
PATENTING ELASTICITIES

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Over the last decade, a growing consensus has emerged: there are too many patents, and they are causing a host of problems. These problems include patent “trolling,” patent “wars,” and other wasteful societal costs. In explaining this patent overabundance, some scholars have pinpointed the United States Patent Office, the governmental body responsible for issuing patents, as the main culprit. Others have blamed patent holders themselves, identifying a number of incentives these parties have to pursue patents even in cases where doing so makes little economic sense. Overall, these analyses thus typically assume a high and relatively uniform demand for patents among inventive parties—one that the United States Patent Office is only too willing to satisfy.

Yet this focus on excessive patenting obscures the reality that parties likely differ significantly in their demand for patents and other forms of intellectual property. In economic parlance, different inventive parties are likely to exhibit different “elasticities,” or sensitivities, in their demand for patents and other types of intellectual property. This Article uses economic principles to disaggregate intellectual property demand by highlighting a number of factors that may affect a party’s demand for patents and other forms of intellectual property. It argues that resource-constrained parties are more likely to exhibit more elastic demand for patents, meaning they are more sensitive to the costs of patenting, both in general and relative to the costs of other intellectual property forms. As a result, rising costs of patenting are more likely to lead resource-constrained parties to forego patenting and rely on alternative, cheaper forms of intellectual property

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protection when available. Well-capitalized parties, on the other hand, are more likely to exhibit relatively inelastic, high demand for patents, regardless of the costs of other intellectual property types that may otherwise function as substitutes. Thus, well-capitalized parties tend to patent en masse and complement patenting with additional intellectual property protections when available.

With this theoretical framework in place, the Article then assesses several recent judicial and legislative changes in patent and trade secrecy laws, including the Defend Trade Secrets Act of 2016, the Leahy-Smith America Invents Act of 2011, and several important Supreme Court patent law cases. Overall, these changes have largely weakened patent rights while potentially strengthening other forms of intellectual property law such as trade secrecy. Many argue the patent law changes in particular are a step in the right direction. This Article's analysis suggests these changes may suppress resource-constrained parties' demand for patents while having little to no effect on well-capitalized parties' demand for patents or other forms of intellectual property. Hence, these intellectual property changes may mean that resource-constrained parties patent even less relative to their well-capitalized counterparts, instead relying on other forms of intellectual property when available. The Article concludes by assessing this possibility and other potential implications for intellectual property law, innovation, and the economy more generally.

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INTRODUCTION

According to many, there are far too many patents, and they are causing a host of problems.¹ From fueling the business models of so-called patent trolls,² to diverting valuable resources into patent “wars,”³ to otherwise failing to live up to their purported theoretical justifications,⁴ the increasing number of patents flooding the U.S. marketplace is of growing concern to scholars and policymakers alike.⁵ In response to these concerns,

1. See, e.g., JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK 10–18, 26 (2008); Michael A. Carrier, *Post-Grant Opposition: A Proposal and a Comparison to the America Invents Act*, 45 U.C. DAVIS L. REV. 103, 108–09 (2011) (suggesting that the fact that half of all litigated patents that make it through trial are invalidated means that the United States Patent Office issues too many invalid patents); Roger Allan Ford, *Patent Invalidity Versus Noninfringement*, 99 CORNELL L. REV. 71, 87–91 (2013); Robert P. Merges, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKELEY TECH. L.J. 577, 589–91 (1999); Richard A. Posner, *Why There Are Too Many Patents in America*, ATLANTIC (July 12, 2012), <http://www.theatlantic.com/business/archive/2012/07/why-there-are-too-many-patents-in-america/259725> (arguing that patents are not needed in most industries and the United States Patent Office often issues patents that they should not, resulting in a complex set of wasteful costs on society); R. Polk Wagner, *Understanding Patent-Quality Mechanisms*, 157 U. PA. L. REV. 2135, 2139–45 (2009); *Too Many Patents*, PAT. PROGRESS, <http://www.patentprogress.org/systemic-problems/too-many-patents> (last visited Nov. 23, 2017) (discussing the astronomical rise in the overall number of patents and the problems, such as patent thickets, that result).

2. See Mark A. Lemley & A. Douglas Melamed, *Missing the Forest for the Trolls*, 113 COLUM. L. REV. 2117, 2149–50 (2013) (discussing the problem of excessive numbers of patents and how patent trolls take advantage of this reality when carrying out their business models).

3. Vivek Wadhwa, *Ending Patent Wars Will Be a Huge Boon to the Tech Industry*, TECHCRUNCH (Mar. 10, 2016), <http://tcrn.ch/1pbUVVU> (discussing patent wars in the smartphone industry and the negative effects such wars have had).

4. Posner, *supra* note 1 (arguing that patents are largely unimportant, and even potentially harmful, in most technological fields for promoting innovation); *Time to Fix Patents*, ECONOMIST (Aug. 8, 2015), <http://www.economist.com/news/leaders/21660522-ideas-fuel-economy-todays-patent-systems-are-rotten-way-rewarding-them-time-fix> (arguing that the patent system is failing to promote innovation, which is its core purpose).

5. See FED. TRADE COMM’N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY 3–7 (2003).

Congress,⁶ the Supreme Court,⁷ the executive branch,⁸ and a vast majority of states⁹ have all recently undertaken significant efforts to help fix what many perceive as a “broken” patent system.¹⁰

Scholars attempting to explain why there are so many patents have typically blamed the parties and institutions involved in the patenting process. Some scholars, for instance, have identified several incentives the United States Patent and Trademark Office (“USPTO”) has to grant patent applications, even in cases when it should not.¹¹ More recently, other scholars have focused on reasons why some inventors patent in excess. For instance, companies often engage in “patent harvesting,” whereby they implement processes to ensure that all patentable inventions find their way into a patent application.¹² In fact, other scholarship has shown that large companies in particular derive the most value from patenting when they are able to amass patents in large “patent portfolios.”¹³ Furthermore, some scholars have pointed to a number of non-traditional reasons for why parties pursue patents even when it seems to make little economic sense.¹⁴

6. See Manus Cooney, *The America Invents Act—How It All Went Down*, IPWATCHDOG (Sept. 20, 2011), <http://www.ipwatchdog.com/2011/09/20/the-america-invents-act-how-it-all-went-down> (describing enactment of the Leahy-Smith America Invents Act, the largest patent system overhaul since the 1952 Patent Act).

7. See Lisa Larrimore Ouellette et al., *Supreme Court Patent Cases*, WRITTEN DESCRIPTION, <http://writtendescription.blogspot.com/p/patents-scotus.html> (last visited Nov. 23, 2017) (listing all patent cases that have come before the Supreme Court since 1952, and showing that a third of all such cases have been decided since 2010).

8. See Edward Wyatt, *Obama Orders Regulators to Root out ‘Patent Trolls,’* N.Y. TIMES (June 4, 2013), <https://nyti.ms/2ze4U2n>.

9. See Jonathan Griffin, *2015 Patent Trolling Legislation*, NAT’L CONF. ST. LEGISLATURES (June 15, 2016), <http://www.ncsl.org/research/financial-services-and-commerce/2015-patent-trolling-legislation.aspx>.

10. Nilay Patel, *The ‘Broken Patent System’: How We Got Here and How to Fix It*, VERGE (July 10, 2012, 2:59 P.M.), <http://www.theverge.com/2011/08/11/broken-patent-system>; Jay Walker, *Our System Is So Broken, Almost No Patented Discoveries Ever Get Used*, WIRED (Jan. 5, 2015, 6:25 A.M.), <https://www.wired.com/2015/01/fixing-broken-patent-system>.

11. Michael D. Frakes & Melissa F. Wasserman, *Does the U.S. Patent and Trademark Office Grant Too Many Bad Patents?: Evidence from a Quasi-Experiment*, 67 STAN. L. REV. 613, 625–29 (2015) (discussing incentives the United States Patent Office has to overgrant patents).

12. Jeremy W. Bock, *Patent Quantity*, 38 U. HAW. L. REV. 287, 304–15 (2016).

13. See Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1, 29–42 (2005) (arguing that the value of patents for many parties is in the aggregate, rather than in individual patents).

14. See J. Jonas Anderson, *Nontechnical Disclosure*, 69 VAND. L. REV. 1573, 1593–98 (2016) (discussing how parties may often patent for purposes of advertising and personal recognition); Clark D. Asay, *The Informational Value of Patents*, 31 BERKELEY TECH. L.J. 259, 286–308 (2015) (discussing how many parties use patents to signal information to capital, labor, and product markets); Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 636–43 (2002) (discussing how many parties

Relatedly, overpatenting may be something firms do, not because pursuing large numbers of patents is always economically rational, but simply because patenting satisfies an industry's norms, conventions, and "myths."¹⁵

Yet focusing on these reasons for the high numbers of aggregate patents obscures the reality that different parties often exhibit vastly different patenting behaviors.¹⁶ Overpatenting, after all, mostly seems to be a phenomenon of large, resource-heavy companies.¹⁷ But even some large companies do not pursue patents as often as they could.¹⁸ Furthermore, a host of other types of parties appear to forego seeking as many patents as we might expect. Many open-source software developers, for instance, decline to pursue patents on software inventions that are almost certainly patentable.¹⁹ Startup companies may also often fail to pursue patents as frequently as they could.²⁰ The industry to which a party belongs may further affect the patenting decisions of that party.²¹

derive value from their patents because of the information about their holders that patents may signal to investors).

15. Dan L. Burk, *On the Sociology of Patenting*, 101 MINN. L. REV. 421, 441–44 (2016).

16. See JOSEPH J. CORDES ET AL., OFFICE OF ADVOCACY, U.S. SMALL BUS. ADMIN., A SURVEY OF HIGH TECHNOLOGY FIRMS 55–58 (1999), <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.202.514&rep=rep1&type=pdf>; Stuart J.H. Graham et al., *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L.J. 1255, 1296–1303, 1309–14 (2009) (providing survey results regarding the various reasons why different parties in different industries patent, and also highlighting some reasons why they may not); Wesley M. Cohen et al., *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)* 14–15 (Nat'l Bureau of Econ. Research, Working Paper No. 7552, 2000), <http://ssrn.com/abstract=214952> (listing the ability of others to invent around patents as a significant reason why many parties forego patenting).

17. See Bock, *supra* note 12, at 293, 301, 304–15; Burk, *supra* note 15, at 440–41.

18. Cf. Bock, *supra* note 12, at 305–13, (discussing patent harvesting programs at large companies as mechanisms for increasing patenting at those companies, with one implication that imperfect patent harvesting systems may yield fewer patents than is optimal).

19. See, e.g., Jason Schultz & Jennifer M. Urban, *Protecting Open Innovation: The Defensive Patent License as a New Approach to Patent Threats, Transaction Costs, and Tactical Disarmament*, 26 HARV. J.L. & TECH. 1, 2–5, 37–49 (2012) (claiming that many open-source software companies do not patent their innovations because doing so is expensive and stigmatized in the open-source community, and arguing that they should more aggressively pursue patents to help combat risks to their innovation model).

20. Graham et al., *supra* note 16, at 1276–78 (indicating that a substantial proportion of early-stage companies hold no patents, and that many startup companies forego patenting even their most important technologies).

21. See, e.g., BESSEN & MEURER, *supra* note 1, at 181–83 (arguing that patents play different roles depending on the industry).

Hence, while the aggregate number of patents may be concerning for a number of reasons, failing to properly disaggregate how different parties make patenting and other intellectual property decisions may also create issues. Such issues may arise, for instance, if reform efforts aimed at reducing excessive numbers of patents fail to properly consider how those reforms affect the economic incentives of different parties in the intellectual property ecosystem.

This Article uses economic principles to more systematically analyze why parties may choose to forego pursuing patents in some cases, and what those reasons for underpatenting tell us about the patent and intellectual property system as a whole. In economic parlance, it attempts to better understand the patent “demand curves” of different types of parties and what those demand curves suggest about recent and proposed intellectual property law reforms.²²

Overall, this Article argues that demand for patents and other forms of intellectual property is likely to differ significantly depending on the resources available to a given party. Well-capitalized parties, on one end of the spectrum, will typically exhibit high demand for patents per innovation, and that high demand will remain relatively constant regardless of increases in the costs of patenting and changes in other economic factors, such as the relative costs of possible “substitute” forms of intellectual property protection like trade secrecy, copyright, and trademark.²³

This high, relatively constant demand for patents has several causes. First, the costs of patenting typically consume a relatively small percentage of a well-capitalized party’s overall resources, meaning that such parties will not be as sensitive to those costs as they would be if they had fewer resources.²⁴ Second, well-capitalized parties often derive the most value from patenting when they are able to amass patents in large numbers, as mentioned above.²⁵ These and several other factors, to be discussed more fully below, mean that well-capitalized parties will typically stockpile high

22. Conceptually, it may also make sense to flip this analysis to focus on the “supply” curves of different parties in providing patents to the marketplace. For reasons that I hope will become clear, however, I have instead chosen to analyze the intellectual property decisions of various parties in the intellectual property ecosystem using economic demand principles.

23. “Well-capitalized” is admittedly a vague term. In general, I simply mean that a party has sufficient resources to run its operations for the foreseeable future without significant financial restraints. And while vague, the distinction nonetheless proves useful in conceptualizing how different parties make intellectual property decisions, as the rest of this Article will attempt to demonstrate.

24. See, e.g., MICHAEL PARKIN, MICROECONOMICS 89–90 (10th ed. 2011).

25. See Parchomovsky & Wagner, *supra* note 13, at 29–42 and accompanying text.

numbers of patents, even when the relative costs of potential substitute forms of intellectual property fall. Indeed, well-capitalized parties, rather than substituting alternative forms of intellectual property for patents, are likely to complement patents with these other types of intellectual property protection when available, thereby building intellectual property “fortresses.”²⁶

On the other end of the spectrum, resource-constrained parties, such as startups, are likely to exhibit lower, more elastic demand for patents compared to their resource-rich counterparts. The reasons for this mirror the reasons why well-capitalized parties are likely to exhibit high, relatively constant demand for patents per innovation. First, because the costs of patenting consume a relatively high percentage of their overall resources, resource-constrained companies are likely to be more sensitive to those costs as they rise and fall.²⁷ Second, because such parties do not have the resources to patent en masse, resource-constrained parties often restrict patenting to acquiring a limited number of strategic patents.²⁸ As a result of these and related factors, to be discussed more fully below, resource-constrained parties are more likely to be selective in their patenting, and their relatively elastic demand for patents will be more responsive to changes in the relative costs of other forms of intellectual property. For instance, resource-constrained parties seem more likely to be willing to sacrifice patenting when the relative costs of substitute forms of intellectual property—such as trade secrecy, copyright, or trademarks—decrease. Hence, resource-constrained parties are more likely to use these forms of intellectual property as patent substitutes than are their well-capitalized counterparts, who will typically use them as patent complements.

Between these two ends of the spectrum, of course, there will be a variety of parties with varying levels of resources. But the point remains: those varied resource levels are likely to play a significant role in how a party makes intellectual property decisions.

This model for assessing how different parties make intellectual property decisions has implications for recent changes in intellectual

26. See John Dodds, *Patenting Strategies: Building an IP Fortress*, in 1 *INTELLECTUAL PROPERTY MANAGEMENT IN HEALTH AND AGRICULTURAL INNOVATION: A HANDBOOK OF BEST PRACTICES* 911, 919–20 (Anatole Krattiger et al. eds., 2007), <http://www.iphandbook.org/handbook/resources/Publications/links/ipHandbook%20Volume%201.pdf>.

27. See PARKIN, *supra* note 24, at 89–90.

28. See Graham et al., *supra* note 16, at 1310–12 (finding the costs of obtaining and enforcing patents to be a major reason why early-stage companies sometimes do not patent at all, or patent only inventions at the core of their business models).

property law. For instance, a slew of recent Supreme Court patent law decisions, as well as the biggest legislative patent law changes in some sixty years, have weakened patents in important respects.²⁹ This weakening may yield some positive effects by ridding the marketplace of patents of dubious quality; in fact, there is evidence to indicate that this is already happening.³⁰ But this weakening may also suppress resource-constrained parties' demands for patents by making, for instance, substitute forms of intellectual property more attractive. This result may be even more likely given that other recent legislative changes, such as the Defend Trade Secrets Act of 2016, may have bolstered the relative value of other forms of intellectual property.³¹ Well-capitalized parties' demand for patents, on the other hand, is likely to remain high in spite of these changes, in part because these types of parties' demand for patents is less responsive to the relative costs of different forms of intellectual property. Whether these and other possible implications are beneficial or harmful will be explored in greater detail below.

This Article proceeds as follows. Part I reviews five general reasons why parties may choose to forego patenting. Its basic insight is that demand for and ability to secure patents often differ depending on the resources available to a party. Highly-capitalized parties tend to patent in bulk and make fewer tradeoffs as between different forms of intellectual property—they can afford them all. Resource-constrained parties, on the other hand, must often choose between different types of intellectual property protection, so the relative costs of each are important in how much they patent per innovation. Part II then reviews several recent changes in intellectual property law that appear to increase the costs and risks of patenting relative to the costs of other forms of intellectual property. It thus builds on Part I's analysis by arguing that these changes are likely to suppress resource-constrained parties' demand for patents, while having only negligible effects on well-capitalized parties' demand for patents vis-

29. Cf. Mark A. Lemley, *The Surprising Resilience of the Patent System*, 95 TEX. L. REV. 1, 10–49 (2016) (discussing many of these changes and noting that, despite them, the patent system manifests a surprising resiliency based on several metrics).

30. See, e.g., Robert R. Sachs, *Two Years After Alice: A Survey of the Impact of a "Minor Case" (Part One)*, FENWICK & WEST: BILSKI BLOG (June 16, 2016), <http://www.bilskiblog.com/blog/2016/06/two-years-after-alice-a-survey-of-the-impact-of-a-minor-case.html> (showing that since a series of important Supreme Court decisions, certain types of patents have been easier to invalidate).

31. Patrick J. Coyne, *What You Should Know About the Defend Trade Secrets Act*, LAW360, (June 27, 2016, 11:10 P.M.), <http://www.law360.com/articles/806201/what-you-should-know-about-the-defend-trade-secrets-act> (discussing how the Defend Trade Secrets Act has bolstered trade secret protection).

à-vis other forms of intellectual property. Part III then assesses some potential implications of this Article's analysis, including whether less patenting by resource-constrained parties is normatively desirable.

