# OUR MORE-THAN-TWENTY-YEAR PATENT TERM

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## ABSTRACT

We study all of the nearly 4.5 million patents, filed on or after May 29, 2000, that were issued by the United States Patent and Trademark Office since 2005. We find that most patents (63.6%) get at least some "patent term adjustment" (PTA)—an additional patent term to compensate for delays in patent prosecution. The patents that get PTA get more than a year on average (411 days, a median of 290 days), and more than 25% of all patents have more than a year of extra term. Some get as much as ten years of extra term.

Despite its imperfections, the PTA system works pretty well at achieving the goal of compensating patentees for patent prosecution delay. But we would be better off with a world in which delay wasn't nearly as common as it is, because adding a year at the end of a patent's life is not the same as having an extra year at the beginning. And the PTA system ends up disproportionately being used by patent trolls in litigation, a result that seems socially unproductive. We offer some suggestions for how to reduce delay and describe the more efficient PTA that could potentially result.

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We know there are a lot of acronyms in the paper, and they all have Ps in them. Sorry about that.

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## TABLE OF CONTENTS



## I. INTRODUCTION

Since 1995, patents in the United States expire twenty years from the day they were filed.[1] Except when they don't. Beginning in 2000, Congress provided certain "exceptions" to the twenty-year patent term, extending the life of patents to compensate for excessive delays in patent prosecution, for successful appeals, or certain other proceedings.[2] This is called patent term adjustment (PTA). These exceptions have swallowed the rule. In this Article, we study all of the nearly 4.5 million patents, filed on or after May 29, 2000

1. 35 U.S.C. § 154(a)(2). The law changed in 1995 from the former rule, under which patents expired 17 years after they were issued.

2. *See* American Inventors Protection Act, Pub. L. No. 106-13 (1999); 35 U.S.C. § 154(b).

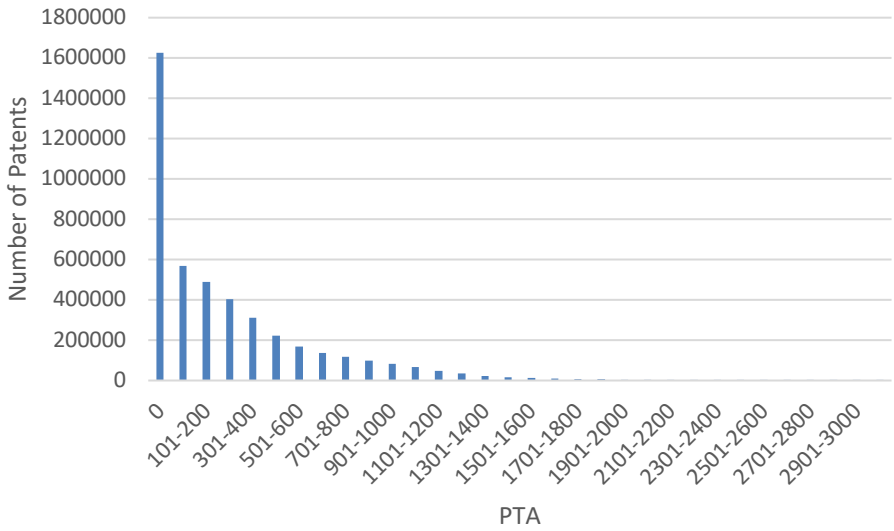
(the date the relevant statutory provisions took effect[3]), that were issued by the United States Patent and Trademark Office (USPTO) since 2005. We find that most patents (63.6%) get at least some PTA. The patents that do get PTA get more than a year on average (411 days, a median of 290 days), and more than 25% of all patents have more than a year of extra term. A small number of patents have much more PTA. Five percent of all patents get more than 1000 days of additional term; one percent get more than four years of additional term. Table 1 below provides a summary of PTA statistics for all patents (including those that receive no extension), and Figure 1 below provides an illustration of the number of patents by the amount of PTA. As Figure 1 shows, as the amount of PTA increases, the number of patents with such PTA decreases.

**Table 1: PTA for All Patents**

| | **PTA (days)** |
|---|---|
| Mean | 261.7 |
| Median | 108 |
| Standard Deviation | 370 |
| Min | 0 |
| 25th Percentile | 0 |
| 75th Percentile | 384 |
| 95th Percentile | 1030 |
| 99th Percentile | 1568 |
| Max | 8398[4] |

3. *See* American Inventors Protection Act, Pub. L. 106-13, § 4405 (1999).
4. This delay calculation appears to be an error. *See infra* note 54.

**Figure 1: Number of Patents by Amount of PTA**




Further exploration reveals interesting facts about the PTA patents. Contrary to our expectations, it is not life sciences patents that take the most advantage of extended patent terms, but software patents. We find that patents with PTA are overall less likely to be litigated than their non-PTA counterparts. But non-practicing entities (NPEs) are more likely to employ patents with extended terms. And the patents most likely to be litigated are those with either no PTA or substantial amounts of PTA.

Our results have important implications for understanding the patent system in general and patent litigation in particular. Despite the potential for abuse of the PTA system, we don't see clear evidence of patentees unfairly taking extra patent term. Most of the PTA results from the fact that, for large parts of this century, the USPTO has been slow to issue patents. And, as we discuss below, the current PTA rules allow for double-counting of PTA under some circumstances.

Because patents last longest in the very industries where technology moves the fastest, those patents can hold up innovation when they are enforced, particularly when plaintiffs enforce them at the end of their elongated patent term. Brian Love has shown that NPEs, for instance, tend to enforce very old software patents, and that that is bad as a matter of patent policy;[5] the disproportionate use of PTA in software makes that problem worse. And

5. *See generally* Brian J. Love, *An Empirical Study of Patent Litigation Timing: Could a Patent Term Reduction Decimate Trolls Without Harming Innovators?*, 161 U. PA. L. REV. 1309 (2013).

indeed, we find that NPEs, particularly the subset in the business of buying patents to assert them, make more use of term-extended patents than other plaintiffs. Below we suggest several possible changes to address these problematic observations.

We also analyze the other major form of term elongation: patent term extension (PTE).[6] This is a process specific to pharmaceutical patents that compensates for delays in receiving FDA approval. In short, we find that PTE is very rare. Only 331 patents that issued in the 2000s have received PTE. But those patents that have PTE have lots of it—the mean and median PTE are nearly 1000 days. And these patents are extremely important. We find that more than 30% of them have been litigated at least once, which is approximately fifteen to twenty times as likely as the typical patent. Moreover, assertions of such patents are overwhelmingly made by product companies, not NPEs.

In Part II, we explain the changes to the patent term at the end of the last century and the various forms of PTA Congress created. In Part III, we present our basic results on the prevalence of PTA and how it differs by industry, litigant status, and owner. In Part IV, we explore some of the potential policy implications of our results.

## II. PATENT TERM

### A. PATENT TERM ADJUSTMENT

In 1994, Congress enacted the Uruguay Rounds Agreement Act (URAA), which fundamentally changed the patent term in the United States.[7] Prior to that time, a patent expired seventeen years after the date it was *issued*.[8] Under the URAA, subject to some exceptions, a patent expired twenty years from the date the earliest nonprovisional U.S. patent application was *filed*.[9]

This change was primarily prompted by two developments. In 1994, member nations of the World Trade Organization entered into the Agreement

6. This type of delay is also often referred to as patent term restoration.

7. Uruguay Round Agreements Act, 103 Pub. L. No. 465, 108 Stat. 4809 (1994).

8. Patent Act, 950 Pub. L. No. 593, 66 Stat. 792, 804 § 154 (1952); 35 U.S.C. § 154 (1952); *see also*, *e.g.*, Mark A. Lemley, *An Empirical Study of the Twenty-Year Patent Term*, 22 AIPLA Q.J. 369, 374 (1994) ("[T]he fundamental baseline of the 1952 Act was a seventeen-year term across industries.").

9. Uruguay Round Agreements Act, 103 Pub. L. No. 465, 108 Stat. 4809 (1994); 35 U.S.C. § 154(a)(2). As a practical matter, the patent term usually ends 21 years from the earliest relevant filing, because most applications begin with a U.S. provisional application and/or a patent application in another country, after which the applicant has one year to file a nonprovisional U.S. application.

on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which required patents to extend at least twenty years from the date of filing.[10] Additionally, because American patent term was calculated based on the date of issuance, applicants could delay a patent's issuance without any term penalty. This term-calculation scheme allowed applicants to shift the patent's term and, consequently, sometimes allowed patent owners to take a mature industry by surprise and force it to license the "new" technology.[11] There were multiple high-profile cases of patentees, who kept their applications pending in the office for more than forty years before popping up to sue companies that had employed the technology for decades.[12] Keying patent term to filing date weakens or eliminates the incentives to engage in such submarine patenting, because an applicant's prosecution delay generally results in a corresponding reduction in total patent term.[13] As a result, it encouraged patentees to prosecute their patents more quickly.

One concern with linking patent term to the filing date was that extensive delays during prosecution by the USPTO could significantly reduce the patent term from the previous seventeen-year term.[14] In response to this concern, in 1999, Congress enacted the American Inventor's Protection Act, which

10. Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299, 33 I.L.M. 81, art. 33.

11. Such patents are often referred to as "submarine patents." *See, e.g.*, Lemley, *supra* note 8, at 377–80; Donald S. Chisum, *The Harmonization of International Patent Law: Introduction*, 26 J. MARSHALL L. REV. 437, 445 (1993); Fritz Machlup, *An Economic Review of the Patent System*, Study No. 15, Subcomm. Pat., Trademark, & Copyright, Jud. Comm., 85th Cong., 2d Sess. 10, 10 (1958).

12. *See, e.g.*, Hyatt v. USPTO, 904 F.3d 1361 (Fed. Cir. 2018); Symbol Tech., Inc. v. Lemelson, 277 F.3d 1361, 1363 (Fed. Cir. 2002); Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U. L. REV. 63, 79–80 (2003). This is still going on. *See, e.g.*, Hyatt v. Hirshfeld, 998 F.3d 1347, 1351–52 (Fed. Cir. 2021); Personalized Media Commc'ns, LLC v. Apple Inc., 57 F.4th 1346, 1351 (Fed. Cir. 2023).

13. Lemley, *supra* note 8, at 379.

14. *See, e.g.*, Robert A. Matthews, *Extensions for PTO Delays*, 1 ANNOTATED PAT. DIG. § 9:24; H.R. Rep. No. 106-287, 1999 WL 569140, at *32; Dana Rohrabacher & Paul Crilly, *The Case for a Strong Patent System*, 8 HARV. J.L. & TECH. 263, 265 (1995).

At the time, one of us (Lemley) predicted to the contrary that the change would generate longer effective patent terms by speeding up prosecution. *See generally*, Lemley, *supra* note 8.

Optimal patent timing is also bound up with the decision of when in a research process to file the patent application. *See generally* Christopher A. Cotropia, *The Folly of Early Filing in Patent Law*, 61 HASTINGS L.J. 65 (2009); Mark A. Lemley, *Ready for Patenting*, 96 B.U. L. REV. 1171 (2016).

provided for PTA for certain prosecution delays caused by the USPTO.[15] Specifically, as currently codified, 35 U.S.C. § 154 accommodates three types of delay, which are respectively referred to as "A delay" (under 35 U.S.C. § 154(b)(1)*(A)*), "B delay" (under § 154(b)(1)*(B)*), and "C delay" (under § 154(b)(1)*(C)*).

Type A delay generally guarantees prompt responses from the USPTO during prosecution.[16] In particular, the statute provides one day of extra patent term for each day that a patent's issuance is delayed by the USPTO's failure to comply with various deadlines. This includes no more than fourteen months from filing to the first Office action and four months for subsequent Office actions and certain additional actions.[17]

B delay generally provides PTA to make up for any USPTO-caused application pendency greater than three years.[18] In particular, the statute generally provides one day of term adjustment for each day that a patent's issuance is delayed by the USPTO beyond three years from filing.[19]

C delay compensates for delays due to derivation proceedings, secrecy orders, and appellate review if "the patent was 'issued under a decision in the review' reversing an adverse determination of patentability."[20]

PTA generally equals the sum of A, B, and C delay, with three noteworthy subtractions. First, where two or more periods of delay "overlap, the period of any adjustment . . . shall not exceed the actual number of days the issuance of the patent was delayed."[21] While this important limitation helps prevent double counting, its effectiveness was somewhat curbed in *Wyeth v. Kappos*.[22] There, the USPTO argued that A delays may sometimes "cause" B delays, leading to double-counting.[23] The Federal Circuit ruled against the USPTO, reasoning

15. *See* American Inventors Protection Act, Pub. L. No. 106-13 (1999). For a discussion of all term-tailoring mechanisms, see generally Sarah R. Wasserman Rajec, *Patent Term Tailoring* (work-in-progress) (manuscript on file with authors).

