1377 (Fed. Cir. 2017) (Linn, J., concurring in part and dissenting in part).

104. Patent Eligibility Restoration Act of 2023, S. 2140, 118th Cong. § 2(3) (2023).

105. Gruner, *supra* note 20, at 1061 (asserting that *Alice* “produc[ed] a fragmented (and unpredictable) body of subsequent case law from which neither later courts nor patent specialists can draw much direction”); see also David O. Taylor, *Amending Patent Eligibility*, 50 U.C. DAVIS L. REV. 2149, 2155–56 (2017) (“[T]he Supreme Court has resurrected a purely subjective test that the USPTO and courts cannot apply with any predictability given its subjective nature.”); Daniel R. Cahoy, *Patently Uncertain*, 17 NW. J. TECH. & INTELL. PROP. 1, 37–40 (2019) (“What all of this means from the perspective of innovators in certain fields, such as software and life sciences, is that patentable subject matter is an uncertainty minefield.”); Michael Xun Liu, *Subject Matter Eligibility and Functional Claiming in Software Patents*, 20 N.C. J.L. & TECH. 227, 266 (2018) (“[F]iguring out which software patents are eligible requires wading into a morass of seemingly conflicting judicial decisions.”).

106. Brief for the United States as Amicus Curiae at 19–21, *Interactive Wearables, LLC v. Polar Electro Oy*, 143 S. Ct. 2482 (2023) (mem.) (No. 12-1281), 2023 WL 2817859 (“Recent Federal Circuit precedent reflects significant confusion over the application of this Court’s Section 101 decisions. . . . In recent years, Section 101 cases have repeatedly fractured the Federal Circuit. . . . The U.S. Patent and Trademark Office (USPTO) has also struggled to apply this Court’s Section 101 precedents in a consistent manner.”).

The law of patent claim interpretation, we are told, is a mess. . . . Perhaps no subject is as central to patent law. . . . Yet, according to many observers, instability and unpredictability in the law of claim interpretation have reached a point of crisis. Dire warnings that the appellate courts have left off all stability, predictability, and certainty are not unique to patent law, nor to this era. But . . . commentators, practitioners, trial judges, and even some judges of the Federal Circuit themselves seem united in their view that uncertainty and unpredictability are the order of the day.¹⁰⁷

It has been two decades since this alleged crisis arose, and there have been no Supreme Court opinions or legislative changes to claim construction law to save the day. Instead, the key guiding light that has served as the compass for district courts, the PTO, and practitioners on claim construction issues is a 2005 Federal Circuit en banc decision: *Phillips v. AWH Corp.*¹⁰⁸

To be sure, there existed then¹⁰⁹—and still exist now¹¹⁰—fundamental disagreements among Federal Circuit judges on the appropriate methodology for claim construction. However, Lefstin’s work at the time revealed that claim construction law was in nowhere near the state of disarray that it had been represented to be. By comparing the frequency of dissent at the Federal Circuit on claim construction issues to other patent law issues, Lefstin found that claim construction was no less determinate or predictable than any other patent law issue at the Federal Circuit.¹¹¹ Specifically, Lefstin found very little difference in dissent frequencies on patent issues decided by the Federal Circuit, as seen below.

Table 1

Claim Construction	Infringement	Invalidity	Inequitable Conduct	Other
8.3%	7.5%	7.7%	8.5%	9.2%

Lefstin also found that “the average indeterminacy of patent claim construction was virtually indistinguishable from the indeterminacy associated with contract interpretation at the regional Circuit Courts of Appeals.”¹¹² If similar findings exist for patent eligibility law now, perhaps the same fate awaits patent eligibility.

107. Jeffrey A. Lefstin, *The Measure of the Doubt: Dissent, Indeterminacy, and Interpretation at the Federal Circuit*, 58 HASTINGS L.J. 1025, 1025–26 (2007) (footnote omitted).

108. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315–17 (Fed. Cir. 2005) (en banc).

109. R. Polk Wagner & Lee Petherbridge, *Is the Federal Circuit Succeeding? An Empirical Assessment of Judicial Performance*, 152 U. PA. L. REV. 1105, 1111 (2004) (“[W]e find that the Federal Circuit utilized the procedural approach in 63% of the cases and the holistic approach in the remaining 37%.”).

110. Judge Paul Michel (Ret.) & John Battaglia, *On Claim Construction, Predictability, and Patent Law Consistency: The Federal Circuit Needs to Vote En Banc*, IPWATCHDOG (Feb. 3, 2020, 4:15 PM), <https://ipwatchdog.com/2020/02/03/claim-construction-predictability-patent-law-consistency-federal-circuit-needs-vote-en-banc/id=118481> [https://perma.cc/CB73-NJ6D].

111. Lefstin, *supra* note 107, at 1069–88.

112. *Id.* at 1072 tbl.14, 1087 (emphasis omitted).

B. GROUNDS FOR PREDICTABILITY CRITICISMS

Unfortunately, the argument that the *Mayo/Alice* framework is unpredictable is frequently repeated in conclusory fashion without any supporting basis or reasoning. On the rare occasion the assertion is backed by some empirical evidence, that support is found in a few select studies that included relatively small time periods from many years ago.¹¹³ Such outdated studies are unlikely to be reliable empirical evidence on the *current* state of predictability regarding the *Mayo/Alice* framework, as much has happened in the past seven years. Thus, the narrative that the framework is unpredictable (at least currently) has largely taken on a truth of its own.

One of the main arguments for unpredictability is that judges can disagree on the “level of abstraction” regarding the “focus” of the claim and what the claim is “directed to” under Step 1 of the *Mayo/Alice* framework. Generally speaking, we agree with the characterization that the current framework allows room for judges to characterize the “focus” of the claim in a different light, and as we recognize in this paper, this doctrinal “wobble room” can lead to difficult cases. However, our empirical analysis of “error rates” found only 2 (out of 166) instances in which the Federal Circuit noted that a district court judge framed the abstractness level incorrectly.¹¹⁴ This suggests that despite the doctrinal flexibility, there isn’t as much disparity on this issue as we have been led to believe. Moreover, nearly every area of the law, including the copyright eligibility standard,¹¹⁵ and virtually every key area of patent doctrine is subject to the same criticism as well. Questions regarding claim meaning, indefiniteness, and obviousness are a far cry from clear bright lines. They, too, provide doctrinal flexibility. So, those looking for clear bright-line certainty are sure to be disappointed in many areas of the law, but especially patent law, and not just subject matter eligibility.

We address this argument at the outset to draw a distinction between flexibility in the law (a phenomenon that allows judges and other decision-makers flexibility in how to frame and apply the law to a set of facts) and unpredictability in the law (a result allowed through unreasonable flexibility in the law that makes it impossible to determine expected outcomes with reasonable certainty). Thus, in considering and evaluating the predictability of § 101 law, we consider predictability not in the abstract but in context—relative to the flexibility in the law of other areas of patent doctrine.

Perhaps the level of flexibility in other doctrines offers less (or more) doctrinal wiggle room than the § 101 framework, but we ultimately see this issue of degree as more about process rather than outcome, at least when it comes to predictability. If two or more judges frame the “focus” of the claims differently, but all agree the claims are invalid, the disagreement has no

113. See, e.g., Gruner, *supra* note 20, at 1068–69 (arguing *Alice* is currently a systemic failure based on empirical study of *Alice* in only PTO proceedings that included a mere two years of post-*Alice* data from more than seven years ago).

114. See *infra* note 231.

115. See Mark R. Carter, *Copyright’s Hand Abstractions Test for Patent’s Section 101 Subject-Matter Eligibility*, 30 SANTA CLARA HIGH TECH. L.J. 469, 473 (2014).

impact on the outcome, and seemingly the question of predictability, because the relevant question under § 101 is not whether the judges view the claims in the same level of abstractness but whether they view them as patent eligible. Whether judges read the scope and meaning of claims in the same way strikes us more as an issue of claim construction. As such, while doctrinal flexibility is an important consideration (and likely a driver) in evaluating predictability, we believe the proper focus is on the predictability of outcomes rather than merely doctrinal flexibility.

Aside from the overarching criticism of doctrinal flexibility—which we appreciate and recognize—the nonconclusory arguments on unpredictability that have been offered fall along several evidentiary grounds: (1) district courts frequently invalidate patents issued by the PTO; (2) district courts boast significantly different invalidity rates; (3) the Federal Circuit is devastatingly fractured in applying the law; and (4) Federal Circuit judges’ diverging views of the law have led to disparate judge eligibility rates. Even setting aside the lack of support from comprehensive current empirical studies for all but the last argument, these metrics suffer from significant flaws for the purpose of evaluating the predictability of the *Mayo/Alice* framework.¹¹⁶

1. High District Court Invalidation Rates

One of the most frequently cited bases in arguing that § 101 is unpredictable relies on prior studies that have shown high invalidity rates of patents challenged under § 101 at the district courts.¹¹⁷ The explicit (or sometimes implicit) argument is that because the PTO issued a patent as valid and the district court later invalidated the patent, the law is unpredictable. The difference in outcomes between these two adjudicative bodies is *prima facie* evidence that “no one really knows how to apply the framework,” and we are destined to receive inconsistent and unpredictable results when different parties are tasked with deciding whether a patent claim satisfies the *Mayo/Alice* framework—or so the argument goes. This is perhaps the weakest argument, and reliance on such studies in support of this argument is problematic for several reasons.

First, some of the patents invalidated at the district court were issued from the PTO prior to the *Mayo/Alice* decisions, and others were issued before the case law on how to apply the eligibility framework developed. Thus, for at least some of these decisions, the PTO was applying a different law at the time it decided eligibility when it issued the patent. For patents prosecuted prior to *Mayo*, it is entirely improper to argue that the *Mayo/Alice* framework is

116. Some have questioned whether critics’ arguments based on predictability might simply be a mask for their general disdain of the current law and its invalidation of so many patents. We certainly cannot eliminate the possibility that some have made (or repeated) arguments of unpredictability because of dissatisfaction with how current § 101 law balances the line for patent eligibility. But our data in this study allows us to evaluate neither the driver nor intent of the arguments surrounding predictability. As such, we have sought to clarify what we view as the proper question of predictability, address the merits of the key arguments that § 101 is unpredictable, and propose what we view as better metrics of predictability.

117. See, e.g., Gruner, *supra* note 20, at 1076–77 (citing Sachs, *supra* note 40).

unpredictable by citing a comparison of outcomes that applied two different legal standards for determining eligibility.¹¹⁸

Second, even for patents issued after *Alice*, the PTO simply may not have devoted meaningful time or effort to the question of eligibility (though presumably, they at least considered it). As other studies have found, on average, patent examiners spend less than twenty hours per application, which covers all patentability issues.¹¹⁹ Because patent examinations are not contested proceedings, examiners do not always have the time or resources necessary to devote to meaningfully analyzing all patentability issues. Thus, if the PTO did not meaningfully analyze patent eligibility during prosecution, a contested district court decision later finding ineligibility does not reliably speak to predictability. Rather, it may speak to the inadequate resources available to patent examiners or perhaps a patent examiner simply missing the issue.

Third, district courts invalidate a significant number of patents even outside of § 101. While it may be surprising to those not familiar with patent prosecution, a substantial percentage of patents issued by the PTO are later found invalid. Some scholarship indicates that “nearly half of all patent[s]” that are litigated to a decision are found invalid.¹²⁰ Proceedings at the PTAB in the past decade have been even less flattering for the PTO’s issuance of invalid patents.¹²¹ Of the patents that reached a final written decision, 62% included claims that were *all* invalid.¹²² Another 18% of those decisions included a patent with some invalid claims.¹²³ That means that a mere 20% of patents granted by the PTO and ultimately adjudicated by the PTAB were valid as issued—on grounds *other than* § 101.¹²⁴

The issuance of a significant number of invalid patents by the PTO may be due to a lack of adequate resources for examiners to fully address all issues or systemic institutional pressures that incentivize granting a patent in close or questionable cases. As Professors Jonathan Masur and Melissa Wasserman have argued, the PTO may be structured so as to “err on the side of granting”

118. Notably, even some time after *Mayo* may be suspect to rely on for such purposes, as practitioners and patent examiners alike needed time to adjust to the impact of the Supreme Court’s decision in *Mayo*. Indeed, in the litigation context, a significant rise in utilization of § 101 challenges did not occur until after the *Alice* decision in June 2014. *See, e.g., supra* Figure 1.

119. *See, e.g.,* Mark A. Lemley, Essay, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1528 (2001) (“Examiners do not in fact spend long hours poring over a patent application or the prior art. They spend very little time, and far less than either the lawyers or the triers of fact in infringement cases.”); Paul R. Gugliuzza, *Patent Law’s Deference Paradox*, 106 MINN. L. REV. 1397, 1439 (2022) (“[O]n average, a patent examiner spends nineteen hours total working on an application.”); Matthew Sag & Kurt Rohde, *Patent Reform and Differential Impact*, 8 MINN. J.L. SCI. & TECH. 1, 18 (2007); Gideon Parchomovsky & Michael Mattioli, *Partial Patents*, 111 COLUM. L. REV. 207, 215 (2011).

120. *See* Paul R. Gugliuzza, *(In)valid Patents*, 92 NOTRE DAME L. REV. 271, 272 (2016).

121. U.S. Pat. & Trademark Off., PowerPoint Presentation, Trial Statistics, at slide 11 (Aug. 2020), https://www.uspto.gov/sites/default/files/documents/trial_statistics_20200831.pdf [https://perma.cc/97YH-LT8S].

122. *Id.*

123. *Id.*

124. *Id.*

patents.¹²⁵ In patent application proceedings, only the applicant and the examiner participate, and only decisions *not* to allow a patent are appealed. This creates a one-way ratchet that pushes the PTO towards allowance of patents and, arguably, the law in a direction more favorable to patent applicants. In the context of § 101, this patent-granting incentive may be exacerbated by the PTO's patent eligibility guidance documents. The Federal Circuit has repeatedly said that the PTO's guidance documents—as helpful as they may be to practitioners and examiners—do “not carry the force of law.”¹²⁶ Yet, patent examiners routinely apply the guidance from the PTO (as they must), which some scholars have argued results in the PTO applying a different law than that called by judicial precedent.¹²⁷ So, there could be a greater percentage of patents issued by the PTO after 2019 which may have enjoyed a broader view of eligibility than the law calls for. As a result, even those patents that were issued post-*Alice* and underwent a meaningful discussion of § 101 may include a greater percentage that are actually invalid when the judicial legal standard (used by district courts) is applied.

Taking into account all of these considerations, it is not at all surprising that the PTO sometimes grants patents a court later finds invalid under § 101. Moreover, they raise significant doubts for relying on a comparison between PTO grants and district court decisions to judge predictability of the *Mayo/Alice* framework. If the PTO is applying a legal standard different from the one mandated by the courts—or did not meaningfully analyze the § 101 issues—then citing a difference in outcomes appears to be an improper comparison and an invalid indicator of predictability.

2. Disparate District Court Invalidation Rates

Another empirical metric used to support the unpredictability argument is the disparity in invalidity rates among district courts that have decided § 101 cases. Some of the earlier scholarship indicates that some district courts (with at least ten § 101 decisions) find patents invalid 80% of the time while others less than 40% of the time.¹²⁸ Although these statistics help to understand how § 101 law is making its way through the district courts, its use to support an argument on predictability seems similarly misplaced.

First, the grouping of cases within each court is different from the others. For example, some include more cases based on software patents, while others

125. See Jonathan Masur, *Patent Inflation*, 121 YALE L.J. 470, 474 (2011); Melissa F. Wasserman, *The PTO's Asymmetric Incentives: Pressure to Expand Substantive Patent Law*, 72 OHIO ST. L.J. 379, 407 (2011); see also Lisa Larrimore Ouellette, *What Are the Sources of Patent Inflation? An Analysis of Federal Circuit Patentability Rulings*, 121 YALE L.J.F. 347, 347–48 (2011) (responding to Masur, *supra*).

126. *cxLoyalty, Inc. v. Maritz Holdings Inc.*, 986 F.3d 1367, 1376 n.1 (Fed. Cir. 2021) (quoting *In re Rudy*, 956 F.3d 1379, 1382 (Fed. Cir. 2020)).

127. See Joshua D. Sarnoff, Comment in *Regard to the USPTO Request for Information on the Current State of Patent Eligibility Jurisprudence in the United States* 4–5 (Oct. 15, 2021), https://downloads.regulations.gov/PTO-P-2021-0032-0114/attachment_1.pdf [<https://perma.cc/5TX7-HU6U>]; see also Lemley & Zyontz, *supra* note 40, at 50 (“The PTO issued guidelines in January 2019 that effectively instructed patent examiners to ignore Federal Circuit case law.”).

128. Lemley & Zyontz, *supra* note 40, at 75.

include more biotech patents. As others have found—and as we found—there is a significant difference in invalidity rates based on this distinction.¹²⁹ But even within the same subject matter area, there exist important differences that may be outcome determinative. Each case is decided on its own facts and its own specific patent claims. Thus, we cannot draw confident conclusions that the outcome of any given case (for example in the 80% invalidity district) would have been different had it been decided in a different district (for example in the 40% invalidity district). Moreover, a district-by-district comparison of *different* patents and cases also fails to take into account the difference in invalidity outcomes at the district courts over time, which have consistently and significantly declined (unlike the Federal Circuit outcomes).¹³⁰ Therefore, a high-level metric of outcomes at different courts based on different patents raises equally significant doubts about its reliability in evaluating the predictability of patent eligibility law.

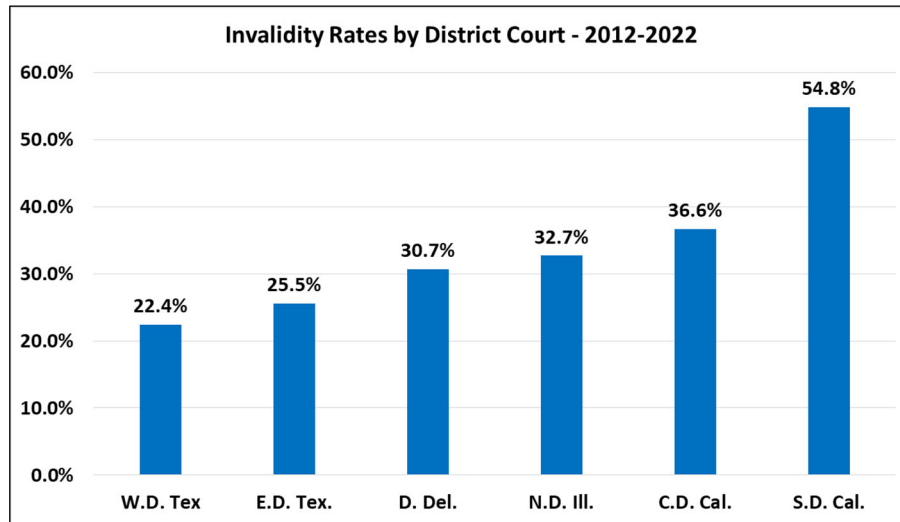
Second, if there are differences in judicial views on how to apply the law, that may simply be based on judges' own perceptions and views regarding all of patent law—not just § 101. Some judges simply might harbor more pro-patent or anti-patent views that are reflected not just in § 101 outcomes but in all patent outcomes. Indeed, similar invalidity findings are reported across different district courts under other statutory grounds for invalidity. For example, the Western District of Texas and Eastern District of Texas have some of the lowest invalidity rates under § 101, but as shown in Figure 12, they also have some of the lowest overall invalidity rates (based on all statutory grounds, including 35 U.S.C. §§ 102 and 103)¹³¹:

129. *Id.*; see *infra* Figure 28; see also Kesan & Wang, *supra* note 38, at 604 (illustrating how software, bioinformatics, and business methods received varying § 101 rejections).

130. Lemley & Zyontz, *supra* note 40, at 65 (showing an average district court invalidity rate around 70% in 2014 before declining to less than 40% in 2019); Sachs, *supra* note 40 (showing an invalidity rate between district courts and the Federal Circuit of 74% in 2015 before declining to 50% in 2019).

131. See Nikola L. Datzov & Jason Rantanen, District Court Invalidity Rates (Nov. 14, 2024) (unpublished dataset) (on file with the *Iowa Law Review*); see also Anderson & Gugliuzza, *supra* note 79, at 441 (finding that the Eastern District of Texas grants only 17.6% of defendants' summary judgment motions, in comparison to 32.1% in the District of Delaware and 33.7% in the Northern District of California).

Figure 12



Third, each district has its own procedural rules that could significantly impact the type and number of § 101 challenges that are brought, which could be factors (beyond the strength of the claims) that impact invalidity rates. For example, the Eastern District of Texas previously required leave to bring a § 101 motion¹³² and in 2019 issued a standing order requiring “Eligibility Contentions.”¹³³

Thus, some disparity in invalidity rates across different district courts (or judges) might simply reflect differences in procedural rules or doctrinal, policy, and philosophical viewpoints on patent law rather than an inability to understand or apply patent eligibility law (as well as other areas of patent law). As a result, metrics on different district court § 101 invalidity rates are not a particularly reliable indicator for evaluating the predictability of § 101 specifically.

