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Exclusionary and Diffusionary Levers in Patent Law¹

Abstract

The patent system is built on the premise that exclusion leads to innovation. But a mounting body of evidence calls into question the assumption that “innovation by exclusion” – innovation based on excluding rivals– is the only, or even primary, way innovation happens today: nearly 50% of manufacturers got the idea for their most important new product from an outside source that shared it with them, 45-60% of patentees acquire patents to access the technology of others, and over 1,300 companies, including five of the ten top holders of patents, have pledged to share their patents with others. But because of the patent system’s traditional focus on exclusion, policymakers have paid less attention to how patents can better support the diffusion of technology through mechanisms such as disclosure, transfer, waiver, and the pursuit of freedom to operate. This paper addresses this gap by exploring in depth the way that the patent system can encourage the diffusion of technology between rivals and innovators, revealing a surprising number of overlooked levers within the patent system for encouraging innovation.

For example, making it easier to place inventions in the public domain through effective defensive publication, encouraging greater disclosure of patent-product relationships through the marking requirement, and changing the default for provisional applications to being open rather than closed, and for utility applications to publish upon filing, rather than after an 18-month delay, but with the right of inventors to opt-out of this default, would enhance patent disclosure by enabling technical information and permissions to use them to be available earlier to the world. Improving reporting and discovery of patent information, including ownership, availability for licensing, licensing status in the case of publicly funded inventions in accordance with existing law, patent licenses, and standards commitments, could boost markets for technology. Making it easier to waive patent rights and rely on waivers of patent rights, through the creation of a government registry of patent rights, and creating, e.g. an “open” or “defensive only” option that allows patentees to pay discounted maintenance fees in exchange for promising to use their patents only defensively, or to give up certain rights, akin to “license of right” schemes in the UK and Germany, would increase freedom to operate. As innovation increasingly takes place in open and closed modes, and often both, the patent system, by offering more ways for patentees to decide the fate of their inventions, can increase its relevance to “all of the above” types of innovation.

¹ © Colleen V. Chien, 2015. I thank in particular Michael Risch, and David Schwartz, as well as Ted Sichelman, Robert Merges, Peter Menell, Molly Van Houweling, Pam Samuelson, Brett Frishmann, Felix Wu, Michael Burstein, Shawn Miller, Bronwyn Hall, Jorge Contreras, Brian Love, Eric Goldman, Lisa Ouellette, Hannah Jiam, Patrick Wu, and students at the Berkeley Law IP Colloquium, Stanford Law IP Colloquium, and Cardozo IP Law Colloquium for helpful conversations, research assistance, and comments on earlier drafts. I thank the Santa Clara School of Law Faculty Scholarship Support Fund for its support of this research. I thank Dirk Calcoen for his support. All errors are mine.

Introduction

On June 12, 2014, Elon Musk, CEO of Tesla, published a blog post, “All Our Patent Belong To You.”² In it, he announced that Tesla would “open source” its patents and make them freely available.³ The real competition was not the “small trickle” of non-Tesla electric cars, but the “enormous volumes of gasoline-powered cars being sold every day.”⁴ By making its technology available to all, the company hoped to advance electric vehicle technology, to benefit all.⁵

Like the meme that inspired the post’s name,⁶ the announcement engendered admiration, imitation, and confusion. Was Musk’s move altruistic, about saving the planet, or shrewd, about driving adoption of Tesla’s technology to achieve market dominance?⁷ Was it a marketing gimmick, or a naïve and self-destructive act, “reduc[ing] the value of the embedded option that is the primary foundation of the Tesla valuation,” as one investor claimed?⁸

Why the strong response? It’s because we’re used to thinking that excluding rather than including rivals in the practice of one’s technology, leads to innovation.⁹ The Constitution enshrines this idea, authorizing Congress “to promote the Progress of Science and useful Arts, by

² Elon Musk, *All Our Patent Are Belong To You*, TESLA MOTORS BLOG (June 12, 2014), <http://www.teslamotors.com/blog/all-our-patent-are-belong-you> (last visited _____).