I. WHY PARTIES DO NOT PATENT

Because many scholars have been focused on why parties overpatent, they have devoted less recent attention to why parties forego patent protection altogether. This Part seeks to more systematically analyze the reasons why parties may forego seeking patents, even when they could, thereby better elucidating different types of parties' demand for patents and other forms of intellectual property.

The reasons against patenting typically fit into one of five general categories: (1) the likely costs of obtaining, maintaining, and enforcing patents are too high relative to the patents' likely value; (2) parties rely on alternative types of intellectual property protection, such as trade secrecy, copyright, or trademark, instead of patent protection; (3) parties are sometimes ignorant of patent law's requirements and thereby forfeit patenting opportunities; (4) parties sometimes act irrationally against their own self-interest in choosing to forego patenting; and (5) the norms in a particular community may deter some parties in that community from patenting as much as they could. While I have separated these reasons into distinct categories, these reasons can and sometimes do work in concert to prevent patenting, as the following sections will explore.

Overall, this Part claims that these reasons against patenting are often likely to affect parties differently depending on the resources available to them. The high costs of patenting, for instance, are less likely to affect the patenting decisions of well-capitalized parties, and changes in the relative costs of other forms of intellectual property are also unlikely to affect well-capitalized parties' demand for patents. Furthermore, well-capitalized parties are unlikely to miss out on many chances to patent due to ignorance or irrationality, and norms for well-capitalized parties typically push in favor of patenting, rather than against it. Resource-constrained parties, on the other hand, are likely to exhibit greater sensitivity to both the high costs of patenting and the relative costs of substitute forms of intellectual property protection. They are also more likely to miss out on patenting opportunities due to ignorance or irrationality, while in some cases the norms of their particular communities push against patenting. The following sections discuss these claims in turn.

A. THE HIGH COSTS OF OBTAINING, MAINTAINING, AND ENFORCING PATENTS

One important disincentive to patenting is that obtaining, maintaining, and enforcing patents is extremely costly.³² For purposes of simplicity, I will call these costs, collectively, “the costs of patenting.” To see how the costs of patenting may dissuade some parties from pursuing patents, it is useful to briefly explain the patenting process and what comes thereafter. To obtain a patent, a party must file an application with the USPTO.³³ That application must satisfy several substantive patent law requirements, including demonstrating that the patent covers a useful invention that qualifies as patentable subject matter and is new and non-obvious in light of what others have already invented.³⁴ Furthermore, the application must disclose enough technical information regarding the invention that a person with ordinary skill in the area would be able to (1) replicate the invention without “undue experimentation,” and (2) recognize the applicant is in possession of what they claim to have invented.³⁵ An applicant must also distinctly lay out the “metes and bounds” of their patented invention at the end of the application, in what are called patent “claims.”³⁶

These requirements mean that successfully crafting patent applications is typically a highly technical exercise. As a result, inventors wishing to obtain patents normally seek the assistance of patent lawyers to help them “prosecute” patent applications before the USPTO.³⁷ That prosecution process generally involves a significant amount of time for both drafting the initial application and finalizing it as the patent lawyers and USPTO examiners haggle over whether the patent application satisfies patent law’s

32. Graham et al., *supra* note 16, at 1310 (finding the costs of obtaining and enforcing patents to be a major reason why early-stage companies forego patenting even their major innovations).

33. See 35 U.S.C. § 111(a) (2012) (“An application for patent shall be made, or authorized to be made, by the inventor, except as otherwise provided in this title, in writing to the Director [of the USPTO].”).

34. See *id.* §§ 101–103 (laying out the patentable subject matter, utility, novelty, and non-obviousness requirements).

35. See *id.* § 112(a) (providing for the enablement and written description requirements); Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 546–47 (2009).

36. See 35 U.S.C. § 112(b); Fromer, *supra* note 35, at 546–47, 550.

37. See Cathie Kirik, *Working with a Patent Practitioner*, U.S. PAT. & TRADEMARK OFF.: INVENTORS EYE (Jan. 2011), <https://www.uspto.gov/inventors/independent/eye/201101/advicepractitioner.jsp> (recommending that inventors use patent lawyers to help them prosecute patent applications before the USPTO).

substantive requirements.³⁸ All of this means that obtaining a patent is often quite expensive. While costs vary depending on a variety of factors, a typical range for many patents is in the tens of thousands of dollars.³⁹

Furthermore, patent applicants must often pursue patents in multiple countries and layers to ensure their inventions receive effective protection, which increases the costs of patenting even further.⁴⁰ For instance, because patent law is territorial, a U.S. patent provides little to no protection against someone practicing the same invention in another country.⁴¹ Consequently, in order to combat infringement in other important territories, a patent applicant may often seek patents in those jurisdictions.⁴²

Moreover, to ensure effective patent protection, parties often prosecute multiple related applications concerning the same invention. For example, a party might pursue an initial application for its core technology, but then also file separate applications relating to the technology's design, improvements to the technology, and methods of using it.⁴³ These additional patents are necessary in some cases to ensure that other parties cannot find simple workarounds to the initial patent.⁴⁴ Hence, obtaining patents becomes an even more expensive proposition when considering that effective protection often requires filing and prosecuting numerous related patent applications in multiple jurisdictions.

Obtaining a patent is also not the end of a patent's costs. For instance, the U.S. patent system requires periodic payment of maintenance fees in order to keep an issued patent from expiring before the end of its twenty-year term.⁴⁵ In addition, for many parties a patent is only valuable if successfully enforced against infringers.⁴⁶ But enforcing patents is notoriously expensive, with the average cost of patent litigation ranging in

38. Kathleen Kuznicki, *How Long Does It Take to Get a Patent?*, LYNCH L. GROUP (Apr. 20, 2014), <http://lynchlaw-group.com/how-long-does-it-take-to-get-a-patent> (describing the usual back-and-forth between the USPTO and applicants).

39. Gene Quinn, *The Cost of Obtaining a Patent in the US*, IPWATCHDOG (Apr. 4, 2015), <http://www.ipwatchdog.com/2015/04/04/the-cost-of-obtaining-a-patent-in-the-us>.

40. See Dodds, *supra* note 26, at 918–19.

41. Jay A. Erstling & Frederik W. Struve, *A Framework for Patent Exhaustion from Foreign Sales*, 25 *FORDHAM INTELL. PROP. MEDIA & ENT. L.J.* 499, 508–18 (2015) (providing an overview of the territoriality of U.S. patent law).

42. *Id.*

43. Dodds, *supra* note 26, at 919–20.

44. See Graham et al., *supra* note 16, at 1310 (listing the ease with which patented inventions can be invented around as one major reason parties forego patenting).

45. *Maintain Your Patent*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/patents-maintaining-patent/maintain-your-patent> (last visited Nov. 23, 2017).

46. *But see* Asay, *supra* note 14, at 286–308; Long, *supra* note 14, at 636–43.

the millions of dollars.⁴⁷ Indeed, analyzing one's own patents and determining who may be infringing them is often a costly exercise in its own right, let alone the additional costs of actually negotiating with and litigating against the potential infringers.⁴⁸ The high costs of maintaining and enforcing patents thus also likely influence many parties' decisions to forego patent protection.⁴⁹

Of course, the high costs of maintaining and enforcing patents may not always affect a party's decision whether to patent, simply because they are future, less immediate costs. Yet knowing that maintaining and enforcing a patent will entail significant costs down the road frequently can dissuade a party from pursuing a patent in the first place.⁵⁰

Last, the high costs of patenting are particularly likely to deter patenting when the potential commercial value of an invention is low.⁵¹ In other words, the prospect of the high costs discussed above is likely to have an even greater deterrent effect on patenting when the invention in question is of limited value because, for instance, others can easily invent around it.⁵² Although large companies may still regularly obtain such low-value patents as part of a "patent harvesting" program, the high costs of maintaining and enforcing them relative to their value still appear to have their effect, as significant percentages of patents are allowed to lapse for failure to pay maintenance fees.⁵³ And failing to obtain patents or allowing them to lapse (because of the high costs of patenting relative to the patent's

47. Chris Neumeyer, *Managing Costs of Patent Litigation*, IPWATCHDOG (Feb. 5, 2013), <http://www.ipwatchdog.com/2013/02/05/managing-costs-of-patent-litigation>.

48. Clark D. Asay, *Patent Pacifism*, 85 GEO. WASH. L. REV. 645, 663 (2017).

49. Of course, one way to mitigate these costs is to outsource them to a patent assertion entity, otherwise known as a patent troll, or to seek some form of patent litigation financing. See David L. Schwartz, *The Rise of Contingent Fee Representation in Patent Litigation*, 64 ALA. L. REV. 335, 373–74 (2012). This Article will return to these topics in Part III.

50. See Todd Hixon, *For Most Small Companies Patents Are Just About Worthless*, FORBES (Oct. 7, 2014), <https://www.forbes.com/sites/toddhixon/2013/10/04/for-most-small-companies-patents-are-just-about-worthless> (discussing how the difficulty of enforcing patents makes patenting for small companies "worthless"). Of course, one way to deal with many of these costs is to outsource them to a third party, such as a patent assertion entity, or to obtain litigation funding. See, e.g., Asay, *supra* note 48, at 652. These options may cause some parties that would otherwise forego patenting to pursue a patent, though the uncertainty of obtaining funding or finding a third-party enforcer may still deter patent acquisition in many cases.

51. Cf. John R. Allison et al., *Valuable Patents*, 92 GEO. L.J. 435, 435–37 (2004) (arguing that most patents are never enforced because most patents lack significant commercial value).

52. Cohen et al., *supra* note 16, at 15.

53. See, e.g., Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1503, 1504 tbl.3 (2001) (showing that by the seventeenth year of protection fees are paid on only 36% of patents).

value), may be particularly palatable in cases where alternative, cheaper forms of intellectual property are available, as discussed in Part I.B.

So far this discussion has examined the high costs of patenting in general. Yet it is clear that the high costs of patenting do not affect all parties equally.⁵⁴ For instance, these high costs may dissuade resource-constrained parties in particular from patenting as frequently as they could, as some survey evidence confirms.⁵⁵ These high costs may have such an effect because they consume too high of a percentage of a party's limited resources, thus preventing it from effectively pursuing other important goals.⁵⁶ In economic parlance, the marginal costs of patenting often outweigh the marginal benefits, in part because the high costs of patenting entail sacrifices, or "opportunity costs" (for example, diversion of resources from hiring), that outweigh the benefits of patenting.⁵⁷ And while it is true that recent legislation has reduced patent application and maintenance fees for parties with fewer resources,⁵⁸ those fees are typically only a small part of what makes patenting so expensive, as discussed above. Hence, the overall patenting burden remains high for resource-constrained companies, and that burden is likely to deter many of them from pursuing as many patents as they could.

An example better drives home these points. Imagine a startup company with under ten employees. These employees are passionate about the technology they are developing. But, like with many startups, they can hardly find the time to do everything they are asked to do, and the capital the company has at its disposal is severely limited.⁵⁹ In fact, the employees are being paid primarily in company stock, which at this point in the

54. As a general matter, it has long been clear that the resources available to a party affect that party's ability to successfully navigate the legal system. See Russell G. Pearce, *Redressing Inequality in the Market for Justice: Why Access to Lawyers Will Never Solve the Problem and Why Rethinking the Role of Judges Will Help*, 73 *FORDHAM L. REV.* 969, 969–73 (2005) (discussing the disadvantages that resource-constrained parties face in traversing the legal system).

55. See CORDES ET AL., *supra* note 16, at 55–59; Graham et al., *supra* note 16, at 1310–12; Cohen et al., *supra* note 16, at 15–16, 15 n.35.

56. See PARKIN, *supra* note 24, at 89–90.

57. For a fuller explanation of this type of marginal analysis, see IRVIN B. TUCKER, *MACROECONOMICS FOR TODAY* 37–38 (7th ed. 2011).

58. See U.S. PATENT & TRADEMARK OFFICE, *USPTO FEE SCHEDULE* (2017), https://www.uspto.gov/sites/default/files/documents/USPTO%20fee%20schedule_current.pdf (archive version on file with author) (listing filing and prosecution fees for "small entity" and "micro entity" applicants, which are 50 percent and 25 percent of the regular fees, respectively).

59. See Sarah White, *Pros and Cons of Working for a Startup Company*, MONSTER, <https://www.monster.com/career-advice/article/pros-and-cons-of-working-for-a-startup-company> (last visited Nov. 23, 2017) (listing longer hours and lower base salaries—which are often justified by providing employees with equity—as likely cons to working for a startup).

startup's life cycle is basically worthless, but, the employees hope, will become quite valuable if the company succeeds.⁶⁰

Now imagine that some of these employees develop a patentable innovation. Even if the company's management is familiar with patents and recognizes the potential benefits of patenting the innovation, the high costs of patenting may simply be too daunting given the company's significant resource constraints. For instance, diverting employees' time into helping patent lawyers draft and finalize a patent application means those employees have less time to devote to their engineering responsibilities (for which they already had insufficient time). Furthermore, the costs of applying for patents may eat up too much of the company's already limited capital; in some cases, in fact, that capital may be needed to get the company through the next financial quarter. Finally, even if the company were in a position to use some of its limited resources to obtain a patent, the prospect of ongoing maintenance and enforcement costs down the road may deter them from even applying. In sum, while patenting may seem like a good idea in the abstract, the practical realities for many resource-constrained companies mean that patenting's opportunity costs are simply too great.⁶¹

There are other reasons why the high costs of patenting may prevent resource-constrained parties from patenting. For example, a poorly capitalized party may actually desire a patent, but the high costs of patenting mean that the party is unable to file the patent application before another, better-resourced party files an application for the same invention. For patents filed before March 16, 2013, resource-constrained parties have some comfort on this score: even if filing after another party, the poorly capitalized party can still win the patent race by demonstrating that it conceived of the invention first and was diligent in reducing it to practice from a time before the other party conceived of the same invention.⁶² Yet this all may be cold comfort for many parties, because providing sufficient evidence in support of such arguments can be difficult.⁶³ Furthermore, for patents filed on or after March 16, 2013, the 2011 Leahy-Smith America Invents Act ("AIA") means that whichever party files the first patent

60. *Id.*

61. For an explanation of opportunity costs, see David R. Henderson, *Opportunity Cost*, LIBRARY ECON. & LIBERTY: CONCISE ENCYCLOPEDIA ECON., <http://www.econlib.org/library/Enc/OpportunityCost.html> (last visited Nov. 23, 2017).

62. See Sean T. Carnathan, *Patent Priority Disputes—A Proposed Re-Definition of "First-to-Invent,"* 49 ALA. L. REV. 755, 761–70 (1998) (providing background on how this system works).

63. *Id.*

application for an invention automatically wins the patent race.⁶⁴ Hence, going forward, this reality may mean that resource-constrained parties have a more difficult time patenting vis-à-vis their well-capitalized counterparts.⁶⁵

None of the above means, of course, that resource-constrained parties will not pursue patents at all—in fact, some evidence suggests that *some* patent acquisition helps early-stage companies attract financing.⁶⁶ Yet the high costs of patenting may mean that many resource-constrained parties forego adding patents beyond the absolute minimum number deemed necessary because the marginal costs of more patenting exceed the marginal benefits. Per innovation, therefore, resource-constrained parties are likely to patent less than those with greater resources. The result is fewer patents than what otherwise might be. And as will be discussed in Part II, as legal changes increase the costs of patenting, parties with more malleable demand for patents—such as startup companies and other resource-constrained parties—may patent even less than they traditionally have.

The high costs of patenting are likely to affect well-capitalized parties much differently. For instance, on average patenting consumes a lower percentage of such parties' overall resources, especially since the large-scale patenting systems common at larger companies result in economies of scale.⁶⁷ The result is that for well-capitalized companies, the high costs of patenting seem less likely to deter them from patenting, particularly since many large companies derive much of their value from patents in large aggregations.⁶⁸ This is not to say that the high costs of patenting will not deter well-capitalized parties from pursuing patents in some cases. But it is to say that those high costs are less likely to discourage well-capitalized parties than their resource-constrained counterparts from pursuing patents.

64. Gene Quinn, *A Brave New Patent World—First to File Becomes Law*, IPWATCHDOG (Mar. 16, 2013), <http://www.ipwatchdog.com/2013/03/16/a-brave-new-patent-world-first-to-file-becomes-law> (explaining the Leahy-Smith America Invents Act and its new “first-to-file” priority system). *See also* 35 U.S.C. § 100 note (2012) (Effective Date of 2011 Amendment).

65. David S. Abrams & R. Polk Wagner, *Poisoning the Next Apple? The America Invents Act and Individual Inventors*, 65 STAN. L. REV. 517, 546–550 (2013) (providing evidence from Canada suggesting first-to-file patent laws may reduce the number of patents individual inventors acquire).

66. Long, *supra* note 14, at 637, 655–56; Stuart J.H. Graham & Ted Sichelman, *Why Do Start-Ups Patent?*, 23 BERKELEY TECH. L.J. 1063, 1071–82 (2008) (discussing the many roles that a patent can play for startup companies, including attracting financing).

67. *See* Cohen et al., *supra* note 16, at 15–16. *See also* Bock, *supra* note 12, at 309–15 (describing the resource-intensive process of patent harvesting that enables some companies to stuff their patent portfolios).

68. *See* Parchomovsky & Wagner, *supra* note 13, at 29–42.

Again, an example helps illustrate these points. Assume the startup company described earlier has made it through its early struggles and is now a public company with access to significant amounts of capital. Rather than ten or fewer employees, the company now boasts thousands of engineers and other personnel. The company routinely churns out patentable innovations, and it patents as many of these innovations as possible.⁶⁹ Why the difference compared to its early startup days?

While many possible explanations exist,⁷⁰ the greater resources available to the company would certainly seem to play a role. For instance, while patenting still entails opportunity costs—for example, the costs of patenting could be devoted to some other purpose, and employees must sacrifice time helping in the patenting process—several factors reduce the importance of those costs. First, as mentioned above, patenting en masse creates significant value for well-capitalized parties, which often rely on large patent portfolios to protect their positions in the marketplace.⁷¹ In other words, for well-capitalized parties, the opportunity costs of patenting typically pale in comparison to the benefits of high-volume patenting. Second, the opportunity costs of patenting are simply lower in many cases because the company's significant resources allow it to continue to pursue its other goals in spite of the resources—including employees and capital—being devoted to patenting. Unlike in its startup days, then, the high costs of patenting are simply not that high for the now well-provisioned company because diversion of resources to patents does not affect the company's ability to operate.