16. *See* 35 U.S.C. § 154(b)(1)(A).

17. *Id.*

18. *See* 35 U.S.C. § 154(b)(1)(B).

19. *Id.* This excludes time consumed by continued examination, secrecy orders, appellate review, or delays requested by the applicant.

20. *See* 35 U.S.C. § 154(b)(1)(C); *see also* SawStop Holding LLC v. Vidal, 48 F.4th 1355, 1356 (Fed. Cir. 2022) (holding that an appeal must directly result in the issuance of a patent; it is not enough that the patentee prevails on appeal on a particular ground but then faces a different rejection.).

21. 35 U.S.C. § 154(b)(2)(A).

22. 591 F.3d 1364 (Fed. Cir. 2010).

23. *Id.* at 1370 (explaining that if "A delays during the first three years of prosecution ultimately lead to B delays after the three-year mark from filing," "it would be double counting if A and B delays were both used to adjust because A delays 'cause' B delays.").

that the term "overlap" in the statute means that the delay must "occur at the same time."[24] As we discussed in Part IV.B.4, *Wyeth* improperly permits patentees to benefit from double counting. Specifically, for any patent that takes longer than three years to issue, USPTO delay in the first three years can lead to two days of PTA (one day of A delay and one day of B delay) even though it led to only one actual day of delay of patent term. The reason, as the USPTO explained, is because the one day of A delay also causes a day of B delay.

Second, the period of adjustment is also reduced by the amount "of time during which the applicant failed to engage in reasonable efforts to conclude prosecution of the application."[25] The goal of this reduction is to prevent submarine patentees from delaying prosecution of their own patents, knowing they will get the term back as B delay. But the reduction is only partial. The reduction will not apply during any period "during which there were no efforts in which the applicant could have engaged to conclude prosecution of the patent."[26] So if a patentee adds additional layers to the process, extending prosecution time, some but not all of that time may be returned in the form of an additional patent term. As discussed in more detail below, there are safeguards designed to avoid rewarding patentees for endless refiling.

Third, when a patentee files a terminal disclaimer—a statement by an applicant that disclaims part of the end of a patent's term—the patent ends on the last day not disclaimed regardless of PTA.[27] A patentee typically does this to overcome an argument that a patent is invalid because it is too similar to another of the patentee's patents.[28]

To take a concrete example, imagine the USPTO takes two years to issue a first Office action. The patentee takes six months to respond, filing a 3-month extension of time to do so. The USPTO takes six months to issue a "final rejection." Three months later the USPTO holds an interview, after which the examiner allows the claim, and the patent issues three months after that. The total time in the USPTO was forty-two months. The A delay is twelve

24. *Id.* at 1369.

25. 35 U.S.C. § 154(b)(2)(C).

26. Supernus Pharms., Inc. v. Iancu, 913 F.3d 1351, 1359 (Fed. Cir. 2019).

27. *See* 35 U.S.C. § 253.

28. This is referred to as obviousness-type-double patenting (ODP). For a discussion of ODP and its interaction with PTA, see, e.g., Robert A. Matthews, *General Prohibition Against Double Patenting*, 1 ANNOTATED PATENT DIGEST § 19:1; *see also In re* Cellect, LLC, 81 F.4th 1216, 1226 (Fed. Cir. 2023) ("[W]hile the expiration date used for an ODP analysis where a patent has received PTE is the expiration date before the PTE has been added, the expiration date used for an ODP analysis where a patent has received PTA is the expiration date after the PTA has been added.").

months—the difference between the fourteen-month target for the first Office action and the twenty-four months the USPTO actually took, plus the difference between the four-month target for responses and the six months it actually took. The B delay is six months—the difference between the forty-two months the prosecution takes and the thirty-six months the statute guarantees. The deduction is three months, because the patentee contributed to the delay by taking an extension and spending six instead of three months to respond to the Office action. So, the total PTA is sixteen months, and the total patent term is seventeen years and ten months. The patentee benefits from six months of double-counting; the patentee received six months of B delay, and there would have been no B delay if it weren't for the A delay.

In many instances, calculating PTA involves analyzing volumes of correspondence between the applicant and the USPTO. The USPTO currently utilizes a computer program to make PTA calculations.[29]

Although PTA may seem perfectly compensatory—qualifying delay attributable to the USPTO is accompanied by an equal increase in patent term—in reality it is much more complicated. For example, double-counting means that patentees can in fact benefit from delay. In addition, a lost day of patent term on the front end of a patent typically would not be worth the same as an added day of patent term on the back end. One reason is due to the time value of money: all else equal, a firm would rather be given the ability to make money today than a day far in the future.[30] That suggests PTA can be less valuable than a quick issuance. Another reason is that the value of inventions and patents generally depend on time. For example, pharmaceutical and biotechnology patents frequently cover inventions that remain relevant near the end of the patent term, and due to regulatory delays, the patents may even be most valuable at the end of their term. Conversely, software patents are more likely to cover inventions that quickly become technologically obsolete due to the constantly changing nature of the software industry.[31] So the value

29. *See* M.P.E.P. § 2734; *Explanation of Patent Term Adjustment Calculation*, USPTO, https://www.uspto.gov/patents/apply/checking-application-status/pair-announcements/explanation-patent-term (last visited Dec. 1, 2023). This computer is not perfect. *See infra* note 54.

30. *See, e.g.*, RONALD W. MELICHER & EDGAR A. NORTON, *Time Value of Money*, INTRODUCTION TO CORPORATE FINANCE (2013).

31. *See, e.g.*, Love, *supra* note 5, at 1342; Norhène Chabchoub & Jorge Niosi, *Explaining the Propensity to Patent Computer Software*, 25 TECHNOVATION 971, 975 (2005); Ronald J. Mann, *Do Patents Facilitate Financing in the Software Industry?*, 83 TEX. L. REV. 961, 979 (2005); Kimberly A. Moore, *Worthless Patents*, 20 BERKELEY TECH. L.J. 1521, 1543 (2005); Èloïse Gratton, *Should Patent Protection be Considered for Computer Software-Related Innovations?*, 7 COMP. L. REV. & TECH. J. 223, 231 (2003); Lemley, *supra* note 8, at 377 n.32; Eric Goldman, *Fixing Software Patents* 2 (Santa Clara Univ. School of Law Legal Studies, Working Paper No. 01-13, 2013), http://

of PTA may be either greater or less than the value of early issuance depending on the circumstances. Finally, some patent enforcement strategies deliberately target defendants at the end of patent life, when the industry is more mature and potential damages are greater.[32] For those plaintiffs, PTA may be more valuable than the lost early term.

### B. PATENT TERM EXTENSION

PTE is available under the Drug Price Competition and Patent Term Restoration Act of 1984.[33] PTE is designed to counteract, for certain classes of products, loss of patent term due to a different type of agency delay: time taken to obtain FDA approval to market products.[34] PTE is capped at five years,[35] and the total patent life cannot be extended to exceed 14 years from the product approval date.[36]

PTE is reduced in two noteworthy ways. First, the extension is reduced by any time attributable to applicant delay.[37] Second, only half the time a product spends in testing counts for PTE.

Only one patent can be extended for any given regulatory review period for the same product (even if the relevant product is covered by multiple patents),[38] and a patent can only be extended once (even if the patent covers multiple FDA-approved products).[39] Furthermore, the PTE extension rights are "limited to any use approved for the product."[40]

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ssrn.com/abstract=2199180; Alan D. Lourie, *Patent Term Restoration: History, Summary, and Appraisal*, 40 FOOD & DRUG COSMETIC L.J. 351, 352 (1985).

32. Love, *supra* note 5, at 1334.

33. *See* 35 U.S.C. § 156.

34. *See* 35 U.S.C. § 156. This is important; empirical evidence suggests that pharmaceutical companies are more likely to abandon projects that have less market exclusivity. *See* Fabian Gaessler & Stefan Wagner, *Patents, Data Exclusivity, and the Development of New Drugs* (Working Paper, 2019). But patents are not the only or even the most important form of exclusivity for pharmaceuticals; data exclusivity periods may provide more robust protection. *See generally* John R. Thomas, *The End of "Patent Medicines"? Thoughts on the Rise of Regulatory Exclusivities*, 70 FOOD & DRUG L.J. 39 (2015).

35. 35 U.S.C. § 156(g)(6)(A).

36. 35 U.S.C. § 156I(3). The extension is added to the "expiration date of the patent, which shall include any patent term adjustment granted under section 154(b)." 35 U.S.C. § 156(a).

37. 35 U.S.C. § 156(c)(1).

38. 35 U.S.C. § 156(c)(4).

39. 35 U.S.C. § 156(a)(2).

40. 35 U.S.C. § 156(b)(1).

### C. MAINTENANCE FEES

A patent will expire before the end of its term, unless the patentee renews their patent rights by making "maintenance" fee payments.[41] These payments are due 3.5, 7.5, and 11.5 years after the date of issue.[42] Only around forty to fifty percent of patents stay in force until the end of the full term.[43]

## III. RESULTS

### A. DATASET

The dataset we created to analyze PTA includes information for all patents filed on or after May 29, 2000 (the date the relevant statutory provisions took effect[44]) that issued between January 1, 2005 and June 21, 2022.[45] For each patent, we gathered basic information and PTA information from the Patent Examination Research Dataset ("PatEx") provided by the Office of the Chief Economist of the USPTO.[46] To obtain additional relevant information, we linked the patents to information contained in the Stanford NPE Litigation Database[47] and Lex Machina's Patent Portfolio Evaluator.[48]

41. 35 U.S.C. § 41(b).

42. *Id.*

43. Dennis Crouch, *Maintenance Fees 2015*, PATENTLYO (July 21, 2015), https://patentlyo.com/patent/2015/07/maintenance-fees-2015.html.

44. *See* American Inventors Protection Act, Pub. L. 106–113, § 4405 (1999).

45. Upon analyzing, we noticed that the dataset appears to be missing a very small number of patents, but the number missing is negligible (approximately 5,000 missing patents in a dataset of 4,468,930). It is also likely that many, if not most, of those patents were filed prior to May 29, 2000, meaning that they would not be governed by the relevant provisions anyway.

46. *Patent Examination Research Dataset (PatEx)*, USPTO, https://www.uspto.gov/ip-policy/economic-research/research-datasets/patent-examination-research-dataset-public-pair (last visited Apr. 20, 2023). In addition to the helpful explanatory material provided on the USPTO's website, the USPTO has provided a working paper describing the dataset. Stuart Graham, Alan Marco & Richard Miller, *The USPTO Patent Examination Research Dataset: A Window on the Patent Information* (USPTO Economic Working Paper No. 2015-4).

47. *Welcome to the Stanford NPE Litigation Database*, STAN. L. SCH. NPE LITIG. DATABASE, https://npe.law.stanford.edu/ (last visited Apr. 20, 2023). The team at Stanford Law School prepared an article discussing the dataset. Shawn P. Miller, Ashwin Aravind, Bethany Bengfort, Clarisse De La Cerda, Matteo Dragoni, Kevin Gibson, Amit Itai, Charles Johnson, Deepa Kannappan, Emily Kehoe, Hyosang Kim, Katherine Mladinich, Roberto Pinho, John Polansky & Brian Weissenberg, *Who's Suing Us? Decoding Patent Plaintiffs Since 2000 with the Stanford NPE Litigation Dataset*, 21 STAN. TECH. L. REV. 235 (2018).

48. LEX MACHINA, https://law.lexmachina.com/ (last visited Apr. 20, 2023). Thanks to Lex Machina for providing one of us (Jason Reinecke) with access for public interest purposes.

Based on this data, we produce several descriptive statistics,[49] chronicling the actual terms patents receive for the first time. We relate that data to a variety of variables, including the industry and technology of the patent, whether the patent was litigated and, if it was, the nature of the plaintiff.

We also ran a series of regressions to formally evaluate the statistical significance of our core results. The discussion that follows is consistent with the results provided by the regressions.[50]

## B. BASIC PTA RESULTS

Overall, 63.7% of the nearly 4.5 million patents we studied have at least some PTA.[51] Figure 2 provides the percentage of patents with PTA by issue year. As shown in Figure 2, the percentage of patents with PTA exceeds 50% each year and climbs as high as 81% in 2010.[52] Thus, the shorthand that patents last twenty years from filing is false; the twenty-year term is the exception, not the rule.