³ *Id.*

⁴ *Id.*

⁵ *Id.*

⁶ “All your base are belong to us,” which is a poor “Engrish” translation of a Japanese phrase meaning “we have taken over every last one of your bases,” that was featured in the introduction to a Japanese video game called Zero Wing. See Explanation of the Phrase “All your base are belong to us.” ASKVILLE BY AMAZON, <http://askville.amazon.com/meant-phrase-base-belong-humorous-couldn%E2%80%99t-meaning/AnswerViewer.do?requestId=2265435> (last visited_____).

⁷ Serguei Netessine & Karan Girotra, *Tesla Goes Big, Not Home*, HARV. BUS. R. (June 17, 2014), <https://hbr.org/2014/06/tesla-goes-big-not-home/> (last visited _____).

⁸ Technology Equity Strategies, *Did Tesla’s Actions in Detroit Put its Patents in the Public Domain? Why Investors Should Worry*, SEEKING ALPHA (Feb. 15, 2015), <http://seekingalpha.com/article/2918086-did-teslas-actions-in-detroit-put-its-patents-in-the-public-domain-why-investors-should-worry?page=2> (last visited _____).

⁹ The role of exclusion in the patent system has been the subject of a number of recent scholarly articles, *see, e.g.*, Amy Kapczynski & Talha Syed, *The Continuum of Excludability and the Limits of Patents*, 122 YALE L.J. 1900 (2013) (articulating the concept of an excludability continuum); Oscar Liivak, *Rethinking the Concept of Exclusion in Patent Law*, 98 GEO. L.J. 1643 (2010) (examining the benefits of limiting patent law’s broad exclusion to actual copying, as in copyright law); Adam Mosoff, *Exclusion and Exclusive Use in Patent Law*, 22 HARV. J.L. & TECH. 321 (2009) (using a historical lens to examine the “exclusion concept” in patent law, or the right to exclude, as distinct from the larger set of “exclusive rights” traditionally associated with property that also include the positive rights of use and possession).

securing [] to [] Inventors the **exclusive right** to their [] Discoveries.”¹⁰ As the Supreme Court has added, “the essence of a patent grant is the right to **exclude others**.”¹¹ (emphases added) The importance of exclusion is deeply engrained in property theory – providing owners with the incentive to preserve and utilize property more efficiently.¹²

Tesla’s move turns this logic on its head. Instead of discouraging imitators, it’s creating them. Instead of excluding rivals, Tesla’s patents are diffusing its technology to them, and also serving to pave the way for Tesla’s use of its rivals’ patents, spurring further innovation. It appears to be working. Following the announcement, BMW, Nissan and Tesla, who together make 80% of the world’s electric-car batteries,¹³ were in talks about collaborating on global vehicle-charging standards.¹⁴ Later, Toyota announced that it would open its hydrogen-car patents.¹⁵ Then, the LG group announced that it would share its 29,000 patents, to small and medium-sized companies, and make another 3,058 freely available to startups.¹⁶ The sharing has spread beyond electric cars. Panasonic has moved to open up its source code, technology and patents in order to expedite R&D about the ‘Internet of Things.’¹⁷ A branch of the conglomerate Daweoo will share patents and knowhow relating to liquefied natural gas (LNG) engine technology with local entrepreneurs, and a number of Korean firms, including Samsung, Hyundai Motors, Lotte and have announced plans to open open innovation hubs.¹⁸ Companies like Facebook¹⁹ and Bistream²⁰ have announced that they are developing technology in the open in areas like 3D printing, Bitcoin, and drones, engaging in massive sharing of what otherwise would be proprietary technology.

¹⁰ U.S. CONST., art. I, § 8, cl. 8.

¹¹ *Dawson Chem. Co. v. Rohm & Haas Co.*, 448 U.S. 176, 215 (1980). (“a patent...consists altogether in the right to exclude.”)

¹² *See, e.g.*, Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. R. 347, 356 (1967) (“an owner, by virtue of his power to exclude others...[has] incentives to utilize resources more efficiently”), and *infra* Part I.A.

¹³ *Id.*

¹⁴ Netessine & Girotra, *supra* note ____.

¹⁵ Sebastian Blanco, *Toyota Follows Tesla, Makes Hydrogen Patents Open Source*, AUTOBLOG (Jan. 5, 2015, 5:30 PM), <http://www.autoblog.com/2015/01/05/toyota-follows-tesla-makes-hydrogen-patents-open-source/> (last visited ____).