Finally, it is worth noting that the disparity in district court invalidity rates is not especially high. In fact, many district courts with a substantial number of § 101 decisions have produced comparable invalidity rates. For example, eight of the fourteen districts examined in Lemley and Zyontz’s study were

132. Ryan Davis, *Judge Gilstrap Requires Permission to File Alice Motions*, LAW360 (June 9, 2015, 5:00 PM), <https://www.law360.com/ip/articles/665542> (on file with the *Iowa Law Review*).

133. Standing Order Regarding Subject Matter Eligibility Contentions Applicable to All Patent Infringement Cases Assigned to Chief District Judge Rodney Gilstrap (E.D. Tex. July 25, 2019), <https://txed.uscourts.gov/sites/default/files/judgeFiles/EDTX%20Standing%20Order%20Re%20Subject%20Matter%20Eligibility%20Contentions%20.pdf> [<https://perma.cc/RZG2-K4FE>]. The “Eligibility Contentions” require a party challenging a patent claim’s eligibility to identify the asserted exception to which the claim is directed “and the factual and legal basis therefor,” along with additional explanations for how the elements of the claimed invention were “well understood, routine, and convention” in a particular industry. *Id.*

between 65% and 50% invalidity.¹³⁴ Three were between 80% and 70%, and three were between 40% and 25%.¹³⁵ Sachs's study showed that three of the four districts (District of Delaware, Northern District of California, and Central District of California) with a substantial size of § 101 decisions (more than thirty cases) all had an invalidity rate between 64% and 53%, with the Eastern District of Texas the sole outlier at 42%.¹³⁶ The districts with less than thirty decisions fluctuated from 82% (W.D. Wash.) to 35% (W.D. Tex.).¹³⁷ As such, the disparity in invalidity rates across different districts—for different cases and different patent claims—is not as scattered as might first appear.

3. Divided Federal Circuit Decisions

The other commonly cited evidence of inconsistency and unpredictability in § 101 law is the purported devastating division within the Federal Circuit.¹³⁸ The go-to exemplar for this has been the *American Axle* decision, which, after a divided panel opinion, fractured the Federal Circuit judges into a 6–6 vote on eligibility.¹³⁹ However, while looking at the frequency of dissent within appellate decisions is one of the leading ways in which to determine if a particular area of law is predictable,¹⁴⁰ this is not the type of support critics rely on. Rather than citing the overall rate of dissent at the Federal Circuit—which to date has not been studied for patent eligibility—critics of current patent eligibility law frequently rely on only one or a few cases as purported evidence of significant division among the judges. In our view, a single case or a few cases of dissent on a topic are not a reliable indicator that an entire area of law is unpredictable. Such division may merely demonstrate a difference of opinion in how the law applies to one or a few sets of facts, or it may indicate differences in how a handful of judges believe the law should be applied. But it is not a particularly strong metric that judges, in general, do not predictably apply the law.

If the Federal Circuit demonstrated a high rate of dissents throughout *all* or a substantial portion of its cases, it would support the argument that the law is unpredictable. However, as we analyze below, this is not the case with

134. Lemley & Zyontz, *supra* note 40, at 78.

135. *Id.*

136. See Sachs, *supra* note 40.

137. *Id.*

138. See, e.g., *Athena Diagnostics, Inc. v. Mayo Collaborative Servs., LLC*, 927 F.3d 1333, 1337 (Fed. Cir. 2019) (Hughes, J., concurring); Gruner, *supra* note 20, at 1073–74.

139. *Am. Axle & Mfg., Inc. v. Neapco Holdings LLC*, 966 F.3d 1347, 1348, 1367 (Fed. Cir. 2020) (denying petition for rehearing en banc).

140. See, e.g., Rantanen & Petherbridge, *supra* note 94, at 2015 (“Perhaps the most objective (and one of the most traditionally accepted) way to measure judicial disagreement over the content of the law is to measure separate writings.”); Christopher A. Cotropia, *Determining Uniformity Within the Federal Circuit by Measuring Dissent and En Banc Review*, 43 LOY. L.A. L. REV. 801, 810 (2010) (“Dissents are relevant to the question of uniformity . . . Dissents show a division among the judges of a court . . . on a given legal issue.”); see also Arthur D. Hellman, *Precedent, Predictability, and Federal Appellate Structure*, 60 U. PITT. L. REV. 1029, 1038–43 (1999) (relying on dissents to analyze court unpredictability).

§ 101. In fact, examination of the Federal Circuit's *entire* body of case law demonstrates that the court is remarkably consistent and uniform in its application of the law. Our analysis shows that only 6.5% of § 101 decisions at the Federal Circuit result in a dissent, which is directly in line with the average rate of dissent at the Federal Circuit on issues other than § 101 and far below some of the historic dissent rates on topics lacking consensus.¹⁴¹ Even looking more broadly at *potential* disagreement (but not with the result), there were only thirty-seven decisions (9.6%) that resulted in a separate opinion. As such, we view the hundreds of cases in which the judges showed no disagreement as a better indicator of predictability than the outlier few in which they did. This is especially true in comparison with dissent rates in other areas of patent law at the Federal Circuit over the past few decades.

4. Individual Judges' Patent Ideology and Panel Composition Effects

In addition to the purported diverging views among the Federal Circuit judges on § 101, some have argued that the Federal Circuit's random panel assignments (and judges' patent ideology) have played a role in § 101 becoming "hopelessly unpredictable."¹⁴²

In his empirical study of Federal Circuit § 101 determinations, Sipe concluded that there exist "panel-dependent outcomes" on § 101 decisions.¹⁴³ Specifically, he found a significant spread of eligibility outcomes (ranging from 3.2% to 20.4%) for judges who heard more than thirty "decisions,"¹⁴⁴

141. See *infra* notes 253–59 and accompanying text.

142. Sipe, *supra* note 53, at 499.

143. *Id.* at 457.

144. *Id.* at 469. As with our study, there were several judges who heard an insignificant number of § 101 cases to be reliably included in the analysis of the data and were excluded by the author. Due to a methodological difference, Sipe's ranges are greater than ours. Whereas our study used a single opinion or Rule 36 affirmance as the unit of analysis, Sipe used claim groupings as a § 101 "decision" as his unit of analysis—meaning that each group of claims addressed by the Federal Circuit counted as a separate "decision." *Id.* at 458–64. So, if the Federal Circuit decided three separate groupings of patent claims (all in the same patent) in a single decision, that counted as three "decisions" for purposes of his analysis. *Id.* at 461–64. Our research shows that in nearly all § 101 cases, the Federal Circuit reaches the same outcome for all of the claims that are at issue in the appeal. In 93% of cases, the claims at issue were all invalid or all valid—in fact, only 27 out of 386 decisions even included a separate analysis for different claims. See *supra* note 61 and accompanying text. Thus, while each patent claim is technically a separate invention and a decision of its patent eligibility is independent of any other patent claim (even if in the same patent), the Federal Circuit, district courts, the PTAB, and parties alike use representative claims in addressing the eligibility of claims. In addition, it is largely impossible to apply the claim grouping approach to Rule 36 summary affirmances because there is no judicial analysis to review. For these reasons, we chose to use a case decision as our "unit of analysis" rather than individual claims or groupings of claims. The effect is modest, but using either individual claims or groupings of claims has the potential to amplify the spread of eligibility rates. For example, if one judge analyzed five separate groupings of claims and found them all eligible (as 93% of the time the Federal Circuit does) and another judge analyzed a single group of claims and found them to be eligible, and each of the judges decided nine other cases with each having a single grouping of ineligible claims, one judge's eligibility rate would be 35.7% while the other would be 10%—even though each of them issued only one "opinion" of eligibility for (likely) very closely related claims. That said, the specific

concluding that “a majority-strict panel appears roughly twice as likely to find a given patent ineligible under § 101 compared to a majority-lenient one.”¹⁴⁵

At a fundamental level, we do not disagree that different Federal Circuit judges vote differently on patent law issues, that some judges have a more “pro-patent” ideology than others, and that the composition of a particular panel could lead to different outcomes for a given appeal. Scholars have extensively documented this phenomenon across patent law issues at the Federal Circuit, most recently in a detailed study by Professor Jason Reinecke.¹⁴⁶ Where we disagree is in concluding that § 101 is any different than other patent law issues. Critically, Sipe’s study does not demonstrate that differences in individual judge voting behavior are greater than on other routine patent law issues.¹⁴⁷ To the contrary: The differences in voting patterns on § 101 that Sipe reports largely match the patent ideology voting patterns that Reinecke reports¹⁴⁸—in other words, judges that generally express a pro-patent ideology tend to be more likely than their peers to vote in favor of patent eligibility, and judges that generally express an anti-patent ideology tend to vote against patent eligibility more often. Thus, when looked at in the broader context of patent law, both our study and Sipe’s study show that individual judge variability on § 101 looks essentially like variability on other standard patent law doctrines.

Indeed, while our study corroborates Sipe’s conclusion that different Federal Circuit judges determined eligibility at different rates, that is consistent with patent law decisions more generally. In our study, judges who participated in more than thirty § 101 “decisions”—defined as case opinions rather than claim groupings—the spread of eligibility rates ranged from 3.5% to 16.3%.¹⁴⁹ The spread is slightly lower than that found by Sipe, which is very likely due to the different approach in defining a “unit of analysis.” Even so, our two separate studies produced remarkably consistent results. We found that Federal Circuit Judges Prost (3.5%), Chen (5.1%), and Taranto (7.1%) had the lowest eligibility rates;¹⁵⁰ whereas Sipe found that Chen (3.2%), Taranto (4.6%), and Prost (4.9%) had the lowest eligibility rates.¹⁵¹ Similar results were observed at the opposite end: In our study, Federal Circuit Judges Moore

choice of unit of analysis here doesn’t make an enormous difference since only about 7% of the opinions included multiple units of analysis. *Accord* Rantanen, *supra* note 60, at 272–73 (observing that the specific choice of record unit in claim construction studies is “relatively small”).

145. Sipe, *supra* note 53, at 477.

146. See Jason Reinecke, *Decisionmaking in Patent Cases at the Federal Circuit*, 81 WASH. & LEE L. REV. 169, 169–70 (2024) (citing empirical studies); see also Wagner & Petherbridge, *supra* note 109, at 1163.

147. See Sipe, *supra* note 53, at 478–79.

148. Compare *id.* at 469 (discussing the *Alice/Mayo* Eligibility Rates at the Federal Circuit, by judge), with Reinecke, *supra* note 146, at 195 (discussing the judges’ voting patterns).

149. See *supra* Figure 11.

150. See *supra* Figure 11 (showing invalidity rates and number of validity, invalidity, and “multiple” outcome decisions).

151. See Sipe, *supra* note 53, at 469 tbl.2.

(16.3%), O'Malley (16.2%), and Stoll (15.6%),¹⁵² were the judges with the highest eligibility rates, whereas Sipe found Moore (20.4%), O'Malley (15%), and Stoll (14.6%) to be near the top.¹⁵³

One important caveat to drawing confident conclusions from this data is that due to the small number of decisions for each judge, there could be some case selection effects. For example, is Judge Moore more inclined to find eligibility than Judge Chen, or was Judge Moore simply assigned to decide more cases than Judge Chen where the proper finding was that the claims were eligible (i.e., every Federal Circuit judge would agree the claims are eligible)?

But we agree with the general proposition that in some cases which judges are assigned to the panel (and what patent ideology they believe) can influence the court's decisions on patent claim validity. As confirmed by Reinecke's recent broader empirical study of Federal Circuit patent ideology, that is true for all of patent law—not just § 101.¹⁵⁴ After analyzing 2,675 decisions issued by the Federal Circuit between January 1, 2014, and May 31, 2021, Reinecke found a spread in judges' decisions that favored the patentee, ranging from 16.4% to 31.1% for judges who decided more than thirty cases¹⁵⁵:

152. See *supra* Figure 11 (showing invalidity rates and number of validity, invalidity, and “multiple” outcome decisions).

153. See Sipe, *supra* note 53, at 469 tbl.2. Sipe's study showed Judges Linn and Bryson to be in between Judge Moore and Judge O'Malley, but Judge Linn had only thirty “decisions” and Judge Bryson had only forty “decisions” in his study—neither had thirty decisions in our study—so we hesitate to compare them across studies for this question. *Id.*

154. See Reinecke, *supra* note 146, at 169–70 (“[T]he results show that, in the aggregate, patent-related ideology plays a role in voting and decision-making at the Federal Circuit—that is, some judges are more likely to vote in a pro-patentee direction than others.”).

155. *Id.* at 195 tbl.1.

Figure 13

	Pro-patentee	Pro-challenger	Mixed	% Pro-patentee	% Pro-challenger
Dyk (D)	101	426	89	16.4	69.2
Prost (R)	126	492	95	17.7	69.0
Bryson (D)	42	149	36	18.5	65.6
Lourie (R)	117	420	81	18.9	68.0
Plager (R)	22	75	16	19.5	66.4
Mayer (R)	33	112	18	20.2	68.7
Schall (R)	33	100	22	21.3	64.5
Wallach (D)	131	404	78	21.4	65.9
Reyna (D)	137	421	69	21.9	67.1
Hughes (D)	134	397	80	21.9	65.0
Chen (D)	129	366	87	22.2	62.9
Linn (D)	33	84	21	23.9	60.9
Taranto (D)	156	388	92	24.5	61.0
Stoll (D)	115	290	63	24.6	62.0
Clevenger (R)	47	122	19	25.0	64.9
O'Malley (D)	143	319	76	26.6	59.3
Moore (R)	162	328	74	28.7	58.2
Newman (R)	152	298	39	31.1	60.9
Rader (R)	14	13	5	43.8	40.6
Total	600	1752	356	22.2	64.7

The spread difference in Reinecke's study was 14.7% between the highest and lowest "pro-patentee" voting, which is very similar to the 17.2% spread difference between the highest and lowest § 101 eligibility rates observed in Sipe's study and the 12.8% eligibility rate difference observed in our study. Again, the slight differences could be explained by the fact that Reinecke and our study used case opinions as the unit of analysis, whereas Sipe's study used claim groupings as the unit. These findings—that patent ideology influences outcomes across all patent issues—are also supported by additional earlier studies, including Sipe's study of individual judges' rates in finding patents obvious, which ranged from 6.5% to 35.8%—a delta of 29.3%.¹⁵⁶ And interestingly, the four most "pro-patentee" judges we identified in our study (with a minimum of thirty decisions) were all in the top six and top five most "pro-patentee" judges identified in the Sipe and Reinecke studies, respectively:

¹⁵⁶ Sipe, *supra* note 53, at 469 tbl.2; see also Lee Petherbridge, Jason Rantanen & Ali Mojibi, *The Federal Circuit and Inequitable Conduct: An Empirical Assessment*, 84 S. CAL. L. REV. 1293, 1336 fig.12 (2011) (finding that individual judge patentee win rates varied from approximately 40% to 100% on the issue of inequitable conduct).

Table 2

Federal Circuit Judge	Datzov & Rantanen Study ¹⁵⁷ (§ 101 Outcomes)	Reinecke Study ¹⁵⁸ (All Patent Outcomes)	Sipe Study ¹⁵⁹ (§ 101 Outcomes)
Moore	#1	#2	#1
O'Malley	#2	#3	#4
Stoll	#3	#5	#5
Newman	#4	#1	#6

Coincidence this is not. Perhaps even more interesting is that the spread of patent ideological impact in other areas of patent law may be larger than in § 101:

Table 3

Study and Date of Data	Patent Law Area	Rate Spread (delta between highest and lowest pro-patentee rates)
Datzov & Rantanen (2012–2023)	§ 101	12.8%
Sipe (2012–2022) ¹⁶⁰	§ 101	17.2%
Sipe (2015–2016) ¹⁶¹	§ 103	29.3%
Reinecke (2014–2021) ¹⁶²	All Patent Areas	14.7%
Petherbridge, Rantanen & Mojibi (1983–2010) ¹⁶³	Inequitable Conduct	~ 60% ¹⁶⁴

Since these studies look at different timeframes, it is not possible to draw a concrete conclusion on that point. Thus, we leave it for future work to determine whether judges have stronger patent ideology in § 101 as compared to other areas of patent law. For our purposes, it appears that there is no meaningful difference in the spread of rates in comparison of our study with that of Sipe's study (of § 101) and Reinecke's study (of all patent areas), which mostly covered the same timeframe.

Based on the individual judge eligibility rates, Sipe also analyzed whether those rates indicated an effect based on panel composition. Sipe found that "as panel composition tilts towards judges with strict § 101 views, the rate of

157. See *supra* Figure 11.

158. See Reinecke, *supra* note 146, at 195.

159. See Sipe, *supra* note 53, at 469 tbl.2.

160. *Id.* (showing delta for judges who had decided thirty or more § 101 decisions); see also *id.* at 466–67 (indicating that while "[d]ecisions predating the *Alice/Mayo* test were included and coded . . . [T]hose data points [were] cut for purposes of the analysis").

161. *Id.* at 479 tbl.9.

162. Reinecke, *supra* note 146, at 195.

163. Petherbridge et al., *supra* note 156, at 1336 fig.12.

164. *Id.* The total number of decisions in this study was 240, and only three judges in the study had more than thirty decisions, so none were omitted in this comparison.

§ 101-eligible decisions drops sharply.”¹⁶⁵ However, while we agree that panel composition can matter, Sipe’s study likely overstates the effect because there is endogeneity between his predictor variable and the panel dependence. Sipe first determined whether a judge was “lenient” or “strict” on § 101 using their votes on patent subject matter eligibility, then used those categories to calculate percentages of outcomes on § 101 decisions when combinations of “lenient” and “strict” judges were combined.¹⁶⁶ Since the categories of “lenient” and “strict” were constructed based on how the judges voted, the effect will necessarily show up in decision outcomes involving those votes.¹⁶⁷ This methodology improperly skews the results.¹⁶⁸ Instead, the better approach would be to use an explanatory variable constructed from a separate population, as done by Reinecke.¹⁶⁹

Even assuming Sipe’s study does show evidence of panel dependence on § 101, however, that is consistent with patent issues more generally. Reinecke also found a difference in case outcomes of all patent cases based on panel composition of judges who are “pro-patentee”¹⁷⁰:

Figure 14

Panel Composition	Pro-patentee	Pro-challenger	Mixed	% Pro-patentee	% Pro-challenger
PPP	88	161	40	30.4	55.7
PPC	250	664	137	23.8	63.2
PCC	216	713	132	20.4	67.2
CCC	40	194	40	14.6	70.8

Specifically, Reinecke observed “that outcomes are increasingly pro-patentee as more pro-patentee judges sit on the appeal.”¹⁷¹ Sipe’s observed difference of 20.5% between the highest and lowest panel eligibility rates (based on a very limited number of data points in the outer margins) is comparable to

165. Sipe, *supra* note 53, at 475.

166. *Id.* at 468–71.

167. Consider a simple example of three judges and three decisions. Judge 1 votes YYY in the three decisions, Judge 2 votes YYY, and Judge 3 votes YYN. We classify judges who always vote Yes as “Yes” judges and judges who sometimes vote No as “No” judges. We then hypothesize that when “Yes” judges are together on a panel, the outcome is more likely to be “Yes,” and we test our hypothesis by *comparing it to our original three cases*. Unsurprisingly, the hypothesis holds because we are just testing it against the same data we used to classify judges in the first place.

168. See Reinecke, *supra* note 146, at 211–13.

169. *Id.* at 213.

170. *Id.* at 217 tbl.8. In Reinecke Table 8, “P” refers to a pro-patentee judge and ‘C’ refers to a pro-challenger judge” *Id.* at 216.

171. *Id.*

Reinecke's observed 15.8% difference in the spread of "pro-patentee" rates between the highest and lowest, especially because the likelihood of "a pro-patentee judge . . . casting a pro-patentee vote" increases "[w]hen only validity cases are assessed."¹⁷²

In summary, we view both Sipe and Reinecke's corroborating studies as additional compelling evidence that individual judge patent ideology and panel composition can influence—in some cases and to some degree—the outcome of *all* patent outcomes (including § 101). As relevant to our study, however, that finding is not compelling evidence for answering the question whether the *Mayo/Alice* framework can be predictably applied.

A judge's penchant to lean toward eligibility, validity, or other pro-patentee outcomes does not directly speak to whether the law can be predictably applied by judges. First, as discussed already, determining individual judge eligibility rates with a small sample size has the potential for selection effects: is the judge's eligibility rate higher than average, or has the judge been assigned to a higher average of "invalidity" cases? Second, even if individual judges carry disparate eligibility rates, it does not demonstrate an inability to apply the law. An argument that a range of eligibility rates demonstrates unpredictability ignores the important fact that each of those judges was deciding *different* cases. A range of eligibility rates does not demonstrate that if the judges had the same case before them, they would have come to different conclusions. For this reason, similar to the argument for district courts, we think invalidity rate disparity based on different cases is not a particularly reliable indicator of measuring predictability in the law—or at least not as reliable as evaluating decisions among judges who decided the exact same patent/case and analyzing whether those judges' decisions evidenced disagreement. This can be looked at by comparing the decision of a district court judge to an appellate judge reviewing the issue *de novo* (i.e., reversal rates) or by comparing the decision of one appellate judge to another appellate judge on the same panel (i.e., dissent rates).