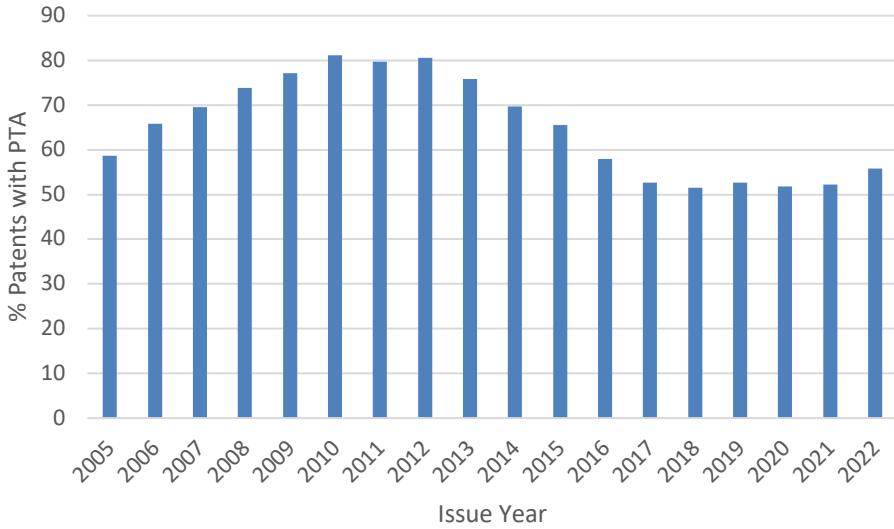
49. We report the results when looking at all the patents in the dataset because we are primarily concerned with describing the PTA that patents receive. We also separately analyzed only patents with no terminal disclaimers, only original patent application filings (by removing continuations, divisionals, and continuations-in-part), and only such patents with no terminal disclaimers. To identify terminally disclaimed patents, we utilized the dataset provided by one of us and Lisa Ouellette in a forthcoming article. *See* Mark A. Lemley & Lisa Larrimore Ouellette, *Fixing Double Patenting*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4888563 (Working Paper, 2024). In general, such patents were even more likely to have PTA. We report the results for such patents when doing so provides additional insight.

50. Our full regression results are available in an online appendix.

51. For comparison, 71.8% of original patents have no PTA, and 69.3% of original patents with no terminal disclaimer have PTA.

52. The slight uptick in PTA around 2021 and 2022 appears to be because the USPTO has been slower to issue an initial office action rejection. Dennis Crouch, *Prosecution Delays and Patent Term Adjustment on the Rise Again*, PATENTLYO (Nov. 13, 2022), https://patentlyo.com/patent/2022/11/prosecution-delays-adjustment.html.

**Figure 2: Percent of Patents with PTA by Issue Year**




It would be one thing if most patents received only negligible amounts of PTA. But that's not the case. The mean PTA across all patents is 262 days (411 when looking only at patents with PTA) and median PTA is 108 days (290 when looking only at patents with PTA).[53] The fact that the mean is larger than the median indicates that a comparatively greater fraction of patents have large amounts of PTA.

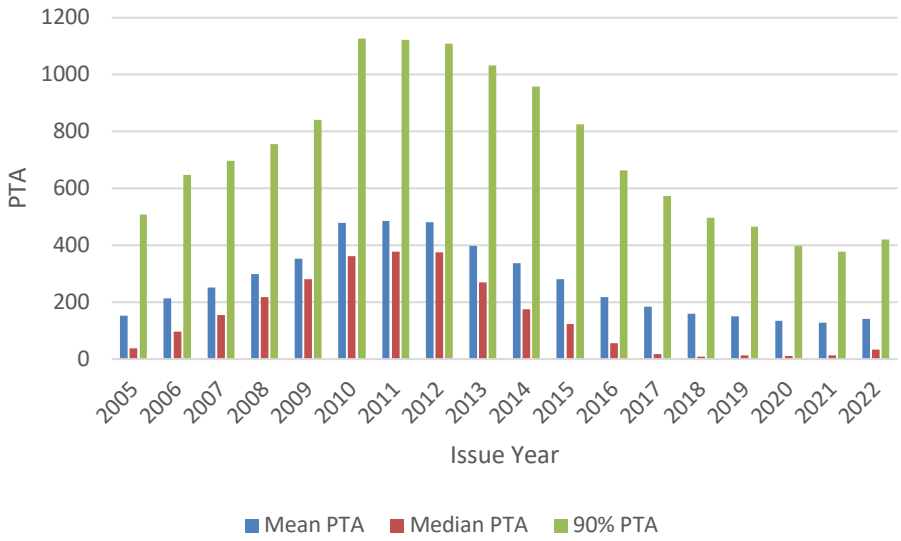
Twenty-six percent of patents have at least one year of PTA, just over five percent of patents have more than 1000 days of PTA, and one percent of patents have at least 4.25 years of PTA. One patent received *twenty-three years* of additional patent term.[54] Figure 3 below provides the mean, median, and 90th percentile PTA for patents by issue year. As with the percentage of

53. When looking only at original patents without terminal disclaimers, the values are somewhat larger: 302 days, 421 days, 168 days, and 301 days respectively.

54. It appears the USPTO miscalculated the PTA for this patent. Specifically, the calculated applicant delay was *negative* 6525 days, which must be incorrect. In total, we identified 156 instances of negative applicant delay. These are not the only errors the USPTO's automatic PTA calculation system makes. *See generally* Dinis Cheian, *I See Dead Patents: How Bugs in the Patent System Keep Expired Patents Alive*, 33 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 1 (2022); *USPTO Has Opportunities to Improve Its Internal Controls and Oversight Related to PTA and PTE Calculations*, Final Rpt. No. OIG-21-030-1 (July 6, 2021) (assessing the USPTO's PTA calculation procedures); S. Sean Tu, Dinis Cheian, Sarah Gabrielle, Benjamin N. Rome & Aaron S. Kesselheim, *The Cost of Drug Patent Expiration Date Errors* (unpublished manuscript).

patents with PTA, there is year-to-year variation, and the largest values again show up between 2010 and 2012.

**Figure 3: PTA by Issue Year**



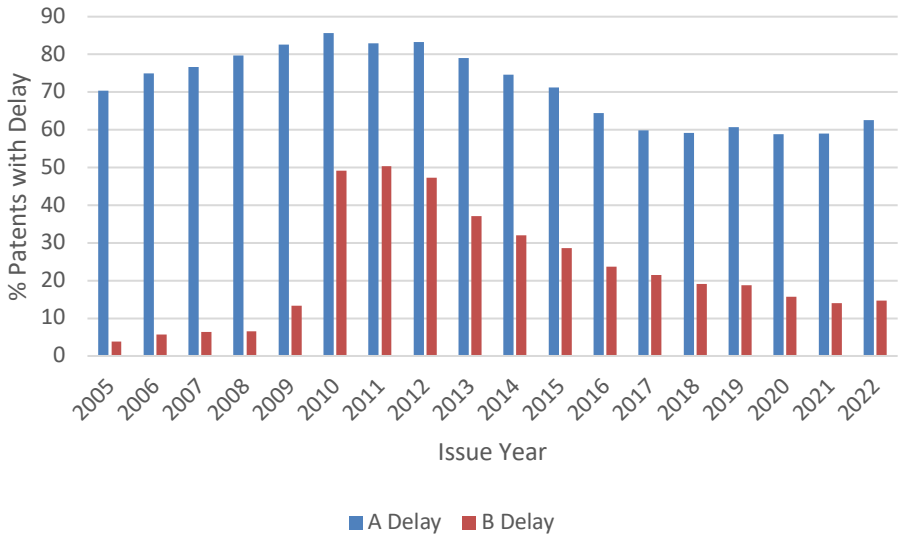

Mean and median patent terms from issuance to expiration are 17.17 years and 17.8 years, respectively. These values did not materially change regardless of whether we looked only at patents without any PTA, patents with at least some PTA, and patents with at least one year of PTA. These results suggest that generally PTA ensures that patentees do not receive less than the pre-GATT 17-year term. But although the length of the term may be preserved, as explained previously, delay and resulting PTA produces a patent term that is shifted in time, resulting in less term on the front end and additional term on the back end.

### C. A, B, AND C DELAY

Next, we look at what type of PTA drives these results. In short, A delay (which generally guarantees prompt responses from the USPTO during prosecution) is the primary source of PTA, though B delay (which generally guarantees that patentees will not be harmed by an application pendency greater than three years) plays a significant role as well. C delay (which compensates for delays due to derivation proceedings, secrecy orders, and appellate review if the patent issues) plays little role.

Overall, 69.8%[55] of patents, and 99.7% of patents with PTA, have A delay; 24.0% of patents, and 36.4% of patents with PTA, have B delay; and 1.0% of patents, and 1.6% of patents with PTA, have C delay. Of patents with PTA and B delay, 99.5% also have A delay. Relatedly, of all patents with B delay, only 1% have no A delay. These facts provide some reason to believe that A delay often causes B delay, particularly because nearly all A delay occurs before the three-year clock starts ticking.[56] Figure 4 below displays the percentage of patents with A and B delay by issue year. The results once again generally follow the same trend, except the jump in B delay between 2009 and 2010 is particularly stark. Notably, the percentage of patents with A delay exceeds 50% every year.

**Figure 4: Percent of Patents with A and B Delay by Issue Year**




Mean and median A delay are 234 days and 141 days, respectively (360 days and 301 days if only patents with PTA are considered). Mean and median B delay are 67 days and 0 days, respectively (104 days and 0 days if only patents with PTA are considered). Ten percent of patents have at least 620 days of A delay (733 days if only patents with PTA are considered), and the same fraction of patents have at least 255 days of B delay (373 days if only patents with B delay are considered). One percent of patents have at least 3.2 years of A delay,

55. This value is somewhat larger (77.3%) when looking only at original patents.
56. *See infra* note 99 and accompanying text.

and the same fraction of patents have at least 2.3 years of B delay. Figures 5 and 6 respectively provide mean, median, and 90th percentile A and B delay by issue year. These figures show a similar trend to Figures 2–4.

**Figure 5: A Delay by Issue Year**

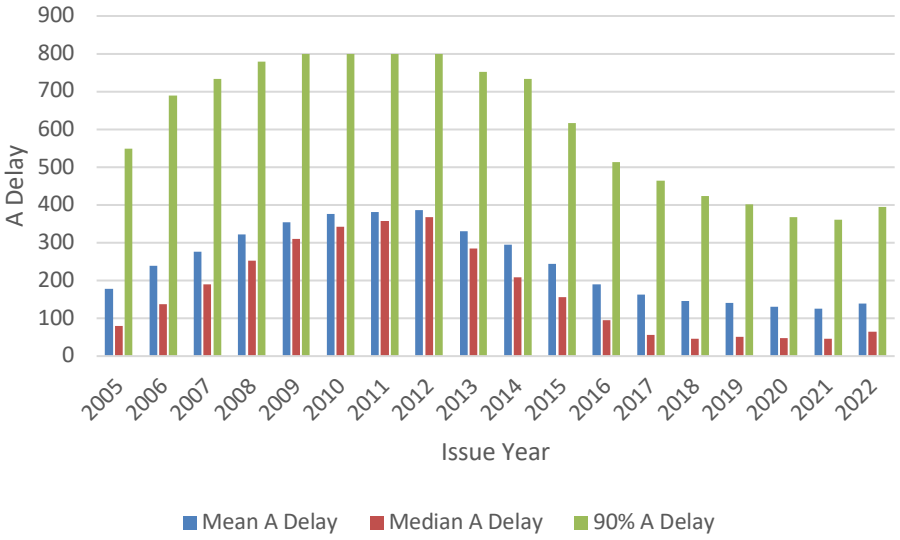
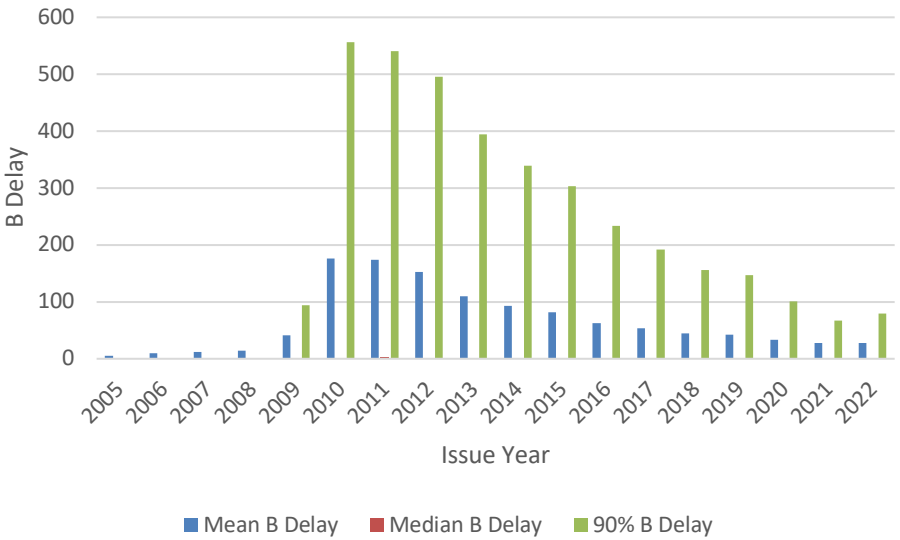