Below I have depicted, in several figures, these relationships between the resources available to a given party and their likely demand for patents. The vertical axes in the figures represent the “price” of patents, while the horizontal axes represent the “quantity” demanded. Figure 1 below depicts a theoretical demand curve for aggregate patent demand. Specific prices and quantities are omitted because they are not important for purposes of this discussion. Instead, the point of Figure 1 is simply to show that, per classic economic theory, as the costs of patenting rise, the demand for patents is expected to fall.⁷² Conversely, as patents become less costly, or

69. Doing so is, in fact, a regular practice of large companies in particular. *See e.g.*, Bock, *supra* note 12, at 304–09, 304 n.94.

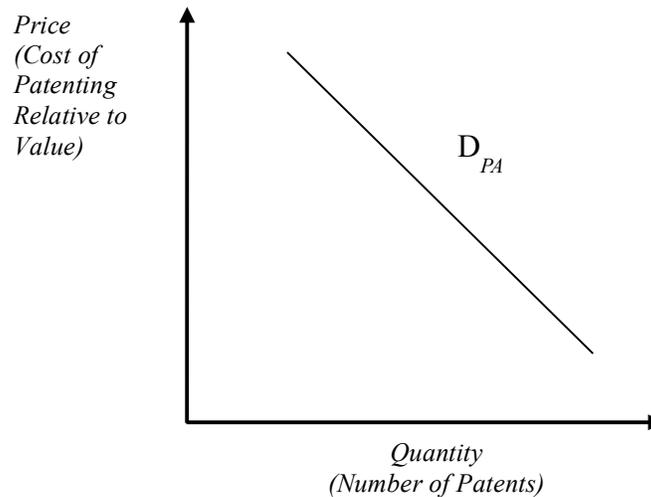
70. *See supra* notes 12–15 and accompanying text.

71. *See* Parchomovsky & Wagner, *supra* note 13, at 29–42.

72. David R. Henderson, *Demand*, LIBRARY ECON. & LIBERTY: CONCISE ENCYCLOPEDIA ECON., <http://www.econlib.org/library/Enc/Demand.html> (last visited Nov. 24, 2017) (“The law of demand

alternatively, more valuable, the demand for patents increases.⁷³

FIGURE 1. Aggregate (Market) Demand for Patents



Yet this simple graphical depiction of aggregate patent demand fails to account for the different sensitivities—or *elasticities*—among parties to the costs of patenting. As discussed above, resource-constrained parties are more likely to patent less per innovation in general, and they are also more likely to be sensitive to changing costs of patenting in making patenting decisions. Their demand is more *elastic* because an increase or decrease in the costs of patenting is more likely to affect how many patents they pursue. Well-capitalized parties, on the other hand, are more likely to exhibit higher demand for patents in general and be less sensitive to the changing costs of patenting.

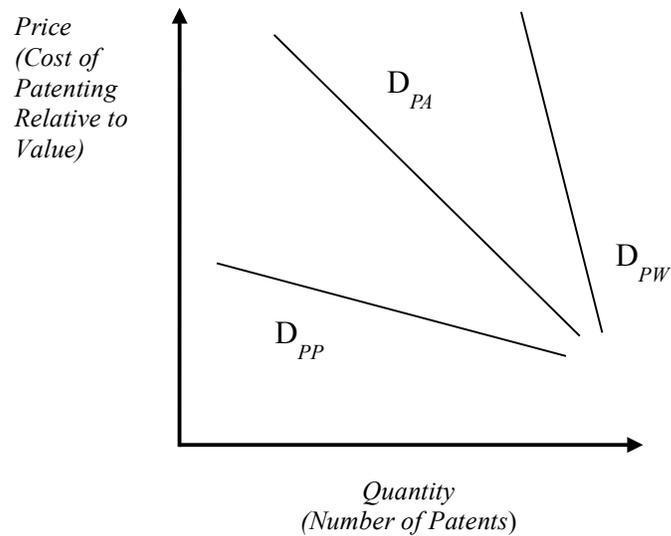
Figure 2 below again depicts the aggregate patent demand (the middle demand curve, still “ D_{PA} ”), which in reality is the aggregate of resource-constrained parties’ more elastic demand curve (to the left of D_{PA} , labeled “ D_{PP} ”) and well-capitalized parties’ relatively inelastic demand curve (to the right of D_{PA} , labeled “ D_{PW} ”). Notice that well-capitalized parties’ demand curve (D_{PW}) is relatively vertical, meaning that the high number of patents they pursue is not expected to change much in response to changes

states that when the price of a good rises, the amount demanded falls, and when the price falls, the amount demanded rises.”).

73. *Id.*

in the costs of patenting. The demand curve for resource-constrained parties (D_{PP}), in contrast, is relatively flat, meaning the lower number of patents they pursue changes significantly as the costs of patenting change. Furthermore, if the costs of patenting reach a high enough threshold, resource-constrained companies may opt out of patenting altogether. The next section builds on this analysis in showing how “economic substitutes,” or alternatives to patenting, may further affect how many patents these differently resourced parties pursue.

FIGURE 2. Aggregate and Disaggregated Demand for Patents



One possible counter to the preceding analysis is that, in general, we would expect capital to flow to productive uses—including for purposes of obtaining, maintaining, and enforcing patents—in well-functioning capital markets.⁷⁴ Hence, even parties with relatively limited resources should be able to patent their inventions as much as necessary because capital markets, including venture capitalists, will recognize the value of that patenting and channel additional capital to those parties accordingly.

There are several reasons, however, to doubt that capital markets will always, or even typically, function this way. First, innovation and any

74. See e.g., Schwartz, *supra* note 49, at 373–74 (discussing various forms of litigation financing used by small businesses).

associated patenting are often speculative processes—it can be difficult even for experts to know which innovations will ultimately prove valuable.⁷⁵ For this reason, venture capitalists typically diversify their investments among a variety of early-stage companies to mitigate risk.⁷⁶ Hence, capital markets may often fail to identify instances where funneling more capital into an innovative startup makes economic sense. As a result, poorly capitalized parties may often lack access to additional capital for patenting purposes, forcing them to ration their limited resources among a variety of purposes, of which patenting may not be the most immediately important—even if it would otherwise be economically rational.

Second and relatedly, failures to recognize the economic sense of some or more patenting may often be attributable to innovators themselves. Indeed, resource-constrained parties may often fail to recognize the need for more, or any, patenting, particularly as they struggle to establish themselves commercially.⁷⁷ Of course, there is plenty of evidence suggesting that resource-constrained parties recognize that *some* patenting is often important, including as a means of attracting more funding.⁷⁸ But that evidence does not demonstrate that such parties recognize all economically prudent instances of patenting and that they deploy their resources accordingly. Hence, though in theory capital markets and innovators should always funnel their available capital into productive patenting practices, in many cases the factors discussed above suggest reasons to be skeptical of such a result in practice.

In fact, some evidence suggests a belief among policymakers that capital markets do not always channel sufficient capital to poorly capitalized parties for patenting purposes. For instance, individuals and small businesses pay only half the fees that other types of parties must in order to obtain and maintain their patents.⁷⁹ Other scholars, moreover, have noted that the small inventor lobby has often proved quite effective at

75. See, e.g., F.M. Scherer, *The Innovation Lottery*, in EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 3, 16–21 (Rochelle Cooper Dreyfuss et al. eds., 2001) (analogizing innovation and patenting to a lottery system, in which parties often overinvest in hopes of earning supracompetitive returns). John R. Allison and others do provide some evidence as to the characteristics of valuable patents at filing and prosecution. See Allison et al., *supra* note 51, at 437–39, 448–65. Nonetheless, these predictors still occur after a party has decided whether to seek a patent at all.

76. Ryan Caldebeck, *Successful Venture Investing: The Importance of Understanding Risks, and Diversification*, FORBES (Feb. 19, 2014, 5:55 P.M.), <https://www.forbes.com/sites/ryancaldebeck/2014/02/19/successful-venture-investing-the-importance-of-understanding-risks-and-diversification>.

77. Graham et al., *supra* note 16, at 1310–12.

78. See Graham & Sichelman, *supra* note 66, at 1067.

79. 35 U.S.C. § 41(h)(1) (2012).

preventing legislation that it perceives as advantaging large companies over smaller ones.⁸⁰

A few final notes: these graphs, as well as the preceding analysis and the analysis to follow, are obviously oversimplified in a number of respects. For instance, as briefly mentioned in the Introduction, not all parties can easily be classified as either “well-capitalized” or “poorly capitalized;” this bi-modal analysis thus simplifies what is in reality a spectrum in terms of how many resources a party has at its disposal. Nor do all poorly and well-capitalized parties exhibit the same sensitivities to the costs of patenting. Other factors, such as a company’s culture, the industry in which the company operates, the company’s products and services, and the actual personnel involved, will undoubtedly affect how any given party makes intellectual property decisions. Indeed, a party’s industry may frequently dictate patenting decisions, as scholars have noted for some time that patents play significantly different roles from one industry to the next.⁸¹

But despite these and other generalizations, the analysis in this Part I helps articulate a theoretical model for explaining some evidence regarding how parties make patenting and other intellectual property decisions. Indeed, theory is not meant to capture all relevant nuances that may arise in a particular scenario.⁸² Furthermore, as Parts II and III will examine, this theoretical model provides a useful lens through which to assess recent and proposed changes to intellectual property law and how those changes may ultimately impact the intellectual property ecosystem and economy as a whole.

B. ALTERNATIVE FORMS OF INTELLECTUAL PROPERTY

Another reason parties may choose to forego patenting is because, in some cases, other forms of intellectual property prove more enticing. Importantly, the high costs of patenting discussed above may often play a role in determining how enticing these other forms of intellectual property are, particularly for resource-constrained parties. The following sections describe three alternatives to patenting and how the resources available to a

80. See Mark A. Lemley & Colleen V. Chien, *Are the U.S. Patent Priority Rules Really Necessary?*, 54 HASTINGS L.J. 1299, 1304 (2003).

81. See, e.g., DAN L. BURK & MARK A. LEMLEY, *THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT* 49 (2009) (“Companies in different industries vary widely in the importance they attribute to patents and in the cost and effort they expend to obtain them.”).

82. See KENNETH N. WALTZ, *THEORY OF INTERNATIONAL POLITICS* 7 (1979) (“A full description would be of [the] least explanatory power . . .”).

party may affect the intellectual property protections it chooses.

1. Trade Secrecy

Trade secrecy, often viewed as the primary alternative to a patent,⁸³ offers innovators several potential advantages over patent protection. First, trade secret protection can last indefinitely, whereas patents only last twenty years from the date the patent application was filed.⁸⁴ Second, as discussed above, the life cycle of a patent is expensive: obtaining a patent entails a costly application process, maintaining a patent even after issuance requires payment of periodic maintenance fees,⁸⁵ and enforcing patents is incredibly expensive. While enforcing trade secrets is also typically expensive,⁸⁶ obtaining trade secret status requires primarily that a party actually keep its inventions secret.⁸⁷ Of course, keeping things secret often entails non-trivial costs, including implementing physical security measures and routinely training employees.⁸⁸ But those costs are less than they might seem with respect to any specific invention, because companies often undertake these types of security measures as a matter of course and thus need not expend significant additional funds for each new invention they want to keep secret.⁸⁹ For instance, a company may incur significant costs in initially training employees and getting processes in place to protect trade secrets. But once those systems are in place, the company's additional costs in keeping new inventions secret are minimal.

Third, parties can enjoy trade secret protection without having to disclose details about their inventions to the public—in fact, if they did, they would lose trade secret status for the disclosed inventions.⁹⁰ Patents, on the other hand, force applicants to disclose important technical

83. See *Kewanee Oil Co. v. Bicon Corp.*, 416 U.S. 470, 487–88 (1974) (discussing the choice between patents and trade secrecy).

84. J. Jonas Anderson, *Secret Inventions*, 26 BERKELEY TECH. L.J. 917, 924 (2011).

85. *Id.* at 925.

86. See James Morando, *Defending Trade-Secret Claims*, FARELLA BRAUN & MARTEL LLP (May 5, 2008), http://www.fbm.com/files/Publication/0c2adca1-3549-4cd7-896e-957205dea39c/Presentation/PublicationAttachment/b83233e6-fd45-4cdf-9a1a-9638c3b99163/6154c86f-0cf6-42d3-8037-5c2f2cb0822f_document.pdf (explaining that trade secret litigation is often just as costly as patent litigation).

87. *See id.*

88. *Id.*

89. For a discussion on the physical measures a company may take to protect its trade secrets, see Pamela Passman, *Eight Steps to Secure Trade Secrets*, WIPO MAG., Feb. 2016, at 22, 23–24, http://www.wipo.int/export/sites/www/wipo_magazine/en/pdf/2016/wipo_pub_121_2016_01.pdf.

90. Anderson, *supra* note 84, at 926.

information about their inventive ideas as part of the patenting process.⁹¹ And that information typically becomes available to the public, either as a published patent application eighteen months after filing the application⁹² or once the patent issues. In fact, some survey evidence indicates that patent law's disclosure requirements deter a good number of parties from seeking patents, who instead rely on trade secrecy.⁹³

Of course, trade secret protection is weaker vis-à-vis patent protection in other respects. For instance, trade secret law typically offers no recourse when a competitor reverse-engineers the trade secret owner's product in order to obtain the trade secrets.⁹⁴ Furthermore, if Party B independently develops information similar to or the same as Party A's trade secrets, Party A has no recourse against that party (or any other party to which Party B discloses the information, for that matter).⁹⁵ Indeed, once a party's trade secrets become generally known, that party's remedial options are often at an end.⁹⁶

Nonetheless, despite these and other potential risks, many parties may prefer trade secret protection over patent protection because of its relative merits, including affordability, as described above. As such, a preference for trade secret protection provides one important disincentive to patenting.

2. Copyright

Copyright protection is another form of intellectual property that can function as an alternative to patenting. Technically, a party can enjoy both copyright and patent protection simultaneously; a party need not choose between the two forms as long as the invention is otherwise eligible for both types of intellectual property protection.⁹⁷ Software is a good case-in-point: a party can obtain patent protection for the inventive concepts relating to the software, but can also obtain copyright protection for the software code (the software's "text") and other nonliteral, expressive elements of the software.⁹⁸

91. *Id.*

92. 35 U.S.C. § 122(b) (2012).

93. See Cohen et al., *supra* note 16, at 13–16, 15 n.33.

94. Anderson, *supra* note 84, at 924–25.

95. *See id.*

96. *Id.* at 926.

97. See, e.g., *In re Yardley*, 493 F.2d 1389, 1395–96 (C.C.P.A. 1974) (holding that the constitutional provision that authorizes both copyrights and patents does not require parties to choose one over the other).

98. See Jonas P. Herrell, *The Copyright Misuse Doctrine's Role in Open and Closed Technology Platforms*, 26 BERKELEY TECH. L.J. 441, 458 (2011).

Yet copyright is cheaper to obtain than patent protection. Copyright arises, for instance, as soon as the work is fixed in a tangible medium of expression for more than a transitory period of time.⁹⁹ In other words, as soon as a party writes (or types) the work down, it is subject to copyright. Furthermore, copyright subsists in things that exhibit only trivial amounts of creativity—they must merely be “original” to the author, meaning the author independently created the work and it includes some “modicum” of creativity.¹⁰⁰ A person’s doodling, for instance, may be subject to copyright once created, regardless of how poorly done. Patents, on the other hand, are only supposed to issue for useful inventions that are new and non-obvious in light of what others have already done.¹⁰¹ Hence, as discussed above, a relatively stringent application process is required for those seeking patents, whereas those seeking the advantages of copyright remedies need merely register their work with the United States Copyright Office (“Copyright Office”) and undertake a few other relatively simple formalities.¹⁰²

All of this suggests that for some technologies such as software, the availability of copyright may make obtaining patent protection less crucial. Consequently, many parties with both options may choose to simply rely on copyright, particularly since copyright is much cheaper to obtain, resulting in less patenting.¹⁰³ Of course, obtaining both forms of protection is often the ideal approach, particularly since copyright protection is in some key respects weaker than patent protection.¹⁰⁴ And many parties do, in fact, pursue dual protections when available.¹⁰⁵ Yet the high costs of

99. See 17 U.S.C. § 102(a) (2012).

100. Feist Publ’ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 345–46 (1991).

101. See 35 U.S.C. §§ 102–103 (providing for the novelty and non-obviousness requirements of patent law).

102. Jane C. Ginsburg, *The U.S. Experience with Mandatory Copyright Formalities: A Love/Hate Relationship*, 33 COLUM. J.L. & ARTS 311, 333–42 (2010) (describing the effects of undertaking formalities with respect to a copyrighted work, including the ability to sue infringers). *But cf. infra* text accompanying notes 138–42 (discussing the limited copyright protections that attach even without registration).

103. Cf. Viva R. Moffat, *Mutant Copyrights and Backdoor Patents: The Problem of Overlapping Intellectual Property Protection*, 19 BERKELEY TECH. L.J. 1473, 1512–15, 1523–24 (2004) (describing how copyrights can function as “backdoor patents” by providing similar rights of exclusion after a patent has expired).

104. Cf. Samson Vermont, *Independent Invention as a Defense to Patent Infringement*, 105 MICH. L. REV. 475, 479 (2006) (arguing in favor of making patent law more like copyright law by including an independent invention defense to patent infringement).

105. See Dodds, *supra* note 26, at 916–20 (“Patents are not the only way to protect IP. Trademarks, copyrights, and trade secrets are used as well, and very often they form an important part of an overall IP strategy.”).

patenting may frequently push parties to sacrifice that ideal for an economically prudent alternative.

3. Trademark

Trademark protection may also sometimes function as an alternative to patent protection. Trademark protection may seem like a less likely candidate for this role than trade secrecy or copyright, in part because the historical purposes behind trademark law differ significantly from those of patents, trade secrecy, and copyright. For instance, traditionally the primary justification for trademark protection lies in marketplace integrity.¹⁰⁶ Trademark protection is supposed to achieve marketplace integrity by prohibiting third parties from using the trademarks of others in ways that confuse consumers.¹⁰⁷ Hence, by credibly signaling to consumers the actual source of goods and services, trademarks reduce the debilitating information costs that consumers would otherwise face in making consumption decisions.¹⁰⁸

The traditional purposes behind patents, copyrights, and trade secrecy differ significantly from the consumer protection rationale for trademarks. For instance, the predominant justification for patents is that they incentivize technological and scientific innovation.¹⁰⁹ Trade secrecy is similar in its purpose of promoting such innovation.¹¹⁰ And while copyright's purpose centers on incentivizing parties to undertake creative activities, those activities often overlap with and result in technological innovation, meaning that copyright protection may also end up incentivizing such innovation.¹¹¹ Hence, given trademark's different purpose, labeling it a possible alternative to patent protection may seem odd at first glance.