In short, to determine whether judges can predictably apply the law, the most relevant question is not how many times they reached a particular eligibility outcome but whether different judges—looking at the same facts—agreed on the legal outcome for those same patent claims. Indeed, we have not found an empirical academic study measuring the predictability of a legal doctrine based solely on validity outcomes. Instead, as explained below, studies that sought to evaluate the predictability of legal frameworks relied on the metrics we do here: reversal rates and dissent rates.

C. BETTER INDICATORS OF PREDICTABILITY

We have already explained why we do not view the above metrics identified in some arguments as reliable indicators of predictability in the law. Now we explain our views on why we believe the metrics we used in our study serve as more reliable metrics to evaluate predictability in the law.

172. *Id.* at 219–20.

1. Why Judicial Outcomes?

Rather than relying on eligibility rates alone, apples-to-oranges comparisons of different claims or different legal frameworks, or looking to a mere few outlier decisions at the Federal Circuit, we see longitudinal judicial outcomes by judges deciding patent cases as more reliable indicators of the predictability in applying the § 101 framework. Specifically, we evaluate three particular judicial outcomes of all appellate patent cases since the *Mayo/Alice* framework was established: (1) whether lower tribunals are reaching the legally correct *outcome* in the view of the appellate court (i.e., reversal rates); (2) whether lower tribunals are correctly applying existing law in each case in the view of the appellate court (i.e., error rates); and (3) whether appellate judges evidence disagreement in applying the law (i.e., dissent rates). While these three markers each evaluate predictability independently and from a different perspective, they all focus on whether different judges reach the same decision for the same reasoning when considering the *same* patent claims. The first and third criteria we rely on are well-established methods of empirically evaluating uniformity and predictability within a particular area of law—in fact, from our research, they appear to be the only metrics consistently used in such studies in any area of law, not just patent law.¹⁷³ The second criterion (error rate), surprisingly, has been ignored in empirical work. We believe that evaluating decisions that get the right result for the wrong reasons—particularly in conjunction with the two other criteria—can be similarly probative of the level of uniformity and predictability in the law.

Before addressing each of the judicial outcomes' criteria, it is worth commenting on why we view *judicial* outcomes as likely the best indicators of predictability in the law. Simply put, we believe that evaluating predictability through the work of judges (rather than practitioners or policy analysts) is the most likely data to produce objective and trustworthy results. Not only do federal judges possess exceptional legal acumen, they are also disinterested parties whose sworn duty is to reach the objectively right result in the matters before them. Of course, reasonable minds can differ on the “right” result when given the same facts and the same law. And as acknowledged above, some (seemingly few) judges appear to have an ideology that in some cases influences their decision. There is already extensive literature debating how judges make decisions and how human nature and individual past experiences might shape judicial decision-making. Our point is not that federal judges are perfect—it is that, as a group, they are the most reliable group of decision-makers to make “objective” decisions. Indeed, federal district court and appellate judges all have a duty to decide matters objectively based on the specific facts and law before them. “A judge should be faithful to . . . the law and should not be

173. See, e.g., Rantanen & Petherbridge, *supra* note 94, at 2039. In seeking feedback from reviewers of our work, we continually asked if others were aware of legal academic studies that regularly used metrics other than reversal rates and dissent rates in measuring predictability—not just in patent law but any area of law. None were suggested to us.

swayed by partisan interests, public clamor, or fear of criticism.”¹⁷⁴ Additionally, when a “judge’s impartiality might reasonably be questioned,” they must disqualify themselves.¹⁷⁵ In other words, it is the quintessential function of each federal judge to objectively, and to the best of their ability, get the right result in each case. The same is largely true for the PTO’s administrative judges, though there is some room to question their independence.¹⁷⁶ Likewise, we agree with others who have argued that “judges of an appellate court are the best possible subjects for an attempt to measure indeterminacy observationally.”¹⁷⁷

2. The Benefits of a Multi-Dimensional Approach

Additionally, to gain greater confidence in our results, we sought to evaluate the predictability of judicial decision-making on § 101 through more than just one perspective. First, we analyzed how frequently district court judges reached the right *result* when deciding § 101 issues. This kind of empirical analysis—known as examining reversal rates—is a very well-established method of evaluating predictability in a particular area of law.¹⁷⁸ From our research, this appears to be one of the two predominant ways in which empirical studies measure doctrinal predictability. Indeed, in her 2005 influential law review article, Markman *Eight Years Later: Is Claim Construction More Predictable?*, Chief Judge Moore (then law professor) measured claim construction predictability by looking at reversal rates.¹⁷⁹ Simply put, if district court judges are consistently reaching the right results (as determined by the appellate court), it is a strong indicator that they understand how to apply the law.

Second, we analyzed whether district courts are committing errors in *applying* the law that might not be reflected in measuring only outcomes. Although an analysis of reversal rates is an important and helpful measure of the state of the law on patent eligibility, reviewing only affirmance and reversal

174. CODE OF CONDUCT FOR UNITED STATES JUDGES Canon 3(A)(1) (2019), https://www.uscourts.gov/sites/default/files/code_of_conduct_for_united_states_judges_effective_march_12_2019.pdf [<https://perma.cc/7NU2-JPP9>].

175. *Id.* Canon 3(C)(1).

176. *Interim Process for PTAB Decision Circulation and Internal PTAB Review*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/interim-process-ptab-decision-circulation-and-internal-ptab-review> [<https://perma.cc/TKA9-TUJE>] (“The panel has final authority and responsibility for the content of a decision . . . Judges are required to apply pertinent statutes, binding case law, as well as written guidance issued by the Director or the Director’s delegate that is applicable to PTAB proceedings. . . . As has been customary, where judges on a panel have additional or dissenting views, they may express them in concurring or dissenting opinions as they deem appropriate.”). *But see* Masur, *supra* note 125, at 474; Wasserman, *supra* note 125, at 407 (arguing that institutional structure may incentivize the PTO toward a lower patentability standard); U.S. GOV’T ACCOUNTABILITY OFF., GAO-23-105336, PATENT TRIAL AND APPEAL BOARD: INCREASED TRANSPARENCY NEEDED IN OVERSIGHT OF JUDICIAL DECISION-MAKING 23 (2022), <https://www.gao.gov/assets/gao-23-105336.pdf> [<https://perma.cc/2NQV-HULF>] (“[T]he majority of judges (75 percent) responded that oversight practiced by U.S. Patent and Trademark Office (USPTO) directors and PTAB management has affected their independence.”).

177. Lefstin, *supra* note 107, at 1032.

178. *See, e.g., id.* at 1063.

179. *See* Moore, *supra* note 52, at 231–33.

outcomes provides a somewhat incomplete picture of the district courts' and the PTO's ability to apply the law predictably and correctly. After all, a decision-maker can err in the legal analysis or incorrectly apply a legal standard and still reach the correct overall result—in other words, get the right result for the wrong reasons. In the appellate world, this is often referred to as harmless error¹⁸⁰ or the “tipsy coachman” doctrine.¹⁸¹ In those cases, measuring only outcomes might hide a deeper flaw in judges' abilities to apply the law predictably and correctly. Thus, to better understand whether the *Mayo/Alice* has been (and can be) predictably and correctly applied, we must look beyond just results and outcomes. To determine if district courts and the PTAB might be making errors in *how* they apply the law (which wouldn't always be reflected in decisions where they ultimately reached the right outcome), we reviewed the Federal Circuit's decisions for instances where they noted an error in the lower tribunal's analysis or reasoning. This provides an additional measure of how capable judges are at applying the law correctly and predictably.

Third, we examined the level of disagreement within the Federal Circuit. As already highlighted, analyzing disagreement by federal appellate judges may be the best indicator we have of the predictability and consistency within a particular area of law.¹⁸² Professor Lefstin argued that “appellate dissent is a superior measure” of predictability in comparison to reversal rates because “a measure based on reversal may overstate the effect of indeterminate law.”¹⁸³ For the reasons explained in the earlier scholarship that established the use of such empirical analysis—and our reasoning above—we believe examining disagreement at the Federal Circuit is highly probative in evaluating the predictability of the current framework for patent eligibility law.

Because no matters or arguments can be presented on appeal that were not made before the district court or the PTO,¹⁸⁴ in every case involving § 101, the district court (or PTO) judges and appellate judges face the same legal question—considering the same underlying facts and applying the same law. If four disinterested individuals (a lower tribunal judge and three appellate

180. See, e.g., Daniel Epps, *Harmless Errors and Substantial Rights*, 131 HARV. L. REV. 2117, 2126–35 (2018) (describing the origins of harmless error).

181. See *Lee v. Porter*, 63 Ga. 345, 346 (1879) (“It may be that we would draw very different inferences, and these differences might go to uphold the judgment; for many steps in the reasoning of the court below might be defective, and still its ultimate conclusion be correct. It not infrequently happens that a judgment is affirmed upon a theory of the case which did not occur to the court that rendered it, or which did occur and was expressly repudiated. The human mind is so constituted that in many instances it *finds the truth* when wholly unable to *find the way* that leads to it. '[T]he pupil of impulse, it forc'd him along. His conduct still right, with his argument wrong; Still aiming at honor, yet fearing to roam, The coachman was tipsy, the chariot drove home.'”).

182. See, e.g., Lefstin, *supra* note 107, at 1069–88 (assessing the indeterminacy of claim construction and other patent issues and comparing interpretive regimes); see sources cited *supra* note 140 (explaining how dissents can be used as an objective measure of judicial disagreement and provide insight into questions of uniformity and predictability).

183. Lefstin, *supra* note 107, at 1032.

184. *Singleton v. Wulff*, 428 U.S. 106, 120 (1976) (“It is the general rule, of course, that a federal appellate court does not consider an issue not passed upon below.”).

panel judges) agree on the answer and reasoning when facing the same legal question, it is a strong indicator that the right outcome for that particular legal issue has been reached. Indeed, this is a fundamental tenet that gives us confidence in the structure of our federal judicial system, taking into account that there is no guaranteed right to appeal with the U.S. Supreme Court. And consistent outcomes among different decision-makers is a hallmark of predictability. To ensure we were not only looking at the decision-making for the same set of facts through a vertical lens (appellate judges' agreement with trial judges), we also looked at the agreement in decision-making through a horizontal lens (appellate judges' agreement with other appellate judges). Overall, this kind of analysis provides two distinct approaches for evaluating the same set of facts and legal decisions through two different types of decision-makers.

3. Potential Selection Bias Effects

We believe these empirical metrics are far more reliable indicators for evaluating predictability than those discussed in Section IV.B. However, because all three of our metrics depend on appellate decisions, we must also consider the potential for selection bias mentioned earlier. Specifically, it is appropriate to consider a potential selection bias in what types of cases ultimately lead to an appellate decision, such as biases in the population of appellate decisions. This “population bias” is the result of the parties' selection of which cases they elected to appeal and allowed to reach a final decision.¹⁸⁵

We do think that some party selection is happening—in particular, we think it is likely that cases in which the district court rejected a § 101 argument are less likely to be appealed than those in which the district court decided the patent was invalid on § 101 grounds. If a court finds the asserted patent(s) invalid under § 101 at the pleading or summary judgment stage, the case is over. The only option for the patentee is to appeal the decision. Conversely, if a Rule 12 or Rule 56 motion does not invalidate the patent, the case proceeds through its normal course, and the parties will need to litigate a host of other issues that may lead the patentee to lose, such as noninfringement, other invalidity grounds, and perhaps Inter Partes Review (“IPR”) proceedings. The vast majority of patent disputes settle, and even those that don't will not necessarily result in an appellate decision.¹⁸⁶ In fact, only “6% of patent infringement cases have an appeal,” and “only about 60% of those appeals

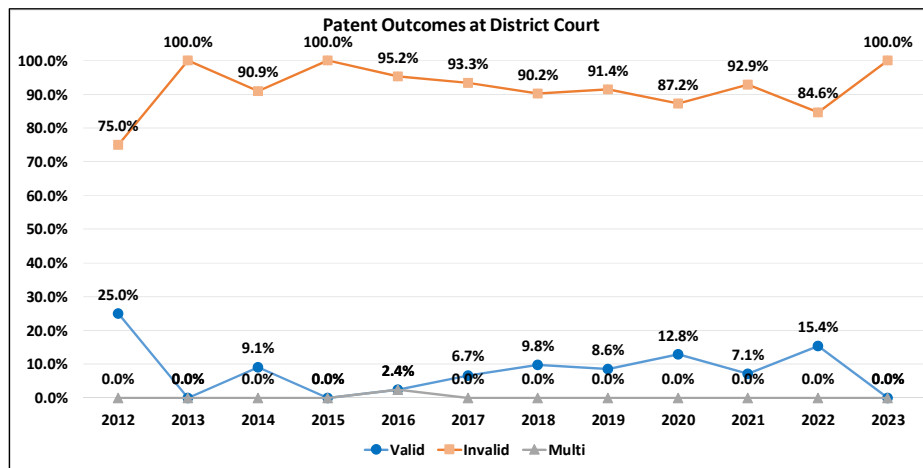
185. See Rantanen, *supra* note 60, at 243–44; Jason Rantanen, Lindsay Kriz & Abigail A. Matthews, *Studying Nonobviousness*, 73 HASTINGS L.J. 667, 699–702 (2022). Although some selection bias from judges is possible, we do not believe it is plausible enough to take into account in this study. Generally, judges do not get to choose whether to decide an issue that has been appealed by a party as a matter of right. While appellate judges may affirm for any reason, for example, that the patent is invalid under § 103 such that they no longer need to decide the § 101 issue, our deep review of the case law has not revealed this to be a recurring concern. Thus, we can be reasonably confident that when the parties have presented a § 101 issue in their appellate briefs, it will be addressed—even if just through a Rule 36 affirmance.

186. Rantanen et al., *supra* note 63, at 308.

result in a decision on the merits.”¹⁸⁷ This means that a decision finding a patent is eligible under § 101 is much less likely to ultimately result in an appellate decision because of the additional steps in the litigation process before the eligibility decision could be addressed on appeal. Therefore, these validity decisions may “disappear” because parties settle those cases or because the parties choose to pursue invalidity grounds other than § 101 when they appeal. Regardless of the reason, a judgment as a matter of law that a patent is valid under § 101 is much less likely to be addressed by the Federal Circuit than a judgment of invalidity. If there are certain types of cases that do this more frequently than others, this could affect the population of appeals that the Federal Circuit reviews.

Indeed, we observed higher invalidity rates at the district court level for decisions that reach a final appellate decision, as shown in Figure 15,¹⁸⁸ than invalidity rates others have found in district court decisions overall (including the larger number of non-appealed decisions) in earlier empirical studies.¹⁸⁹

Figure 15



A possible explanation for this difference is that parties are more likely to raise a § 101 challenge at an early stage of the litigation before the district court to take what may be a long-shot chance of a § 101 dismissal, which they ultimately drop as an argument at a later stage in the case. In other words, they eventually give up on the “weak” § 101 arguments they might otherwise make at an early stage. As Professor Saurabh Vishnubhakat explained, § 101 has sometimes been used as “a significant doctrinal shortcut to the other

187. *Id.*

188. The validity outcomes shown in Figure 15 include 22 district court decisions finding the patent(s) valid. They do not include a CFC decision finding a patent valid nor an IPR decision finding that a proposed claim was valid under § 101.

189. Lemley & Zyontz, *supra* note 40, at 65 fig.3 (showing declining invalidity rates trending toward between 50% and 60%).

requirements for patentability.”¹⁹⁰ So, it can be tempting to offer § 101 as quick means of disposing of a “bad” patent. Another reason to bring an early § 101 attack that is abandoned upon a loss is because district courts often stay a case (and expensive discovery) during a pending motion to dismiss. Thus, parties might file an early § 101 motion to dismiss as a strategic reason even if the motion might have a low chance of success at the pleading stage. A further reason for higher district court eligibility rates might be that district courts are not conclusively determining that the patent is eligible, they are simply unable to conclude—at that stage of the litigation—that the patent is ineligible (for example, due to unresolved fact or claim construction issues).

Whatever the reason, our data indicates that a high percentage of appellate § 101 decisions arise from a Rule 12 motion.¹⁹¹ This made us question whether these § 101 decisions decided at the pleadings stage might represent a larger percentage of “easier” cases in comparison to other doctrinal grounds, such as obviousness. If there are in fact a lot of “easier” cases in our dataset,¹⁹² we might misunderstand those cases to indicate a lot of agreement on the doctrinal issue, when in fact they might merely represent agreement on that selection of specific cases—not doctrine. We don’t believe this to be the case for several reasons.

First, while it might be tempting to think that Rule 12 § 101 decisions are easier to decide and generate less disagreement, there isn’t necessarily a strong reason to think so. Patent eligibility is a question of law, which may include underlying questions of fact. But neither Rule 12 nor Rule 56 permit a judge to weigh facts—they must only consider whether facts exist that support the nonmoving party’s argument.¹⁹³ In fact, in some instances, it may be substantively harder to win at the pleadings stage if a judge is leery of disposing of an entire patent claim before the facts are more fully developed or the claim terms better understood. So, there appears to be little reason to think that presenting the § 101 question of law in the context of Rule 12, rather than Rule 56, itself should make it any easier to decide the issue.

In terms of selection effects, however, it is possible that Rule 56 decisions as a group might represent a “harder” set of cases for the simple reason that they reached that later stage of the litigation. If a defendant believes they have a particularly strong § 101 challenge, it would behoove them to raise that challenge as early in the litigation as possible—likely at the Rule 12 stage before expensive discovery begins. Additionally, since the vast majority of cases settle, it would stand to reason that “easier” cases—those where it is easier to determine the eventual winner and loser—are more likely to settle, especially as parties

190. Saurabh Vishnubhakat, *The Antitrust of Patentability*, 48 SETON HALL L. REV. 71, 94 (2017).

191. See *supra* Figures 5, 6.

192. Again, because we did not choose which § 101 cases to include, our analysis has not influenced whether “easy” or “hard” cases were included—all of them were included.

193. Under Rule 12, have facts been pled that would support the nonmoving party’s position? Under Rule 56, do admissible facts exist in the record that support the nonmoving party’s position? As such, under both rules, the legal analysis should proceed under only one set of facts—those most favorable to the nonmoving party—and therefore, any disagreement of case outcomes would have to be based on application of the law itself.

are allowed to complete discovery. The “harder” cases would need to proceed to Rule 56 or trial because the parties cannot meaningfully determine who is likely to win or lose. If, in fact, parties in § 101 cases do a good job of resolving the “easier” § 101 cases through Rule 12 and settlement, that could potentially leave a higher percentage of “harder” § 101 cases that make it to a Rule 56 decision. And if that were the case, then it is possible that the higher percentage of Rule 12 cases in our dataset—relative to Rule 56—*could* represent a higher percentage of “easier” cases. Though, again, that would seemingly be driven by the stage of the litigation rather than the framework of the motion.

To the extent this theory holds true, however, we think its selection effects would be dampened by the same underlying rationale of litigating cases to decision on appeal. “[I]f one assumes the legal process is working efficiently, cases that reach a written judgment and written decision on appeal might also be cases that present the closest questions under the law.”¹⁹⁴ “Some law-and-economics literature, including Professor [Richard] Gruner’s article, suggests that the appealed cases should always be the closest cases.”¹⁹⁵ Regardless of the procedural posture at the district court or how the case came to appeal, rational parties (and their lawyers) should be resolving the “easier” cases prior to a final appellate decision. Thus, even if Rule 12 decisions (as a group) represent the “easier” decisions at the district court level, those cases should still filter themselves out in large part before an appellate decision, such that we wouldn’t expect Rule 12 appellate cases to represent easier cases than Rule 56 in our dataset of decisions.

Second, separately examining the actual affirmance rates and dissent rates in our study, for § 101, Rule 12, and Rule 56 decisions showed no significant difference. Rule 12 decisions were affirmed 86.4% of the time, whereas Rule 56 decisions were affirmed 82.7% of the time. For dissent rates of all decisions (including Rule 36 decisions), Rule 12 decisions boasted a 5.6% dissent rate compared to a 9.9% for Rule 56. For opinions (excluding Rule 36 decisions), Rule 12 carried a 11.1% dissent rate compared to 16.3% for Rule 56. While five percentage points might seem significant, it is important to note that there were only eleven Rule 12 dissents and eight Rule 56 dissents. With so few data points to consider, the percentage difference amounts to a mere two dissents (i.e., if there were six Rule 56 dissents, it would amount to a 12.2% dissent rate). In other words, our conclusions hold true regardless of whether we consider the entire dataset of § 101 decisions or only Rule 56 decisions. As such, we do not believe our conclusions are based on an “easier” collection of Rule 12 cases.