**Figure 6: B Delay by Issue Year**



### D. RESULTS BY TECHNOLOGY

In this subsection, we assess PTA by technology. In short, we find significant variation across different technologies. Even though software and business method patents tend to be simpler on average than drug and chemical patents and have less complex prosecution histories,[57] the former tend to have the most PTA (along with computer, communications, and medical patents) and the latter the least PTA. That is particularly surprising because of the received wisdom that patents are important earlier in their lives in fast-moving industries like software, and more important at the end of their lives in FDA-regulated industries like pharmaceuticals.[58]

We divide the patents into the six technological categories identified by Hall, Jaffe, and Trajtenberg: computers and communications; drugs and medical; electrical and electronics; chemical; mechanical; and others.[59] We also assess the following three categories of patents that have been used in other studies: drugs, business methods, and software.[60]

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57. *See generally* John R. Allison, Mark A. Lemley, Kimberly A. Moore & Derek Trunkey, *Valuable Patents*, 92 GEO. L.J. 435 (2004); John R. Allison, Mark A. Lemley & David L. Schwartz, *Our Divided Patent System*, 82 U. CHI. L. REV. 1073 (2015); Bill Richardson, *Meeting Challenges in Pharmaceutical Patent Cases and Other Types of IP Litigation*, ASPATOR, 2011 WL 2532982, at *1 (2011); *see also* Michael Shur-Ofry, *Access-to-Error*, 34 CARDOZO ARTS & ENT. L.J. 357, 383 (2016) (noting the differences between industries).

58. FDA approval for a drug is an extremely time intensive process. *See, e.g.*, Gail A. Van Norman, *Drugs, Devices, and the FDA: Part 1 An Overview of Approval Processes for Drugs*, 1 JACC: BASIC TO TRANSLATIONAL SCIENCE 170, 171 (2016) (indicating that the FDA approval process for a drug takes 12 years, on average); Ross Tonkens, *An Overview of the Drug Development Process*, 31 PHYSICIAN EXECUTIVE 48 (2005) (indicating that it takes, on average, 2 to 12 years to bring a new drug to the market); Martin S. Lipsky & Lisa K. Sharp, *From Idea to Market: The Drug Approval Process*, 14 J. AM. BD. FAMILY PRACTICE 362, 364 (2001) (indicating that the drug development and approval process takes an average of 8 to 12 years); Eric V. Patridge, Peter C. Gareiss, Michael S. Kinch & Denton W. Hoyer, *An Analysis of Original Research Contributions Toward FDA-Approved Drugs*, 20 DRUG DISCOVERY TODAY 1182, 1185 (2015) (finding the gap between discovery and approval to be 12 years for industry and 24 years for academia). This lengthy process reduces the effective life of a patent, making the last part of the patent term the valuable part in industries that require FDA approval.

59. *See* Bronwyn H. Hall, Adam B. Jaffe & Manuel Trajtenberg, *The NBER Patent Citations Data File: Lessons, Insights and Methodological Tools* 3 (Working Paper No. 8498, 2001). We use these categories as updated by Lucy Xiaolu Wang. Lucy Xiaolu Wang, *Patent Classification Systems and Technological Categorization: An Overview and Data Update* (Working Paper, 2020).

60. *See, e.g.*, Brian J. Love, Shawn P. Miller & Shawn Ambwani, *Determinants of Patent Quality: Evidence from Inter Partes Review Proceedings*, 90 U. COLUM. L. REV. 67, 115–16 ns. 205–07 (2019); James Bessen, *A Generation of Software Patents*, 18 B.U. J. SCI. & TECH. 241, 253 (2012).

Figure 7 displays the percentage of patents with PTA for each of the nine categories. As shown in the figure, business method, software, medical, computer, and communications patents are most likely to have PTA—approximately 70% of such patents have PTA—and mechanical, chemical, other, electrical, and drug patents are the least likely to have PTA (63.8%, 62.8%, 62.4%, 58.1%, and 45.7%, respectively).[61]

**Figure 7: Percent of Patents with PTA by Technology**

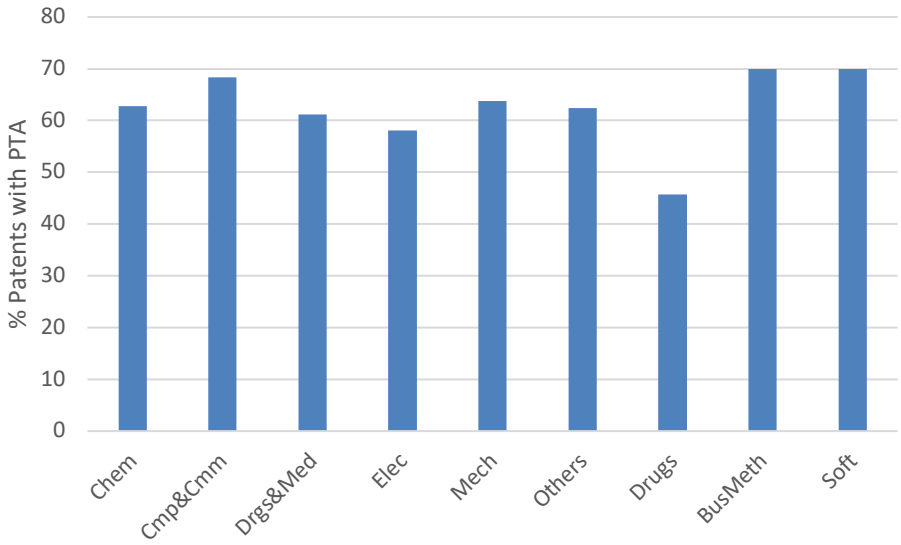



Figure 8 shows the mean, median, and 90th percentile PTA by technology category. And here, the same types of patents that are most likely to have PTA are the ones that have the most PTA, and the differences are particularly extreme when looking at the PTA for the top ten percent of patents. Figure 9 shows the same information, but only for the subset of patents with PTA. Even then, business method, software, computer, and communications patents tend to have more PTA than chemical and drug patents—except for the upper ten percent of drug patents, which have PTA similar to software, computer, and communications patents.[62]

61. We find similar relative trends even when looking only at patents without terminal disclaimers and/or original patents.

62. We find similar relative trends even when looking only at patents without terminal disclaimers and/or original patents.

**Figure 8: PTA by Technology**

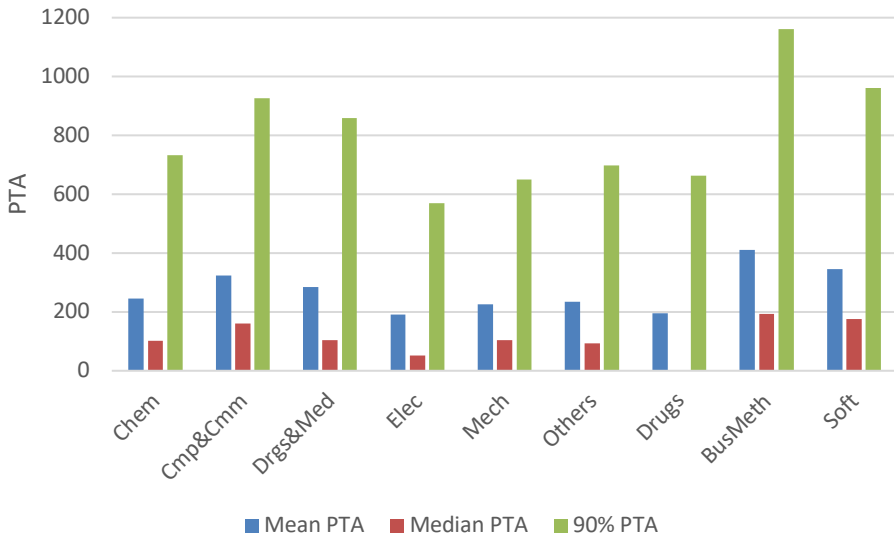
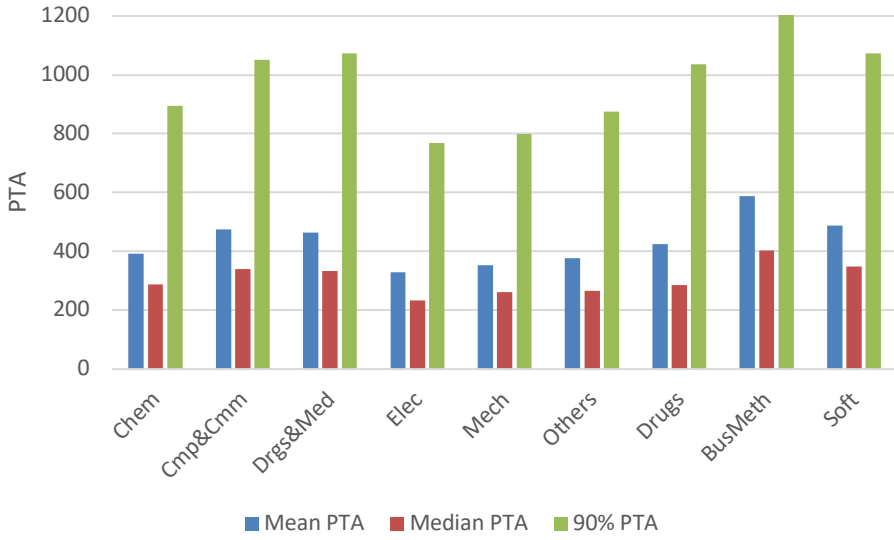



**Figure 9: PTA by Technology (Only Patents With PTA)**




Mean patent term from issuance to expiration does not significantly change depending on the technology, although mean patent term is somewhat less for drug and drug and medical patents (~15.9 years and ~16.7 years,

respectively). This may indicate an increased amount of applicant delay for those patents during prosecution.[63]

We also looked at the prevalence and amount of A, B, C, and applicant delay by industry. The results generally mirror the overall results by industry with two caveats: (1) drugs, medical, and business method patents have the most B delay, on average;[64] and (2) mean applicant delay (which reduces PTA) is by far the largest for drug patents.[65] It seems technology-specific backlog delay in the USPTO drives these industry-specific results. Software and computer art technology centers have a bigger backlog, so such patents receive more A delay. Drug and medical patents have longer and more complex prosecutions, so they have more B delay. Business methods are the outlier; they seem to have the largest A *and* B delay. This may be because business method patents face a tougher prosecution road,[66] which may delay the process for all applications in the group.

We also separately calculated mean PTA for each examiner art unit and then calculated the standard deviation of those values to obtain an estimate of the variability in PTA by art unit. We find substantial variation in mean PTA by art unit. For example, the standard deviation of the mean PTA values for each of the art units is 161 days, and the standard deviation for the 95th percentiles is 343 days. These results indicate that some art units are responsible for significantly more PTA than others.

Furthermore, we divided the patents into those that had and had not expired for nonpayment of maintenance fees. We assessed both the percentage of patents with PTA and the mean, median, and 75th percentile PTA for both groups of patents, controlling for issue year and technology. The differences were extremely small—the percentages of patents with PTA generally varied by less than three percent, and the amounts of PTA were typically within 50

63. Notably, however, the effective lives of drug and medical patents are often extended by the process of "evergreening"—obtaining multiple patents on variants of the same drug. *See* Robin Feldman, *Patent Term Extensions and the Last Man Standing*, 42 YALE L. & POL'Y REV. 1 (2023) (showing that the effective patent life for most drugs exceeds both PTA and PTE).

64. The mean for drugs and medical was 165 days, and the mean for business method was 181 days. The others (other than drugs, which was similar to drugs and medical) were between 70 and 126 days.

65. The mean for drugs was 115 days. The mean for the other categories (other than drugs and medical) were between 34 and 78 days (the mean for medical alone was 82 days).

66. *See Allowance Rate by USPC Class*, USPTO, https://developer.uspto.gov/visualization/allowance-rate-uspc-class (last visited July 31, 2023).

days of each other.[67] Moreover, there was no consistent trend that cut across issue year and technology.