106. Mark P. McKenna, *The Normative Foundations of Trademark Law*, 82 NOTRE DAME L. REV. 1839, 1844 (2007) ("It would be difficult to overstate the level of consensus among commentators that the goal of trademark law is—and always has been—to improve the quality of information in the marketplace and thereby reduce consumer search costs.").

107. *Id.*

108. *Id.*

109. John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439, 439 (2004) ("Traditionally, the economic rationale for granting intellectual property rights in innovations has been that the rights provide an incentive or reward for the sizeable investments needed to create the intellectual property disclosed in the patent document.").

110. See Mark A. Lemley, *The Surprising Virtues of Treating Trade Secrets as IP Rights*, 61 STAN. L. REV. 311, 319–20 (2008) (suggesting that the two traditional theories behind trade secret protection both focus on incentivizing innovation, whether directly or indirectly).

111. Clark D. Asay, *Intellectual Property Law Hybridization*, 87 U. COLO. L. REV. 65, 90–96 (2016).

Yet over time, trademarks have taken on roles that in some cases make them a plausible alternative to patent protection. For instance, some scholars have argued that trademarks serve an important incentive function.¹¹² That is, because innovative parties know that trademark protection prohibits third parties from using an innovator's mark to sow confusion about its products, trademark protection may embolden parties to devote more resources to increasing the quality of their goods and services.¹¹³ Hence, although trademark protection is less direct than patents, trade secrecy, or copyright in encouraging parties to innovate, trademarks nonetheless may sometimes play a nontrivial role in inspiring parties to invest in innovation.¹¹⁴

Of course, similar to copyright and trade secrecy, trademark protection is an imperfect substitute for patent protection. Trademarks, after all, provide no protection against a third party copying the trademark owner's invention, so long as the third party uses its own trademark on its product.¹¹⁵ Indeed, trademark law's functionality doctrines prohibit trademarks owners from using trademarks to protect functional aspects of their goods and services.¹¹⁶

But despite these limitations, trademarks indirectly protect a party's innovative products by protecting its branding of those products. In fact, a party's branding may often be the primary driver of its commercial success.¹¹⁷ Hence, while trademarks do not match patents in what they protect against, trademarks nonetheless provide innovative parties with key protections for their inventive products.

112. Bryan L. Frye, *IP as Metaphor*, 18 CHAP. L. REV. 735, 738 (2015); Daniel J. Gifford, *The Interplay of Product Definition, Design and Trade Dress*, 75 MINN. L. REV. 769, 769–70, 772–74 (1991); Gideon Parchomovsky & Peter Siegelman, *Towards an Integrated Theory of Intellectual Property*, 88 VA. L. REV. 1455, 1460–61, 1460 n.17 (2002).

113. See Parchomovsky & Siegelman, *supra* note 112, at 1460 n.17.

114. See William M. Landes & Richard A. Posner, *Trademark Law: An Economic Perspective*, 30 J.L. & ECON. 265, 269–70 (1987) (arguing that trademarks encourage investments in improving the quality of products sold under the marks).

115. See *Qualitex Co. v. Jacobsen Prods. Co.*, 514 U.S. 159, 164–65 (1995) (describing trademark law's functionality doctrine, which prohibits parties from using trademarks to protect functional aspects of their products and services).

116. *Id.*

117. See *Bilski v. Kappos*, 561 U.S. 593, 651 (2010) (Stevens, J., concurring) (“[F]irms that innovate often capture long-term benefits from doing so, thanks to various first mover advantages, including lockins, branding, and networking effects.”); Scott Goodson, *Why Brand Building Is Important*, FORBES (May 27, 2012, 4:47 A.M.) <https://www.forbes.com/sites/marketshare/2012/05/27/why-brand-building-is-important> (“[I]t's easy to see why brands are more important now than at any time in the past 100 years.”).

Consequently, some parties may elect to rely on trademark protection, perhaps in combination with trade secrecy and copyright, rather than incurring the costs of patenting. Again, like copyright, parties can and often do seek both patents and trademarks with respect to a good or service.¹¹⁸ But compared to patenting, obtaining trademark protection is relatively cheap. To qualify, for instance, a party need merely use an otherwise eligible mark in commerce; no application process is necessary.¹¹⁹ Parties may federally register their trademarks under the Lanham Act, which brings a host of advantages.¹²⁰ But that process is also relatively cheap, especially in comparison to patent prosecution and maintenance.¹²¹ Hence, in cases where the costs of patenting are too high, parties may elect to simply rely on trademark protection or on some combination of trademark, trade secrecy, and copyright.

4. Substitutionary Versus Complementary Intellectual Property

In sum, these other forms of intellectual property protection may sometimes function as imperfect “substitutes” to patenting.¹²² Importantly, the high costs of patenting discussed in Part I.A may often affect whether parties substitute these alternative forms of intellectual property for patents. Thus, while parties frequently prefer multiple forms of protection when available, the relative advantages of trade secrecy, copyright, and trademarks, combined with the high costs and risks of patenting, may lead many parties to substitute one or more of these intellectual property alternatives for patents.

But again, how often parties substitute these other forms of intellectual property for patents is likely to differ depending on the resources available to a party. Highly capitalized parties are less likely to exhibit sensitivity to the relatively high costs of patenting in making decisions about whether to pursue patents, trade secrecy, copyrights, or some combination thereof. This lack of sensitivity derives from the same factors discussed above in Part I.A. First, the main value of patents for many large companies lies in their aggregation; any individual patent, on its own, is typically

118. See Parchomovsky & Siegelman, *supra* note 112, at 1460–61 (arguing that patent and trademark protection often complement each other in spurring innovation).

119. William Fisher, *Overview of Trademark Law*, BERKMAN KLEIN CTR. FOR INTERNET & SOC’Y HARV. U., <https://cyber.harvard.edu/metaschool/fisher/domain/tm.htm> (last visited Nov. 24, 2017).

120. *Id.*

121. U.S. PATENT & TRADEMARK OFFICE, USPTO FEE SCHEDULE (2017), https://www.uspto.gov/sites/default/files/documents/USPTO%20fee%20schedule_current.pdf (archive version on file with author).

122. ARLEEN J. HOAG & JOHN H. HOAG, *INTRODUCTORY ECONOMICS* 65 (4th ed. 2006).

unimportant. Instead, patents become valuable to highly capitalized parties mostly when patents are assembled in large “patent portfolios.”¹²³ This means that well-capitalized parties’ demand for patents is likely to be relatively high, even as the costs of patenting relative to other forms of intellectual property are high and rising. In economic parlance, their high demand for patenting is relatively *inelastic* in response to changes in other economic factors, including changes in the costs of patents, trade secrecy, copyrights, and trademarks.¹²⁴

Second, well-capitalized companies are able to reduce the relative costs of patenting through economies of scale. For instance, large companies often implement systematic processes for harvesting patentable inventions, which create a variety of efficiencies that help keep the costs of patenting in check.¹²⁵ For many well-capitalized parties, these efficiencies likely help prevent the costs of patenting from becoming so high that they affect such parties’ demand for patents by increasing the appeal of cheaper forms of intellectual property protection.

Finally, because the costs of intellectual property protection typically consume a small percentage of well-capitalized companies’ overall assets, in many cases such entities need not choose between the different types of intellectual property protection—where multiple forms are available, they can afford them all.¹²⁶ Hence, rather than substituting one form for another, well-capitalized parties are more likely than their resource-constrained counterparts to use the different forms of intellectual property as economic “complements” to each other.¹²⁷

Poorly capitalized parties, on the other hand, are more likely to exhibit greater sensitivity to the relative costs of each form of intellectual property. Their demand for patents, therefore, is likely to exhibit greater *cross-price elasticity*, meaning as the costs of substitute forms of intellectual property fall relative to the costs of patenting, their demand for patents decreases.¹²⁸

As discussed in Part I.A, the reasons for this mirror the reasons behind well-capitalized parties’ relatively inelastic demand for patents. Unlike

123. Parchomovsky & Wagner, *supra* note 13, at 27.

124. *Cf.* PARKIN, *supra* note 24, at 89–90.

125. Bock, *supra* note 12, at 305–09.

126. This is not to say that large companies have no sensitivity to the costs of intellectual property protection, but simply that their superior resources mean they are, on average, less sensitive to those relative costs than a party with greater resource limitations.

127. HOAG & HOAG, *supra* note 122, at 65.

128. *See* DAVID A. BESANKO & RONALD R. BRAEUTIGAM, MICROECONOMICS 52 (4th ed. 2010) (explaining cross-price elasticity of demand).

well-capitalized parties, poorly capitalized parties face greater resource constraints that often force them to choose one form of intellectual property over another. Hence, such parties' demand for patents is likely to be more sensitive—or *elastic*—to the costs of patenting relative to the costs of other forms of intellectual property, meaning that resource-constrained parties are more likely to substitute these other forms of intellectual property for patents. And as Part II will discuss, this substitution effect is likely to become even more pronounced as recent legal changes increase the advantages of trade secrecy, copyright, and trademarks relative to patents.

That said, it is important to stress that in some cases, parties' preferences for a particular type of intellectual property protection are likely to remain fairly stable, regardless of the relative costs of each form of intellectual property. For instance, a startup company may seek to patent its core software technology no matter how much it costs to patent it relative to the costs of trade secrecy, copyright, or trademarks. A pharmaceutical company is likely to pursue patents on new drugs it develops, regardless of the relative costs of trade secrecy, copyright, or trademark, simply because it is the most viable form of intellectual property protection for its products.¹²⁹ Indeed, trade secrecy may not be a viable alternative in many cases where the patented invention, once commercialized, becomes readily apparent.¹³⁰

On the other hand, parties may choose trade secrecy over patenting in cases where it is clearly the best option, such as Coca-Cola protecting its drink formula through trade secrecy to avoid having to disclose the formula as part of the patenting process.¹³¹ Substitution is still occurring in these types of scenarios, but the substitution patterns are typically driven by the relative merits of the distinct forms of intellectual property, rather than by the parties' resource constraints.

Hence, one of this section's primary points is to highlight that there is a grey area of intellectual property protection—where “peripheral” technologies are concerned—in which resource constraints are more likely to affect what type of intellectual property protection a party chooses. By peripheral technologies, I do not necessarily mean technologies of trivial or

129. Graham et al., *supra* note 16, at 1290–91, 1296–98.

130. See Cohen et al., *supra* note 16, at 7 n.12. Survey results have shown that first-mover advantage is often the most important way that startups secure a competitive advantage. Graham et al., *supra* note 16, at 1288–90. Note, however, that first-mover advantage need not be distinct from patents; in fact, startups may bolster their first-mover advantage by securing a patent.

131. Cf. Cohen et al., *supra* note 16, at 14–15 (noting that having to disclose technical information as one significant reason why parties forego patenting).

minimal value. Sometimes that might be the case, but not always; indeed, some peripheral technologies may be significant innovations with meaningful potential value. But for a variety of reasons, they may not fit within a party's current business plans, thus leaving them on the periphery.

To illustrate: large technology companies frequently tinker with a variety of innovations, but may decline to pursue them commercially for any number of reasons. Microsoft, for instance, is notorious for experimenting internally with a variety of possible innovations, only to forego commercializing them, even if they do patent them.¹³² The oft-cited reason for this behavior is that the innovations in question do not connect meaningfully enough to Microsoft's core business, the Windows operating system.¹³³ They are, in a word, peripheral to the company's core commercial vision. Even when a company launches a product—such as Amazon's failed bid to revolutionize the smartphone industry—the failed attempt may solidify the technology's position on the periphery.¹³⁴ In other words, while companies such as Amazon may have high hopes for their peripheral technologies ultimately becoming something more, their failure to become so is typically not a make-or-break event for the company. Hence, as I use the term, the category of “peripheral technology” covers technologies that are unnecessary for realizing a party's core commercial vision.

Core technologies, conversely, are those that parties deem as crucial to their immediate commercial prospects. For instance, a core technology for a software startup might be its software database technology, because that is the startup's primary commercial product. Hence, core technologies are those that relate in some meaningful way to a party's vision of how it intends to stay commercially afloat. That vision, of course, will often change as parties experiment with a variety of different possibilities. Indeed, as discussed with respect to Amazon's smartphone foray, parties often attempt to move peripheral technologies into the core technology category. But ultimately parties settle or focus their commercial efforts (at least for a time), and when they do, a party's core technologies emerge.

132. Kurt Eichenwald, *Microsoft's Lost Decade*, VANITY FAIR: HIVE (Aug. 2012), <http://www.vanityfair.com/news/business/2012/08/microsoft-lost-mojo-steve-ballmer> (discussing how Microsoft often innovates internally without launching those innovations as commercial products).

133. Gary P. Pisano, *You Need an Innovation Strategy*, HARV. BUS. REV. (June 2015), <https://hbr.org/2015/06/you-need-an-innovation-strategy> (“Microsoft is often criticized for milking its existing technologies rather than introducing true disruptions.”).

134. Eugene Kim, *How Amazon CEO Jeff Bezos Has Inspired People to Change the Way They Think About Failure*, BUS. INSIDER (May 28, 2016, 9:49 A.M.), <http://read.bi/1P6kTWP> (describing the failure of Amazon's Fire Phone).

These definitions are admittedly leaky. Nonetheless, they are useful in thinking through how different types of parties make intellectual property decisions. For instance, for core technologies, both poorly capitalized parties and highly capitalized parties are more likely to use all forms of intellectual property protection available. Parties will either patent or rely on trade secrecy, depending on the nature of the invention, and where copyright and trademarks protections are available, they will rely on them, too. In such cases, then, the resources available to a party and the relative costs of each form of intellectual property protection are likely to play less of a role in driving parties' decisions as to which form of intellectual property protection to choose. And again, while substitution may occur in these cases, that substitution often has less to do with the relative costs of different forms of intellectual property and more to do with the relative advantages and disadvantages of each form.

Where peripheral technologies are concerned, however, the resources available to a party and the relative costs of each form of intellectual property are more likely to affect how parties make intellectual property decisions. For instance, resource-constrained parties are more likely to opt out of patenting in this grey area and instead rely on cheaper forms of intellectual property such as copyright, trade secrecy, and trademarks—or, in some cases, no protection at all. Indeed, even if other forms of intellectual property are unavailable for these peripheral technologies, a poorly capitalized party may still often decide that the high costs of patenting are simply not worthwhile.¹³⁵

Well-capitalized parties, conversely, will typically pursue patenting in addition to other forms of intellectual property, when available, because their high demand for patents is relatively inelastic in response to the relative costs of the different intellectual property forms. In other words, their lack of similar resource constraints means they often also end up patenting peripheral technologies. Furthermore, because of their resource advantages, they are more likely to create peripheral technologies in the first place.¹³⁶ As Part III will further explore, this reality has implications for the patent and intellectual property system as a whole.

135. See, e.g., Cohen et al., *supra* note 16, at 15 (discussing how some parties forego patenting because of patenting's high costs). This may occur even in cases where technical details about the invention are disclosed as part of the commercialization process.

136. See, e.g., Ryan Tate, *Google Couldn't Kill 20 Percent Time Even if It Wanted To*, WIRED (Aug. 21, 2013, 6:30 A.M.), <https://www.wired.com/2013/08/20-percent-time-will-never-die> (describing a trend among large technology companies of allowing employees time to tinker with their own ideas).

Table 1 below provides a brief summary of these possible relationships. Note that every box includes patents as an option, except for when poorly capitalized companies develop peripheral technologies. In such scenarios, as discussed above, patents are likely to disappear as an option because the high costs of patenting relative to other forms of intellectual property protection (or no protection at all) mean that patents are not worth pursuing in light of these parties' resource constraints.

In every other box, however, patents remain in the mix. This does not mean the relative costs of different forms of intellectual property will not affect parties' decisions as to which form to select—even for core technologies, for instance, some evidence suggests that poorly capitalized companies forego patenting because of its high costs, instead relying on other forms of intellectual property or no protection at all.¹³⁷ The point here is simply that resource constraints likely lose some of their predictive power, particularly with respect to well-capitalized companies because of their relatively inelastic demand for patents generally and inelastic cross-price demand for patents vis-à-vis the costs of other forms of intellectual property.

TABLE 1. Disaggregating Intellectual Property Protection Choices

	<i>Peripheral Technology</i>	<i>Core Technology</i>
<i>Poorly Capitalized Party</i>	<ul style="list-style-type: none"> • Trade Secrecy • Copyright • Trademarks 	<ul style="list-style-type: none"> • Patents (relatively elastic demand) • Trade Secrecy • Copyright • Trademarks
<i>Well-Capitalized Party</i>	<ul style="list-style-type: none"> • Patents (relatively inelastic demand) • Trade Secrecy • Copyright • Trademarks 	<ul style="list-style-type: none"> • Patents (relatively inelastic demand) • Trade Secrecy • Copyright • Trademarks

C. IGNORANCE

Another reason parties may forego patenting and instead rely on trade secrecy, copyright, and trademarks (or nothing at all) is ignorance of patent law. To be clear: parties may also be, and often are, ignorant of copyright, trade secret, and trademark law. Yet that ignorance will often not be as

137. See Graham et al., *supra* note 16, at 1309–15.

damning to a party's copyright, trade secrecy, and trademark prospects as ignorance of patent law is to a party's patent prospects.

To see why, consider each body of law in turn. As briefly discussed above, copyright applies immediately once a party creates the work—a party need not undertake any sort of formality before copyright applies.¹³⁸ This was not always so. In earlier eras, a party ignorant of copyright's requirements could easily forfeit copyright protection by “publishing” (a technical term of art) its work without attaching an appropriate copyright notice.¹³⁹ Furthermore, a party also had to register their copyrighted work with the Copyright Office for copyright to apply.¹⁴⁰ But Congress softened those requirements with the Copyright Act of 1976 and then did away with them entirely when it implemented the Berne Convention, an international treaty, in 1989.¹⁴¹ As a result, in today's world a party does not forfeit copyright in a work when it fails to attach a copyright notice or register a work with the Copyright Office. Such failures may limit a party's remedies, but copyright still applies, and a party may still avail itself of copyright remedies once it gets its house in order.¹⁴² Hence, while a party may inadvertently limit its remedial options because of its ignorance of copyright law, that ignorance does not result in the forfeiture of copyright protection.

Trade secrecy exhibits important similarities to copyright law in these regards. As with copyright, parties desiring trade secret protection need not undertake any sort of formality in order to qualify for trade secret protection.¹⁴³ Essentially, parties qualify merely by keeping their inventions secret.¹⁴⁴ The benefits of trade secrecy, therefore, largely align with how trade secret law works, the result being that ignorance of trade secret law is unlikely to doom many parties' trade secret prospects.