Ultimately, we believe party selection is not detrimental to our analysis because in the context of the question we explore, the selection bias concern

194. Rantanen & Petherbridge, *supra* note 94, at 2012.

195. David L. Schwartz, *Pre-Markman Reversal Rates*, 43 LOY. L.A. L. REV. 1073, 1101 & n.165 (2010) (citing Richard S. Gruner, *How High Is Too High?: Reflections on the Sources and Meaning of Claim Construction Reversal Rates at the Federal Circuit*, 43 LOY. L.A. L. REV. 981, 1008–09 (2010)). *But cf.* Jason Rantanen, *Why Priest-Klein Cannot Apply to Individual Issues in Patent Cases* 3–4 (Univ. of Iowa, Legal Studies Research Paper No. 12-15, 2012) (questioning whether the uncertain-appeals hypothesis can apply to individual issues in multi-issue litigation).

most often at issue is that reversal and dissent rates will be *over*representative of a lack of predictability because it is widely considered that the cases most likely to result in an appellate decision are the “hardest” or “closest” cases.¹⁹⁶ Because we reveal very low reversal rates and comparatively low dissent rates, we are not concerned with a potential overrepresentation of unpredictability. If anything, by analyzing predictability for a larger share of the cases that are “harder” to decide—those that reach appellate decisions—we should observe more unpredictability, but we don’t.

As Lefstin remarked, “[T]here can be little better test of whether the legal principles are determinative than to assess whether different observers arrive at the same outcome when presented with the same legal and factual scenario.”¹⁹⁷ When there emerges a strong, consistent pattern of agreement—with little dissent—regarding the outcomes among those disinterested parties throughout a significant passage of time with many different cases involving the same legal issue, it is strong evidence that the law can be predictably applied. After all, if a law was unpredictable, then one would expect disinterested parties—duty bound to reach an objectively correct result—to reach varied outcomes, or at the very least to provide varied reasoning for the same outcomes, along with many instances of disagreement. One would not expect near-uniform agreement on outcomes *and* reasoning across vertical and horizontal judging. Yet, that appears to be precisely what has happened with § 101 for the past decade.

V. ASSESSING THE PREDICTABILITY OF THE *MAYO*/*ALICE* FRAMEWORK

In analyzing § 101 appellate decisions from the past decade, we sought to gain a better understanding of the law on three important questions relating to the predictability of the *Mayo/Alice* framework: (1) are district courts and the PTO reaching the right *results*; (2) are district courts and the PTO reaching the right result for the right *reasons* in each case; and (3) is the Federal Circuit as fractured on deciding § 101 issues as some anecdotal commentary suggests. Our findings demonstrate: (1) district courts and the PTO are overwhelmingly reaching the right results; (2) they are reaching the right results for the right reasons; and (3) Federal Circuit judges rarely show disagreement on outcomes or reasoning.

A. EXAMINING REVERSAL RATES: DISTRICT COURTS AND THE PTO OVERWHELMINGLY CORRECTLY DECIDE § 101 ISSUES

As shown in Figure 16, the Federal Circuit has affirmed the lower tribunal 87.6% of the time. The PTO, in particular, has fared incredibly well on appeal, with only four of eighty-nine decisions resulting in something other than a complete affirmance.¹⁹⁸ District courts fared slightly poorer but still resulted in

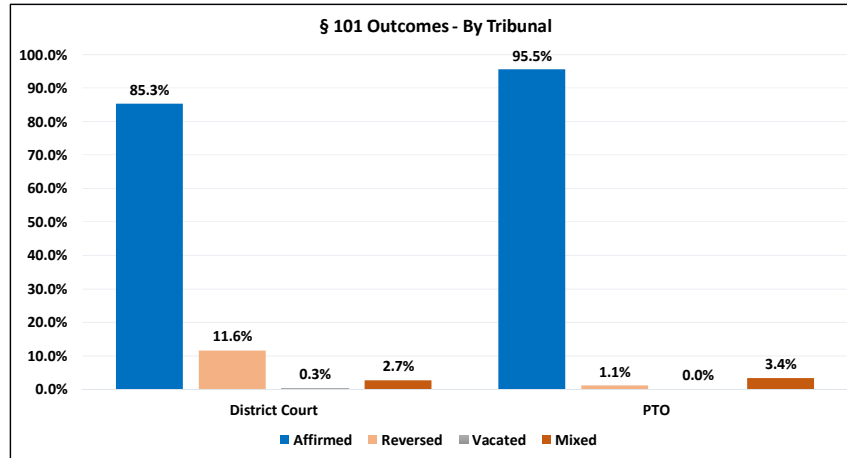
196. See, e.g., *supra* notes 192–93.

197. Lefstin, *supra* note 107, at 1032.

198. It is worthwhile to remember that all decisions appealed from the PTO are decisions finding the patent or patent application invalid—when the patent is found valid, neither the

an impressive 85.3% affirmance rate. As discussed further below, this is a historically high affirmance rate for an issue of patent law.

Figure 16



Gugliuzza and Lemley’s earlier study examining § 101 affirmances from June 2014 through June 2017 found a 90.4% affirmance rate.¹⁹⁹ At the time, with only four lower court decisions finding the patent valid,²⁰⁰ they aptly questioned whether such a very high affirmance rate could be maintained “[o]nce the Federal Circuit begins reviewing more decisions upholding validity.”²⁰¹ Figure 17, below, now tells us the answer: yes. Notably, however, the very substantial portion of the cases before the Federal Circuit are based on invalidity appeals,²⁰² and the Federal Circuit affirms validity appeals at a significantly lower rate than invalidity appeals.²⁰³ Therefore, if the ratio of validity/invalidity appeals changes in the future, it could also impact the overall affirmance rate.

patent owner nor the PTO would have grounds to appeal. Since the PTO’s guidance documents on patent eligibility may be more eligibility-friendly than the Federal Circuit’s case law, see *supra* note 127, it might not be all that surprising that the Federal Circuit affirms the PTO (i.e., agrees the claims are invalid) in a very high percentage of cases.

199. Gugliuzza & Lemley, *supra* note 41, at 793; see also Sachs, *supra* note 40 (finding similar results).

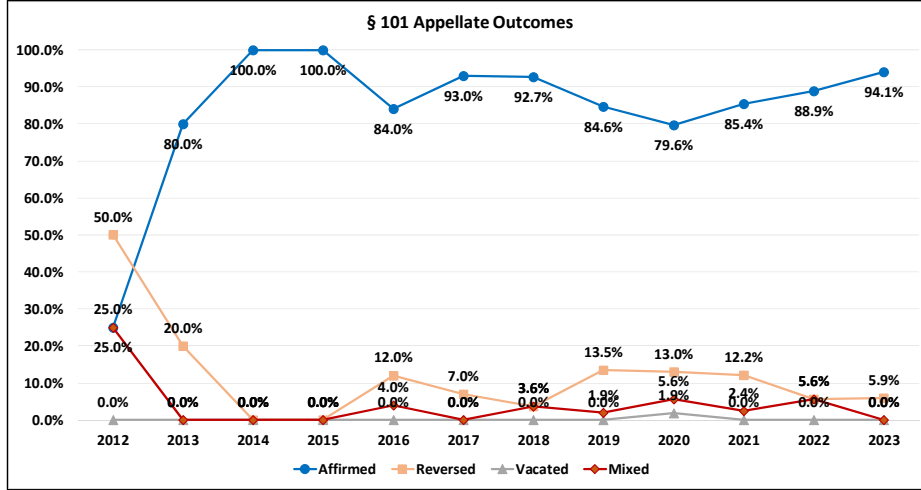
200. Gugliuzza & Lemley, *supra* note 41, at 786–87.

201. *Id.* at 768.

202. See *infra* text accompanying note 220.

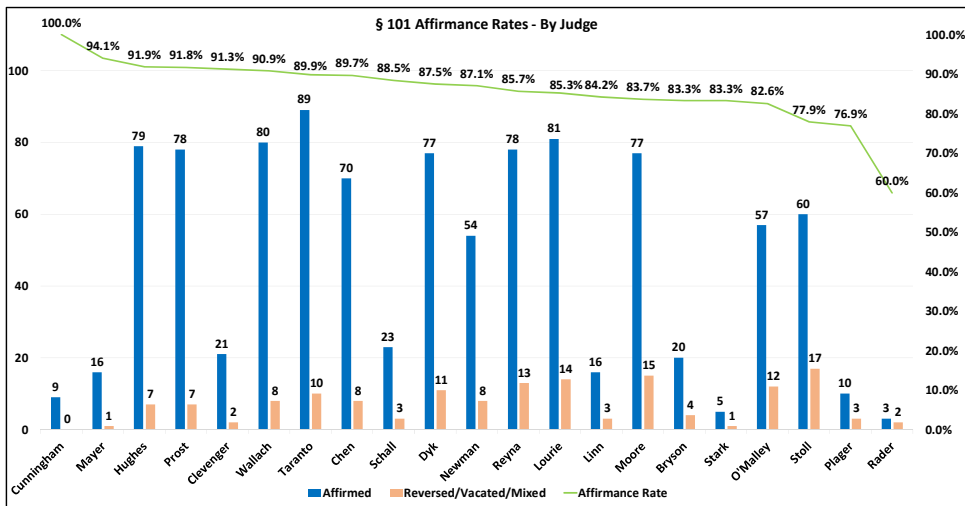
203. See *infra* Figure 20.

Figure 17



It is abundantly clear that the Federal Circuit believes district courts and the PTO are getting the right result in a *very* high percentage of cases. This is especially notable given that most of the district court decisions being reviewed by the Federal Circuit arise in the context of a Rule 12 or Rule 56 motion—procedural postures in which the standard of review on appeals owes no deference to the district court. Moreover, a judge-by-judge comparison of affirmance rates reveals that nearly all judges think district courts and the PTO are overwhelmingly getting the right result.

Figure 18



The lowest affirmance rate of any judge who heard more than five eligibility cases was 76.9% (Judge Plager). Of the twenty judges who heard more than five cases, eighteen affirmed the lower tribunal more than 82% of the time. This is a very high affirmance rate on its face and in the historical context of other patent law issues.²⁰⁴

Although understanding affirmance rates by the Federal Circuit for different patent issues is notoriously difficult to capture, it appears that the 87.6% affirmance rate on § 101 is the highest affirmance rate of any patent law issue tracked over a continuous period of time.²⁰⁵ Indeed, as has been well documented, for a considerable period of time, the Federal Circuit carried a mere 50% affirmance rate on issues relating to claim construction.²⁰⁶ The Federal Circuit's overall district court affirmance rates are also historically lower, hovering around 69%.²⁰⁷ With regard to obviousness, affirmance rates historically also have been much lower²⁰⁸:

Figure 19

	1/1/1997– 6/26/2006	4/30/2007– 4/30/2012	5/1/2012– 12/31/2019
Obvious	56%	82%	78%
Nonobvious	71%	65%	83%

204. Figure 18 represents how often each judge voted to affirm (i.e., the judge's eligibility outcome matched that of the district court), irrespective of the rest of the panel. Thus, the percentage of affirmances includes cases in which the judge dissented.

205. See Rantanen, *supra* note 60, at 239–40; see also Gugliuzza & Lemley, *supra* note 41, at 793 (noting that “no studies put the reversal rate [of the Federal Circuit] below the less-than-10% figure [they] have found on the issue of patentable subject matter”).

206. Wagner & Petherbridge, *supra* note 109, at 1127 (noting studies identifying claim construction reversal rates of 30% and 50%).

207. See, e.g., Jason Rantanen, *Federal Circuit Dataset & Stats: 2021 Update*, PATENTLY-O (Jan. 10, 2022), <https://patentlyo.com/patent/2022/01/federal-circuit-statistics-package.html> (on file with the *Iowa Law Review*); see also Dan Bagatell, *Fed. Circ. Patent Decisions in 2022: An Empirical Review*, LAW360 (Jan. 9, 2023, 5:13 PM) [hereinafter Bagatell, *Patent Decisions in 2022*], <https://www.law360.com/articles/1562614/fed-circ-patent-decisions-in-2022-an-empirical-review> (on file with the *Iowa Law Review*) (showing 57% affirmance rate for district court decisions in 2022 and 74% in 2021, as compared to 69% affirmance rate for all Federal Circuit appeals in 2022 and 78% in 2021); Dan Bagatell, *Fed. Circ. Patent Decisions in 2023: An Empirical Review*, LAW360 (Jan. 4, 2024, 1:28 PM), <https://www.law360.com/articles/1782102/fed-circ-patent-decisions-in-2023-an-empirical-review> (on file with the *Iowa Law Review*) (showing affirmance rate of 78% in patent decisions for 2021); Dan Bagatell, *Fed. Circ.'s 2017 Patent Decisions: A Statistical Analysis*, LAW360 (Jan. 5, 2018, 2:41 PM) [hereinafter Bagatell, *2017 Patent Decisions*], <https://www.law360.com/articles/999115/fed-circ-s-2017-patent-decisions-a-statistical-analysis> (on file with the *Iowa Law Review*) (finding 75% affirmance rate in all patent cases in 2017).

208. Rantanen et al., *supra* note 185, at 707 tbl.13; see Jason Rantanen, *The Federal Circuit's New Obviousness Jurisprudence: An Empirical Study*, 16 STAN. TECH. L. REV. 709, 744 tbl.4 (2013).

As such, putting the consistently high § 101 affirmance rate into historical context makes it even more pronounced—perhaps even suspect. Why is the Federal Circuit nearly always finding that the district court and PTO reached the right result in an area of law that has been labeled by so many as unpredictable, confusing, and incapable of administration? If we are expecting district court judges (and even some of those judges themselves are claiming²⁰⁹) to be simply throwing darts at the wall, they sure are hitting a lot of bullseyes.

Perhaps the first possible explanation that comes to mind is that Federal Circuit judges are simply deferring to the district court. Notably, although it may involve underlying questions of fact, patent eligibility is a question of law, and as such, the Federal Circuit must independently decide it without giving deference to the lower tribunal.²¹⁰ Although the determination under Step 2 of whether something “is well-understood, routine, [or] conventional . . . is a question of fact and deference must be given to the determination made by the fact finder on this issue,”²¹¹ nearly all of the district court cases on appeal (287 of 293) were decided on the pleadings, at summary judgment, or as part of a judgment as matter of law (“JMOL”) motion. Thus, in those decisions, the district court made no factual findings and decided the issue as a matter of law—for which it would be owed no deference at all on appeal. In the other six decisions, the Federal Circuit did not indicate any deference on the issue.²¹²

Even without formal deference, though, perhaps the Federal Circuit judges were providing “informal” deference by not fully analyzing the § 101 issues before them or refusing to disagree and thereby deferring to the district court without saying so. Given the commentary from numerous Federal Circuit judges that even the Federal Circuit does not know how to consistently apply § 101 law,²¹³ perhaps the state of the law is so bad that the Federal Circuit has simply raised a white flag on even trying to decide patent eligibility issues and is “rubber-stamping” the lower tribunals’ results without independent analysis. Considering the Federal Circuit’s high utilization rate of Rule 36 under our study (44.6%) to decide cases without providing any reasoning,²¹⁴ on its face, perhaps there exists an argument that the Federal Circuit is simply pushing

209. Sipe, *supra* note 39, at 29.

210. See, e.g., *Berkheimer v. HP Inc.*, 890 F.3d 1369, 1370 (Fed. Cir. 2018); *Rapid Litig. Mgmt. Ltd. v. CellzDirect, Inc.*, 827 F.3d 1042, 1047 (Fed. Cir. 2016); *USC IP P’ship, L.P. v. Meta Platforms, Inc.*, No. 2022-1397, 2023 WL 5606977, at *1 (Fed. Cir. Aug. 30, 2023) (“Validity under 35 U.S.C. § 101 is a question of law, and receives *de novo* review.”).

211. *Exergen Corp. v. Kaz USA, Inc.*, 725 F. App’x 959, 965 (Fed. Cir. 2018).

212. *In re BRCA1- & BRCA2-Based Hereditary Cancer Test Pat. Litig.*, 774 F.3d 755, 759–65 (Fed. Cir. 2014); *Finjan, Inc. v. Blue Coat Sys., Inc.*, 879 F.3d 1299, 1303–06 (Fed. Cir. 2018); *Vanda Pharms., Inc. v. W-Ward Pharms. Int’l Ltd.*, 887 F.3d 1117, 1125, 1133–36 (Fed. Cir. 2018); *Intell. Ventures I LLC v. T-Mobile USA, Inc.*, 748 F. App’x 330, 330 (Fed. Cir. 2019) (Rule 36 decision); *INO Therapeutics LLC v. Praxair Distrib., Inc.*, 782 F. App’x 1001, 1005–12 (Fed. Cir. 2019) (noting district court findings but performing an independent analysis on Steps 1 and 2); *Packet Intel. LLC v. NetScout Sys., Inc.*, 965 F.3d 1299, 1307–10 (Fed. Cir. 2020) (noting the standard of review for factual findings but still performing an independent analysis).

213. See *supra* notes 99–103.

214. See also *Gugliuzza & Lemley*, *supra* note 41, at 787–89 (reporting Rule 36 dispositions occurred 51.9% of the time).

through the § 101 decisions it is asked to decide. Indeed, some have written about a possible unwritten district court deference standard or practice at the Federal Circuit,²¹⁵ and one of the authors has heard a Federal Circuit judge openly comment in public remarks that the judge “goes in rooting for the district court.” Importantly, however, “rooting” for the district court to get the right result and ignoring one’s judicial responsibilities and duty to independently evaluate the decision to ensure the district court did so are two vastly different things that should not be confused.

In this context, we think the argument that the Federal Circuit is simply deferring to the lower tribunals on § 101 issues lacks merit for a number of reasons. First, it would require the judges on the Federal Circuit to have intentionally and deliberately disregarded the ethical duties they swore to uphold in deciding and administering the cases before them.²¹⁶ Such an incredible claim would demand substantial proof (none of which has been shown to exist in the context of § 101) and far more than just data showing frequent agreement with lower tribunals. Federal appellate judges hold some of the highest integrity standards in the legal profession and are expected to carry themselves in such regard. Sure, rare exceptions exist. But to suggest that the entire (or even majority) of the judges on this high-impact court in patent law have made a conscious decision to abdicate their judicial responsibilities in the face of a purportedly difficult standard to apply seems highly implausible.

Second, while the Federal Circuit acts as one court regardless of who comprises the panel in each case—just as corporations act through individual people—the court acts through individual judges. As shown above in Figure 18, it is not just one or a few judges who affirm at a high rate (and by extension of this argument would be rubberstamping decisions)—it is all judges at the Federal Circuit. The notion that *all* Federal Circuit judges have entered into a conspiracy to push through all § 101 decisions seems as farfetched as the assertion that *all* Federal Circuit judges found themselves in such a spot through happenstance. As has been shown through the recent controversy surrounding Judge Newman’s competency to continue serving on the bench,²¹⁷ the Federal Circuit judges are willing to hold each other to the relevant legal standards.²¹⁸ Thus, if there existed any evidence or unwritten resolve to ignore § 101 cases

215. J. Jonas Anderson & Peter S. Menell, *Informal Deference: A Historical, Empirical, and Normative Analysis of Patent Claim Construction*, 108 NW. U. L. REV. 1, 6 (2013); see also Gugliuzza & Lemley, *supra* note 41, at 793–94 (noting that “the Federal Circuit should not be deferring to lower tribunals because patent eligibility is a question of law reviewed de novo,” but questioning whether the results of their study “indicate that the Federal Circuit is simply deferring on the issue of patentable subject matter to the tribunals it reviews”).

216. See CODE OF CONDUCT FOR UNITED STATES JUDGES, *supra* note 174, Canon 3(A)(1), Canon 3(C)(1).

217. See Dennis Crouch, *Judge Newman on Saving Patent Law*, PATENTLY-O (June 5, 2023), <http://patentlyo.com/patent/2023/06/newman-saving-patent.html> (on file with the *Iowa Law Review*).

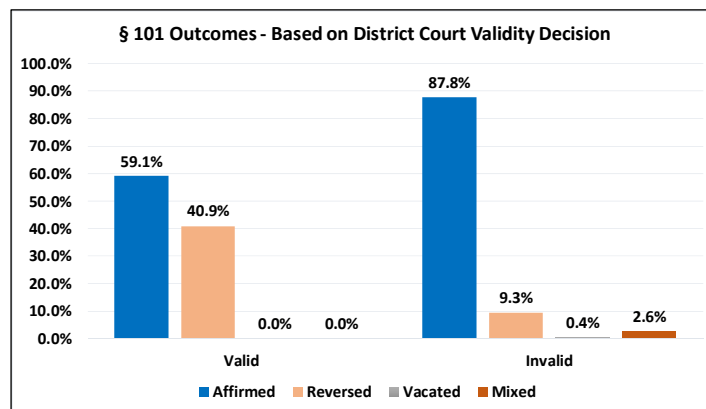
218. In noting so, we do not suggest we believe Judge Newman violated any standards. We mention it only to highlight that the judges will speak up—even against each other—when they believe one of them has acted in a way inconsistent with their judicial duties.

at the Federal Circuit, at least one (or likely more) of the judges would have blown the whistle by now.