### E. PTA AND LITIGATED PATENTS

In this subsection, we focus on the PTA characteristics of litigated patents.[68] Litigated patents are less likely to have PTA. While 63.7% of patents have PTA, only 52.7% of litigated patents do. A smaller percentage of litigated patents have PTA even after controlling for technology.[69] After controlling for issue year, litigated patents are still less likely to have PTA, though the differences are rather small in the earliest years of the dataset and much larger in the later years.

This difference may be because, in many industries, the most valuable patents are prosecuted quickly so they can be asserted.[70] It could also be based on the interplay between delay and patent value. Figure 10 below depicts the percentage of patents with a given amount of PTA that are litigated as a function of the patent's PTA.[71] The patents most likely to be litigated are those with PTA at the poles—that is, patents with either no PTA or substantial amounts of PTA. This result is understandable. Patents without PTA are least likely to miss out on early patent term when patents tend to be most valuable. And because some patents are quite valuable later in life, some patents with lots of PTA are particularly valuable and worth asserting at the end of their life.

After controlling for issue year, we see this same general trend for the earlier issue years in the study. For the patents with later issue years, we do not

67. This result was nonetheless statistically significant ($p<0{,}001$), likely because of the enormous size of our database.

68. Although PTA accrues only when an "original" (i.e., not reissue) patent is delayed by a failure of the USPTO, *see* 35 U.S.C. § 154(b), reissue patents can still benefit from PTA because they issue for any "unexpired part of the term of the original patent." 35 U.S.C. § 251. In this section, we link reissues to their original patents and treat the reissues as having the same amount of PTA as the original. We also conducted the analysis ignoring reissues altogether, and the results are similar.

69. Unless stated otherwise, when we refer to controlling for something, we mean that we break the data down into parts based on that thing and analyze those parts separately.

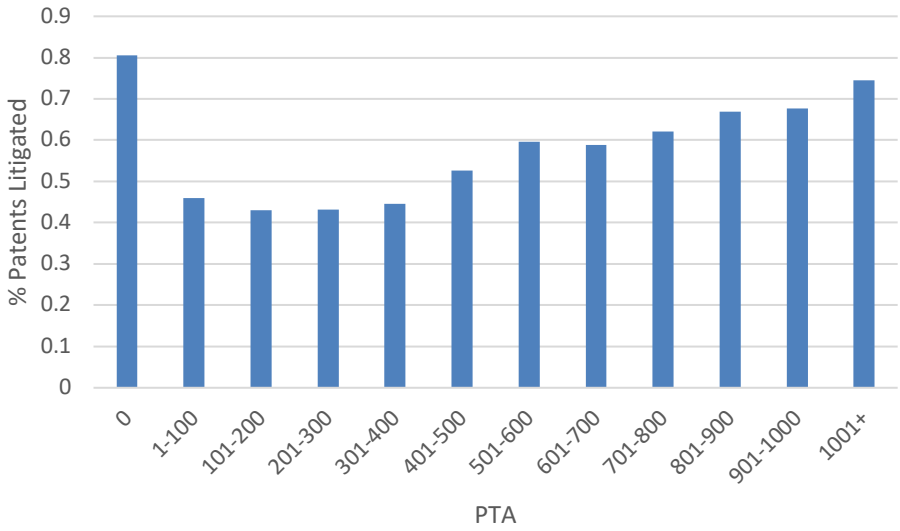
70. The USPTO has a special Track One status to allow applicants to pay for faster prosecution, *see USPTO's Prioritized Patent Examination Program*, USPTO, https://www.uspto.gov/patents/initiatives/usptos-prioritized-patent-examination-program (last visited Mar. 16, 2024), as well as a Petition to Make Special that allows for accelerated prosecution if the patentee has already identified a potential infringer. Manual of Pat. Examining Proc. § 708.02, https://mpep.uspto.gov/RDMS/MPEP/E8r8#/E8r8/d0e76445.html.

71. For example, 0.806% of patents with no PTA are litigated, whereas only 0.459% of patents with 1–100 days of PTA are litigated.

see a spike in the number of assertions of patents with significant PTA, presumably because those patents have not yet reached the later years of their term when they will be most valuable.

Deliberate delay does not appear to explain the litigation frequency of patents with significant PTA. It is A delay, not B delay, that is responsible for the vast majority of PTA. And we find that applicant delay occurs in the same percentage of patents with PTA as in patents without PTA. The mean and median applicant delays are also similar between the two. Furthermore, companies with PTA are no more likely to maintain their patents, which we would expect to see if companies were deliberately delaying issuance of their most valuable patents. So, it does not seem that delay in litigated patents is the result of applicant behavior.

**Figure 10: Percent of Patents Litigated by PTA**




While PTA can be meaningful in any patent case—additional patent term will frequently mean a longer-running royalty—we find additional evidence that PTA has a meaningful impact on patent assertion behavior.

Specifically, we compare assertion timing between patents with and without PTA after controlling for exogenous effects on the likelihood of delay over time.[72]

72. What we want to assess is whether the presence or absence of delay during prosecution and/or the resulting PTA causes a difference in assertion behavior. One difficulty

We find that litigation of PTA patents is somewhat more focused on late-term assertions than litigation of non-PTA patents. Figure 11 below provides assertion information for patents with PTA (red) and patents without PTA (blue) based on the years from expiration. We studied only patents without terminal disclaimers. The y-axis provides the number of assertions of PTA/non-PTA patents at the indicated number of years from expiration divided by the total number of PTA/non-PTA assertions possible at the time. The results show that PTA patents are generally more likely to be asserted near the end of their term and generally a bit less likely to be asserted early in the patent term.[73] We see the same general trend when we break down the data by technology. Except for chemical, drug, and medical patents, peak assertions are a few years earlier, and in most cases, patents without PTA tend to be slightly more likely to be asserted.

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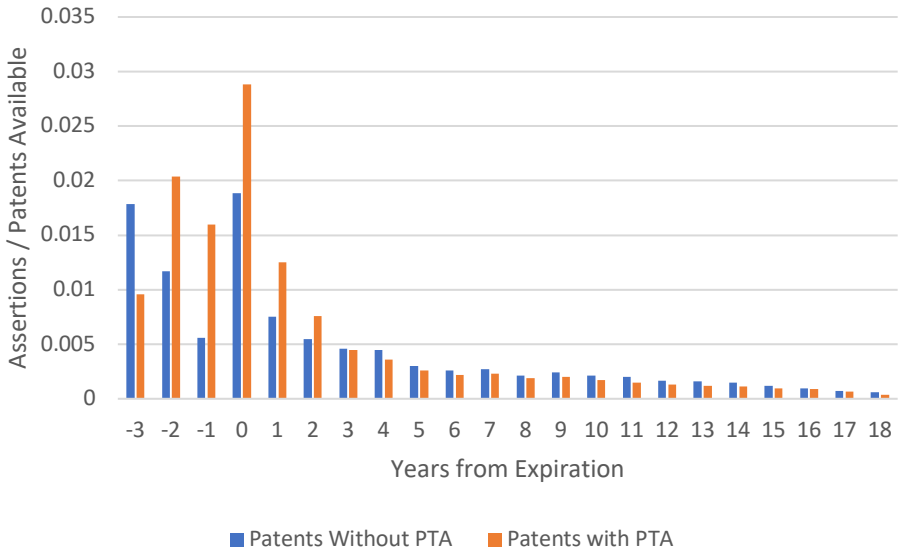
with such a comparison is that the distribution of expiration dates between PTA and non-PTA patents might differ, and it could be that distribution that causes an apparent difference in assertion timing. For example, suppose prosecution delays occurred almost exclusively during the last two years of the studied time period (note that this is obviously not the case in reality but rather provides a useful hypothetical). In that scenario, if we simply compared assertion behavior of PTA and non-PTA patents, we would find that non-PTA patent assertions are more likely to be near expiration than PTA patent assertions. But the reason would not be because of the prosecution delay or the added term but rather because patents with PTA are, on average, much younger and that many patents with PTA had not even matured to the point of being able to be asserted close to expiration.

To account for this issue, we calculate (separately for PTA and non-PTA patents) the number of assertions as a function of years from expiration and divide those values by the number of patents that could have been asserted that many years from expiration. For instance, suppose there were 100 assertions of PTA patents ten years from expiration and 50 assertions of PTA patents one year from expiration. Suppose also that 1000 PTA patents could have been asserted ten years from expiration but only 500 PTA patents could have been asserted one year from expiration (the others had expiration dates more than one year after the last studied day in the dataset). In this scenario, just looking at assertions would lead one to believe that near-expiration assertions are rarer than mid-life assertions, but after controlling for the number of patents that could have been asserted, mid- and late-term assertions seem approximately equally likely.

73. Because we studied patents that were filed on or after May 29, 2000, and that issued after 2005, many of the patents in our dataset are still in force and have not yet reached the later years of their term. Nevertheless, the dataset still included numerous patents without terminal disclaimers that nearly reached expiration. For example, nearly 150,000 such patents with PTA and nearly 300,000 such patents without PTA could have been asserted three years from expiration. And just over 50,000 such patents with PTA and nearly 90,000 such patents without PTA could have been asserted. It would be interesting to conduct the analysis again once more patents in the dataset have expired. The total number of asserted patents at -3 years from expiration is rather small for patents with PTA, which might explain the flip in the trend for that value.

**Figure 11: Probability of Patent Assertion by Years from Expiration**



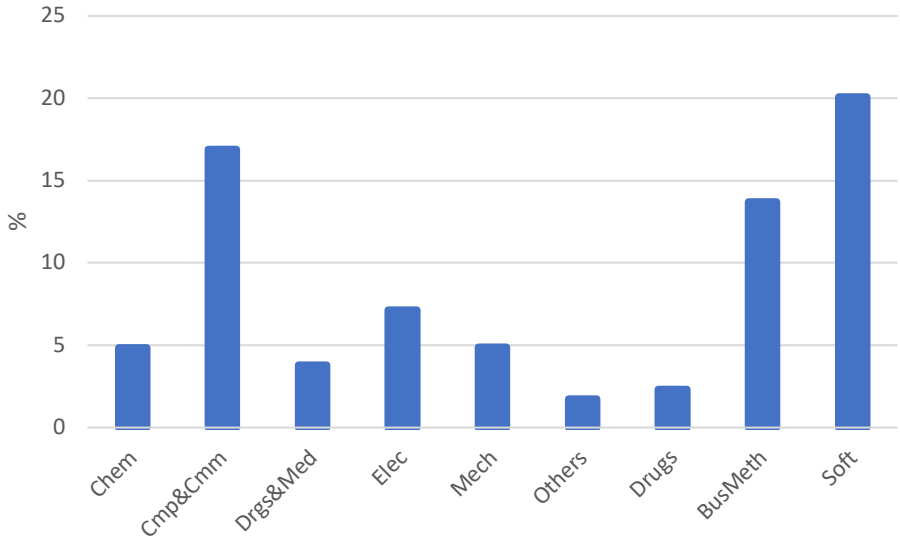

While we cannot draw causal conclusions from these associations, our findings are consistent with our theory noted above: patents with PTA miss out on some valuable early terms—making them less likely to be asserted early on. And PTA patents may be more likely to be asserted later, because a subset of patents particularly benefit from late-term extensions, whether that is because the technology is more useful at that late stage or because patent owners attempt to utilize late patent term to force a mature industry to license.

Figure 12 shows, by technology, the percentage of assertions of patents with PTA and no terminal disclaimer that fall within three years of expiration.[74] As shown in the figure, software, computer, communications, and business method patents are by far the most likely to be asserted within this time period. This result is surprising, considering such patents are widely believed to be most technologically relevant early in their lifespan.[75]

74. We find the same trend even after controlling for the fact that the distribution of expiration dates might differ for different technologies, an issue we discuss below. The total number of assertions for each category on the x-axis are as follows, respectively: 1178, 17595, 3858, 3287, 2286, 3298, 2352, 2363, and 9931.

75. *See supra* note 31 and accompanying text. Interestingly, another study showed that, in response to the changes in patent term following trips, market participants rushed to file certain software patent applications, suggesting that market actors care about patent term in the software space. *See* Neel U. Sukhatme & Judd N.L. Cramer, *Who Cares about Patents? Cross-Industry Differences in the Marginal Value of Patent Term*, 21 AM. L. & ECON. REV. 1, 5 (2019).