There are exceptions, of course. For instance, generally a party must have employed “reasonable efforts” to maintain the information's

138. See Christopher Sprigman, *Reform(aliz)ing Copyright*, 57 STAN. L. REV. 485, 487–88 (2004).

139. *Id.* at 491–94.

140. *See id.*

141. *Id.* at 538–45.

142. *Id.* at 494–95.

143. See Christopher B. Seaman, *The Case Against Federalizing Trade Secrecy*, 101 VA. L. REV. 317, 326–29 (2015) (discussing promulgation of the Uniform Trade Secrets Act, which has been adopted in most states, and which defines what constitutes a trade secret). Notably, trade secrecy arises so long as something is secret and not readily ascertainable, and a party has taken reasonable precautions to protect the information's secrecy. *Id.*

144. *See id.*

secrecy,¹⁴⁵ and it is not always straightforward what such reasonable efforts entail. A court's determination that a party failed in this regard can thus mean a party has no protectable trade secret. But again, while ignorance of these intricacies can result in trade secret forfeiture, the reality is that parties ignorant of the law often end up qualifying for protection anyway, simply by pursuing their interest in keeping the inventions secret.

Trademark law is also more forgiving of those ignorant of its details. As mentioned, trademark rights arise once a party begins using a mark in commerce.¹⁴⁶ A party thus need not undertake any sort of application process to qualify for rights, though doing so at the federal level provides the trademark owner with a number of advantages.¹⁴⁷ But while parties may lose out on an ability to expand their rights by failing to register their marks, they nonetheless retain rights of use so long as they were first to use their marks in a particular geographic area and have not otherwise relinquished their rights in the mark.¹⁴⁸

Ignorance of patent law, however, is more likely to result in forfeiture of rights than ignorance of copyright, trade secret, or trademark law. Unlike these other bodies of law, a party desiring patent rights must apply for them and pass a relatively rigorous application process, as discussed above.¹⁴⁹ Furthermore, patent law is often highly technical, particularly with respect to timing issues.¹⁵⁰ And these technicalities can easily trip up those ignorant of them.

For instance, in a famous patent case, a repairman of boats invented a means of preventing corrosion of a boat's stern drive, which aids in boats' propulsion.¹⁵¹ He then made this invention available to several friends and acquaintances, all without retaining control of the invention prototypes or seeking feedback from his friends about their use of his invention.¹⁵² Over

145. *Id.*

146. *See supra* notes 119–21 and accompanying text.

147. *Id.*

148. Keith A. Barritt, *Prior User vs. Federal Registrant: Whose Mark Is It, Anyway?*, FISH & RICHARDSON (Feb. 18, 2009), <http://www.fr.com/news/prior-user-vs-federal-registrant-whose-mark-is-it-anyway1> (discussing the rights of “prior users” vis-à-vis those that register their marks under the Lanham Act).

149. *See supra* Part I.A.

150. *See* Peter Lee, *The Supreme Assimilation of Patent Law*, 114 MICH. L. REV. 1413, 1415–16 (2016) (describing patentable subject matter as “highly technical”). *See generally* Paul R. Gugliuzza, *Patent Law Federalism*, 2014 WIS. L. REV. 11 (2014) (critiquing the assumptions underlying the Federal Circuit's exclusive jurisdiction over patent law appeals inasmuch as they assert that patent law is overly technical for general jurisdiction courts).

151. *Lough v. Brunswick Corp.*, 86 F.3d 1113, 1114–16 (Fed. Cir. 1996).

152. *Id.* at 1116.

a year later, he filed a patent application for his invention, which was ultimately granted.¹⁵³ But in a later dispute about the validity of his patent, a court deemed it invalid because he had not filed the patent application early enough in light of his having made the invention available to his friends.¹⁵⁴ In fact, his failure to retain control over his prototypes and seek feedback helped defeat his defense that he was still tinkering with the invention, which otherwise might have saved his patent.¹⁵⁵ Hence, patent law's technicalities with respect to timing and evidentiary issues may often mean that parties fail to obtain valid patents simply because they are ignorant of the law's intricacies.

The resources available to a party may often play a role in determining whether ignorance of patent law has such effects. Ignorance, for instance, seems more likely to affect poorly capitalized parties than highly capitalized ones.¹⁵⁶ This certainly will not always be true—some poorly capitalized parties are undoubtedly sophisticated with respect to patent law. For instance, a poorly capitalized startup company may have at its helm a former patent attorney. Yet as with the case described above, a party's limited resources may often function as an accurate proxy for a lack of sophistication in patent law. Indeed, a lack of resources may often prevent parties from obtaining that sophistication since the assistance of patent attorneys comes at such a high price, as discussed in Part I.A.

Ignorance of patent law may also sometimes doom the patent prospects of even well-capitalized parties. For instance, though larger companies often implement internal systems to help ensure that all patentable inventions make their way into patent applications, these systems undoubtedly still fail to capture all patentable inventions.¹⁵⁷ And part of that failure is due to inventors and other personnel failing to carry out their inventive activities in ways that satisfy patent law's often arcane

153. *Id.*

154. *Id.* at 1122.

155. *See id.*

156. *Cf.* Gene Quinn, *The Top 5 Mistakes Inventors Make with Their Invention*, IPWATCHDOG (July 18, 2015), <http://www.ipwatchdog.com/2015/07/18/top-5-mistakes-inventors-make-invention> (describing a variety of timing issues “newbies” should be aware of if they want to patent their inventions).

157. *See, e.g.*, Matt Rosoff, *If Patents Are Weapons, These Companies Are Armed to the Teeth*, BUS. INSIDER (Mar. 14, 2012, 7:52 P.M.), <http://read.bi/x6iWdh> (providing a list of twenty-three large companies with patent numbers ranging from 448 (Amazon) to over 70,000 (IBM)). While IBM may simply be that much more innovative than others on the list, the greater likelihood is that it has focused on patent acquisition more than many of the other companies on the list.

requirements.¹⁵⁸ Despite such possibilities, however, ignorance seems on average more likely to negatively affect the patent prospects of poorly capitalized parties, for the reasons described above.

In sum, while a party's ignorance of each type of intellectual property law may ultimately affect its ability to use each type, ignorance of patent law can be particularly devastating to its chances of obtaining patents. Moreover, resource constraints may make such ignorance more likely because, for instance, a party lacks specialized patent counsel or appropriate patenting protocols. Hence, while ignorance may affect well-capitalized parties in some instances, it likely hampers the patent prospects of poorly capitalized parties more frequently. The result of that ignorance is fewer patents generally, but fewer for resource-constrained parties in particular.

D. IRRATIONALITY

Parties may also fail to pursue patents, even when they could, due to irrational decision making. For example, even if parties understand patent law's requirements, appreciate a patent's potential advantages, and have resources with which to procure, maintain, and enforce patents, those parties may still choose to forego patenting because they fail to understand their own self-interests.

Some scholars have suggested this to be a potential issue in the open-source software world.¹⁵⁹ That world stresses freely sharing software resources in order to enhance collaborative software innovation.¹⁶⁰ Yet that world is also characterized by a lack of patents, despite the fact that many open-source software developers and companies create inventions that could be patented and—at least in some cases—have means by which to procure patents.¹⁶¹ Hence, scholars have argued that those involved in open-source software development should better recognize their own self-interests by adopting a more aggressive strategy of patenting to better protect their open model of software innovation.¹⁶²

158. See, e.g., *Pfaff v. Wells Elecs., Inc.*, 525 U.S. 55, 68–69 (1998) (holding that a party's acceptance of an order from Texas Instruments constituted an “on-sale” event, triggering a one-year clock within which the inventor must file a patent application covering the invention or lose the right altogether).

159. See Schultz & Urban, *supra* note 19, at 2–5.

160. See Clark D. Asay, *A Case for the Public Domain*, 74 OHIO ST. L.J. 753, 754–56, 759–65 (2013) (providing background and analysis on “open license movements”).

161. See Clark D. Asay, *Enabling Patentless Innovation*, 74 MD. L. REV. 431, 459–60 (2015).

162. See Schultz & Urban, *supra* note 19, at 5–6.

Despite such pleas, the open-source software community has largely neglected to aggressively pursue patents.¹⁶³ This Article does not take a position on this particular issue in the open-source software community—it simply points to the community as an example where irrational decision making may help explain why parties choose to forego seeking patents.

The resources available to a company may sometimes play a role in whether a party makes such irrational intellectual property decisions. For instance, irrational decision making with respect to patenting may be more likely when a party lacks significant resources, because that lack of resources may prevent the party from hiring patent counsel and business strategy personnel to help steer the party into a more economically rational patent acquisition strategy.¹⁶⁴ And while irrational decision making may affect choices regarding other forms of intellectual property, those other forms, unlike patents, may often escape irrationality's consequences simply because, as discussed above, they often do not require deliberate choices in order to apply.¹⁶⁵

Well-capitalized parties, on the other hand, seem less likely to forego patenting due to irrational decision making. Their access to resources, for instance, enables such parties to hire patent counsel and other business strategy personnel, who may help them make economically rational decisions regarding patents and other forms of intellectual property. Of course, other forms of irrationality may creep into such parties' decision-making processes, such as "groupthink"¹⁶⁶ and a form of "path dependence."¹⁶⁷ But that irrationality may often actually push in favor of overpatenting. Indeed, some evidence indicates that well-capitalized parties typically tend to overpatent rather than underpatent.¹⁶⁸

In sum, irrationality may result in parties failing to pursue patents when doing so would be economically prudent. And because patenting, unlike other forms of intellectual property, requires parties to affirmatively seek out patents, the window for overcoming that irrationality is often short. Resource-constrained parties seem on average more likely than their

163. Asay, *supra* note 161, at 460.

164. Of course, patent counsel may also push parties to irrationally acquire too many patents, because their specialization in the field can skew their perspective.

165. See *supra* Part I.C.

166. See generally IRVING L. JANIS, VICTIMS OF GROUPTHINK (1972) (coining the term "groupthink" to describe the degradation of moral judgment that results from group pressure).

167. See Christopher Marquis & András Tilcsik, *Imprinting: Toward a Multilevel Theory*, 7 ACAD. MGMT. ANNALS 193, 203 (2013).

168. See Bock, *supra* note 12, at 293, 301, 304–15; Burk, *supra* note 15, at 424–25, 440–41.

well-capitalized counterparts to exhibit such irrationality, simply because they more frequently lack access to patent counsel and other business strategy personnel. The result is fewer patents generally and even fewer for those with greater resource constraints.

E. SOCIOLOGY

Sometimes parties may appear to be acting irrationally, but in reality their behavior is in some sense rational because it conforms to the norms and values of their particular community. Sociology may thus provide an alternative explanation for why parties fail to seek patents as often as they might.

For instance, sociology may help explain underpatenting in the open-source software world, as briefly discussed above. That community, as mentioned, is built on norms of freely sharing and reusing software resources.¹⁶⁹ In fact, in some cases the licenses under which the software resources are made available mandate that those wishing to use the resources must abide by the same norms.¹⁷⁰ Hence, a patent's exclusionary nature has long been anathema to many in the community.¹⁷¹ And that anathema (and the values underlying it) may help explain why parties in the open-source software community elect to forego many patenting opportunities.

Thus, though some scholars have recently argued that some strains of sociology predict parties will typically overpatent,¹⁷² sociology may also predict underpatenting in communities where anti-patent norms are dominant. And in such communities, resource constraints may play less of a role in deterring patenting, simply because the real driver of underpatenting appears to be those norms and values, rather than resource considerations.

Yet resource constraints may still play a role by reinforcing the anti-patent norm. For example, it may be easier for parties with limited means to stick with the norm against patenting. Well-capitalized parties, on the other hand, may be more tempted to deviate from the non-patenting norm, and in fact we see some of that happening in the open-source software world, where billion-dollar open-source software companies have begun to

169. See Asay, *supra* note 160, at 755.

170. *Id.*

171. Asay, *supra* note 161, at 460.

172. See Burk, *supra* note 15, at 424–27, 440–50.

build modest-sized patent portfolios.¹⁷³ Hence, the resources available to a party may still play a role in directing a party's intellectual property decisions, even when sociological factors heavily influence them as well.

II. WHY (SOME) PARTIES MAY NOW PATENT EVEN LESS

Part I reviewed five categories of reasons why parties may forego pursuing patents, even in cases where they clearly could. Importantly, in each of these five categories, the resources available to a party appear to play an important role in determining whether and to what extent a party pursues patents vis-à-vis other types of intellectual property protection.

Part II now turns to assessing several recent changes in intellectual property law. In building on Part I's analysis, it argues that these changes, by increasing the costs of patenting relative to other forms of intellectual property, are likely to suppress resource-constrained parties' demand for patents. On the other hand, these same changes are unlikely to affect well-capitalized parties' intellectual property decisions because of those parties' relatively inelastic demand for patents. Later, Part III will explore the possible implications of this analysis.

A. THE DEFEND TRADE SECRETS ACT

The recently enacted Defend Trade Secrets Act of 2016 ("DTSA")¹⁷⁴ is the first legal change that may affect some parties' demand for patents. It is poised to do so because it enhances the value of trade secrecy in at least three ways. First, and most importantly, it provides trade secret owners with the option of bringing trade secret misappropriation claims in federal courts.¹⁷⁵ Traditionally, state courts have been the primary venue for trade secret misappropriation claims, because trade secret law has principally been state law.¹⁷⁶ But with the DTSA, parties now have civil recourse for

173. See Sean Michael Kerner, *What Is the Value of Red Hat's Patents?*, INTERNET NEWS (Mar. 28, 2011), <http://www.internetnews.com/bus-news/article.php/3929261/What+is+the+Value+of+Red+Hats+Patents.htm> (discussing Red Hat's relatively robust patent acquisition strategy).

174. Defend Trade Secrets Act of 2016, Pub. L. No. 114-154, 130 Stat. 376 (codified in scattered sections of 18, 28 U.S.C.); Robert B. Milligan et al., *President Obama Signs the Defend Trade Secrets Act: Tips for Navigating the New Law*, SEYFARTH SHAW: TRADING SECRETS (May 11, 2016), <http://www.tradesecretslaw.com/2016/05/articles/trade-secrets/president-obama-signs-the-defend-trade-secrets-act-tips-for-navigating-the-new-law/#page=1>.

175. 18 U.S.C. § 1836(c) (2016); Eric Goldman, *The New 'Defend Trade Secrets Act' Is the Biggest IP Development in Years*, FORBES (Apr. 28, 2016, 1:04 P.M.), <http://www.forbes.com/sites/ericgoldman/2016/04/28/the-new-defend-trade-secrets-act-is-the-biggest-ip-development-in-years>; Milligan et al., *supra* note 174.

176. See Goldman, *supra* note 175.

trade secret misappropriation in federal courts as well.¹⁷⁷ Hence, this recourse is poised to enhance trade secret protection by providing trade secret owners with more remedial options.

Second, the DTSA may bolster trade secret protection by defining trade secrets more broadly than existing state laws do.¹⁷⁸ For instance, the DTSA's definition may allow for misappropriation claims even in cases where the trade secrets are only stored in a person's memory.¹⁷⁹ In fact, even outside this possibility, the DTSA's definition is arguably broader than under existing state laws, encompassing *any* type of secret information that derives independent economic value from that secrecy and which has been subject to reasonable measures to maintain its secrecy.¹⁸⁰ This broader definition may thus bolster trade secret protection by allowing parties to bring more misappropriation claims than existing state laws would countenance.

Third, the DTSA may bolster trade secret protection by providing for enhanced remedies. For instance, the DTSA allows for ex parte seizures of misappropriated trade secrets, all without advance notice to the defendant.¹⁸¹ As some have noted, there is no comparable provision in any existing state trade secret law.¹⁸² Hence, by providing enhanced remedies in federal courts for a potentially broader range of activities, the DTSA has the potential to strengthen trade secret protections in at least these three key ways.

Of course, since the DTSA has only recently come into effect, it is impossible to say whether the DTSA will ultimately make much of a difference in practice. So far, the law does not seem to have resulted in any ground-breaking changes in trade secrecy.¹⁸³ Yet despite being in its infancy, there are good reasons to believe that the Act will enhance trade secret protection over time.¹⁸⁴

177. *Id.*

178. Peter J. Toren, *Five Things to Know About the Defend Trade Secrets Act*, IPWATCHDOG (May 11, 2016), <http://www.ipwatchdog.com/2016/05/11/five-things-know-defend-trade-secrets-act>. See also 18 U.S.C. § 1839.

179. Toren, *supra* note 178.

180. *Id.*

181. *Id.* See also 18 U.S.C. § 1836(b)(2).

182. Toren, *supra* note 178.

183. See Benjamin H. McCoy, *The First Year of the Defend Trade Secrets Act*, LEGAL INTELLIGENCER (July 11, 2017), <http://www.thelegalintelligencer.com/id=1202792752504/The-First-Year-of-the-Defend-Trade-Secrets-Act> (discussing the limited amount of jurisprudence surrounding the Act since its implementation).

184. See Goldman, *supra* note 175.

And if it does so, the DTSA will increase the value of trade secrecy, meaning an effective decrease in trade secrecy's costs. In other words, by providing the enhancements described above, the DTSA gives a trade secret owner more trade secret protection today than the party had before the DTSA's passage, all without the owner incurring any additional costs. To put it more colloquially, in a post-DTSA world, a party obtains more trade secrecy bang for its buck.

These trade secrecy enhancements may thus push inventors to choose trade secrecy over patents in a broader range of cases. As discussed in Part I, this may be so because patents and trade secrecy often function as economic substitutes for one another, meaning parties frequently make choices between the two. Of course, not all inventors will have this choice, because the nature of their products may preclude effective trade secret protection. For example, some inventions are evident as soon as the product encompassing it is made available to the public.

Furthermore, also discussed in Part I, in some cases the benefits of one form of intellectual property over the other may trump any relative cost considerations; a party may want to patent its core technology no matter what it costs, for instance, and other parties may keep their inventions secret simply because that is the best business strategy in a variety of scenarios. But in cases where the relative costs of patents versus trade secrecy matter, the DTSA, by effectively decreasing the costs of trade secrecy relative to patents, may lead some parties that would otherwise choose patenting to pick trade secrecy.