Third, in the majority of cases, the Federal Circuit issues an opinion explaining its reasoning for the decision. And its reliance on summary affirmances for § 101 cases has actually substantially decreased since 2018. It seems difficult to accept that the court would go through such a painstaking and laborious exercise only to say “ditto.” If this were the case, we should expect to see increased reliance on Rule 36 decisions. Yet, the opposite is true. We also seriously doubt that most competent lawyers could routinely invest so much effort (even if just reviewing a lower court record but not writing an opinion) and yet resist the temptation to share their own views.

Fourth—and most important—the data indicates that judges are not afraid to disagree with district courts in some circumstances: particularly, when the district court finds the patent valid. Figure 20 shows that there is a noticeable disparity in affirmance rates by the Federal Circuit depending on whether the district court found the patent valid or invalid.

Figure 20



When the district court²¹⁹ found the patent invalid, the Federal Circuit affirmed 87.8% of the time. In contrast, when the district court found the patent valid, the Federal Circuit affirmed a mere 59.1% of the time. Given the consistently high affirmance rates overall, when looked at historically or on a judge-by-judge basis, this difference is substantial. Because there were only 22 instances in which a district court found a patent valid (compared to the 270 instances it found the patent(s) invalid),²²⁰ our data sample for this consideration is admittedly limited. However, this is the entirety of all § 101 decisions to reach an appellate outcome throughout the past decade. Thus, it is simply all the data that exists on the question. And as such, the (relatively) low affirmance

²¹⁹ PTO decisions are excluded because they can only be appealed when found invalid.

²²⁰ There was one district court decision that resulted in findings that included both invalid and valid claims. Predictable Unpredictability Dataset, *supra* note 58.

rate on validity decisions—particularly taking into account the three other reasons above—is strong evidence that the Federal Circuit judges are independently reviewing the district court’s work rather than simply rubber-stamping lower tribunals’ decisions.²²¹

In light of the low number of district court validity decisions on appeal and the relatively high reversal rate, a related question that surfaces is whether district courts might be finding patents invalid more often simply because they expect that decision to be more likely to result in an affirmance. We do not believe that is the case for several reasons.

First, considering the duties of judges noted above, we are skeptical that district court judges would disregard their role in making the best objective decisions possible in favor of “playing the odds” for an affirmance. Second, as noted earlier, district courts found validity outcomes much more frequently than our appellate data suggests.²²² For the reasons we noted earlier, those validity decisions simply didn’t result in an appellate decision.²²³ Third, even if courts were engaging in any such improper behavior, we would still expect to see errors in how they apply the law, which we analyze as our second metric of predictability. We would also expect their appellate reviewers would catch improper outcomes in the form of reversals and dissents. No such significant errors, reversals, or dissents were observed.

Fourth, similar trends exist with Federal Circuit affirmance rates on other invalidity grounds. For example, for the five years after the Supreme Court decided *KSR International Co. v. Teleflex Inc.*,²²⁴ the Federal Circuit affirmed district court obviousness findings approximately 82% of the time but affirmed nonobviousness conclusions only 65% of the time.²²⁵ Although the discrepancy eventually balanced out, it could be indicative of the need for the Federal Circuit to have more opinions on validity before it can be reflected in the § 101 data.

Finally, if the district court’s primary goal was to avoid a reversal on § 101, it would presumably be more motivated to deny the motion (and find validity) because such a decision is not immediately appealable. Indeed, most § 101 trial court decisions never reach an appellate decision on the merits for a variety of reasons.²²⁶ For example, by the time a validity § 101 finding is appealed, it will be part of a well-developed litigation record that will almost certainly include other invalidity grounds, which often may prove to be better appellate arguments. Thus, the § 101 issue might fade into the background. In other

221. Importantly, we do not believe that the relatively high reversal rate for the limited number of district court validity outcomes can be viewed as evidencing a lack of predictability in applying the framework overall. Not only does the overall reversal rate tell a different picture, but the validity outcomes do not provide a sufficient number of cases based upon which we can draw a confident conclusion on that question.

222. See *supra* notes 188–89 and accompanying text.

223. See *supra* notes 186–89 and accompanying text.

224. See generally *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007).

225. See *supra* Figure 19, note 208 and accompanying text.

226. Rantanen et al., *supra* note 63, at 311 (showing frequency of appeals in patent cases).

cases, the appeal might simply not be worth the cost, or the parties might settle the case. Conversely, when a district court finds a patent ineligible and grants a motion to dismiss (or a motion for summary judgment), the decision will be immediately appealable, with the § 101 issue taking center stage. So, if district court judges simply wanted to minimize the risk of reversal, their best bet likely would be to find validity—not invalidity.

Based on the consistently low reversal rate, the only plausible conclusion to draw from the Federal Circuit's § 101 case law throughout the past decade is that the Federal Circuit—after independent review and consideration—believes that the district courts and the PTO are overwhelmingly reaching the right results in deciding § 101 issues. This finding seriously challenges the argument and popular narrative that federal judges are incapable of administering the *Mayo/Alice* framework or that it cannot be predictably applied. In fact, they are doing so with remarkable consistency and agreement.

*B. EXAMINING ERROR RATES: DISTRICT COURTS OVERWHELMINGLY
CORRECTLY APPLY THE § 101 FRAMEWORK*

In determining whether district courts and the PTO are correctly applying the law—and thus predictably understand how the law should be applied—we undertook a novel analysis examining how often the Federal Circuit identifies a legal error by the lower tribunal even when it affirms the result. We excluded decisions in which the Federal Circuit did something other than completely affirm on the § 101 issues²²⁷ for the obvious reason that there was already something incorrect in the district court's legal analysis. In those cases, the district court made a § 101 error. Additionally, we excluded Rule 36 affirmances from this portion of our analysis for the equally obvious reason that the Federal Circuit's decision includes no reasoning from which we could determine if the judges had any concerns with how the district court or the PTO judge reached their decision. Through these criteria, we narrowed our dataset to 166 decisions.²²⁸ The decisions were reviewed by two research assistants and one of the Authors, an experienced patent litigator, to determine whether the Federal Circuit determined that the district court made an error in its analysis.

After reviewing each of those affirmance opinions for any indication of an error in the district court's § 101 analysis or reasoning, we found an error in a mere seven cases.²²⁹ Stated differently, in the 166 instances where the lower

^{227.} Our focus for affirmance/reversal was strictly on § 101. If the Federal Circuit reversed on an issue other than § 101 but completely affirmed the district court's § 101 decision, the case was coded as an affirmance.

^{228.} As noted earlier, we excluded the Federal Circuit's May 10, 2013, en banc *Alice* decision, issued before the Supreme Court's *Alice* decision. See *CLS Bank Int'l v. Alice Corp. Pty.*, 717 F.3d 1269, 1274 (Fed. Cir. 2013) (en banc), *aff'd*, 573 U.S. 208 (2014).

^{229.} Because one of those district court decisions was decided prior to *Mayo*, it is difficult to characterize this as an "error," but for the sake of overinclusion, we include it in the list of errors. See *Accenture Glob. Servs., GmbH v. Guidewire Software, Inc.*, 800 F. Supp. 2d 613, 615 (D. Del. 2011), *aff'd*, 728 F.3d 1336 (Fed. Cir. 2013). One Federal Circuit opinion noted in a footnote that it was "not persuaded that the district court was correct that a presumption of validity does

tribunal got the right result and the Federal Circuit issued an opinion, it misapplied the *Mayo/Alice* framework in some way only 4.2% of the time. If we assume that the Federal Circuit's issuance of a Rule 36 decision reflects its view that there was no mentionable error in the § 101 analysis, then the error rate would be even lower—2.1% (7 errors in 338 affirmance decisions). Thus, our more granular examination of district courts' and the PTO's applications of § 101 for the past decade reveals that those tribunals are not only getting the right result when applying this doctrine, they are also correctly applying the law.

The types of errors made by the district courts (there were none by the PTO)²³⁰ varied. In two instances, the district court defined the abstract idea too broadly.²³¹ In another instance, the district court erred in finding that the patent claims were directed to laws of nature under Step 1 (though it found them eligible under Step 2 to ultimately reach the right outcome).²³² On another occasion, the district court (supposedly) erred by incorporating conventionality of claim elements into Step 1.²³³ As further noted in Part VI, we question

not apply” when it cited a prior Federal Circuit concurring opinion but chose not to address the issue. *Tranxition, Inc. v. Lenovo (U.S.) Inc.*, 664 F. App'x 968, 972 n.1 (Fed. Cir. 2016). While the Federal Circuit did not decide the issue (and whether the district court erred), we included it as a potential error, to be overinclusive. *Id.* However, we excluded two district court decisions with procedural type errors—not substantive § 101 errors—in which the lower courts considered matters outside of the pleadings on a Rule 12 motion and found claims ineligible beyond those at issue in the case.

230. Under the *Chenery* doctrine, appellate courts generally may not affirm an administrative action on grounds different from those found by the agency. *See SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947). However, the Federal Circuit has clarified that the doctrine is “not applied inflexibly. . . . [and] does not prohibit a reviewing court from affirming an agency decision on a ground different from the one used by the agency if the new ground is not one that calls for ‘a determination or judgment which an administrative agency alone is authorized to make,’” or “if it is clear that ‘the agency would have reached the same ultimate result.’” *Fleshman v. West*, 138 F.3d 1429, 1433 (Fed. Cir. 1998) (citing *Koyo Seiko Co. v. United States*, 95 F.3d 1094, 1100–01 (Fed. Cir. 1996); *Ward v. Merit Sys. Prot. Bd.*, 981 F.2d 521, 528 (Fed. Cir. 1992)). “[P]rinciples of harmless error apply to judicial review of agency action generally.” *Oracle Am., Inc. v. United States*, 975 F.3d 1279, 1290–91 (Fed. Cir. 2020). Indeed, the Federal Circuit has affirmed an agency's decision on alternative grounds. *See, e.g., Fomby-Denson v. Dep't of the Army*, 247 F.3d 1366, 1373 (Fed. Cir. 2001) (deciding “appeal on a ground not considered by the Board”); *Koyo Seiko Co.*, 95 F.3d at 1098 (“We conclude that the judgment of the Court of International Trade holding the cap inapplicable appropriately should be affirmed on a clearer and simpler alternative ground.”). Thus, we do not believe the *Chenery* doctrine would necessarily preclude the Federal Circuit from affirming a PTO decision that included some kind of error. Since we would expect the Federal Circuit to at least mention such an issue—and it did not in the relevant opinions—we included the PTO decisions as part of our analysis.

231. *Accenture Glob. Servs.*, 728 F.3d at 1346; *Bridge & Post, Inc. v. Verizon Commc'ns, Inc.*, 778 F. App'x 882, 894 (Fed. Cir. 2019).

232. *Vanda Pharms. Inc. v. W-Ward Pharms. Int'l Ltd.*, 887 F.3d 1117, 1134 (Fed. Cir. 2018).

233. *iLife Techs., Inc. v. Nintendo of Am., Inc.*, 839 F. App'x 534, 537 (Fed. Cir. 2021) (“While we agree with the district court that these claims are directed to the abstract idea of gathering, processing and transmitting data, the district court erred to the extent that it incorporated conventionality of claim elements at step 1. ***The conventionality of the claim elements is only considered at step two*** if the claims are deemed at step 1 to be directed to a patent ineligible concept, such as an abstract idea.” (emphasis added)). Notably, a later panel comprised of Judges Lourie, Bryson,

whether this was even an error under the Federal Circuit's current precedent and highlight this particular issue of the *Mayo/Alice* framework as an area that could benefit from clarification.²³⁴ In another case, the Federal Circuit agreed with the district court that the claims were directed to an abstract idea but suggested that the district court may have misread the amount of similarity between the claims at issue and the claims in an earlier case.²³⁵ On one occasion, the Federal Circuit suggested (but did not hold) that the district court erred in holding the presumption of validity doesn't apply to a § 101 challenge.²³⁶ In the final error we observed, the district court quoted the *Enfish* district court decision, which was reversed on appeal, for the proposition "that courts 'should recite a claim's purpose at a reasonably high level of generality.'"²³⁷ Despite the misstatement, the Federal Circuit found "the district court's analysis correctly found that [asserted] claims [were] directed to an abstract idea."²³⁸

As mentioned earlier, this type of granular examination of appellate outcomes has not been applied in earlier empirical studies. One study evaluating the unpredictability of claim construction "found [a] claim construction error in 32.6% of the opinions" and an outcome that resulted in something other than an affirmance 28.5% of the time, suggesting a 4.1% error rate in affirmances.²³⁹ Although that study featured a different time period and different methodology, the observed error rate is nearly identical to our 4.2% error rate for patent eligibility. Unfortunately, we have no other data from other areas of law or other federal appellate courts to which we can compare our results. The Authors are exploring this gap in the scholarship in other work and hope to be able to provide further clarity on the issue. For now, however, the rate of errors identified in district court and PTO § 101 decisions we have been able to identify strikes us as remarkably low and another strong indicator that district courts and the PTO understand how to apply the law.

Our data and conclusions on this metric are subject to a key limitation. In determining whether the district court or the PTO judge made an error in

and Hughes—in an opinion written by Judge Lourie—disagreed with this statement of the law from the appendix, unpublished opinion in *iLife* written by Judge Moore and decided by Judges Moore, Reyna, and Chen. See *CareDx, Inc. v. Natera, Inc.*, 40 F.4th 1371, 1379 (Fed. Cir. 2022). Under Federal Circuit Rule 32.1(d), "[t]he court may refer to a nonprecedential or unpublished disposition in an opinion or order and may look to a nonprecedential or unpublished disposition for guidance or persuasive reasoning but will not give one of its own nonprecedential dispositions the effect of binding precedent." FED. CIR. R. 32.1(d).

234. See *CareDx*, 40 F.4th at 1379 ("CareDx also incorrectly characterizes our precedent as limiting the conventionality inquiry to step two. On the contrary, and as the district court recognized, **we have repeatedly analyzed conventionality at step one as well.**" (emphasis added)); see also *infra* notes 287–90.

235. *Universal Secure Registry LLC v. Apple Inc.*, 10 F.4th 1342, 1349 (Fed. Cir. 2021) ("While we see differences between claim 22 and the claims at issue in *Prism*, we agree with the district court that, like the claims at issue in *Prism*, claim 22 is directed to an abstract idea.>").

236. *Tranxition, Inc. v. Lenovo (U.S.) Inc.*, 664 F. App'x 968, 972 n.1 (Fed. Cir. 2016).

237. *Secured Mail Sols. LLC v. Universal Wilde, Inc.*, 873 F.3d 905, 910 (Fed. Cir. 2017).

238. *Id.*

239. Shawn P. Miller, "Fuzzy" Software Patent Boundaries and High Claim Construction Reversal Rates, 17 STAN. TECH. L. REV. 809, 823 (2014).

their analysis, we rely only on the Federal Circuit's comments in its opinions. It is possible that one or more Federal Circuit judges on a panel took issue with something in the lower tribunal's analysis or reasoning without that issue finding its way into the written opinion, and any such "errors" are not included in our data.

We did not capture this information for two reasons. First, short of attempting to obtain copies of internal memos or notes shared among the judges and clerks while deciding the case, there simply does not exist a way to find out this information. And even if we could capture such written materials, we would have little confidence that they represent a full record of the judges' discussions on the case, considering that the judges' conferences and deliberations after oral argument do not typically include minutes or notes. Second, if there was a meaningful misstatement or misapplication of the law or other consequential error such that it would reflect a lower judge's inability to correctly or predictably apply the law, we would expect to find it mentioned in the Federal Circuit's opinion. We would expect so particularly in the 70 of the 166 opinions designated as precedential because the purpose of designating an opinion as precedential is "to inform the bar and interested persons other than the parties."²⁴⁰ Those seventy decisions accounted for four of the seven errors noted above. Thus, in affirming *precedential* opinions, the Federal Circuit identified a district court error a comparable 5.7% of the time.

To address this limitation, we also could have compared each district court and PTO order to the Federal Circuit's corresponding opinion to see whether any additional differences or errors revealed themselves. We did not do so for two key reasons: (1) such determinations would require a high level of judgment and subjectivity in what differences amount to "errors"; and (2) it would require time and resources that were beyond the scope of this project. In future work, we may revisit this analysis to explore whether there exist any *meaningful* errors in lower tribunals' orders that are not reflected in the Federal Circuit's opinions. However, notwithstanding the minute potential for a small number of invisible "errors" not captured within our data, we believe that the incredibly low percentage of cases in which the district court or the PTO misapplied the *Mayo/Alice* framework (and yet still reached the correct outcome) further challenges the view that judges are unable to correctly and predictably apply the current patent eligibility standard.

To summarize our findings from district court and PTO outcomes, we saw that over the past decade (since *Mayo* issued and initially set forth the *Mayo/Alice* framework), district courts reached the wrong § 101 outcome 14.7% of the time and further erred in applying the legal analysis only 4.2% of the time when reaching the right result. Thus, 81.1% of the time, the district court's *Mayo/Alice* analysis was error-free. The PTO did even better: It made the wrong § 101 decision 4.5% of the time and showed no additional errors in its analysis when it reached the right result. Thus, 95.5% of the time, the PTO's *Mayo/Alice*

240. U.S. CT. OF APPEALS FOR THE FED. CIR., INTERNAL OPERATING PROCEDURES 17 (2022), <https://cafc.uscourts.gov/wp-content/uploads/RulesProceduresAndForms/InternalOperatingProcedures/IOPs-03012022.pdf> [<https://perma.cc/B6N6-KC7H>].

analysis was error-free. In our view, district courts' and the PTO's remarkable consistency (over a decade) in issuing error-free § 101 decisions significantly undermines the assertion that the law cannot be predictably applied by judges.

C. *EXAMINING DISSENT RATES: FEDERAL CIRCUIT JUDGES RARELY DISAGREE
IN DECIDING § 101 CASES*

As mentioned above, there are a few decisions (*Alice*,²⁴¹ *Athena Diagnostics*,²⁴² and *American Axle*²⁴³) frequently cited in support of the argument that Federal Circuit judges cannot agree on how to determine patent eligibility, much less predictably and consistently apply the *Mayo/Alice* framework. These decisions, the dogma goes, demonstrate a clear division among the court on § 101.²⁴⁴ Surprisingly, despite the attention § 101 has received, as highlighted above, there have been almost no empirical studies to examine this question.

One early study after *Alice* was decided undertook an empirical examination of a few § 101 decisions authored by each Federal Circuit judge and found some differences in each judge's approach to deciding § 101.²⁴⁵ Importantly, the data from which the article drew conclusions was quite limited. It drew conclusions about each judge's approach in most instances based only on two cases (and no more than five), with many of those decisions being nonprecedential. It also attributed the approach of each judge based solely on the judge who authored the opinion—without further considering the judge's participation in other § 101 panels—which may not be consistent with how appellate decisions are decided (or opinions written) in practice. Additionally, its data was limited to the period between the *Alice* decision in 2014 and April 2017 and thus does not take into account how each judge has developed their judicial philosophy on § 101 in the past seven years.²⁴⁶ Nevertheless, although the study found that different judges emphasized somewhat different factors and arguments in those handful of cases, it ultimately concluded that in Step 1, the judges are “asking the same question,” and in Step 2, the judges “have been relatively consistent with each other.”²⁴⁷ In other words, it found differences in some of the particular points of emphasis for each judge in the analysis of those few early decisions, but overall, it observed a consistent approach in analyzing the patent claims.

241. *CLS Bank Int'l v. Alice Corp. Pty.*, 717 F.3d 1269, 1273 (Fed. Cir. 2013) (en banc), *aff'd*, 573 U.S. 208 (2014).

242. *Athena Diagnostics, Inc. v. Mayo Collaborative Servs., LLC*, 927 F.3d 1333, 1334 (Fed. Cir. 2019).

243. *Am. Axle & Mfg., Inc. v. Neapco Holdings LLC*, 966 F.3d 1347, 1348 (Fed. Cir. 2020).

244. See *CLS Bank*, 717 F.3d at 1273 (resulting in six separate opinions); *Am. Axle & Mfg.*, 966 F.3d at 1348 (denying petition for rehearing en banc, resulting in six different opinions and a six to six vote on whether the claims are patent eligible).

245. Hershkowitz, *supra* note 41, at 132–62 (examining at a very early stage a few of each judge's opinions).

246. *Id.* at 131.

247. *Id.* at 168.

The Sipe study discussed above looked at the eligibility outcomes for the Federal Circuit and observed a significant spread between the lowest and highest eligibility rates of the Federal Circuit judges.²⁴⁸ However, as explained earlier, because each of the judges was deciding different cases, and there exist only a relatively small number of § 101 cases for each judge, it is possible that the divergence in eligibility rates could be due to selection effects of the cases each judge was deciding rather than a divergence in how all the judges would decide the case if it was before them. Moreover, the Sipe study examined only the outcomes of the cases and did not analyze divergence in the reasoning, ideologies, or explanations of the different judges who decided § 101 cases.