**Figure 12: Percent of Patent Assertions Within Three Years of Expiration (Only Patents With PTA)**




Next, we turn to the relationship between PTA and asserter type. For the rest of this section, when we refer to Patent Assertion Entities (PAEs), we mean those NPEs that acquire patents, and do not include individual patent owners, universities, or other NPEs asserting patents they themselves developed.[76] And when we refer to practicing entities (PEs), we mean product-producing companies and their subsidiaries.[77] We exclude litigation exclusively from patentees who do not fit in either category.[78]

Patents asserted by PAEs are more likely to have PTA than patents asserted by PEs (62.5% versus 51.1%). They also have more PTA. Looking only at patents that have PTA, patents asserted by PAEs tend to have more PTA (mean 593 days versus 466 days, median 508 days versus 340 days, 75th percentile 846 days versus 681 days), though the difference is fairly modest. We also compared these metrics when using each patent assertion as a unique

76. These entities are identified as Asserter Category 1 in the Stanford NPE Litigation Dataset.

77. These entities are identified as Asserter Categories 8 and 12 in the Stanford NPE Litigation Dataset.

78. The dataset includes more than 40,000 assertions by PEs and more than 20000 assertions by PAEs. The next closest asserter-type had fewer than 3500 assertions, and many had fewer than 1000.

data point (as opposed to each patent, so that patents are weighted by how frequently they are asserted) and reach similar findings.[79]

Many of these differences are explained by the differences in the technologies that patents asserted by PAEs and PEs tend to cover. In particular, after controlling for technology, the differences in the percentages of PAE- and PE-asserted patents with PTA goes away when the unit of measure is a patent. When weighted by the number of patent assertions, the differences largely remain,[80] suggesting that PAEs are more likely to assert patents with PTA more frequently. The differences in mean PTA largely go away regardless of weighting once we take technology into account, though PAE asserted patents still tend to have slightly more PTA than PE asserted patents.[81]

Although, after controlling for technology, PAE asserted patents are not all that different from PE asserted patents in terms of PTA, PAE assertion timing is different even after controlling for technology. For example, looking only at patents with PTA and no terminal disclaimer, 16.6% of PAE software patent assertions occurred within three years of expiration, while only 8.8% of PE assertions did.[82]

Of all such software patents PAEs asserted, 12.8% of them were asserted at least once in this timeframe. The same is true for only 3.5% of PE patents.[83] Comparing this to the numbers in the prior paragraph, it is evident that late assertions by PEs are concentrated in a small number of patents asserted multiple times (3.5% of PE patents make up 8.8% of PE assertions). The difference is much smaller for PAEs. The reason for this disconnect is unclear. For example, late-term PAE assertions may be more likely to focus only on the small percentage of patents that remain technologically relevant, while PAEs may be more likely to press even weak infringement claims near the end of a patent's term in an attempt to reap as much benefit as possible.

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79. For instance, the percentages of patents with PTA are similar, though slightly more disparate (65.6% versus 47.9%). The descriptive statistics concerning the amount of PTA are similar (mean 624 days versus 484 days, median 576 days versus 354 days, and 75th percentile 886 days versus 697 days).

80. The difference is 8 percentage points (73.0% versus 65.0%) for software patents and 6.9 percentage points for computer and communications patents (68.3% versus 61.4%).

81. Without weighting for number of assertions and looking only at patents with PTA, the means are 640 days versus 590 days for computers and communications, and 670 days versus 632 days for software. After weighting, the means are 645 days versus 602 days for computers and communications, and 677 days versus 645 days for software.

82. The percentages are similar for computer and communications patents (17.1% versus 6.9%).

83. The difference in the results is similar when looking at computer and communications patents (14.6% versus 3.3%).

Finally, we look at litigation outcomes between patents with and without PTA. We utilize Lex Machina's Patent Portfolio Evaluator, which provides information as to the number of validity and invalidity rulings issued by a district court concerning a patent.[84] For the rest of this section, the percentages refer to the percentages of patents with at least one invalidity or validity ruling. We find evidence that patents with PTA are slightly less likely to be held valid, on average, than patents without PTA. For example, 59.6% of patents without PTA have been the subject of only validity rulings, while the same is true for only 51.9% of patents with PTA. Patents with PTA are also more likely to be the subject of only invalidity rulings (42.2% versus 35.7%).[85]

We find similar, though generally smaller, differences when controlling for both assertion entity and technology. In particular, PE-asserted software patents with PTA are slightly less likely to be the subject of only validity rulings than such patents without PTA (32.6% versus 36.6%), though the percentages of patents subject to only invalidity rulings is approximately the same. PAE software patents with PTA are far more likely to be the subject of only invalidity rulings (76.9% versus 61.8%) and far less likely to be the subject of only validity rulings (16.7% versus 30.9%), though the total number of observations for patents without PTA (55) is relatively small.[86] When looking at computer and communications patents, the differences are still present but far smaller.[87]

As a robustness check, we also compared our dataset to Jonathan Ashtor's model that allows us to estimate similarity between patents.[88] Similarity between patents might be evidence of the weakness of the patents, since it suggests that the later patent does not differ significantly from the prior art.

84. The Evaluator includes rulings on motions, including rulings at the pleadings and at summary judgment. A patent can have more than one invalidity ruling where an initial invalidity decision invalidated only some claims of the patent.

85. The results for patents with PTA and B delay are extremely similar to the results for patents with PTA generally.

86. The values for patents with PTA and B delay are again similar to those for patents with PTA. Specifically, for PEs, 30.8% of such patents were subject to only validity rulings and 63.8% to only invalidity rulings. For PAEs, 15% of such patents were subject to only validity rulings and 82.5% to only invalidity rulings, though again the total number of such patents is small (40).

87. The difference between only validity and only invalidity rulings for PE patents is approximately 2%, and the differences for PAE patents is 6% and 4%, respectively.

88. *See generally* Jonathan H. Ashtor, *Investigating Cohort Similarity as an Ex Ante Alternative to Patent Forward Citations*, 16 J. EMPIRICAL LEG. STUD. 848 (2019). We are grateful to Jonathan Ashtor for sharing his dataset with us.

We find that patents with PTA are marginally more similar to their cohort than patents without PTA, but the difference is quite small.[89]

In short, the analysis of case outcomes suggests that among patents that were litigated to at least one merits decision, the weakest asserted patents are the ones that benefit most from PTA. But this observation appears to stem largely from the fact that software and computer patents—which tend to fare worse in court than other types of patents—tend to have the most PTA, as opposed to from some causal connection between patent strength and the patent's inherent ability to accumulate PTA.

### F. PTE RESULTS

In this section we report our results relating to PTE, which were calculated based on the data we obtained from the USPTO website.[90]

In total, 949 patents have received PTE—a far cry from the millions of patents that have PTA. Patents that have PTE, however, have a lot of it: the mean PTE is 1048 days, the median PTE is 986 days, and 14.5% of the patents received the maximum 5-year extension. PTA and PTE are potentially cumulative,[91] and some patents have benefited from both.

For the rest of the analysis, we look only at the 331 patents that issued on or after 2000 because that's the first year of litigation coverage in the Stanford NPE Litigation Dataset. For such patents, the mean and median PTEs are similar (993 days and 966 days, respectively), and 10.3% of patents received the maximum 5-year extension.

The percentage of patents that have been litigated at least once is 31.1% (103 of 331), which is significantly larger than the percentage of patents that are litigated more generally, which is approximately 2% or less.[92] While the

89. Across all patents the mean cohort similarity is 2.34, with a higher number indicating more similarity. For PTA patents the mean is 2.35, and for patents without PTA the mean is 2.29. Because the standard deviation for the whole is 0.97, this difference is quite small.

90. *See Applications for Patent Term Extension and Patent Terms Extended Under 35 U.S.C. § 156*, USPTO, https://www.uspto.gov/patents/laws/patent-term-extension/patent-terms-extended-under-35-usc-156 (last visited June 2, 2023). For additional analysis concerning PTE, see generally Victor L. Van de Wiele, Aaron S. Kesselheim, Sarosh Nagar & S. Sean Tu, *The Prevalence of Drug Patent Term Extensions in the United States, 2000–2018*, 41 NATURE BIOTECHNOLOGY 903 (2023); Erika Lietzan & Kirstina M.L. Acri née Lybecker, *Distorted Drug Patents*, 95 WASH. L. REV. 1317 (2020).

91. *See* 35 U.S.C. § 156(a); John R. Thomas, *Towards FDA-USPTO Cooperation* (working paper 2024).

92. Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1507 (2001) (estimating 1.5%); Jean O. Lanjouw & Mark Schankermann, *Characteristics of Patent Litigation: A Window on Competition*, 32 RAND J. ECON. 129, 134–35 (2001); Christopher Beuchamp, *The First Patent Litigation Explosion*, 125 YALE L.J. 848, 882 (2016); David Pridham,

magnitude of the difference is quite striking, the direction of the difference is not. It is widely believed that life sciences, and particularly pharmaceutical, patents are most valuable,[93] and patents with PTE are on a subset of pharmaceutical inventions that have gone through the FDA regulatory approval process.[94] Comparing these percentages is also complicated by the fact that most litigation concerning FDA-approved drugs arises out of the Hatch-Waxman Act, which provides special rules that likely change the incentives to litigate.

The litigated and non-litigated patents with PTE have similar amounts of PTE. The mean and median number of assertions of litigated patents with PTE is 6 and 3, respectively.

Also contrary to patent assertions more generally, but not surprising given the FDA approval process, the vast majority of assertions were made by product companies. Specifically, all but three assertions were made by product companies (either alone or along with other entities), and the remaining three assertions were by an individual-inventor-started-companies. Of all the assertions, 85.3% were made solely by product companies or product companies and their subs. Only 4.7% of assertions were made by PAEs, and even those assertions were only made in cases where a product company was also a plaintiff.

While PTE is important because it will often delay generic entry, we briefly discuss litigation timing of PTE patents. Figure 13 below depicts the number of PTE patent assertions based on the number of years of remaining patent term. Most patents are asserted around the middle of their term, but there are still a meaningful number of assertions near the end of their term. We found

*The Patent Litigation Lie*, FORBES (Apr. 13, 2017), https://www.forbes.com/sites/davidpridham/2017/04/13/the-patent-litigation-lie/?sh=26a9df987ea9 (reporting Lex Machina data as showing a 1.9% litigation rate over the previous decade).

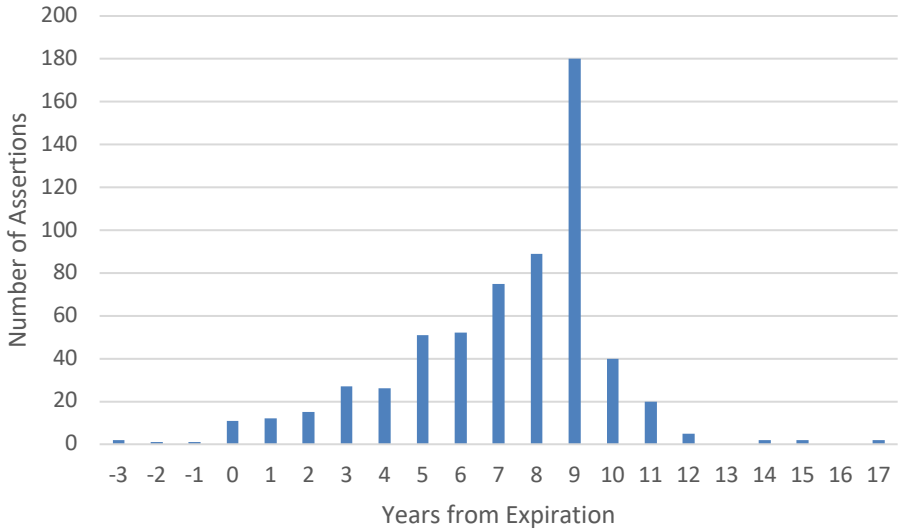
93. One study found that nearly half of the 170 top-selling drugs benefited from PTE, with the median extension being 2.75 years. *See* R.F. Beall, J.J Darrow & Aaron S. Kesselheim, *Patent Term Restoration for Top-Selling Drugs in the United States*, 24 DRUG DISCOVERY TODAY 29 (2019).