Moreover, in line with Part I's analysis, the DTSA is more likely to have such effects on resource-constrained parties because such parties' demand for patents exhibits a higher cross-price elasticity with respect to changes in the prices of other intellectual property forms such as trade secrecy. On the other hand, the DTSA seems less likely to affect the patenting decisions of highly capitalized companies. Such parties' demand for patents is relatively inelastic and thus insensitive to changes in the costs of other forms of intellectual property such as trade secrecy. Hence, well-capitalized parties are likely to continue to harvest large numbers of patents, regardless of the newfound attractions of trade secrecy that the DTSA ushers in.¹⁸⁵

That is not to say that the DTSA will not benefit companies with significant resources. To the contrary, for those inventions for which such

185. *Cf. generally* Parchomovsky & Wagner, *supra* note 13.

parties choose trade secrecy, the DTSA may provide several benefits, as discussed above. But the DTSA and its bolstered protections seem less likely to push highly capitalized parties away from patenting into trade secrecy in cases where they would otherwise choose patenting. Instead, that effect is more likely for parties with fewer resources. Moreover, that effect may become even more pronounced as the costs of patents also (and independently of the DTSA) rise, as discussed below.

The DTSA's enhancements to trade secrecy seem less likely to affect parties' patenting decisions based on sociology, irrationality, or ignorance. From a sociological standpoint, over time one can certainly imagine different communities adopting new norms in response to changes in intellectual property laws such as the DTSA. But while the DTSA bolsters trade secrecy in the ways discussed above, it does not so dramatically change existing intellectual property laws that dramatic shifts in behavior are likely. Instead, the changes seem poised to push some parties, particularly resource-constrained ones, to choose trade secrecy over patents in a broader range of cases, for the reasons discussed above.

The DTSA's trade secrecy enhancements also seem unlikely to affect intellectual property decisions grounded in irrationality or ignorance. While resource constraints may make it more likely that parties miss patenting opportunities based on irrationality and ignorance, the DTSA would not appear to exacerbate that irrationality or ignorance in any relevant way. Instead, because of the DTSA's enhancements to trade secrecy, rational, informed parties seem poised to increasingly choose trade secrecy over patents in cases where resource constraints matter.

B. THE WEAKENING OF PATENTS

A general weakening of patent rights is another reason more parties may forego patenting. Over the last decade in particular, patent law has experienced some of the most far-reaching changes in some sixty years.¹⁸⁶ And while these changes may ultimately have a number of effects, one early result appears to be a general weakening of patents by making it easier for third parties to invalidate them.¹⁸⁷ This weakening of patents is

186. See, e.g., Gene Quinn, *Patent Reform 101—A Primer on Pending Patent Legislation*, IPWATCHDOG (May 7, 2015), <http://www.ipwatchdog.com/2015/05/07/patent-reform-101-a-primer-on-pending-patent-legislation> (pointing to the recent Leahy-Smith America Invents Act as “the most substantive change to U.S. patent laws since 1952” and indicating that patent law reform “is the new normal.”).

187. See Lemley, *supra* note 29, at 10–11 (detailing several legal changes between 2000 and 2016 that have weakened patent rights).

likely to deter some parties—particularly resource-constrained ones—from pursuing patents in a broader range of cases because that weakening effectively increases the costs of obtaining and enforcing patents.

Of course, some evidence suggests that changes in patent law, whether they strengthen or weaken patent rights, actually have very little effect on parties' patenting behavior.¹⁸⁸ This may be because few parties that obtain patents ever actually intend to enforce them.¹⁸⁹ Indeed, given the pervasiveness of patent non-assertion, one might plausibly argue that a weakening of patent rights is hardly a cost consideration for those deciding whether to pursue a patent. Hence, the relative strength of patent rights may be of little importance to many parties deciding whether to patent their inventions.

Yet such analysis suffers from the same problem identified at the outset of this Article: it assesses patenting behavior in the aggregate, rather than disaggregating the parties involved in patenting and determining how patent law changes may affect them differentially.

Indeed, as discussed above, this Article's analysis does not suggest that the relative costs of different forms of intellectual property, including patents, fully dictate how parties make patent and other intellectual property decisions. Its claims are much more modest: that the relative costs of different forms of intellectual property matter more to resource-constrained parties than well-capitalized ones. Thus, resource-constrained parties are more likely to move away from patenting, particularly with respect to peripheral technologies, when patenting costs increase relative to the costs of other intellectual property forms. In fact, this claim may be perfectly consistent with the aggregate data mentioned above, since that aggregate data may mask varied responses to the legal changes from parties situated differently along the resource spectrum.

One might still argue that weakening patents is not a cost that parties take into account when deciding whether to patent. Yet significant survey evidence suggests that parties, both big and small, patent their inventions primarily to prevent third-party copying.¹⁹⁰ Hence, greater difficulties in achieving that purpose because of weakened patent protection would

188. *Id.* at 14–18 (highlighting that patent applications and grants do not seem to respond in any sort of predictable way to weakening or strengthening of patent rights).

189. Lemley, *supra* note 53, at 1501 (estimating that a very low percentage of patents are ever enforced, let alone asserted).

190. Ted Sichelman & Stuart J.H. Graham, *Patenting by Entrepreneurs: An Empirical Study*, 17 MICH. TELECOMM. & TECH. L. REV. 111, 153–57 (2010).

certainly seem to be a significant cost consideration for many parties when deciding whether to patent in the first place.

The following sections describe some of the recent legal changes that have weakened patents and how those changes may deter some parties, particularly resource-constrained ones, from pursuing patents. Note that the following sections limit themselves to two sets of changes—the Supreme Court’s recent patentable subject matter decisions and the AIA’s new post-grant proceedings. But as Mark Lemley has noted, the list of recent legal changes that have weakened patent rights goes beyond just these.¹⁹¹ Nonetheless, I have chosen to focus on these two sets of changes because they have arguably weakened patents more than any other recent legal reforms.¹⁹² Furthermore, to the extent that other recent legal changes weaken patents, that additional weakening only reinforces this Article’s claims.

1. Patentable Subject Matter

Over the last decade, the Supreme Court has been especially active in reviewing patent law cases.¹⁹³ In fact, over that time period, the Court has decided more patent law cases than it did in the previous three decades combined.¹⁹⁴

Some of the most important of these patent cases relate to patent law’s patentable subject matter requirement.¹⁹⁵ This requirement defines the types of things that can be patented. Based solely on the patent statute, very few things fall outside the scope of patentable subject matter: the statute merely stipulates that, subject to patent law’s other substantive requirements, any “new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof” is

191. Lemley, *supra* note 29, at 10–11.

192. See, e.g., Brian J. Love & Shawn Ambwani, *Inter Partes Review: An Early Look at the Numbers*, 81 U. CHI. L. REV. DIALOGUE 93, 99–105 (2014) (reviewing early statistics relating to *inter partes* review, one of the AIA’s new post-grant proceedings, and finding high petition grant rates and high invalidation rates); Sachs, *supra* note 30 (pointing to data demonstrating the far-reaching impact of *Alice Corp. v. CLS Bank International* and its predecessor decisions on the patent eligibility of a variety of patent types). See also *Alice Corp. v. CLS Bank Int’l*, 134 S. Ct. 2347 (2014).

193. See Ouellette et al., *supra* note 7 (listing the eighty-six Supreme Court patent cases heard since 1952, thirty-five of which were post-2006).

194. *Id.*

195. See generally Lisa Larrimore Ouellette, *Patentable Subject Matter and Nonpatent Innovation Incentives*, 5 U.C. IRVINE L. REV. 1115 (2015) (analyzing government-provided incentives beyond patents).

eligible for patenting.¹⁹⁶ Given the breadth of these categories, the patent statute itself thus imposes very few limitations on the scope of patentable subject matter.¹⁹⁷

Over time, however, courts have defined several common law exceptions to patentable subject matter.¹⁹⁸ According to this case law, abstract ideas, laws of nature, and products of nature may not be patented because, the argument goes, these categories are the “handiwork of nature”¹⁹⁹ and do not owe their origin to human ingenuity.²⁰⁰ Instead, they are the building blocks of human ingenuity, and patenting these building blocks would hinder progress by preventing others from discovering inventive applications for them.²⁰¹

Hence, the most important controversies over patentable subject matter revolve around determining what these common law exceptions mean.²⁰² And many of the most important recent Supreme Court patent law cases have dealt with articulating and applying these exceptions.²⁰³ This section does not provide a comprehensive overview of these cases; others have already trodden that ground.²⁰⁴ Instead, it focuses on showing how these cases have generally weakened many patents by making it easier to invalidate them.

196. 35 U.S.C. § 101 (2012). According to the Supreme Court, Congress intended wide breadth when drafting the statute, determining that patentable subject matter should “include anything under the sun that is made by man.” *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980) (quoting S. REP. NO. 82-1979, at 5 (1952) and H.R. REP. NO. 82-1923, at 6 (1952)).

197. See John M. Golden, *Patentable Subject Matter and Institutional Choice*, 89 TEX. L. REV. 1041, 1058–64 (2011) (describing the inquiry as to whether the claimed invention fits within one or more of the statute’s “broadly drawn categories” as “merely a coarse filter” that involves “only a threshold question for patentability”).

198. See *id.* at 1048, 1058–64, 1060 n.101.

199. See *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 127–32 (1948) (rejecting patent claims for combining bacteria to produce an inoculant because the combination yielded nothing beyond what nature produced on its own).

200. See *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 70–71 (2012).

201. *Id.*; *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972) (“Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work.”).

202. See generally Peter S. Menell, *Forty Years of Wondering in the Wilderness and No Closer to the Promised Land: Bilski’s Superficial Textualism and the Missed Opportunity to Return Patent Law to Its Technology Mooring*, 63 STAN. L. REV. 1289 (2011) (reviewing decades of Supreme Court case law addressing patentable subject matter, all of which focuses on determining whether an invention runs afoul of one of the exceptions to patentable subject matter).

203. See Ouellette, *supra* note 195, at 1116–24 (noting that the Court has decided four patentable subject matter cases in its last five terms).

204. See e.g., Amy L. Landers, *Patentable Subject Matter as a Policy Driver*, 53 HOUS. L. REV. 505, 517–30 (2015) (reviewing several recent cases); Ouellette, *supra* note 195, at 1116–25 (same).

For instance, in the important 2014 *Alice Corp. v. CLS Bank International* case, the Supreme Court, building on its other recent patentable subject matter cases,²⁰⁵ articulated a two-step test for assessing whether a patent covers patentable subject matter.²⁰⁶ According to the Court, the first step requires a court to determine whether the patent at issue claims “laws of nature, natural phenomena, or abstract ideas.”²⁰⁷ But in establishing this step, the *Alice* Court provided little guidance on how courts should go about making this determination.²⁰⁸ For instance, it is unclear what criteria courts should use in determining whether something is merely an abstract idea.²⁰⁹ In the *Alice* case itself, the Supreme Court seemed to simply frame the patent claims as covering the abstract idea of “intermediated settlement,” without clearly specifying how or why the Court chose that level of abstraction.²¹⁰

The *Alice* Court did emphasize that the idea of intermediated settlement was a basic economic practice that had long been prevalent, which seemed to drive its analysis under the first step of its two-part test.²¹¹ Yet even if true, that fact still provides little to no guidance on how courts should choose the level of abstraction at which to view patent claims.²¹² Indeed, the idea behind any patent claim, if abstracted at high enough a level, becomes just that: an abstract idea.²¹³

Furthermore, it is also unclear what criteria courts should use to determine whether a concept such as “intermediated settlement” constitutes

205. See, e.g., *Mayo Collaborative Servs.*, 566 U.S. at 70–73.

206. *Alice Corp. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2355 (2014).

207. *Id.*

208. See Ryan Davis, *3 Lessons from Fed. Circ.’s Latest Post-Alice Patent Ruling*, LAW360 (Nov. 3, 2016, 7:48 P.M.), <http://www.law360.com/technology/articles/858667> (summarizing recent case law from the Federal Circuit and arguing that the court has struggled, and ultimately failed, to provide concrete guidance as to how to assess this question).

209. Cf. Dan L. Burk & Mark A. Lemley, *Quantum Patent Mechanics*, 9 LEWIS & CLARK L. REV. 29, 32–46 (2005) (discussing the inherent difficulties of construing claims, including the difficulty of choosing the right level of abstraction at which patent claim elements should be assessed).

210. See *Alice*, 134 S. Ct. at 2355–57.

211. *Id.*

212. Cf. Burk & Lemley, *supra* note 209, at 32–40; Tun-Jen Chiang, *The Levels of Abstraction Problem in Patent Law*, 105 NW. U. L. REV. 1097, 1118–34 (2011) (discussing problems courts face in choosing the correct level of abstraction in defining patented inventions).

213. *Alice*, 134 S. Ct. at 2354. See also Zachary Silbersher, *McRo Decision Expected to Clarify Abstract Idea Doctrine Under Alice*, IPWATCHDOG (Jan. 5, 2016), <http://www.ipwatchdog.com/2016/01/05/mcro-to-clarify-abstract-idea-under-alice> (discussing how a district court judge found patent claims to be merely abstract ideas by “stripping the claim of its conventional elements before looking at it again and concluding that, adequately stripped, it is indeed directed to an abstract idea without ‘significantly more.’”).

a basic economic practice long in practice, such that it constitutes an ineligible abstract idea. The *Alice* Court did point to some evidence suggesting that the idea of intermediated settlement had long been in use throughout economic history.²¹⁴ But the decision nonetheless falls short of providing future courts with specific guidelines for determining whether something constitutes a long-standing, basic economic practice ineligible for patent protection.²¹⁵

The *Alice* test also purports to formulate a framework for assessing all of the exceptions to patentable subject matter, not just the abstract-idea category. But because the *Alice* case dealt specifically with the “abstract ideas” exception to patentable subject matter, the case provides little to no guidance regarding how to determine whether something constitutes a “law of nature” or “natural phenomen[on].”²¹⁶

Once a court determines that a patent claims an abstract idea, law of nature, or physical phenomenon, *Alice* specifies a second step: besides that patent-ineligible abstract idea, law of nature, or natural phenomenon, “[w]hat else is there in the claims?”²¹⁷ As the Court put it, “[t]o answer that question, we consider the elements of each claim both individually and ‘as an ordered combination’ to determine whether the additional elements ‘transform the nature of the claim’ into a patent-eligible application.”²¹⁸ In other words, does the patent include an “inventive concept” such that the patent is significantly more than simply a patent on an ineligible concept?²¹⁹

With regards to this second step, the Court again failed to provide much guidance about what criteria future courts should use in resolving the question. It is unclear, for instance, what “significantly more” than a patent on an ineligible concept looks like in practice, or what types of “additional features” must be included for the patent to survive invalidation.²²⁰

The *Alice* Court did indicate that simply adding conventional or well-understood steps for implementing an ineligible abstract idea, law of nature, or physical phenomenon fails to implicate an inventive concept.²²¹

214. *Alice*, 134 S. Ct. at 2356.

215. *See id.* at 2356–57.

216. *Id.* at 2355–57.

217. *Id.* (alteration in original) (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 78 (2012)).

218. *Id.* (quoting *Mayo Collaborative Servs.*, 566 U.S. at 78–79).

219. *Id.* (quoting *Mayo Collaborative Servs.*, 566 U.S. at 72).

220. *See id.* at 2355, 2357.

221. *Id.* at 2357–58.

For instance, implementing the abstract idea of intermediated settlement using generic computer equipment involves merely conventional or well-understood means for doing so, and thus fails to transform the abstract idea of intermediated settlement into patent-eligible subject matter.²²² But this reasoning suggests that most if not all software patents are invalid, since most software can be conceived of as an abstract idea that is merely implemented using generic computer equipment.²²³ Yet it does not seem to have been the Supreme Court's intent to prohibit software patents in general, since the *Alice* decision fails to even mention software.²²⁴ Furthermore, because the *Alice* case dealt specifically with the abstract idea exception, the case provides no specific commentary on what an "inventive concept" may look like with respect to a law of nature or physical phenomenon.²²⁵ Hence, with regards to the second step of the *Alice* test as well, the Court fell short of providing clear criteria for determining when something is so conventional or well-understood that an inventive concept is lacking.

Largely because of these issues, courts, the USPTO, and the Patent Trial and Appeals Board ("PTAB") have struggled to apply *Alice*. So far, the primary trend has been high rates of invalidation for issued patents, and high rejection rates for those patent applications still before the USPTO.²²⁶ Subsequent to *Alice*, for instance, the Court of Appeals for the Federal Circuit, to which all patent appeals go, has invalidated the vast majority of patent claims it has reviewed where patentable subject matter was the appealed issue.²²⁷ District courts have also invalidated a high percentage of patents where patentable subject matter was the key concern.²²⁸ The PTAB, which conducts a recently introduced "post-grant" review procedure (discussed in greater detail below), has also invalidated patent claims on

222. *Id.* at 2357–60.

223. See Gene Quinn, *The Ramifications of Alice: A Conversation with Mark Lemley*, IPWATCHDOG (Sept. 4, 2014), <http://www.ipwatchdog.com/2014/09/04/the-ramifications-of-alice-a-conversation-with-mark-lemley> (discussing the reality that the reasoning in *Alice* may mean that the majority of software patents are invalid for failing to claim patentable subject matter).

224. Robert Sachs, *Alice, the Illusory Death of Software Patents*, IPWATCHDOG (June 27, 2014), <http://www.ipwatchdog.com/2014/06/27/alice-the-illusory-death-of-software-patents> ("The Court did not even mention 'software' or 'computer programs' or discuss the eligibility of software as a general matter.").

225. See *Alice*, 134 S. Ct. at 2355–57.

226. Sachs, *supra* note 30.

227. *Id.*

228. Brandon S. Bludau, Elliot C. Cook & Darren M. Jiron, *Section 101 Metrics: Post-Alice District Court Rulings on Section 101 Motions*, IP LITIGATOR, Sept.–Oct. 2015, at 6, 6–7, (revealing that in the year following *Alice*, those challenging patents on the basis of patentable subject matter won their motions 68% of the time); Sachs, *supra* note 30.

the basis of *Alice* in each of the three decisions it has rendered so far, though the limited number of such reviews makes identifying trends premature.²²⁹ Nonetheless, other review mechanisms at the PTAB have also resulted in high rates of invalidation under *Alice*.²³⁰

Still-pending patent applications also face an uphill battle following *Alice*. For instance, immediately after the *Alice* decision, some data indicate that the USPTO rejected more than 90% of applications in the area of e-commerce on the basis of *Alice*.²³¹ Appeals of USPTO rejections to the PTAB have similarly fared poorly under *Alice*.²³²

In sum, though the Federal Circuit has begun to uphold some patents subsequent to the Supreme Court's *Alice* decision,²³³ *Alice* and its antecedents continue to have their impact.²³⁴ And their primary impact has been to make obtaining and enforcing patents—particularly software, business method, and biotechnology patents—more difficult.