In our comprehensive analysis of all § 101 appellate decisions, we sought to better understand whether the few decisions noted above that divided the court are representative of a deeper problem in the Federal Circuit judges' disagreement on § 101 or whether they instead serve as isolated examples of the "hard cases," in which reasonable minds can differ on how the law should be applied to a particular set of facts. We also sought to examine whether the spread in eligibility rates would manifest in outcome disagreement when judges with low and high eligibility rates were deciding the exact same case. To answer both questions, we analyzed how often the Federal Circuit judges disagreed with one another on § 101 issues in the past decade. As has been covered by scholars, analyzing dissent²⁴⁹ among appellate judges is a strong indicator of uniformity within the court, and tracking "separate writings fairly serve[s] as a measure of the extent to which judges disagree about the content of the law."²⁵⁰ Based on this analysis, we found that the few cases cited by critics of § 101 are better understood as outliers rather than representative of broader disagreement, unpredictability, or inability to apply the law. Similarly, we observed that when judges with diverging eligibility rates heard the same case, they all agreed on the outcome of the decision almost all of the time.

From March 20, 2012 (issuance of the Supreme Court's *Mayo* opinion) to December 31, 2023, the Federal Circuit issued 386 decisions that decided a patent eligibility issue.²⁵¹ In those cases, there were twenty-five dissenting

248. See Sipe, *supra* note 53, at 469.

249. In measuring judicial disagreement, we can look to both concurring opinions and dissenting opinions. As explained by Lefstin, although some empirical scholarship includes concurring opinions, focusing on dissenting opinions may more accurately measure disagreement because "[o]nly the dissenting opinion is an unambiguous declaration that the dissenting judge disagreed with the outcome reached by the majority." Lefstin, *supra* note 107, at 1051. For completeness, however, we note that adding concurring opinions made no significant difference, as it added only fourteen opinions over more than eleven years. Thus, there were only thirty-nine separate opinions in 386 § 101 decisions (10.1%) in comparison to twenty-five dissents (6.5%).

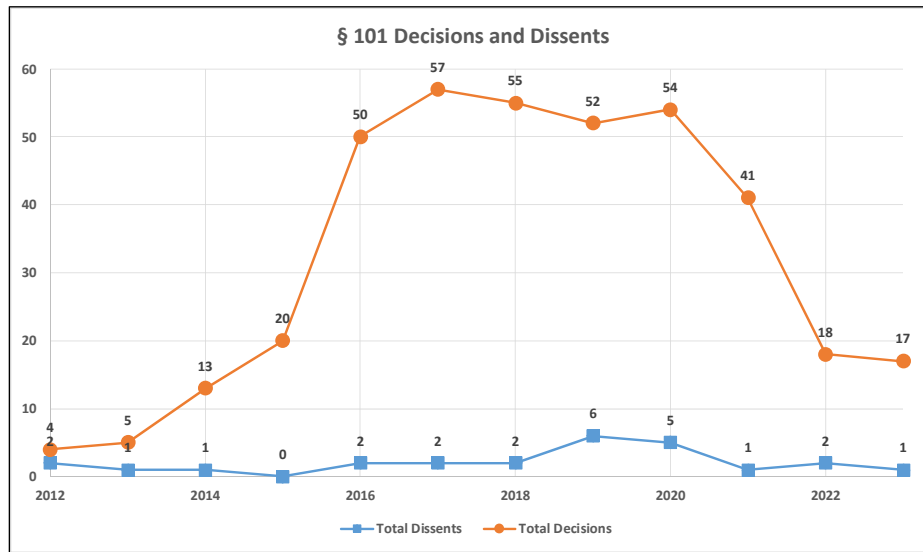
250. Rantanen & Petherbridge, *supra* note 94, at 2015.

251. We chose to measure disagreement at the Federal Circuit by taking into account Rule 36 decisions, especially given the findings of Gugliuzza and Lemley. Gugliuzza & Lemley, *supra* note 41, at 765–66. While Lefstin excluded those cases from his analysis because it was "extremely resource-intensive," we analyzed all Rule 36 § 101 decisions as part of our study. Lefstin, *supra* note 107, at 1053. More importantly, as Gugliuzza and Lemley explained, excluding Rule 36 decisions omits a large and important piece of the § 101 story at the Federal Circuit. Gugliuzza

opinions relating to § 101, which we use as an indicator of disagreement among the panel judges on the outcome of § 101. In twelve of those cases, the dissenter would have found the patent invalid when the majority thought otherwise. In another seven of the cases, the dissenter viewed the patent as valid in contrast to the majority's invalidity finding. In six of those cases, there was some partial agreement and partial disagreement.

As shown in Figure 21, the number of cases in which there was a dissenting opinion on § 101 has remained consistently low and peaked in 2019 and 2020.

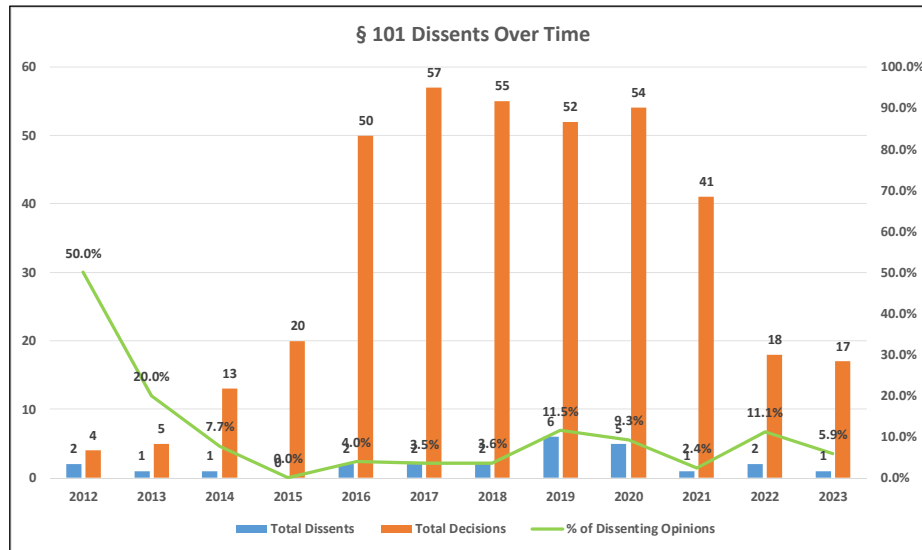
Figure 21



Furthermore, as shown in Figure 22, considering the number of § 101 decisions each year, the percentage of cases in which the Federal Circuit found some disagreement (i.e., at least one judge dissented) has been quite low, at least after the Federal Circuit began to decide more than just a few cases and the Supreme Court clarified its standard in *Alice*.

& Lemley, *supra* note 41, at 765–66. Although Rule 36 decisions do not provide a written opinion as to the court's reasoning, they do still tell us that all three judges agreed with the result to affirm after viewing the appellate record. Since the overwhelming majority of § 101 decisions did not raise grounds other than § 101 on appeal, we can confidently expect that the affirmances were based on § 101, at least in an overwhelming percentage of the cases. Thus, all three judges had an opportunity to voice disagreement and chose not to. For those reasons, we believe Rule 36 decisions are valuable data points in evaluating the amount of disagreement at the Federal Circuit on § 101 and should not be ignored. For the sake of completeness, however, we also compare the dissent rates for all decisions and opinions only (excluding Rule 36 decisions). *See infra* Tables 5, 6.

Figure 22



Viewing the § 101 dissent rates over the past decade in historical and subject matter context further confirms that § 101 law has not been the subject of more disagreement than other areas of patent law. Historically, the Federal Circuit has maintained a significant dissent rate—especially among patent law decisions.²⁵² Lefstin’s 2007 study found that from 1983 to 2005, 4.20% of all Federal Circuit written opinions and 7.14% of opinions arising from patent cases at the district courts contained a dissent.²⁵³ Among patent infringement cases specifically, the dissent rate in written opinions was even higher: 10.58% for the same period.²⁵⁴ Lefstin’s study of pre-2005 opinions found no significant differences among dissent rates for specific areas of patent law:

252. In interpreting dissent rates, it is important to take into account the denominator that a given study is using. Since dissents almost exclusively appear in precedential opinions, the more other types of decisions are included in the denominator, the lower the reported rate will be. For example, a dissent rate in which the denominator is both precedential and nonprecedential written opinions will be lower than if the denominator is just precedential opinions, and including Rule 36 summary affirmances will result in a yet lower rate. For consistency, we report dissent rates as a function of both all decisions (which includes Rule 36 summary affirmances) and all written opinions (which includes both precedential and nonprecedential opinions).

253. Lefstin, *supra* note 107, at 1057. The highest averages in Lefstin’s study appeared in 2002 to 2004, which explains why a longer view dating back to 1983 would bring the average down. *Id.*

254. *Id.* at 1068.

Table 4

Claim Construction ²⁵⁵	Infringement	Invalidity	Inequitable Conduct	Other
8.3%	7.5%	7.7%	8.5%	9.2%

Other studies have produced similar findings of the court's dissent rate. For the period from 1998 to 2009, Cotropia's 2010 study found that 3.51% of all Federal Circuit decisions on Westlaw (including Rule 36 summary affirmances and motion panel orders) contained a dissent, as did 9.28% of "patent" decisions.²⁵⁶ Rantanen and Petherbridge's 2014 study examined the period from 2005 to 2013 and found that the dissent rate in Federal Circuit precedential opinions arising from the district courts gradually rose from around 15% in 2005 to an astonishing 43% in 2013.²⁵⁷ Gugliuzza, Nash, and Rantanen's 2024 study observed that 22.2% of all precedential opinions (and 8.1% of all decisions) at the Federal Circuit over the period from 2008 to 2021 contained either a dissenting or concurring opinion; most were dissenting.²⁵⁸ For the period 2012 to 2022, Gugliuzza, Nash, and Rantanen observed a 6.4% dissent rate in all decisions, an 8.9% dissent rate in all written opinions, and a 16% dissent rate in written opinions arising from the district courts, a substantial drop from the rates Rantanen and Petherbridge observed for 2010 to 2013.²⁵⁹

²⁵⁵. *Id.* at 1072.

²⁵⁶. See Cotropia, *supra* note 140, at 816. Cotropia indicates that the dataset contained summary affirmances under Rule 36. In addition, Cotropia included orders from motions panels in the total of "written opinions," which may lead to variability depending on the frequency with which Westlaw collected these orders in a given year and would likely result in lower dissent rates compared to most other studies, which are limited to merits decisions. See Rantanen, *supra* note 59, at 76–78. "Patent" decisions were identified based on whether the document contained the word "patent" or, in the case of a Rule 36 summary affirmance, arose from the district courts, PTO, or ITC. As Cotropia acknowledges, this methodology is overinclusive and would likely lower the frequency of dissents in that set. Thus, if anything, Cotropia understates the amount of reported dissent at the Federal Circuit.

²⁵⁷. Rantanen & Petherbridge, *supra* note 94, at 2019–21 (graphing dissent rates for precedential opinions but also noting a similar general pattern "when all written opinions and Rule 36 dispositions are taken into account").

²⁵⁸. Paul R. Gugliuzza, Jonathan Remy Nash & Jason Rantanen, *Expertise, Ideology, and Dissent*, 74 AM. U. L. REV. (forthcoming 2025) (manuscript at 40) (on file with the *Iowa Law Review*).

²⁵⁹. Predictable Unpredictability Dataset, *supra* note 58. Other studies measuring dissent rates have made similar findings. One law firm blog posting found the Federal Circuit dissent rate on patent law issues in 2017 to be 6.6%, less than 5% in 2021, but more than 8% in 2022. See Bagatell, *2017 Patent Decisions*, *supra* note 207; Dan Bagatell, *Fed. Circ. Patent Decisions in 2021: An Empirical Review*, LAW360 (Jan. 6, 2022, 1:32 PM), <https://www.law360.com/articles/1452355> (on file with the *Iowa Law Review*); Bagatell, *Patent Decisions in 2022*, *supra* note 207. Another blog post found a dissent rate of 5.4% for all Federal Circuit opinions from November 1, 2019, to July 28, 2020. See Brian R. Matsui & Seth W. Lloyd, *Agreeing to Disagree: How Often Do Judges Dissent?*, MORRISON FOERSTER: FED. CIRCUITRY (July 30, 2020), <https://federalcircuitry.mofo.com/topics/200729-agreeing-to-disagree-how-often-do-judges-dissent> [<https://perma.cc/EgZH-2CLV>].

While there was significant turnover of judges at the Federal Circuit from 2010 to 2013 (six of twelve active judgeships), there were very few subsequent judge appointments (Stoll in 2015, Cunningham in 2021, and Stark in 2022).²⁶⁰ Since there was a steady increase of dissents from 2010 to 2013²⁶¹ followed by a significant decline (without much change to the court), there does not appear to be evidence that composition of the court has stymied disagreement. In fact, the reported dissent rates are consistent with our findings of the dissent rate for patent eligible subject matter decisions.

Directly comparing dissent rates from 2012 to 2023 for all Federal Circuit decisions (excluding § 101 cases), Federal Circuit patent decisions (excluding § 101 cases), and § 101 decisions shows that patent eligibility was no more unpredictable than other areas of law—in fact, it was *more predictable* than other areas of patent law²⁶²:

Table 5

	% Dissent All Cases All Decisions		% Dissent All Cases Opinions Only		% Dissent D. Ct. Cases All Decisions		% Dissent D. Ct. Cases Opinions Only	
	Federal Circuit (other than § 101)	§ 101 Law	Federal Circuit (other than § 101)	§ 101 Law	Federal Circuit (other than § 101)	§ 101 Law	Federal Circuit (other than § 101)	§ 101 Law
2012-2023	6.1%	6.5%	8.4%	11.7%	10.0%	8.5%	14.3%	15.5%

Table 6

	% Dissent All Cases All Decisions		% Dissent All Cases Opinions Only		% Dissent D. Ct. Cases All Decisions		% Dissent D. Ct. Cases Opinions Only	
	Patent Law (other than § 101)	§ 101 Law	Patent Law (other than § 101)	§ 101 Law	Patent Law (other than § 101)	§ 101 Law	Patent Law (other than § 101)	§ 101 Law
2012-2023	7.9%	6.5%	12.9%	11.7%	10.5%	8.5%	15.4%	15.5%

As the above table shows, the dissent rate in Federal Circuit decisions involving § 101 over the period from 2012 to 2023 (6.5%) is nearly identical to the rate in all Federal Circuit decisions that don't involve § 101 (6.1%) and was lower than the dissent rate in patent cases that don't involve § 101 (7.9%). And while the rate of dissents in § 101 *opinions* (11.7%) is higher than the

Although the authors did not identify the dissent rate for patent cases specifically, it was certainly noticeably higher, as “non-patent cases made up roughly 40% of the decided cases, [but] they made up only about 20% of cases in which there was a dissent.” *Id.* A limitation of these blog posts is that they contain limited methodological information, so it is difficult to compare them to the more detailed studies reported above.

260. Vacca, *supra* note 94, at 537 n.275.

261. Rantanen & Petherbridge, *supra* note 94, at 2020–21.

262. For this data, we again used the *Predictable Unpredictability Dataset* data and the December 31, 2023 release of the Federal Circuit Document Set. See *Predictable Unpredictability Dataset*, *supra* note 58; Rantanen, *supra* note 62. Section 101 decisions are not counted in the “Federal Circuit” and “Patent Law” categories. We identified a decision as a “Patent Law” decision if it arose from the BPAI or PTAB, or if it was identified as a “Patent infringement” or “Denial-Patent” dispute type in the *Compendium of Federal Circuit Decisions*, *supra* note 62.

Federal Circuit overall dissent rate (8.4%)—likely because a large portion of appeals involving § 101 are summarily affirmed—it is still lower than the dissent rate in patent opinions excluding § 101 (12.9%). In addition, as the table shows, Federal Circuit judges tend to dissent more often in appeals from district courts than in other areas, and since most of the § 101 decisions arise in that context, the more appropriate comparison is to the court’s dissent rate in appeals from district courts. With that in mind, it is remarkable that the overall dissent rate (including Rule 36 affirmances) for § 101 decisions is actually lower than the court’s overall dissent rate in appeals from all origins (8.5% versus 10%) and patent cases other than § 101 (8.5% versus 10.5%). The dissenting rates for opinions alone in appeals from district courts were comparable across the board: 15.5% for § 101, 15.4% for non-§ 101 patent cases, and 14.3% for the Federal Circuit overall.

Nor is the lack of dissents in § 101 decisions likely to be due to passive judges. Numerous studies examining dissent rates since the Federal Circuit’s existence have found that Federal Circuit judges “are willing to voice their opinions as much as, if not more than, judges on other circuit courts.”²⁶³ Indeed, as Lefstin observed, for a long time, the Federal Circuit carried a higher percentage of dissents compared to other federal appellate courts when addressing similar legal questions such as contract interpretation.²⁶⁴ And as we already addressed, we do not believe the judges are simply deferring to the district court—at least no more than in other cases.

Given these “structural variables”²⁶⁵ that seem to open the door for increased dissent and the open criticism of patent eligibility law by several Federal Circuit judges, one would expect to find significant disagreement within the Federal Circuit’s decisions on § 101. Yet, we observed almost the exact same amount of disagreement on § 101 in the court’s decisions overall and in its decisions arising from the district courts.

Additionally, since hearing *Alice* en banc, the Federal Circuit has not heard another § 101 case en banc, which has been used as another marker of predictability within an area of law.²⁶⁶ Thus, as with the lower tribunals, we observed that Federal Circuit judges rarely showed disagreement with each other.

Viewing the data at an even more granular level (shown in Figure 23) reveals that two of the judges, Newman and Reyna, are responsible for more than a third of all dissents (nine out of twenty-five). It is also worthwhile to note that all but one of the judges rarely dissent (less than 9%) in their § 101 decisions. Judge Rader’s sole high dissent rate stands out, but he was involved

263. Cotropia, *supra* note 140, at 824.

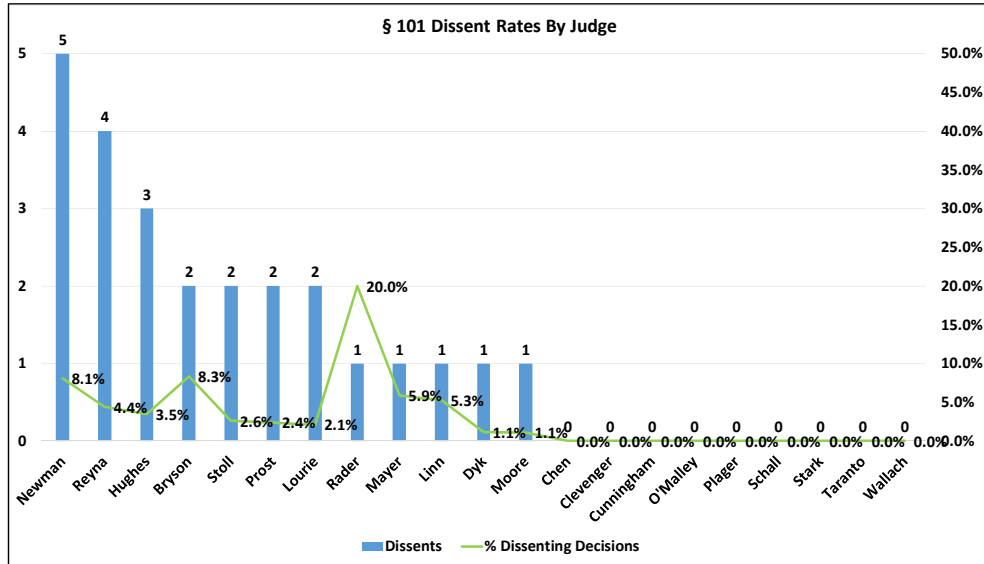
264. See Lefstin, *supra* note 107, at 1077.

265. *Id.* at 1033.

266. See Cotropia, *supra* note 140, at 814 (“This relationship makes en banc review relevant to the question of uniformity.”). *But see* Vacca, *supra* note 94, at 503 (noting that the Federal Circuit did not grant en banc review in any patent cases from 2018 to 2023 except for one design patent case in 2023, which has no application to our study of utility patents). On September 25, 2024, the Federal Circuit granted its first en banc review for a utility patent case since 2018. See *EcoFactor, Inc. v. Google LLC*, No. 2023-1101, 2024 WL 4282269, at *1 (Fed. Cir. Sept. 25, 2024) (granting review over a dispute on the admissibility of expert testimony on patent damages).

in only five § 101 decisions, all at the beginning of the period. Judge Bryson’s 8.3% dissent rate is a bit higher than his colleagues, but he also had a much smaller sample size: two dissents in twenty-four decisions.