94. *See, e.g.*, WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 316 (2003) ("[T]he strongest case for patents in something like their present form is said to be found in a subset of the drug industry."); JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE (2008); Amy Kapczynski, Samantha Chaifetz, Zachery Katz & Yochai Benkler, *Addressing Global Health Inequities: An Open Licensing Approach for University Innovations*, 20 BERKELEY TECH. L.J. 1031, 1045 (2005) ("Many who accept these premises [that strong patents reduce innovation and welfare] nonetheless consider the pharmaceutical sector an exception."); Lisa Larrimore Ouellette, *How Many Patents Does it Take to Make a Drug – Follow-On Pharmaceutical Patents and University Licensing*, 17 MICH. TELE. & TECH. L. REV. 299, 302–04 (2010).

this somewhat surprising, because it suggests that many patents that received PTE would have been valuable even without it.[95]

We thought the results may be an artifact of the fact that we limited our analysis to patents that issued in 2000 or later, meaning that many patents in the dataset have not yet reached the end of their term. But while controlling for the distribution of expiration dates showed that late-term assertions are somewhat more common than Figure 13 would suggest; assertions are still by far most commonly raised between seven and nine years from expiration. The assertion timing results are also complicated by the fact that FDA-approved products are provided a period of regulatory exclusivity, and litigation does not typically ensue until these periods are nearly expired.

**Figure 13: Assertions of PTE Patents Based on Years from Expiration**




## IV. IMPLICATIONS

### A. THE PREVALENCE OF PTA IS PROBLEMATIC

Our data demonstrates that the exceptions to the twenty-year patent term have swallowed the rule. Most patents have at least some PTA, and many patents have significant amounts of PTA. And this PTA is relevant. Although patents without PTA are most likely to be litigated, patents with PTA are increasingly likely to be litigated as the amount of PTA increases. Relatedly,

95. One complication is evergreening, which means that even the end of PTE does not necessarily mean the end of regulatory exclusivity. Feldman, *supra* note 63, at 1.

patents with PTA are generally somewhat less likely to be litigated shortly after issuance and more likely to be litigated near expiration, possibly because such patents miss out on valuable early term on the front end and because some patents are quite valuable to the holder at the end of their term.

Surprisingly, business method, software, computer, and communications patents are among the most likely to have significant PTA. Prosecution delay for such patents is especially problematic because both effects of such delay—delayed issuance and extended term—raise concerns. Starting with delayed issuance, because these patents are most likely to be technologically relevant early in their lifespan,[96] prosecution delays reduce or eliminate the probability of obtaining such a patent while it still has value.[97] Such delays consequently reduce or eliminate the innovation incentive a patent is intended to provide.[98] And as we see, patents with PTA are generally somewhat less likely to be litigated on the front end.

Extended term can also be problematic in this context. For the reasons discussed previously, the extended term is unlikely to adequately compensate ordinary innovators for lost patent term up front.[99] At the same time, the extended term expands the opportunity for patent owners to assert technologically irrelevant patents to hold up innovation when they are enforced. And that is particularly problematic when the patents are bought late in life by PAEs who seek to assert them against a mature industry. Increased opportunity for gamesmanship with PTA patents could be why we see such patents asserted more frequently near expiration. In short, prosecution delay, and thus PTA, is most common in fields where the delay is most likely to reduce innovation incentives, and where the remedy is both least likely to compensate true innovators and most likely to increase opportunity for undesirable gamesmanship.

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96. *See supra* note 31.

97. Although patentees can obtain "provisional rights" damages between the date the patent application publishes and the date of issuance under some circumstances, those circumstances are rare: the accused infringer must have had "actual notice of the published patent application," and "the invention as claimed int eh patent is substantially identical to the invention as claimed in the published patent application." 35 U.S.C. § 154(d). Due to these strict requirements, even seeking such damages is extremely rare.

98. *See* Douglas Gary Lichtman, *The Economics of Innovation: Protecting Unpatentable Goods*, 81 MINN. L. REV. 693, 701–02 (1997); Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017, 1024–25 (1989); Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 276–77 (1977); Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS 609, 615 (1962).

99. *See supra* notes 30–31 and accompanying text.

Indeed, we find that PTA is most likely to be exploited by opportunistic actors in these fields. PAE-owned patents with PTA have the greatest concentration of assertions near the end of their patent life that are most likely to benefit from PTA. PAEs who purchase patents from others to assert them make greater use of term-extended patents than other plaintiffs, and we find evidence that PAEs seem particularly likely to assert such patents after they are technologically obsolete.

The prevalence of PTA isn't ideal. It is not great for ordinary patentees, who get on the back end something that is oftentimes less valuable than what they lose on the front end from delay. It is also not ideal for the public, because inventions enter the public domain later than they otherwise would. The prevalence of PTA increases opportunities for gamesmanship, both in litigation and in patent prosecution.[100] Furthermore, this trend is particularly problematic because it strengthens the hand of the least socially useful patents—those purchased and asserted by PAEs at the end of the patent term in the software industry—well after the technology tends to be obsolete.

## B. POTENTIAL SOLUTIONS

What we should do about the PTA problem depends on whether the source of delay is (a) prosecution gamesmanship by applicants, (b) the fault of the USPTO, or (c) problematic PTA rules. Our evidence suggests—to our surprise—that the latter two likely play the greatest role.

### *1. Is Gaming the Problem?*

It seems unlikely that applicants have significant opportunity to game prosecution to obtain significant delay. As an initial matter, some applicant delay is subtracted from the total PTA calculation, which means that applicants would be able to game prosecution only by creating delay that gets credited against the USPTO. That is certainly possible in part, because filing certain additional documents (such as appeals) triggers additional USPTO responses, and once the three years have passed, the delay can be compensated as B delay

100. For one interesting example, see *In re* Xencor Corp., Inc., No. 23-2048 (Fed. Cir. Jan. 23, 2024). There, the patent applicant appealed an adverse PTAB decision to the Federal Circuit. The USPTO essentially confessed error, saying that the court should dismiss the appeal so the USPTO could reconsider the Board's decision. Despite the fact that the applicant seemed likely to win without having to argue its appeal, it opposed remanding the case. Why? Because it stood to lose 653 days of C delay if it did not obtain a reversal on appeal as opposed to an ultimate agreement to patentability. Dennis Crouch, *USPTO Again Asks for Remand in Xencor to Reconsider its Decisions*, PATENTLYO (Dec. 7, 2023), https://patentlyo.com/patent/2023/12/xencor-reconsider-decisions.html.

or C delay. Further, as we have seen, there is some amount of double-counting, so patentees interested in gaming the delay system can get extra benefits.

But if deliberate efforts at term extension were a significant problem, we would expect to see much more double-counting delay than we do. We would also expect to see manipulation that led to C delay—triggering appeals for certain claims, for instance. But C delay turns out to be a very small part of aggregate delay, suggesting that this behavior is relatively uncommon.[101] We would also expect patentees to be more likely to maintain their patents with PTA. But that is not the case. And we would expect that the parties engaging in gaming would turn out to be the ones asserting those patents at the end of the patents' lives. In fact, however, a large fraction of those assertions is by PAEs who buy the patents much later. They could not have been involved in the delay, and the chain of inferences that suggests patentees might deliberately delay prosecution in hopes of later selling to a PAE seems long and quite improbable.

Type A delay is the greatest source of PTA. We think it would be difficult for patent applicants to manufacture such delay. Type A delay relates to ensuring prompt responses from the USPTO during prosecution. It would generally be difficult for applicants to cause the USPTO to provide a delayed response. By far the biggest source of A delay is the USPTO's general inability to provide a first action within 14 months of the filing of a patent application.[102] It seems most likely that the USPTO's inability to meet this deadline is due to the brevity of this deadline and the volume of patent applications filed each year, not because certain applicants are drafting applications to delay USPTO response times.

Because we found that certain examiner art units are far greater sources of PTA than others,[103] it is theoretically possible that applicants could attempt to shoehorn their application into an art unit expected to provide significant PTA. While the prevalence of such a practice is worthy of future study, and although targeting favorable art units seems to happen at least to place patent applications in art units with high allowance rates,[104] we believe it is unlikely

101. *See supra* Part II.C.

102. *Patent Term Adjustment Data March 2023*, USPTO, https://www.uspto.gov/dashboard/patents/patent-term-adjustment-new.html (last visited May 10, 2023).

103. *See supra* Part II.D.

104. *See, e.g.*, John R. Allison & Starling D. Hunter, *On the Feasibility of Improving Patent Quality One Technology at a Time: The Case of Business Methods*, 21 BERKELEY TECH. L.J. 729, 738, 760–62, 786 (2006); *How Classification Works at the USPTO: Targeted Drafting to Influence Prosecution Outcomes*, LEXISNEXIS (June 16, 2020), https://www.lexisnexisip.com/resources/how-classification-works-at-the-uspto/; Terri Shieh-Newton & Mark D. Hammond, *Examining Art Units to Avoid Subject Matter Eligibility Challenges for Bioinformatics and AI-Related Patents*, MINTZ

that patent applicants are targeting backlogged art units in any significant respect.

Another significant source of PTA is B delay. Again, we think it is unlikely that applicants are manufacturing significant levels of B delay. As an initial matter, it appears that many instances of B delay are caused by A delay, and as we just discussed, we think it is unlikely that applicants are manufacturing significant A delay.

While the instances of B delay that are not caused by A delay seem to be at greater risk of gamesmanship, because applicants may attempt to draw out prosecution beyond three years to receive additional patent terms on the back end, current calculation practices minimize or eliminate such opportunities. In *Intra-Cellular Therapies, Inc. v. Iancu*, the Federal Circuit concluded that an applicant's response to a final Office action did not avoid a reduction for applicant-caused delay unless it was an appeal or an RCE, even if the response amounted to a bona fide attempt to address all outstanding issues.[105] And the PTA statute "prevents extension of PTA through B Delay accrual for time consumed by an RCE."[106]

Additionally, an applicant cannot file numerous child applications in hopes of accumulating additional delay: "a patent term adjustment in a parent patent does not apply to any child patent."[107] In view of these rules, it seems difficult to game prosecution to accrue substantial B delay simply by filing continuations or extra documents before the examiner in normal prosecution.[108]

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(Nov. 18, 2021), https://www.mintz.com/insights-center/viewpoints/2231/2021-11-18-examining-art-units-avoid-subject-matter-eligibility; Gaurav Gupta, *Overcoming Abstract Idea Rejection with Targeted Patent Application Drafting*, SAGACIOUS IP, https://sagaciousresearch.com/blog/overcoming-abstract-idea-rejection-with-targeted-patent-application-drafting/ (last visited May 10, 2023); *Art Unit Predictor*, PATENTBOTS, https://www.patentbots.com/about-art-unit-predictor (last visited May 10, 2023); Gene Quinn, *Avoid the Patent Pit of Despair: Drafting Claims Away from TC 3600*, IPWATCHDOG (June 25, 2020), https://ipwatchdog.com/2020/06/25/avoid-patent-pit-despair-drafting-claims-away-tc-3600/id=122838.

105. Intra-Cellular Therapies, Inc. v. Iancu, 938 F.3d 1371, 1375, 1379–80 (Fed. Cir. 2019).

106. *Id.* at 1382.

107. Robert A. Matthews, *Extensions for USPTO Delays—Tacking a Patent Term Adjustment From One Patent to Another Patent*, 1 ANNOTATED PATENT DIGEST § 9:24.50; *see also*, *e.g.*, Mohsenzadeh v. Lee, 790 F.3d 1377 (Fed. Cir. 2015).

108. Nor can patent applicants game prosecution by filing continuation applications. *See, e.g.*, Matthews § 9:24:50 (explaining that PTA applies only to the patent for which the adjustment was issued).

*2. Speeding the Prosecution Process*

Because PTA seems largely due to delays caused by the USPTO, the best way to address PTA would be to examine patents faster. The changes in PTA from year to year largely stem from the USPTO catching up on its backlog over time, at least before Covid.[109] One way to do that is to increase the USPTO's examination resources (e.g., to increase the number of patent examiners),[110] or at least to prioritize resources in art units where PTA is most problematic. The USPTO could prioritize business method, software, computer, and communications patents because, as explained above, for these technologies PTA has a higher probability of promoting undesirable gamesmanship, a higher probability of reducing innovation incentives, and a lower probability of rewarding true innovation. Alternatively, it could prioritize certain applications that seem particularly important, like those likely to be listed in the FDA's Orange Book.[111] Doing so would cause pharmaceutical patents to expire earlier, reducing drug prices at the end of the patent term when the PTE patent is the one delaying generic entry. Whether that is a good thing depends on whether you think the existing system (including evergreening and multiple patents) provides too much protection to pharmaceutical companies or not enough.[112] Notably, the USPTO could do

109. *See supra* Part II.B.

110. There is a significant literature on when and whether it is efficient to devote more resources to patent examination. *Compare* Lemley, *supra* note 92, *with* Michael D. Frakes & Melissa F. Wasserman, *Irrational Ignorance at the Patent Office*, 72 VAND. L. REV. 975 (2019), *and* S. Sean Tu & Mark A. Lemley, *What Litigators Can Teach the Patent Office About Pharmaceutical Patents*, 99 WASH U. L. REV. 1673 (2022).