That difficulty, in turn, has significantly weakened many patents. Importantly for purposes of this Article, such weakening effectively means that the costs and risks of patenting have risen, particularly for those patents in areas strongly impacted by these decisions. For instance, the cost of an average software, business method, or biotechnology patent has likely risen in part because parties must spend more time and resources assessing how to craft patent applications in ways that pass *Alice* muster.²³⁵ The high

229. Kat Greene, *PTAB Nixes Tracking Patent in Post-Grant Review*, LAW360 (Aug. 3, 2016, 3:01 P.M.), <http://www.law360.com/articles/824677/ptab-nixes-tracking-patent-in-post-grant-review>. See Brad M. Scheller & Lily Zhang, *The Specter of Alice Looms Large Even in PGRs*, MINTZ LEVIN: GLOBAL IP MATTERS (Aug. 15, 2016), <https://www.globalipmatters.com/2016/08/15/the-specter-of-alice-looms-large-even-in-pgrs>.

230. Sachs, *supra* note 30.

231. Ryan Davis, *Wave of USPTO Alice Rejections Has Cos. Tweaking Strategies*, LAW360 (Nov. 2, 2015, 1:36 P.M.), <http://www.law360.com/articles/720762/wave-of-uspto-alice-rejections-has-cos-tweaking-strategies>.

232. See Eli Mazour & James Bennin, *PTAB Wonderland: Statistics Show Alice PTAB Interpretation Not Favorable to Patent Applicants*, IPWATCHDOG (Sept. 27, 2015), <http://www.ipwatchdog.com/2015/09/27/ptab-wonderland-statistics-alice-ptab-interpretation> (providing a variety of statistics regarding 140 post-*Alice* appeals to the PTAB, most of which show the PTAB treating patent applications unfavorably under the *Alice* test).

233. Sachs, *supra* note 30.

234. See, e.g., Lincoln S. Essig & Damien Howard, *Impact of the USPTO Examination Guidelines on Software Patents Post-Alice*, KNOBBE MARTENS: IP PRACTICE (Sept. 2, 2016), <https://knobbe.com/news/2016/09/impact-uspto-examination-guidelines-software-patents-post-alice> (showing that, despite some recent improvements, most patent applications relating to software and e-commerce receive § 101 rejections during the application process at some point).

235. In fact, commentators have written a number of articles providing drafting guidance for patents in these areas in particular, because the Supreme Court's recent patentable subject matter case

rates of *Alice* rejections, even for applications that ultimately issue as patents, also provide evidence that parties are incurring greater costs navigating the post-*Alice* world of patentable subject matter.

The prospective costs of enforcing patents post-*Alice* also loom large. For instance, the high success rates of defendants challenging patents post-*Alice* suggest that patent enforcement will be even more costly than before, in part because the high success rates invite additional challenges and present a greater risk of patent invalidation. Parties crafting new patents in the post-*Alice* world may face fewer obstacles in this regard because their applications and USPTO approvals will have taken *Alice* into account. Yet uncertainty lingers even with respect to these patents, since the USPTO and courts may view and apply *Alice* differently.²³⁶

Hence, by weakening many types of patents, *Alice* and its antecedents have increased the costs of obtaining and enforcing patents. The next section describes some additional patent law reforms that have effectively weakened patent rights, thereby increasing the costs and risks of patenting.

2. The Leahy-Smith America Invents Act

In 2011 the U.S. Congress passed, and President Obama signed, the AIA.²³⁷ The AIA has been called the most important patent law reform since the 1952 Patent Act.²³⁸ The AIA brought about a number of important changes to U.S. patent law, including better aligning it with the rest of the world's patent laws.²³⁹

For purposes of this Article, one of the AIA's most significant reforms

law impacts them disproportionately. *See, e.g.*, Gene Quinn, *How to Patent Software in a Post Alice Era*, IPWATCHDOG (Nov. 17, 2016), <http://www.ipwatchdog.com/2016/11/17/patent-software-post-alice> (providing guidance with respect to software patents). *See also* *Scrutinizing Biotechnology & Software Patent Eligibility in M&A Deal Valuations*, MORSE BARNES-BROWN PENDLETON: M&A TODAY (Jan. 6, 2015), <http://www.mbbp.com/news/patent-eligibility> (analyzing the difficulties of assessing patentable subject matter in the software and biotechnology spaces in light of *Alice* and other recent Supreme Court decisions).

236. *See* Greg Reilly, *Decoupling Patent Law*, 97 B.U. L. Rev. 551, 584–87, 600–13 (2017) (providing some examples of decoupled patent law while arguing the law should be further decoupled depending on the context).

237. Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (codified as amended in scattered sections of 35 U.S.C.); Jennifer Martinez, *Obama Signs, Touts Patent Reform Law*, POLITICO (Sept. 16, 2011, 4:35 P.M.), <https://www.politico.com/story/2011/09/obama-signs-touts-patent-reform-law-063697>.

238. *See* John N. Anastasi et al., *U.S. Patent Reform: America Invents Act Makes Major Changes to Patent Law*, LANDO & ANASTASI, http://www.lalaw.com/news_resources/u-s-patent-reform-america-invents-act-makes-major-changes-to-patent-law (last visited Nov. 24, 2017).

239. *See id.*

was to implement several new mechanisms for reviewing the validity of issued patents. For some time prior to the AIA's enactment, commentators had complained that the USPTO did a poor job of screening patent applications.²⁴⁰ The result was high numbers of issued patents that the USPTO probably never should have granted.²⁴¹ Once issued, these patents impose a variety of costs on society.²⁴² For instance, the abundance of bad patents on the market arguably helps fuel the business models of so-called patent trolls, which sometimes use such patents to wring economic rents from purported infringers.²⁴³ But even beyond the patent troll phenomenon, high numbers of improperly issued patents impose costs on society by forcing third parties to take them into account when making business decisions, responding to litigation, and innovating more generally.²⁴⁴

In part to help deal with these problems, the AIA introduced several new administrative means by which to challenge issued patents.²⁴⁵ "Post-grant review" allows a party to challenge the validity of an issued patent on nearly any ground of substantive patent law.²⁴⁶ These grounds include arguments that the patent fails to claim patentable subject matter, lacks novelty, is obvious in light of what others have already done, lacks utility, or fails to disclose enough technical details about the invention.²⁴⁷ The party wishing to so challenge a patent must file its petition with the USPTO within nine months of the patent issuing,²⁴⁸ and, with the exception of covered business method patents, these post-grant procedures only apply to patents filed for on or after March 16, 2013.²⁴⁹ Going forward, they thus provide a powerful means by which to invalidate patents. This is particularly so since any interested party can make such a petition, not just

240. See e.g., Frakes & Wasserman, *supra* note 11, at 622–25.

241. *Id.* at 644–63.

242. Jonathan S. Masur, *Costly Screens and Patent Examination*, 2 J. LEGAL ANALYSIS, 687, 696–98 (2010) (analyzing the various costs that "bad" patents impose on society).

243. See Lemley & Melamed, *supra* note 2, at 2146–66 (pointing out that many patent trolls rely on "bad" patents in pursuing their business models).

244. Masur, *supra* note 242, at 696–98.

245. Some of these were briefly mentioned *supra* in Part II.B.1.

246. Robert F. Shaffer & Justin A. Hendrix, *Post Grant Proceedings of the AIA Provide New Opportunities and Require Reconsideration of Old Patent Litigation Strategies*, FINNEGAN (June 15, 2012), <http://www.finnegan.com/resources/articles/articlesdetail.aspx?news=598696f7-7eba-4fcb-83b8-2369caa91dd3>. See 35 U.S.C. §§ 321–329 (2012).

247. Shaffer & Hendrix, *supra* note 246.

248. *Id.*

249. See *Post-Grant Proceedings: Post-Grant Review*, FISH & RICHARDSON: POST-GRANT, <http://fishpostgrant.com/post-grant-review> (last visited Nov. 24, 2017).

parties that the patent owner has sued or is poised to sue.²⁵⁰

“Inter partes review” provides an additional mechanism by which to challenge issued patents before the PTAB.²⁵¹ For patents filed on or after March 16, 2013, this review procedure is available once the post-grant review period ends—nine months after the patent has issued or once a post-grant review has ended, whichever comes later.²⁵² For patents filed before March 16, 2013, parties can file a petition for inter partes review immediately, since post-grant review is unavailable for such patents.²⁵³

Inter partes review allows petitioners to challenge the validity of an issued patent on two grounds. First, petitioners may seek to demonstrate that the patent lacks novelty—that is, that the invention already exists.²⁵⁴ Second, petitioners may seek to show that the patent is obvious in light of what others have already invented.²⁵⁵ Petitioners may prove lack of novelty or obviousness by pointing to other issued patents or printed publications as prior art.²⁵⁶

Hence, these and related review procedures have dramatically increased opportunities for parties to invalidate issued patents. In fact, since their implementation, these mechanisms have proved to be fertile grounds for doing so. For instance, invalidation rates have been so high at the PTAB that some have referred to it as the “death squad.”²⁵⁷ Indeed, invalidation rates utilizing some of these review mechanisms have been estimated to be nearly 80% when the procedure results in a final decision.²⁵⁸ The number of petitions in absolute terms has also been rising, demonstrating that these review mechanisms have become a preferred means of invalidating issued patents.²⁵⁹

250. See Michael J. Flibbert & Maureen D. Queler, *5 Distinctions Between IPRs and District Court Patent Litigation*, CORP. COUNS. (Dec. 16, 2015), <https://www.law.com/corpcounsel/almID/1202745014401>.

251. See 35 U.S.C. §§ 311–319; *Post-Grant Proceedings: Inter Partes Review*, FISH & RICHARDSON: POST-GRANT, <http://fishpostgrant.com/inter-partes-review> (last visited Nov. 24, 2017).

252. *Id.*

253. *Id.*

254. Shaffer & Hendrix, *supra* note 246.

255. *Id.*

256. *Id.*

257. Ryan Davis, *PTAB's 'Death Squad' Label Not Totally Off-Base, Chief Says*, LAW360 (Aug. 14, 2014, 5:47 P.M.), <http://www.law360.com/articles/567550/ptab-s-death-squad-label-not-totally-off-base-chief-says>.

258. See Love & Ambwani, *supra* note 192, at 94, 101–02, 102 tbl.6 (reporting findings of an empirical study tracking the outcome of inter partes reviews).

259. See *id.* at 96–97, 97 tbl.1.

The AIA's new review procedures have thus weakened patents by facilitating their invalidation in increasingly more instances. Of course, one might also argue that these mechanisms will ultimately strengthen the patent system by helping to weed out bad patents. That may certainly be the aggregate effect. But for individual patent seekers, the procedures have made patenting costlier by putting more patents at risk of invalidation. As such, they have increased the costs and risks of patenting in several key respects, making effective patent acquisition and enforcement more difficult in a post-AIA world.

3. A Post-*Alice*, Post-AIA World

The previous two sections discussed several Supreme Court decisions and legislative changes that have effectively weakened patents. By doing so, they have increased the costs of obtaining and enforcing patents. In line with Part I's analysis, therefore, these increased costs seem poised to deter patenting in a broader range of cases. And this deterrence seems particularly likely for parties with more limited resources.

For instance, because resource-constrained parties are more likely to be sensitive to the high costs of obtaining and enforcing patents, increasing those costs is more likely to affect how many patents they pursue. Of course, in some cases—particularly with respect to their core technologies—resource-constrained parties may still find it important to pursue patents in spite of the increased costs described above. Plenty of evidence, for instance, suggests that patents can serve important functions for resource-constrained parties, such as enhancing their ability to attract financing.²⁶⁰ But past survey evidence has also already shown that the high costs of patenting deter some resource-constrained parties from patenting even their most important technologies.²⁶¹ Increasing those costs through the legal changes discussed above thus seems likely to deter patenting in even more cases.

Furthermore, for resource-constrained parties, the greater costs of patenting described above are likely to increase the appeal of other forms of intellectual property because of those forms' relative affordability. Trade secrecy, for instance, may increase in appeal not solely because of the DTSA, but also because patenting's growing costs make the cheaper trade secrecy alternative that much more attractive. Indeed, even where the costs and risks associated with other forms of intellectual property protection

260. See *supra* note 66 and accompanying text.

261. Graham et al., *supra* note 16, at 1309–14.

have remained relatively stable, the increasing costs of patent protection may nonetheless increase those other forms' appeal by decreasing their relative costs.

The heightened costs of patenting may also deter resource-constrained parties from patenting in a greater range of cases due to ignorance, irrationality, and sociology. For instance, growing costs may make it that much more difficult to afford patent counsel. Without patent counsel, resource-constrained parties may forfeit additional patenting opportunities due to ignorance and economic irrationality.²⁶² Furthermore, the increased costs of patenting described above may make it even easier for parties that subscribe to anti-patent norms—such as many in the open-source software world—to justify foregoing patenting.²⁶³

On the other hand, the increased costs of obtaining and enforcing patents described above seem less likely to affect well-capitalized parties' intellectual property decisions. As discussed in Part I, these types of parties are less sensitive to changes in the costs of patenting, in large part because they derive value from patents en masse, and the costs of intellectual property protection consume a relatively small percentage of their overall resources. Furthermore, because well-capitalized parties tend to be able to afford the full complement of intellectual property protections, the relative price differentials between the different forms of intellectual property are less likely to affect their intellectual property decisions. They can—and do—choose them all when available.

Last, the increased costs of patenting described above seem unlikely to deprive well-capitalized parties of many patenting opportunities due to ignorance, irrationality, or sociology. Well-capitalized parties will still have access to patent counsel in a post-*Alice*, post-AIA world, and their economic incentives to pursue large numbers of patents likely remain unchanged in most cases. In fact, the legal changes described above may have reinforced those incentives by encouraging such parties to pursue even more patents in order to offset the growing share of potentially invalid patents in their portfolios. The next part turns to addressing this and other possible implications.

262. See *supra* Parts I.C–D.

263. See *supra* Part I.E.

III. IMPLICATIONS

Part I of this Article laid out five reasons why parties may forego patenting. Importantly, it sought to demonstrate how the resources available to a party may often play a critical role in determining whether a party patents its inventions or instead relies on alternative forms of intellectual property protection, or, in some cases, no protection at all. In short, resource-constrained parties seem more likely to forego patenting due to its relatively high costs, instead relying on cheaper forms of intellectual property such as copyrights, trademarks, and trade secrecy. Furthermore, the relatively high costs associated with patents may also disproportionately hamper resource-constrained parties' patenting opportunities due to ignorance, irrationality, or sociology.

Well-capitalized parties, on the other hand, are likely to exhibit a relatively high, steady demand for patents. And the costs of patenting are less likely to affect their intellectual property decisions in general. Indeed, typically such parties can afford the whole gamut of protections, and they act accordingly. While ignorance, irrationality, and sociology may also affect well-capitalized parties in their intellectual property decisions, those factors typically push well-capitalized parties towards overprotection, not underprotection.

Part II, relying on Part I's analysis, then assessed several recent intellectual property law changes. The purpose of doing so was to demonstrate how these changes have increased the costs of patenting even further, while decreasing the relative costs of other types of protections such as trade secrecy. This Part now turns to assessing some potential implications of the analyses in Parts I and II.

A. IF RESOURCE-CONSTRAINED PARTIES PATENT LESS, IS THAT NORMATIVELY DESIRABLE?

In the run-up to the AIA's enactment, many commentators worried that some of its provisions would put resource-constrained parties at a significant disadvantage vis-à-vis larger corporations.²⁶⁴ In particular, commentators viewed the AIA's provisions relating to priority as potentially detrimental to resource-constrained parties' patenting

264. See John Villasenor, *How Entrepreneurs Can Thrive Under the "First-Inventor-to-File" Patent System*, FORBES (Dec. 7, 2012, 4:02 P.M.), <http://www.forbes.com/sites/johnvillasenor/2012/12/07/how-entrepreneurs-can-thrive-under-the-first-inventor-to-file-patent-system> ("Critics of first-inventor-to-file often argue that it will favor larger companies over entrepreneurs who may be unfamiliar with the patent system.").

prospects.²⁶⁵ These provisions align U.S. patent law with most of the rest of the world, stipulating that whoever first *files* a patent application receives the patent.²⁶⁶ This new regime contrasts with earlier U.S. patent law, which assigned patents to whoever *invented* something first.²⁶⁷ The worry with the AIA's new priority rules is that large companies will often receive patents—even when resource-constrained parties were the first to invent—simply because the larger companies' superior resources enable them to file patent applications more quickly.²⁶⁸

This Article highlights additional ways that the AIA, as well as the other intellectual property law changes reviewed in Part II, may affect the patenting prospects of different parties along the resource spectrum. In short, while many of these changes have been viewed as necessary correctives to an overabundance of bad patents,²⁶⁹ they also seem poised to suppress at least some patenting by parties with more limited resources.

What would this mean in practice? It may mean that resource-constrained parties face greater difficulty on a number of important economic fronts. For instance, some studies show that patents help resource-constrained parties attract financing; fend off incumbent rivals; prevent larger companies from stealing their innovations; ensure their freedom to operate; increase their market share; and facilitate collaborations, acquisitions, and initial public offerings.²⁷⁰ Less patenting by resource-constrained parties may thus sometimes harm their economic prospects. And if resource-constrained parties' economic prospects grow bleaker, the economy as a whole may suffer, since resource-constrained parties such as startup companies are vital engines of job growth and innovation.²⁷¹

265. *See id.*

266. Anastasi et al., *supra* note 238.

267. *See* Gene Quinn, *A Simple Guide to the AIA Oddities: First to File*, IPWATCHDOG (Sept. 11, 2013), <http://www.ipwatchdog.com/2013/09/11/a-simple-guide-to-the-aia-oddities-first-to-file>.

268. *See* Villasenor, *supra* note 264. *See generally* Abrams & Wagner, *supra* note 65 (examining analogous changes in Canadian law to predict that the AIA will suppress patenting by individual inventors, thereby reducing their share of patents).

269. *See* Daniel Nazer, *Happy Birthday Alice: Two Years Busting Bad Software Patents*, ELECTRONIC FRONTIER FOUND. (June 20, 2016), <https://www.eff.org/deeplinks/2016/06/happy-birthday-alice-two-years-busting-bad-software-patents>.