Figure 23



Interestingly, even Judge Newman—the Federal Circuit’s “Great Dissenter”²⁶⁷—and Judge Mayer (another historically frequent dissenter) have not shown a similar propensity in § 101 cases that they do in other cases to disagree with their colleagues. Rather, they disagree with their colleagues less frequently on § 101 issues than they generally do in other opinions.²⁶⁸ The same appears to be true for other judges as well.²⁶⁹

Of course, as with our earlier data, there are some limitations to the conclusions we can draw from the lack of disagreement among Federal Circuit judges. For example, some have argued that judges might choose to avoid writing a dissenting opinion (or casting a dissenting vote) in the interest of preserving court collegiality. We recognize that it is possible that some Federal Circuit judges forgo writing separately on a case, even when they do not fully agree with the reasoning or analysis of the majority opinion. After all, Federal Circuit judges (and their law clerks, who also would be expected to expend significant effort in various tasks relating to writing an opinion) are quite busy, and writing separate opinions can be a drain on chambers’ resources. Conversely,

267. See 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, 897 (2017).

268. See *id.* at 915 (finding Judge Newman dissents in 31.11% of her opinions while Judge Mayer dissents in 33.94%).

269. Gugliuzza et al., *supra* note 258 (manuscript at 46 tbl.7) (providing dissent rates for Federal Circuit judges on all legal issues from 2008 to 2021).

though, dissenting does not always require much more work. Many dissents for § 101 cases were a mere few paragraphs. When a judge has already invested dozens of hours reading briefs, reviewing a bench memo, listening to oral arguments, conferencing with judges, and reading a draft opinion, a few more hours to draft a few dissenting paragraphs is likely not a significant burden. Still, in some cases judges may elect to simply sign onto the majority opinion rather than taking the time to express their own views.²⁷⁰ The reasons why judges dissent have been covered in some detail in earlier scholarship.²⁷¹ In some ways, this mirrors our exclusion of Rule 36 opinions in which the Federal Circuit decided to simply say nothing as to the reasoning or analysis by the district court or PTO—except we cannot exclude them from the data because we do not know in which cases one of the non-authoring judges may have silently held different views on something relatively inconsequential. Thus, while we may not feel as confident that we have captured all instances where a panel member shared different views, we can feel reasonably confident that we have captured most instances where a panel member disagreed with the outcome under § 101.

Moreover, this concern for uncaptured dissenting votes/opinions is not unique to our dissent rate study—it is at the heart of *all* dissent rate studies, which is one of the two predominant ways predictability in the law has been measured in earlier scholarship. For the same reasons as discussed earlier regarding why we find it implausible that the Federal Circuit judges are rubber-stamping lower tribunal § 101 decisions, we would find it improbable (albeit slightly less so) that an appreciable number of Federal Circuit judges would fail to note their disagreement with the *outcome* of § 101 cases in a consistent manner. More importantly, though, our conclusions regarding the predictability of § 101 law do not depend on absolute § 101 dissent rates but only the dissent rate for § 101 relative to the other areas of patent law. All of the considerations regarding whether judges dissent apply to all patent law issues. We are not aware of reasons why the court's collegiality would matter more in § 101 cases than it does for other patent opinions or that the judges are less likely to expend the time to write a separate opinion in a § 101 case than they are in another area of patent law. Thus, we may confidently analyze whether § 101 is predictable relative to other areas of patent law. In fact, given the narrative of unpredictability and some of the judges' pleas for guidance from the Supreme Court, it would seem more likely for the judges to look past these areas of concern and continue to highlight the purported problems with § 101 by diligently and correctly issuing their views in the form of dissents. So, if the concerns above regarding resources and collegiality are true, we might expect to see an overrepresentation of § 101 dissents compared to other patent law areas.

In summary, our research shows that only 25 of 386 decisions (6.5%) resulted in a dissent, which represents disagreement on whether any of the

270. *Id.* (manuscript at 9–14) (summarizing key scholarship).

271. *Id.* (manuscript at 6).

patent claims at issue were patent eligible. This dissent rate is lower than the overall patent dissent rate for 2012 to 2023. It is also historically lower than or consistent with the Federal Circuit's overall dissent rate and dissent rate on specific patent issues, as well as the dissent rate in other appellate courts on other issues.

In light of these findings under our third metric of predictability, it seems that the narrative and anecdotal commentary that Federal Circuit judges cannot decide § 101 cases or predictably apply the *Mayo/Alice* framework finds little support in the § 101 outcomes at the Federal Circuit over the past decade. Rather, it suggests that a few outlier decisions that divided the court may have significantly fueled the fire and exaggerated the claim that Federal Circuit judges are constantly in disagreement in § 101 cases.

D. PREDICTABILITY BEYOND JUDICIAL DECISION-MAKING

As already explained, our study measures the predictability of the current § 101 framework in judicial decision-making, which addresses the popular narrative that the framework is unpredictable because even judges do not know how to apply the law.

However, another popular narrative has been that the § 101 framework makes it difficult for business decision-makers to identify if a patent is valid, which has led to “investment-killing uncertainty.”²⁷² It might be tempting to extend our findings for judges' abilities to predict and apply § 101 law to other decision-makers, such as patent examiners, practitioners, and business decision-makers. While we have our own views on what this study does to show how well other actors can predict applying § 101 law, we want to be clear that our study does not measure such predictability, and as such, we cannot draw strong conclusions from this data regarding how predictably practitioners, patent examiners, and business leaders can apply (or are applying) the *Mayo/Alice* framework.²⁷³ Nor do we attempt to tackle the effect of any (potential) such uncertainty on investment and innovation. The litigation data simply does not offer an informed opportunity to fully understand how those decision-makers²⁷⁴ are making decisions regarding patent eligibility.

Nor can such observations be made through the earlier studies—even those that reviewed PTO examination outcomes. To understand practitioner and business decision-maker outcomes, an entirely new empirical study would need

272. Cahoy, *supra* note 105, at 6, 40 (“Importantly, it does not matter if . . . we can determine post-hoc that courts seem to be making policy-aligned, or well-reasoned decisions. If an innovator has no basis for assessing the future probabilities of that ‘right’ decision, it does not resolve the uncertainty.”); *see also supra* note 21 (discussing whether the *Mayo/Alice* framework promotes or stifles innovation).

273. While our dataset includes some appeals from the denial of patent applications on § 101 grounds, it (obviously) does not include the grant of patent applications that have overcome § 101 grounds. Thus, we cannot be as confident in conclusions regarding patent examiners' application of § 101 law as opposed to decisions by PTAB judges at the PTO.

274. We use the term “decision-makers” because patent examiners need not be attorneys. *See Become a Patent Examiner*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/jobs/become-patent-examiner> [<https://perma.cc/M243-LWZJ>].

to be undertaken. Moreover, since practitioners have a duty to zealously advocate on behalf of their clients (i.e., be the opposite of objective fact finders), we must be exceedingly careful about drawing conclusions on the predictability of the law from attorneys' views or abilities to apply the law predictably in individual cases based on litigation outcomes. For instance, we would not draw conclusions regarding what positions an attorney (or party) took and how frequently their view of the law was the correct outcome. It is also appropriate to be skeptical of results derived from those whose business or financial interests are strongly implicated in the eligibility scope. Unlike objective decision-makers (such as judges), attorneys and parties are motivated toward a particular outcome, regardless of whether that outcome is consistent with the existing law. Their analysis of legal issues is likely to be similarly outcome-motivated.

Although we stop short of drawing a conclusion, we offer one reflection about other actors' abilities to predictably apply the law. If judges are able to apply the law predictably, then why not others? Why cannot we have the same level of confidence in the PTO and the patent bar?²⁷⁵ Two main reasons strike us as most relevant: ability and time.

With regard to the first, it does not seem that ability to apply the law can be viewed as exclusively within the possession of federal judges. While federal judges are expected to hold some of the highest abilities in applying the law, they do not become judges in a vacuum. Their legal acumen is most often developed through years of practice. Indeed, this is one of the criteria most heavily weighed during the judicial selection process.²⁷⁶ Thus, undoubtedly, many qualified patent practitioners exist who would be qualified to sit on the federal bench. Furthermore, empirical evidence also shows that practitioners can predict patent eligibility outcomes with reasonable certainty, even at a quick glance. Reinecke's study found that patent attorneys were able to correctly predict court outcomes on patent eligibility 63% of the time (67.3% for those who draft patents) even though most of the attorneys "spent an average of less than one minute analyzing each claim" and without considering "the patent specification, priority date, and prior art."²⁷⁷ With more time and a closer examination of the patent, those attorneys likely would have performed even better.²⁷⁸ In fact, this is precisely where the sage advice of an experienced attorney who is already familiar with § 101 law and precedent can yield

275. We understand the criticism that business decision-makers cannot predict eligibility to be based on corresponding advice of patent counsel. Suggesting that the law should be so clear as to allow non-lawyers to apply it with certainty seems dubious at best and likely not a standard that any current patent doctrine would be able to satisfy. Thus, we address the purported inability of business decision-makers and patent attorneys to apply the law together.

276. See, e.g., BARRY J. McMILLION, CONG. RSCH. SERV., R43538, U.S. CIRCUIT COURT JUDGES: PROFILE OF PROFESSIONAL EXPERIENCES PRIOR TO APPOINTMENT 5 (2014), <https://crsreports.congress.gov/product/pdf/R/R43538> [<https://perma.cc/8RWJ-qJ5N>] (finding that 84.7% of federal circuit court judges have private practice experience); RUSSELL WHEELER & REBECCA LOVE KOURLIS, OPTIONS FOR FEDERAL JUDICIAL SCREENING COMMITTEES 1, 7 (2d ed. 2011), https://iaals.du.edu/sites/default/files/documents/publications/options_2nd_ed_final_9-13-11.pdf [<https://perma.cc/5MAD-FYF6>] (indicating that most judges were in private practice prior to nomination).

277. Reinecke, *supra* note 39, at 603 (emphasis omitted).

278. *Id.* at 583, 602.

significant value because they will have a deeper understanding of how courts have applied the framework without having to research the issue—they simply have to spend their time applying that knowledge to the client’s specific patent claims. As Reinecke’s study indicates, the ability of patent attorneys—particularly patent litigators—to predict patent eligibility “varied significantly.”²⁷⁹ Similarly, many senior patent examiners have substantial experience and legal ability, and patent examiners have significant resources available at their disposal at the PTO, which is led by some of the key leaders in driving patent policy and analysis. As anecdotal evidence, we also rely on our practice experience and interactions with the patent bar and PTO to support our view that many exceptional patent practitioners and examiners are equally capable of applying the law as the judges our study evaluated.²⁸⁰ One study has even sought to “mechanize” the patent eligibility test through machine learning algorithms and concluded that “it is possible to predict, with a reasonably high degree of confidence, whether a patent claim is patent eligible under the *Alice* test” such that the decision-making process can be automated.²⁸¹

As to the second possible reason, we think time may play a role in any difference between judges’ and practitioners’ abilities in predictably applying the law. Certainly, federal judges are busy. But the amount of time a federal judge (and by extension their law clerk) spends on analyzing § 101 issues raised by the parties—on average—far exceeds the amount of time a patent examiner focuses on the issue.²⁸² *If* (and we emphasize there is a lack of empirical data to support a confident conclusion that this is the case) there exists a lack of ability to apply the law predictably by patent examiners, perhaps affording those capable examiners greater available time and resources will lead to better predictability. Doing so may be a better step toward addressing the concern (if it exists) than overhauling the law.

Moreover, we can guard against such undesired lack of predictability by placing a greater emphasis on parties to objectively evaluate their patent claims for compliance with the law to ensure the end result will be a valid patent. After all, if parties knowingly or negligently fail to spend the time and effort to ensure compliance with the law, a complaint that they ultimately receive what they knew or ignored at the beginning should be met with skepticism and reserved compassion. With rising billing rates, we appreciate that parties do not have

279. *Id.* at 598, 603 (“The attorneys’ distribution of scores was much wider than what could be expected due to chance alone, which means that some groups of attorneys were much better predictors than others.”).

280. Some have drawn a different conclusion from Reinecke’s results, finding the 67% rate “remarkably low” and, essentially, the equivalent of “flipping a coin to guess at patentable subject matter.” Gruner, *supra* note 20, at 1078–79. Notably, however, no comparable studies have provided insight into how the rates found by Reinecke compare to rates based on other invalidity grounds. Without that context, it seems difficult to conclude with confidence that the eligibility prediction rates found by Reinecke under § 101 are materially lower than would be found for sections 102, 103, 112, or claim construction issues.

281. Ben Dugan, *Mechanizing Alice: Automating the Subject Matter Eligibility Test of Alice v. CLS Bank*, 2018 U. ILL. J.L. TECH. & POL’Y 33, 79.

282. See sources cited *supra* note 119 and accompanying text (citing hours spent by examiner on application).

an infinite amount of time to spend in evaluating the issue of patent eligibility. But Reinecke's study indicates that, at least for some patent claims, practitioners can quickly and accurately predict whether those claims are patent eligible in about a minute. Spending even just a few hours—and considering relevant information, such as the specification, prosecution history, and priority date—will likely significantly increase the predictive ability, at least for experienced patent attorneys.²⁸³ Of course, parties can choose to expend as much time as they believe to be appropriate (and pay a more experienced attorney) depending on the relative importance of those patent claims. Our goal here is not to determine as a policy matter whether parties should expend less or more time evaluating their patent claims' eligibility—only to evaluate whether such a determination is at all possible under the current doctrinal state of the law. Given the strong results that judges are capable of doing so, we expect that practitioners and examiners may be able to do so as well. Whether the difficulty of doing so (from a time and cost perspective) is far too great for practitioners is a question we leave as a policy issue that needs further research. Though, again, we emphasize that once an attorney is familiar with the body of case law on § 101, those determinations should be significantly streamlined.

Furthermore—to be clear—we are not suggesting that the *Mayo/Alice* framework is an easy-to-apply test or that it cannot benefit from further clarification. Because it is not a bright-line rule, the *Mayo/Alice* framework inevitably will result in differences in opinion, particularly in some harder cases. As we acknowledged, there have been a few cases that have badly fractured the Federal Circuit judges.²⁸⁴ But much of patent law is subject to the same criticism,²⁸⁵ and so is the copyright eligibility standard.²⁸⁶ Additionally, as further detailed below, there is a need for further clarification regarding some aspects of the *Mayo/Alice* framework. We outline below a few observations from analyzing the Federal Circuit decisions that can further improve the ability to more consistently and predictably apply the law. Even in its current state, however, our analysis on the level of predictability does not seem to support the premise that a major overhaul of the current law is necessary, at least for the reason that judges cannot predictably apply the law.

VI. ADDITIONAL KEY QUESTIONS AND TAKEAWAYS FROM A DECADE OF *MAYO/ALICE*

While the focus of this Article has been on better understanding the predictability of the *Mayo/Alice* framework by examining the Federal Circuit's body of case law, those appellate decisions have illuminated a number of other issues.

^{283.} See Reinecke, *supra* note 39, at 584.

^{284.} See cases cited *supra* notes 241–43.

^{285.} See, e.g., *En Banc Cases*, FEDCIRCUITBLOG, <https://fedcircuitblog.com/en-banc/cases/?action=search-en-banc-cases&keyword=&date=&subject=Patent> [<https://perma.cc/GD2V-2E77>] (listing en banc cases before the Federal Circuit).

^{286.} See Carter, *supra* note 115, at 473.

A. THE IMPACT OF STEP 2

The Supreme Court delineated a framework comprised of two individual and separate steps. Presumably, because it separated the analysis, it expected that different considerations would guide the analysis within each step. Regardless of the Supreme Court's intent, however, the considerations within each of the steps appear to have blended together in many ways, such that there is often considerable overlap in what district courts and the Federal Circuit take into account when deciding the separate questions under each step. As Professor Andrew Michaels (and others) have argued, "[a] number of courts and judges have observed that the Supreme Court's two-part test for eligibility is somewhat incomprehensible and could at least arguably be reduced to a single inquiry."²⁸⁷ A number of Federal Circuit cases have expressly acknowledged this issue.²⁸⁸ And as already highlighted earlier, there is some disagreement at the Federal Circuit whether conventionality can be considered under Step 1.²⁸⁹ Even the PTO's guidance reflects the overlap in considerations.²⁹⁰

The slow erosion of the divide between the two steps raises important questions regarding whether courts are really applying the law as a two-step framework, which step is most often outcome-determinative (and appears to drive the analysis), and whether there is a need for two steps. Review of the Federal Circuit's precedent over the past decade shows that Step 2 is almost never outcome-determinative and suggests that the Supreme Court's two-step framework might be better served by a unitary analysis that takes into account the key considerations from both steps.

Our research findings indicate that Step 2 has played an immaterial role in patent outcomes at the Federal Circuit over the past decade. Excluding Rule 36 opinions (for which we do not know the basis of the Federal Circuit's reasoning), 161 opinions found the patent was directed to an unpatentable concept, and 158 of those decisions ultimately found no inventive concept. In other words, in all but three of those cases, the Federal Circuit could have simply stopped after analyzing Step 1 and reached the same outcome.

²⁸⁷. Andrew C. Michaels, *Benefits of the Invention and Social Value in Patent Law*, 29 GEO. MASON L. REV. 827, 844 (2022); see also Stephen Schreiner, Tom Scott & Jim Carmichael, *The Fed. Circ.'s Secret Merger of Alice Steps 1 and 2*, LAW360 (June 17, 2020, 4:40 PM), <https://www.law360.com/articles/1280622/the-fed-circ-s-secret-merger-of-alice-steps-1-and-2> (on file with the *Iowa Law Review*) ("[T]hese various tests or factors for identifying abstract ideas under [S]tep one have all the hallmarks of factual inquiry thought to be the province of the [S]tep two inquiry.")

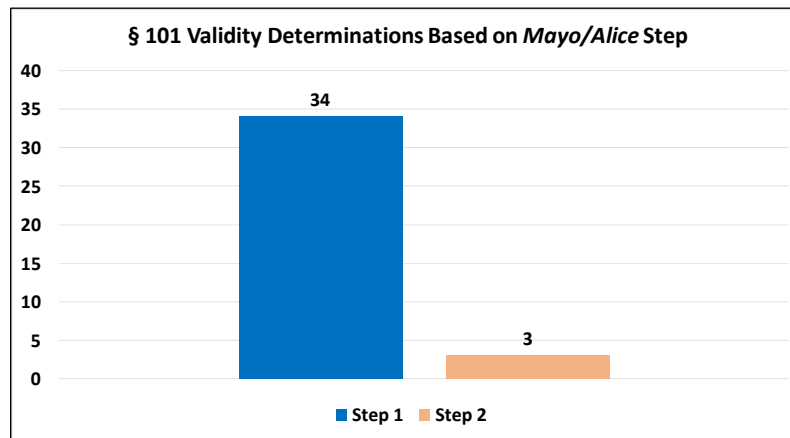
²⁸⁸. See, e.g., *Amdocs (Isr.) Ltd. v. Openet Telecom, Inc.*, 841 F.3d 1288, 1294 (Fed. Cir. 2016) ("Our cases generally follow the [S]tep one/[S]tep two Supreme Court format, reserving [S]tep two for the more comprehensive analysis in search of the 'inventive concept.' Recent cases, however, suggest that there is considerable overlap between [S]tep one and [S]tep two, and in some situations this analysis could be accomplished without going beyond [S]tep one."); *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353 (Fed. Cir. 2016) ("At the same time, the two stages are plainly related: not only do many of our opinions make clear that the two stages involve overlapping scrutiny of the content of the claims . . .").

²⁸⁹. See *supra* notes 233–34 and accompanying text.

²⁹⁰. Compare MPEP § 2106.04 (9th ed. Rev. 7.2022, Feb. 2023), with *id.* § 2106.05.

Looking at validity decisions, under Step 1, the Federal Circuit found in 34 cases that at least some of the claims were not directed to an unpatentable concept—in other words, the Federal Circuit found at least some of the claims in 34 cases valid at Step 1. By contrast, there were only three cases in which the Federal Circuit found at least some of the claims directed to an unpatentable concept (and thus required a Step 2 analysis) but also found at least some of the claims to contain an inventive concept (at Step 2). In thirteen decisions, the Federal Circuit found there was an inventive concept, but some of those decisions either did not perform a Step 1 analysis or analyzed Step 2 even though they could have stopped at Step 1. As such, in all but three cases, the court could have stopped its analysis at Step 1 without impacting the patent outcome.

Figure 24



While some of the Federal Circuit judges who have argued that the *Mayo/Alice* framework is in a state of crisis have opined that “this is not a problem that [the Federal Circuit] can solve,”²⁹¹ recalibrating how the Step 1 vs. Step 2 analysis is performed is precisely within the capability of the Federal Circuit. And given the ability of judges to overall apply the framework, that may be all the fixing that is necessary—or, at least, it would go a long way to improving the application of the current patent eligibility framework. As we noted earlier, the Supreme Court has yet to take another patent eligibility case, just like it refused to do during the purported claim construction crisis two decades ago. Thus, an en banc patent eligibility decision to address the Step 1/Step 2 confusion may mirror the path the Federal Circuit took with *Phillips* to clarify claim construction.