111. The Orange Book refers to the document that lists drugs that the FDA has approved, as well as applicable patents associated with each product. Lemley & Tu demonstrate that pharmaceutical patent applicants know in advance which of their patents are likely destined to be listed in the Orange Book. Tu & Lemley, *supra* note 109, at 1677. And Orange Book patents are far more important than the average patent. *See generally* Michael D. Frakes & Melissa F. Wasserman, *Investing in Ex Ante Regulation: Evidence from Pharmaceutical Patent Examination* 4–7 (Nat'l Bureau of Econ. Rsch., Working Paper No. 27579, 2020). For a discussion of how to predict which patents will be listed in the Orange Book, see Tu & Lemley, *supra* note 9; Colleen V. Chien, Nicholas Halkowski & Jeffrey M. Kuhn, *Distinguishing and Predicting Drug Patents*, 41 NATURE BIOTECHNOLOGY 317 (2023).

112. This is a complex empirical question we do not purport to resolve here. *See, e.g.*, Lisa Larrimore Ouellette, *Patent Experimentalism*, 101 VA. L. REV. 65, 75–87 (2015); Eric Budish, Benjamin N. Roin & Heidi Williams, *Do Firms Underinvest in Long-Term Research? Evidence from Cancer Clinical Trials*, 105 AM. ECON. REV. 2044 (2015); Eric Budish, Benjamin N. Roin, & Heidi Williams, *Do Fixed Patent Terms Distort Innovation?* (Chicago Booth, Working Paper No. 13-79, 2013); Robin Feldman, *'One-and-Done' for New Drugs Could Cut Patent Thickets and Boost Generic Competition*, STAT (Feb. 11, 2019), https://www.statnews.com/2019/02/11/drug-patent-protection-one-done/. Another option is that the system sometimes provides too

these things without any need for action by Congress, merely by reallocating resources.

The USPTO appears to have already begun making headway with respect to reducing PTA for software and computer patents. Specifically, we broke the data into patents issuing between 2005–2014 and patents issuing on or after 2015. We then looked at mean, median, and 75th percentile PTA. After doing so, we see an even starker difference for computer and software patents between 2005 and 2014 and very little difference between technology categories after 2014 (except drug and electrical patents still have less PTA, and software patents still tend to have a bit more PTA). The fact that the PTA differences converge in the later-studied years seems sensible considering that the overall prevalence of PTA was significantly smaller in that timeframe. In addition, we see that the USPTO increased its throughput of software patents more than other types of patents in the later time period, suggesting that the USPTO increased its examination resources for software patents.

Even though the prevalence of PTA in software patents has reduced in recent years and become closer to the amount observed in many other technology categories, we think more can be done. As explained previously, software patents seem particularly prejudiced by late grants and are most prone to be abused late-term, and thus there is a strong argument that software patents should have the least amount of PTA.

Even if the USPTO wasn't willing or able to devote more resources to accelerating patent prosecution, the USPTO could potentially change internal practices in ways that moved patents through the office more quickly. For example, it could promote interviews earlier in the process, in hopes of coming to agreement without going through multiple rounds of rejections.[113] It could change the way examiners are rewarded, to end the cycle of encouraging two office actions including a "final" rejection—a classic misnomer—in almost all cases.[114] It could shorten or eliminate the ability applicants have to extend virtually all deadlines.[115] And it could direct examiners to prioritize responses that are nearing the four-month threshold and patent applications that are

much protection and other times provides not enough, which would mean that PTA is a mixed bag.

113. *Full First Action Interview Pilot Program*, USPTO, https://www.uspto.gov/patents/initiatives/first-action-interview/full-first-action-interview-pilot-program (last visited Aug. 2, 2023).

114. Mark A. Lemley & Bhaven Sampat, 2010 STAN. TECH. L. REV. 1, 9 (2010).

115. The statute provides for a three-month response window, 35 U.S.C. § 154(b), but applicants can pay a fee to extend that time for another three months. *See How Does a Patent Extension of Time Work?*, PATENTTRADEMARKBLOG, https://www.patenttrademarkblog.com/patent-extension-of-time/ (last visited Mar. 16, 2024).

approaching the three-year threshold, reducing the incidence of both A and B delay. To be clear, we should approach these changes with care. Some, like early interviews, may have the effect of speeding the process by reducing the rigor of patent examination.[116] And that is probably undesirable. We are probably better off speeding patent examination, at least in what seem likely to be important patents.

*3. Reducing Incentives for Filing Software Patent Applications*

Even if increasing the USPTO's examination resources is infeasible, another potential solution is to reduce the workload—that is, reduce the number of business method, software, computer, and communications patent applications that are filed. While a cost-benefit analysis concerning the appropriate amount of patent protection afforded to software patents is beyond the scope of this article,[117] we simply note here that changes to the level of patent protection afforded to software patents could have a large impact on the number of software patent applications the USPTO must examine.[118]

*4. Reforming PTA*

Certain PTA rule changes might also be helpful. Most notably, we propose disposing of the rule set forth in *Wyeth*, because it permits patentees to receive PTA for A delay *and* B delay even when the A delay was the "but for" cause of the B delay.[119] The rule thus effectively permits double-counting of delay. A hypothetical discussed in *Wyeth* illustrates the point.[120] Suppose Applicant 1 and Applicant 2 each receive a (different) patent three years and thirty days after filing their applications, but Applicant 1 (and not Applicant 2) incurred 30 days of A delay before the 3-year mark. Here, Applicant 1 receives a sixty-day adjustment while Applicant 2 receives a thirty-day adjustment, even though both patents issued the same amount of time from filing, and even

116. Examiner interviews offer applicants an opportunity to dispute the merits of any rejection with the examiner. At the same time, the interviews are not recorded and usually complete with a limited record. Interviews often lead to the allowance of a patent but for unclear reasons. *See, e.g.*, Tu & Lemley, *supra* note 109, at n.88; *see generally* S. Sean Tu, *Patent Examination and Examiner Interviews*, 49 FLA. ST. U. L. REV. ONLINE 1, 12–13 (2021).

117. For an overview of the scholarly debate and potential fixes to software patents, see generally Mark A. Lemley, *Software Patents and the Return of Functional Claiming*, 2013 WIS. L. REV. 905.

118. Some have suggested that *Alice* created such a change, but in fact the number of software patents quickly rebounded to pre-*Alice* levels, *see* Nikola L. Datzov, *The Role of Patent (In)eligibility in Artificial Intelligence Innovation*, 92 UMKC L. REV. 1 (2023), in part because the USPTO adopted rules that granted patents *Alice* would not in fact uphold.

119. Wyeth v. Kappos, 591 F.3d at 1369–70.

120. *Id.* at 1370.

though Applicant 1 incurred B delay only because of the A delay. That is, after compensating Applicant 1 for the thirty days of A delay, Applicant 1 is placed in a position equivalent to where the patent would have properly issued three years after filing. Thus, Applicant 1 is fully compensated after receiving thirty days of PTA, not sixty.

The court in *Wyeth* countered with a hypothetical that, in its view, demonstrated that the "but for" approach also produces anomalous results. Specifically, suppose Applicant 1 incurs 400 days of A delay before the three-year mark and receives a patent exactly three years from filing. Suppose also that Applicant 2 also incurs 400 days of A delay before the three-year mark but additionally incurs one year of B delay (thus issuing one year after Applicant 1's patent). In such a scenario, both applicants would receive 400 days of PTA under the "but for" rule, which the court thought was imbalanced because Applicant 1's term would be a full year greater than Applicant 2's effective term (due to Application 2 issuing a year later) even though both parties incurred the same A delay.[121]

The court's hypothetical is not persuasive. It merely demonstrates that patent applications that spend additional time in prosecution generally have shorter effective terms. In other words, there is no imbalance here: Application 2 simply took longer to get through prosecution. Importantly, in this hypothetical, Application 2's B delay is due to otherwise timely prosecution—i.e., prosecution that would have been fully within the rules had there been no A delay. In such circumstances, it is understandable that applications 1 and 2 ultimately have different effective terms.[122]

To estimate the impact of *Wyeth*, we calculate that 22.9% of patents with PTA have A and B delay that both exceed the overlap delay (meaning the patent definitely benefits from at least some A delay and at least some B delay).[123] The number is slightly lower when looking at only litigated patents (19.4%) or drugs and medical patents (20.9%), and slightly higher when looking only at software patents (26.3%). Changing this rule alone could impact approximately a third of patents with PTA.

121. *Id.*

122. To be clear, the reason we take issue with the court's hypothetical is because the A delay caused the year of B delay. But suppose instead that application 2's additional year of prosecution included two months of A delay by the USPTO. Under our proposal, those two months would still be credited for the patentee—the cause of that delay is the USPTO's failure to meet a response deadline, not the initial period of A delay.

123. Because nearly all A delay occurs before the three-year clock starts ticking, this calculation provides a rough estimate for the percentage of patents benefitting from *Wyeth*. *See supra* note 99 and accompanying text.

To get a rough upper bound as to how much patents benefit from double-counting under *Wyeth*, for the relevant patents, we estimated double-counted delay as the lesser of A and B delay subtracted by the overlap delay. We also set a max double-counted delay to twenty-two months (the difference between three years and the fourteen months the USPTO is allotted to provide its first response). We calculate a mean double-counted delay of 218 days, a median of 189 days, a 75th percentile of 313 days, and a 95th percentile of 542 days. Although these calculations only provide an estimate, it thus appears that many patents receive significantly extended terms in view of *Wyeth*.

Measures to eliminate double-counting could go even further. One idea would be to get rid of A delay completely; B delay already accounts for undue delay by the USPTO, and an applicant can always move things along by filing an appeal. Because it is based on a set prosecution goal, B delay tries to ensure a minimum term (with important limitations we discussed above to prevent submarine patenting), which seems a laudable goal. A delay seems more based on fairness resulting from the prosecution process, but most significant delays in the prosecution process will be compensated for by B delay.

Short of eliminating A delay altogether, we think it makes sense to eliminate all double-counting of A and B delay. The purpose of term adjustment is to ensure that USPTO behavior and the vagaries of the prosecution process don't unfairly reduce patent terms. But that isn't a reason we should artificially increase patent term by counting the same delay twice. This change should only have modest effects in most cases.

By contrast, we would not eliminate the ability to cumulate PTE and PTA, except when the day involved is the same actual calendar day. Only in that scenario does the patentee earn two days of extension for only one true day of delay.[124] Unlike PTA, PTE is designed to compensate for lost term during the FDA regulatory review process. And while we might worry in theory about pharmaceutical patent owners deliberately racking up PTA to add on to the end of their term when their patents are most valuable, our data suggest that doesn't seem to be very common, and the law has safeguards to prevent most sorts of deliberate delay.

Since the requirement that the first response occur within fourteen months seems a bit arbitrary, another option would be to increase the time allotted for that deadline. If the increase was significant enough, the result would be to

124. *See, e.g.*, John R. Thomas, *Listening Session on Joint USPTO-FDA Collaboration Initiatives Additional Written Remarks of Professor John R. Thomas*, at 15 (Jan. 19, 2023). That scenario is extremely unlikely to occur, because PTA is calculated during prosecution and PTE is applied at the end of a patent term. It may happen only in unusual cases involving continuations or divisional applications.

effectively eliminate A delay except for the most egregious of cases. Another potential advantage would be that the deadline for the first action would better align with current realistic expectations from the USPTO.[125]

## V. CONCLUSION

While we normally refer to patent term as running twenty years from the filing date, that's not true for most patents today. In practice, we have a patent term that runs somewhere between twenty and thirty years but averages something close to twenty-one years. PTA ensures that patentees don't lose term because of delays at the USPTO. But it isn't full compensation; an extra year at the end of a patent's life is not as good as an extra year at the beginning for most patent owners. And the PTA system ends up disproportionately being used by PAEs in litigation, a result that seems socially unproductive.

Despite its imperfections and notwithstanding some suggestions we have for reform, the PTA system works pretty well at achieving the goal of compensating patentees for patent prosecution delay. But we would be better off with a world in which delay wasn't nearly as common as it is.

125. If what we care about most is late-term patent abuse, we could increase the frequency or value of the maintenance fee payments so that more patents expire due to nonpayment of maintenance fees before reaching their final years. *See, e.g.*, Love, *supra* note 5, at 1356–59. Furthermore, we do not advocate for increasing patentees' ability to seek provisional rights because the strict limitations on those rights are important for reducing opportunity for gamesmanship and for ensuring at least some degree of notice. *See supra* note 99.