270. Graham & Sichelman, *supra* note 66, at 1064–70; David Pridham & Brad Sheafe, *The Top 10 Reasons Why Your Startup Needs Patents*, FORBES (Aug. 18, 2015, 4:46 P.M.), <http://www.forbes.com/sites/forbesleadershipforum/2015/08/18/the-top-10-reasons-why-your-startup-needs-patents>.

271. Jeffrey Sparshott, *Sputtering Startups Weigh on U.S. Economic Growth*, WALL ST. J. (Oct. 23, 2016, 11:20 A.M.), <http://www.wsj.com/articles/sputtering-startups-weigh-on-u-s-economic>.

To some extent, resource-constrained companies have always been at an intellectual property disadvantage vis-à-vis their well-capitalized counterparts.²⁷² Indeed, the resource differentials between these groups mean that well-capitalized parties have always been able to afford more intellectual property protections, including patents, than parties with more limited means, and to use those protections to further their own economic interests.²⁷³ Hence, less patenting by resource-constrained parties may not drastically change the status quo. Nonetheless, widening the patent gap between well-capitalized parties and poorly capitalized ones through the changes discussed in Part II could more frequently deprive resource-constrained parties of the benefits they reap from patents, as enumerated above.²⁷⁴ And without such benefits, the economy may suffer.

That possibility becomes even more acute if the same legal changes fail to affect the intellectual property decisions of well-capitalized parties. And as argued throughout, while resource-constrained parties seem poised to decrease patenting in more cases, well-capitalized parties seem likely to maintain their heavy patenting in response to the legal changes discussed in Part II.

In fact, those legal changes may actually push well-capitalized parties to increase their patenting. As discussed, well-capitalized parties rely on patents in bulk.²⁷⁵ Yet the legal changes discussed above mean it has become easier to invalidate patents. Knowing this, well-capitalized parties may increase the number of patents they pursue in order to maintain the necessary patent volume. Hence, while resource-constrained parties seem likely to forego patenting in more circumstances, well-capitalized parties

growth-1477235874 (“The American economy has long relied on fast-growing young companies to fuel job growth and spread the latest innovations.”). See J.D. Harrison, *Who Actually Creates Jobs: Start-Ups, Small Businesses or Big Corporations?*, WASH. POST (Apr. 25, 2013), <http://wapo.st/17TVoN3> (pointing to a variety of data showing the importance of startups and small businesses to economic growth).

272. See Gene Quinn, *The Story of the Bullied Patent Owner, More Widespread than Bad Acting Patent Trolls*, IPWATCHDOG (Nov. 30, 2015), <http://www.ipwatchdog.com/2015/11/30/bullied-patent-owner-more-widespread-patent-troll> (arguing that large corporations often use their intellectual property advantages to bully smaller parties).

273. See Jeff John Roberts, *Which Big Tech Firm Won the Most Patents in 2015?*, FORTUNE (Jan. 13, 2016), <http://fortune.com/2016/01/13/patents-2015> (listing the top ten patenting tech companies from 2015, all of which are large multinational corporations). This does not mean, of course, that small parties do not patent. In fact, in some cases, they may patent more per worker than larger companies, simply because they are more innovative. See, e.g., Harrison, *supra* note 271. Be that as it may, large companies typically still have more patents in absolute terms, which often give them significant advantages in the marketplace.

274. Graham & Sichelman, *supra* note 66, at 1064–70; Pridham & Sheafe, *supra* note 270.

275. See generally Parchomovsky & Wagner, *supra* note 13.

may respond by increasing, rather than decreasing, their patenting activities.

Of course, less patenting by resource-constrained parties may also prove beneficial in some respects. For instance, if resource-constrained parties more frequently elect to forego patenting but still elect to pursue the innovation, society receives the innovation without the significant costs that patents often impose.²⁷⁶ Indeed, those avoided costs may include patent trolling, since the patents of small entities frequently end up in patent-assertion campaigns.²⁷⁷ Despite these possible benefits, it may be the case that if resource-constrained parties forego patenting more of their innovations, society will miss out on the disclosures that patenting an invention requires.²⁷⁸ This may be particularly true if resource-constrained parties respond to the growing relative costs of patents by switching to trade secrecy, where secrecy, rather than disclosure, is required for protection.²⁷⁹ Yet there is widespread doubt that patenting actually discloses much useful information.²⁸⁰ Furthermore, as some scholars have argued, trade secrecy may actually encourage, rather than inhibit, disclosure of information regarding the innovations.²⁸¹

One of the key questions, then, becomes whether resource-constrained parties that elect to forego patents will still have incentives to pursue the associated innovations. For several reasons, I believe the answer in many cases is likely in the affirmative. First, resource-constrained parties are most likely to forego patenting when it comes to peripheral technologies, rather than core technologies.²⁸² Hence, since these technologies reside outside of the party's core commercial vision, the party may not have considered patent protection for the innovation crucial in the first place. Second, parties can still rely on other types of protection, including trade

276. Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 TEX. L. REV. 1031, 1058–59 (2005) (discussing five categories of costs imposed by IP rights).

277. See, e.g., John R. Allison et al., *Extreme Value or Trolls on Top? The Characteristics of the Most-Litigated Patents*, 158 U. PA. L. REV. 1, 20–26 (2009) (discussing how a high percentage of the most litigated patents originated with small entities).

278. See Fromer, *supra* note 35, at 541, 544–62 (discussing the role of patent law's disclosure requirements).

279. See Anderson, *supra* note 84, at 922–27 (discussing the differences between patents and trade secrecy); *supra* Part I.B.1.

280. Cf. Lisa Larrimore Ouellette, *Do Patents Disclose Useful Information?*, 25 HARV. J.L. & TECH. 545, 561–65, 580–85 (2012) (discussing this skepticism while pointing to some evidence in the nanotechnology industry supporting the proposition that patents disclose useful information).

281. See Lemley, *supra* note 110, at 332–37 (arguing that in some situations, trade secrecy actually encourages diffusion of information about innovations).

282. See *supra* Part I.B.4.

secrecy, for many of their innovations. And third, even for core technologies that a party would otherwise wish to patent, there are other important incentives that motivate many parties to pursue innovations, even absent patent rights.²⁸³

Finally, if resource-constrained parties opt to patent less, while well-capitalized parties patent the same or more, the latter may be worse off than the former in key respects. For instance, amassing ever more patents may be increasingly foolhardy if patent rights are growing ever weaker. This may be particularly true if the attractiveness of alternative types of protection, such as trade secrecy, has increased. Hence, though a widening patent gap between well-capitalized and resource-constrained parties may result in some disadvantages for smaller parties, that gap may present some disadvantages to larger parties as well.

Thus, as Congress and courts consider additional patent and intellectual property law changes,²⁸⁴ this Article highlights important economic considerations relevant to such efforts. In short, failing to fully consider the impact of resource differentials on intellectual property decision making could mean that well-intended reforms produce unintended results. The discussion above is not meant to definitively resolve any of the highlighted issues, but instead is meant to stress the significant possible implications of patent law changes that fail to take such resource differentials into account.

B. FEEDING OR STARVING THE TROLLS?

A primary motive behind many of the recent patent law reforms has been to address the growing concern of so-called “patent trolls”—patent owners that do not make goods or services, but sue others that do.²⁸⁵ Such

283. See, e.g., Mark A. Lemley, *Industry-Specific Antitrust Policy for Innovation*, 2011 COLUM. BUS. L. REV. 637, 645–48 (2011) (discussing how competition, first-mover advantages, and lead-time advantages may incentivize parties to innovate even absent monopoly rights); Ouellette, *supra* note 195, at 1125–41 (discussing some non-patent mechanisms, including tax incentives, direct grants and contracts, prizes, and regulatory exclusivity, that provide support to innovative parties); Elizabeth L. Rosenblatt, *A Theory of IP's Negative Space*, 34 COLUM. J.L. & ARTS 317, 322–23, 340–57 (2011) (describing reasons why parties may pursue innovative activity even absent formal intellectual property protections).

284. See, e.g., Ryan Davis, *IP, Pharma Groups Call for Patent Eligibility Law Overhaul*, LAW360 (Jan. 30, 2017, 8:51 P.M.), <https://www.law360.com/ip/articles/884771/ip-pharma-groups-call-for-patent-eligibility-law-overhaul> (discussing calls for new patent law reforms).

285. See, e.g., Gregory Dolin, *Dubious Patent Reform*, 56 B.C. L. REV. 881, 910 & n.194 (2015) (indicating that one of the primary motives behind the AIA's enactment was to help eliminate “dubious” patents, upon which patent trolls purportedly often rely).

entities, according to many, abuse the patent system in various ways, including in some cases relying on patents of dubious quality and scope to extract rents from otherwise productive companies.²⁸⁶

The legal changes discussed herein could encourage patent trolling in a number of ways. First, to the extent that large corporations increase their patenting in order to maintain high patent volume, those bloated patent portfolios may become a fresh source of patents for patent trolls. Indeed, patent trolls often source their patents from companies with overstocked portfolios.²⁸⁷ And if larger corporations patent even more in order to maintain volume, those companies may ultimately have that many more patents to shed, particularly if the increase in patenting leads to patenting in areas unrelated to the companies' core products and services (that is, peripheral technologies). Hence, to the extent the legal changes discussed in Part II—or future reforms—lead well-capitalized parties to maintain or even increase their patenting, those changes may help provide a steady, even growing, source of patents for those engaged in trolling.

Second, some of the legal changes discussed in Part II may increase patent trolling by pushing patent owners to outsource more of their patent enforcement activities to third-party assertion entities. As I have written elsewhere, the high costs and risks of patent assertion may often lead parties to shift those costs and risks to third-party patent assertion entities, all in an effort to realize some return on their patent investments while minimizing the otherwise prohibitive costs associated with patent assertion.²⁸⁸ Hence, to the extent the legal changes discussed in Part II and future reforms increase the costs of patent protection, those changes may push even more patent owners to shift those costs to patent assertion specialists. And when such shifting occurs, patent trolling rates are likely to rise, since patent troll business models demand ever-increasing rates of assertion to survive.²⁸⁹

On the other hand, the changes discussed above may also help starve patent trolls. First, as mentioned above, the patents of resource-constrained

286. Lemley & Melamed, *supra* note 2, at 2118–19, 2126–28.

287. See *Patent Trolls*, ELECTRONIC FRONTIER FOUND., <https://www EFF.ORG/issues/resources-patent-troll-victims> (last visited Nov. 24, 2017) (“[Patent trolls] often buy up patents cheaply from companies down on their luck who are looking to monetize what resources they have left, such as patents.”).

288. See generally Asay, *supra* note 48 (providing an industry-specific, informal model as to why patent owners forego asserting patent rights).

289. *Id.* at 652, 707.

parties frequently find their way into patent assertion campaigns.²⁹⁰ Thus, to the extent that resource-constrained parties patent less in response to the rising relative costs of patenting, they may ultimately have fewer patents to contribute to trolling campaigns. In other words, the legal changes discussed herein may deprive trolls of an important source of patents.

Second, even if large corporations increase their patenting in response to the legal changes described herein, those legal changes may still reduce trolling. For instance, since patents are more difficult to enforce, patent asserters can expect higher costs of assertion and thus reduced profitability. And that reduced profitability may drive some or even many parties away from a business model focused on patent assertion.

In sum, the legal changes described in Part II may help combat patent trolling by, among other things, reducing the supply of patents from resource-constrained parties and making trolling less profitable. On the other hand, the legal changes may contribute to more trolling by helping replenish the patent well from which trolls often draw and pushing more patent owners to outsource patent enforcement activities to patent trolls. Again, the point here is not to resolve these issues once and for all. Instead, it is to highlight that legal changes that fail to account for how resource differentials among parties impact intellectual property decisions neglect an important component of any effective reform.

C. INTELLECTUAL PROPERTY LAW DISTORTIONS

One long-term consequence of the legal changes described in Part II may be incremental distortions in other areas of intellectual property law. For instance, in technological areas where both patents and other forms of intellectual property apply, courts may be tempted to distort the other forms of intellectual property to make up for the perceived patent shortfall.²⁹¹

In fact, such a dynamic may have been at play in a recent high-profile copyright dispute between Oracle and Google.²⁹² In that case, Oracle sued Google for copyright infringement because Google copied thirty-seven of Oracle's Java application programming interfaces ("APIs") into Android,

290. Allison et al., *supra* note 277.

291. See Pamela Samuelson, *Functionality and Expression in Computer Programs: Refining the Tests for Software Copyright Infringement*, 31 BERKELEY TECH. L.J. 1215, 1297–98 (2017).

292. Oracle Am., Inc. v. Google Inc., 750 F.3d 1339 (Fed. Cir. 2014); Samuelson, *supra* note 291, at 1251–66.

its mobile operating system.²⁹³ Software APIs are functional in nature; in essence, they enable distinct software programs using the same APIs to communicate with one another.²⁹⁴ Copyright law typically excludes functional features of otherwise copyrightable works from copyright protection.²⁹⁵ Hence, because of APIs' functional nature, the software industry had for decades prior to the dispute between Oracle and Google assumed that APIs fall outside the scope of copyright protection.²⁹⁶ Indeed, a good number of previous judicial decisions provided a solid basis for that assumption.²⁹⁷

Yet in *Oracle v. Google*, the Court of Appeals for the Federal Circuit deemed the APIs subject to copyright, largely because creation of the APIs entailed some creativity.²⁹⁸ In doing so, the court interpreted copyright expansively, in a way with which many commentators disagreed.²⁹⁹ Some have suggested that the court may have been motivated to take this expansive view in order to counteract the weakening of patent rights it had witnessed over the last several years.³⁰⁰ Indeed, as the exclusive court of appeals for patent cases, the Federal Circuit has had a front-row seat to the last decade's general weakening of patent rights by the Supreme Court and Congress.³⁰¹

The inclination to bolster copyright in the face of declining patent rights may be particularly likely given how previous copyright decisions have addressed the intersection between copyright and patent law. For instance, in an influential Second Circuit decision addressing copyright as applied to software, the court suggested that patents may be better suited than copyright for protecting computer science inventions.³⁰² Similarly, in the Supreme Court's seminal *Baker v. Selden* decision, the Court pointed to

293. *Oracle Am.*, 750 F.3d at 1347. For background on the case, see Clark D. Asay, *Copyright's Technological Interdependencies*, 18 STAN. TECH. L. REV. 189, 228–31 (2015).

294. Brian Proffitt, *What APIs Are and Why They're Important*, READWRITE (Sept. 19, 2013), <http://readwrite.com/2013/09/19/api-defined>.

295. See, e.g., Asay, *supra* note 111, at 75–81 (pointing to a number of copyright law doctrines meant to exclude functional aspects of works).

296. See Pamela Samuelson, *Three Fundamental Flaws in CAFC's Oracle v Google Decision*, 37 EUR. INTELL. PROP. REV. 702, 702 (2015) (reviewing the *Oracle v. Google* decision and noting it to be at odds with several decades of copyright precedent and practice).

297. *Id.* at 702–06.

298. *Oracle Am.*, 750 F.3d at 1353–54, 1363.

299. See e.g., Clark D. Asay, *Software's Copyright Anticommons*, 66 EMORY L.J. 265, 267–73 (2017); Samuelson, *supra* note 296, at 702.

300. Samuelson, *supra* note 291, at 1289.

301. See *supra* Part II.B.

302. *Comput. Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693, 712 (2d Cir. 1992).

patents as the appropriate form of protection for utilitarian solutions to technical and scientific problems.³⁰³ Hence, to the extent courts perceive that patents no longer serve these roles effectively, courts may be inclined to expand copyright's role to provide more effective intellectual protection in these areas.

Beyond copyright, courts may be tempted to distort other areas of intellectual property law to compensate for a perceived weakening of patent rights. For instance, the Supreme Court has long held that parties asserting trademark rights with respect to some feature of their product face a heavy presumption against those rights if the feature is detailed in a patent application.³⁰⁴ With the general weakening of patent rights, however, courts may be tempted to relax that presumption.

In fact, courts may be tempted to relax a host of other intellectual property doctrines meant to screen out functional elements.³⁰⁵ Courts have long considered functional elements outside the scope of other bodies of intellectual property law, in large part because the courts view those elements as the province of patent law.³⁰⁶ But if courts perceive a growing ineffectiveness of patents in protecting such functional features, courts may increasingly relax how these other intellectual property doctrines are applied in order to provide innovators with effective intellectual property protection from these other sources.

If such intellectual property law distortions were to occur, would that be a positive development? After all, if parties subject to significant resource constraints are increasingly unable or unwilling to rely on patent protection, then providing them with more expansive protection from other intellectual property sources may be precisely what is needed. But while such a solution may seem appealing in some respects, the long-term health of the intellectual property system as a whole would likely suffer. As others have written, the various doctrines of each intellectual property law type have been crafted with specific, and in some cases constitutional, ends in mind.³⁰⁷ Hence, when the law in any given area is applied in a way that ignores those ends, the result is often a morphing of the law that imposes

303. See *Baker v. Selden*, 101 U.S. 99, 102–03 (1879).

304. *Traffix Devices, Inc. v. Mktg. Displays, Inc.*, 532 U.S. 23, 29–30 (2001).

305. See Christopher Buccafusco & Mark A. Lemley, *Functionality Screens*, 103 VA. L. REV. 1293, 1306–14 (2017) (discussing how other areas of intellectual property law screen out functionality).

306. See *id.* at 1298–1306.

307. See, e.g., Jeanne C. Fromer, *Should the Law Care Why Intellectual Property Rights Have Been Asserted?*, 53 HOUS. L. REV. 549, 587–89 (2015).

more costs on society than intended, in many cases without any offsetting societal benefits.³⁰⁸

CONCLUSION

Over the last decade in particular, many commentators have focused on the ever-increasing number of patents and the societal problems this patent glut causes. In response, Congress, the USPTO, courts, and other governmental institutions have sought ways to correct for the perceived overabundance of patents.

Yet this focus on the aggregate number of patents obscures the reality that different types of parties have quite different relationships to the patent system. Resource-constrained parties are more likely to be sensitive to the patent system's high costs in selectively patenting and substituting other forms of intellectual property when available. Well-capitalized parties, conversely, are typically impervious to those costs in utilizing other types of intellectual property as complements, rather than substitutes, to high-volume patenting. Hence, when these relative costs change, whether through court decisions, acts of Congress, or otherwise, those changes matter, particularly to those with more limited resources.

Failing to take these relationships into account when implementing patent and other intellectual property law reforms is therefore likely to result in a number of unintended consequences. This Article has briefly touched upon a few possible consequences of some of the most important recent patent and trade secret reforms. Future reform proposals would do well to more fully account for parties all along the resource spectrum.

308. *Id.*