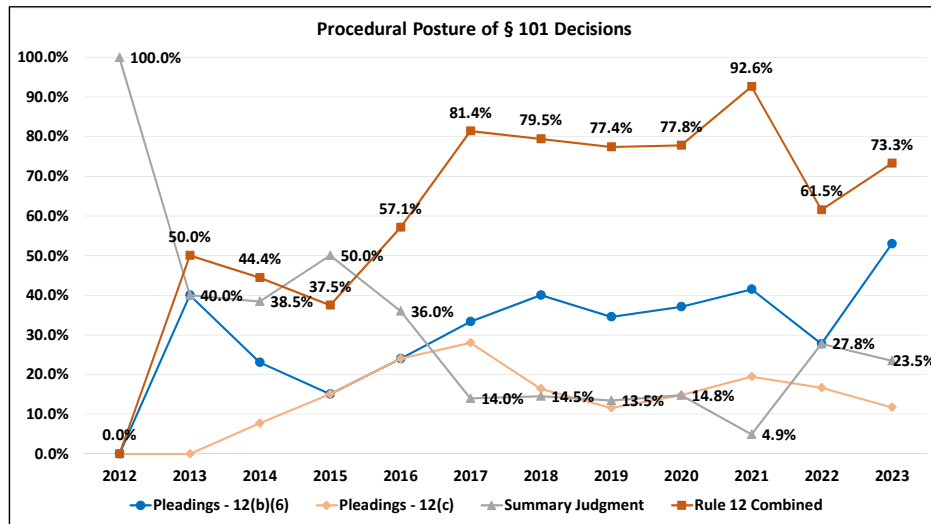
²⁹¹ *Athena Diagnostics, Inc. v. Mayo Collaborative Servs., LLC*, 927 F.3d 1333, 1337 (Fed. Cir. 2019) (Hughes, J., concurring in the denial of the petition for rehearing en banc); *see also Berkheimer v. HP Inc.*, 890 F.3d 1369, 1374 (Fed. Cir. 2018) (Lourie, J., concurring in the denial of the petition for rehearing en banc) (“I believe the law needs clarification by higher authority, perhaps by Congress, to work its way out of what so many in the innovation field consider are § 101 problems.”).

B. BERKHEIMER'S IMPACT ON THE TIMING OF § 101 CHALLENGES

In February 2018, the Federal Circuit clarified that under Step 2, “[t]he question of whether a claim element or combination of elements is well-understood, routine and conventional to a skilled artisan in the relevant field is a question of fact.”²⁹² At the time, many predicted that this would be the end of § 101 challenges under Rule 12 and that more § 101 issues would need to go to trial.²⁹³

As to the first prediction, some earlier studies of district court § 101 outcomes indicated a decline in Rule 12 invalidations and a possible effect from *Berkheimer*.²⁹⁴ Our data shows a sharp decline in the percentage of appellate decisions based on Rule 12 in 2022 but then a significant rise in 2023.

Figure 25



Considering the time to an appellate decision, the decline in Rule 12 appellate decisions in 2022 could be an indication that the dominance of Rule 12 motions might be fading; however, the rise in 2023 suggests the opposite. Given the small number of decisions for 2022 and 2023, data in future years will indicate whether 2022 is a trend or an outlier. Notably, however, we did not observe any significant changes in Step 2 outcomes at the Federal Circuit after *Berkheimer* for cases in which the court found the claims were directed to unpatentable concepts under Step 1, as shown in Figure 26. Thus, it does not

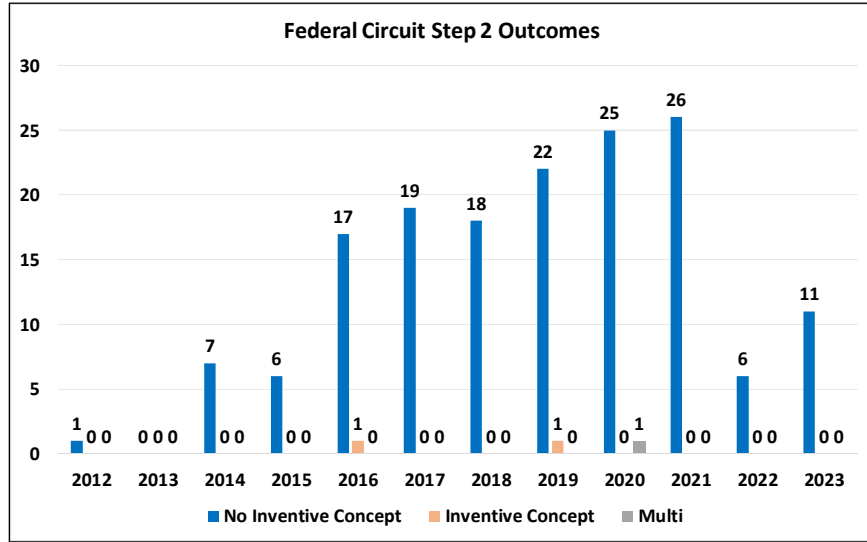
292. *Berkheimer v. HP Inc.*, 881 F.3d 1360, 1368 (Fed. Cir. 2018).

293. See Paul R. Gugliuzza, *The Procedure of Patent Eligibility*, 97 TEX. L. REV. 571, 638–39 (2019) (noting that “in the wake of *Berkheimer*, the prevailing wisdom seems to be that patent eligibility will now often be decided by a jury,” but disagreeing with that outlook).

294. Lemley & Zyontz, *supra* note 40, at 64.

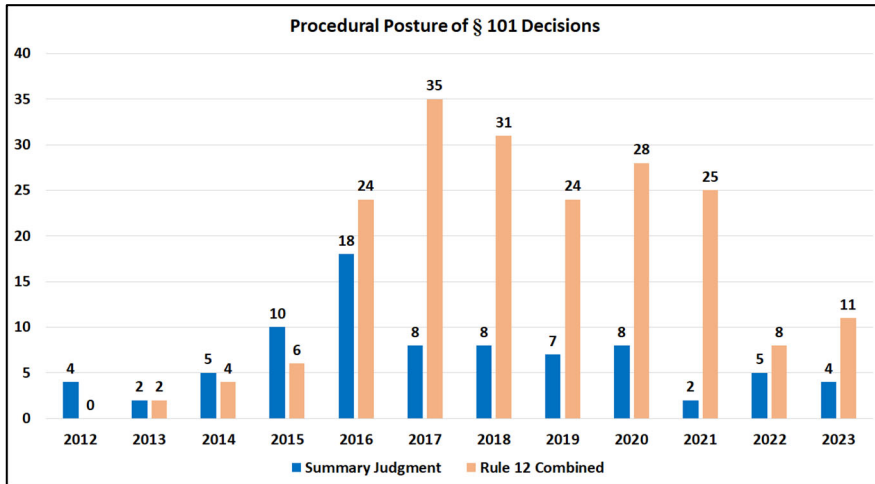
appear that *Berkheimer* had any major effect on how the Federal Circuit decided Step 2 questions after 2018.

Figure 26



With only one year of decline based on Rule 12 outcomes at the Federal Circuit, we cannot draw firm conclusions; however, if this trend returns in 2024 and beyond, it may confirm or disprove others’ findings that *Berkheimer* impacted the procedural posture at which § 101 issues are decided.

Figure 27

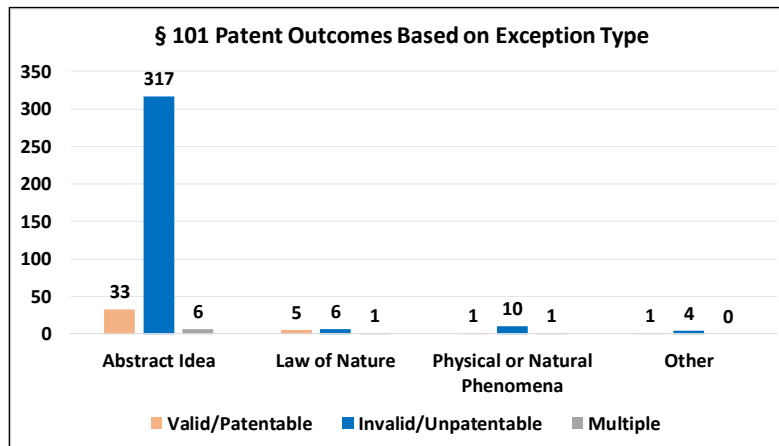


With regard to the prediction (and fear for some) that *Berkheimer* will shift § 101 decisions to the jury, our data indicates that concern has not come to fruition. There were no § 101 jury trials in our dataset. This finding is consistent with other studies finding that sending a § 101 question to the jury is exceedingly rare, notwithstanding *Berkheimer*.²⁹⁵

C. ABSTRACT IDEA LAW

Earlier empirical studies have focused on analyzing § 101 cases by the technological area of the patent. As far as we are aware, this is the first empirical study to examine the utilization of each doctrinal basis for eligibility (i.e., which § 101 exception applied) rather than segmenting the decisions by technology area. We analyze the Federal Circuit decisions by exception type to better understand how the case law on each of the doctrinal grounds for invalidity under § 101 has developed over the past decade. One of the key takeaways from our review of the Federal Circuit’s § 101 case law is that this is really “the abstract idea” case law.

Figure 28



The abstract idea exception was the basis for 92.5% of the Federal Circuit’s decisions on § 101, with law of nature cases comprising only 3.1% and natural phenomena being at the heart of only 3.1%.²⁹⁶ While there is a lot to consider from this finding, perhaps the most important is simply the acknowledgment that we have a much more developed body of case law when it comes to abstract ideas than we do for the other two types of exceptions. As such, we raise for future consideration the question whether, given this limited jurisprudence,

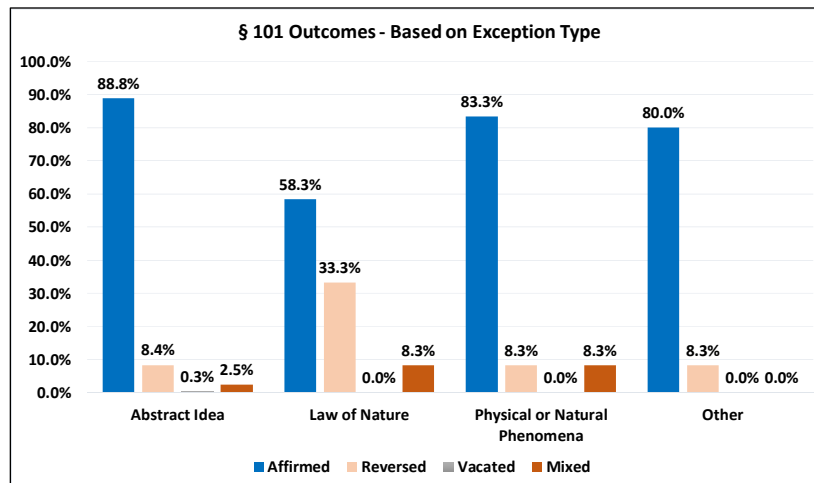
295. See, e.g., C. Graham Gerst & Lily Parker, *Section 101 on Trial: Understanding How Eligibility Issues Have Fared Before Juries*, IPWATCHDOG (Jan. 31, 2022, 3:15 PM), <https://ipwatchdog.com/2022/01/31/section-101-trial-understanding-eligibility-issues-fared-juries/id=145016> [https://perma.cc/4EFT-N8FW] (identifying only four cases in which a § 101 issue was sent to the jury—all of them in the Eastern District of Texas).

296. The remaining 1.6% of grounds for a § 101 decision pertained to nonstatutory grounds.

all eligibility exceptions should be treated in the same manner—or whether we understand how to apply the framework as well for each type of exception.

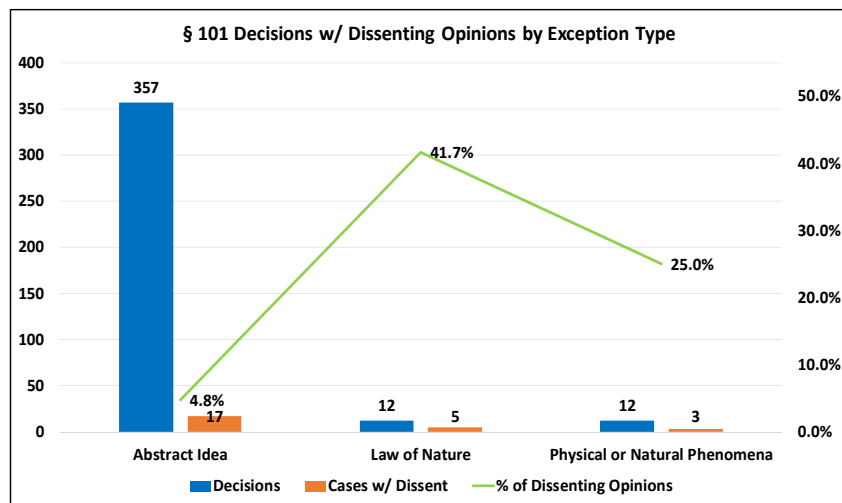
At the very least, this finding suggests that we must be careful about characterizing what we have learned over the past decade with regard to the other two exceptions. For example, some of the criticisms of the *Mayo/Alice* framework have been particularly directed at bioinformatics inventions. And some of the earlier empirical scholarship has indicated that the framework “impacts patent eligibility in different technology areas to different degrees,” with one study finding that “*Alice* place[d] the highest cost of patenting [for patent prosecution] on bioinformatics.”²⁹⁷ Most of these inventions are likely to fall within either the law of nature or natural phenomena exceptions rather than the abstract idea exception, both of which have a very limited number of cases on appeal. Moreover, law of nature cases showed the lowest levels of predictability (based on affirmance rates and dissent rates, as shown in Figures 29 and 30) and were most likely to be found invalid at the Federal Circuit, albeit based only on twelve cases. Indeed, both of the decisions most often cited as evidencing division at the Federal Circuit (*Athena Diagnostics* and *American Axle*), which resulted in many opinions on whether to grant en banc review, involved the law of nature exception.

Figure 29



297. Kesan & Wang, *supra* note 38, at 535.

Figure 30



In contrast to bioinformatics, Kesan and Wang’s study found that “[t]he proportion of office actions in software with initial and final § 101 rejections *did not* increase much after the *Alice* decision or its implementation by the PTO.”²⁹⁸ Since software inventions are most likely to be addressed within the abstract idea exception, their study indicates that the *Mayo/Alice* decisions impacted different exception types differently in prosecution proceedings at the PTO through 2016 (the outer date of their time period).

Therefore, the data from our study corroborates findings from earlier empirical studies that different types of inventions (which most likely fall under different exception types) were impacted differently by the *Mayo/Alice* decisions in the courts as well as the PTO. As such, arguments for the predictability of the law with regard to inventions directed to laws of nature may be on different footing than abstract ideas. Though, to be clear, we are not suggesting our data shows evidence of lack of predictability for the other two exception types. Rather, we are simply acknowledging the absence of a meaningful number of Federal Circuit decisions to help answer the question. Thus, the key areas of the *Mayo/Alice* framework that need greater attention may be inventions that fall within the law of nature and natural phenomena exceptions, such as bioinformatics.

C. IS THE PTO ISSUING INVALID PATENTS UNDER § 101?

As noted earlier, some scholars have raised the concern that the PTO’s guidance documents, which resulted in decreased rejections under § 101, may be based on the PTO’s application of § 101 that is not in alignment with the Federal Circuit’s decisions and could be resulting in the issuance of many

²⁹⁸ *Id.* at 591 (emphasis added).

patents that are actually invalid under Federal Circuit precedent.²⁹⁹ Indeed, on at least a couple of occasions, the Federal Circuit has reminded litigants (and everyone else) that the PTO’s guidance documents “do[] not carry the force of law.”³⁰⁰

Yet, our data shows that PTO *judges* have had the highest success rates at the Federal Circuit of any lower tribunal judges (PTO, CFC, district courts).

Figure 16 (reprinted from *supra*, at 717)

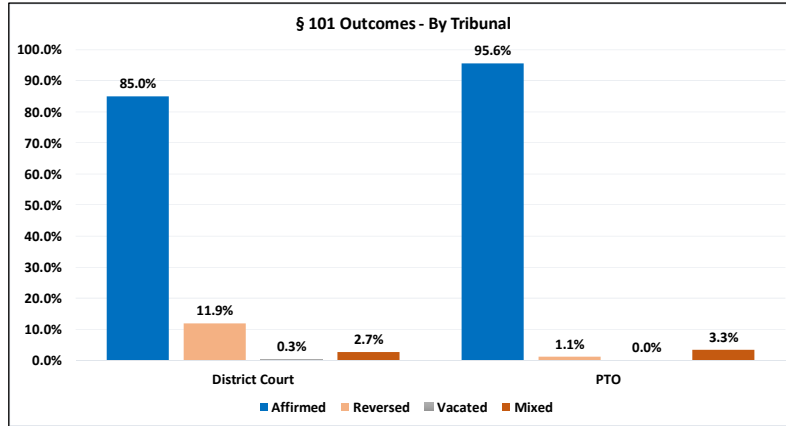
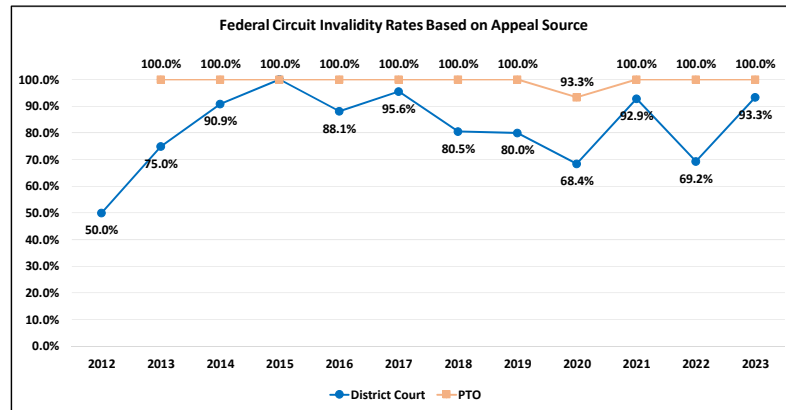


Figure 10 (reprinted from *supra*, at 690)



Does that mean the PTO is likely to be the best at applying § 101 law? Not necessarily. First, it is important to remember that in all PTO decisions, the patent(s) were found invalid. With regard to decisions where the PTAB

299. See *supra* note 127 and accompanying text.

300. *cxLoyalty, Inc. v. Maritz Holdings Inc.*, 986 F.3d 1367, 1375–76 n.1 (Fed. Cir. 2021) (quoting *In re Rudy*, 956 F.3d 1379, 1382 (Fed. Cir. 2020)).

was acting in an appellate scope (for an appeal on an examiner rejection), it would only be appealed and be included in our dataset if the PTAB judges found the claims ineligible. Second, all but one PTO decision were based on a ruling from PTAB *judges*. It does not include the many more PTO patent examiner decisions that found the patent claims eligible or found the claims ineligible but that did not result in a PTAB invalidity decision. Third, taking into account a one-year timeline from appeal to decision, there have been only a small number of appellate decisions that arose from a PTAB decision based on the updated PTO guidance in 2019.

In other words, we do not believe our Federal Circuit data provides an answer on whether the PTO *examiners* are predictably applying the law. What our data does indicate, however, is that if the PTAB judges determined the patent to be invalid, the patentee's chance of success on appeal is minuscule. Stated differently, PTAB judges have been doing a good job of correctly and predictably determining when the patent claims are *ineligible*—not necessarily when they are eligible.³⁰¹

CONCLUSION

Our empirical examination of all § 101 decisions by the Federal Circuit over the past decade—the entirety of decisions under the current framework—reveals several significant disconnects between the data and the doctrinal, theoretical, and anecdotal assertions that have been advanced by leading scholars, judges, and commentators. The most important of those is that there is significant reason to think the popular narrative that § 101 and the *Mayo/Alice* framework cannot be predictably applied, particularly by judges, may be more of a misconception than an accurate narrative.

By analyzing the Federal Circuit's entire body of case law on the issue, we found that district court and PTO judges overwhelmingly reach the right result and for the right reasons when applying the *Mayo/Alice* framework. Indeed, they do so more frequently than in other areas of patent law. Moreover, Federal Circuit judges very rarely disagree with one another on the outcome of § 101 cases—more rarely, in fact, than in other areas of patent law. Thus, our findings indicate that the current standard for patent eligibility is not as indeterminate—and the prospect for predictably applying the current law is not as hopeless—as some have argued. Since the current proposed legislation on § 101 is expressly premised on the notion that the law is unpredictable and cannot be consistently applied *by judges*,³⁰² there is room to question whether it is necessary or wise to overhaul such an important area of patent law based on what may be a false premise.

301. Because there are no appellate decisions of validity from the PTO, we cannot analyze how well PTAB judges determine validity.

302. See *supra* notes 104 and accompanying text.