¹⁶ Jack Ellis, *LG has as Much to Gain from its Open Innovation Drive as Korea’s SMEs*, IAM (Feb. 13, 2015), <http://www.iam-magazine.com/blog/Detail.aspx?g=c4010b69-e529-48ce-b83f-dc2bce3d763c> (last visited ____).

¹⁷ <http://www.iam-media.com/Blog/Detail.aspx?g=0a884580-e30f-4d5a-a827-786dd0b10316>

¹⁸ *Id.*

¹⁹ http://bits.blogs.nytimes.com/2015/03/29/open-sourcing-cars-and-computers/?_r=0

²⁰ <http://www.coindesk.com/blockstream-open-source-code-sidechains/>

But while notable, Tesla’s move to share technology was not original. Patent licensing is an old and well-known way for permitting others –exclusively and nonexclusively– to practice one’s technology, for money.²¹ Defensive patenting – holding patents in order to facilitate freedom to operate, but without the exchange of money – is practiced by an estimated half of patent holders.²² Others have opened up their technology without strings. When a Volvo engineer invented the three-point seatbelt in 1959, the company dedicated the invention to the public, for the safety of all.²³ At the turn of the 18th century, Benjamin Franklin refused to patent what came to be later known as the Franklin stove, writing, “as we enjoy great advantages from the invention of others, we should be glad for an opportunity to serve others by any invention of ours.”²⁴

Across industries, contexts, and settings, modern examples abound of creative people coming up with ideas and, rather than practicing them exclusively, allowing and in some cases even inducing others to adopt them.

For example, Lego Mindstorms, kits that can be used to create programmable robots, were designed in a lab at MIT, not in a toy factory in Denmark.²⁵ Magic Erasers are made of a material originally marketed for soundproofing and insulation by the German company BASF.²⁶ Recently, companies like Google, DuPont, IBM, GE, and Pfizer have taken steps to share their technology with others.²⁷ The Linux Defenders program creates “defensive patent publications” in an attempt to put open source technologies into the public domain.²⁸

²¹ <http://www.hbs.edu/businesshistory/Documents/BHR870102.pdf>

²² See *infra*, Figure 1 and accompanying cites.

²³ Tony Borroz, *Strapping Success: The 3-Point Seatbelt Turns 50*, WIRED (Aug. 13, 2009), <http://www.wired.com/2009/08/strapping-success-the-3-point-seatbelt-turns-50/> (last visited ____).

²⁴ BENJAMIN FRANKLIN, *THE AUTOBIOGRAPHY OF BENJAMIN FRANKLIN* 215 (1791)

²⁵ *Lego Success Built on Open Innovation*, IDEA CONNECTION, <http://www.ideaconnection.com/open-innovation-success/Lego-Success-Built-on-Open-Innovation-00258.html> (last visited ____).

²⁶ Larry Huston & Nabil Sakkab, *Connect and develop*, 84 HARV. BUS. REV. 58 (2006).

²⁷ See *PAI’s Comments on the New Strategy for American Innovation*, PARTNERSHIP FOR AMERICAN INNOVATION (Sept. 23, 2014) (describing specific steps its member companies have taken to support open and collaborative innovation) and Part II.D., *infra*.

²⁸ *About Linux Defenders*, LINUX DEFENDERS, http://www.linuxdefenders.org/?page_id=167 (last visited ____).

These examples are indicative of broader trends. While innovation by exclusion – the use of patents to exclude rivals and others during the term of the patent – remains important, a mounting body of evidence challenges the assumption that the exclusive practice of one’s own patents is the only, or even primary way that patents encourage innovation today. Consider the following:

- Nearly 50% of manufacturers report that their most important new product originated from an outside source, and that patented inventions were among the most valuable inputs;²⁹
- 45%-60% of companies say that accessing the technology of others motivates them to acquire patents;³⁰
- Biopharmaceutical companies signed \$32B worth of licenses in 2014;³¹ and over a third of biotech startups license in technology.³²

The patent system has always supported the spread of technology through the greater availability of the patented product and placement of technology in the public domain when the patent has expired,³³ and the transferability of patent rights from one innovator to another. However, as in other property systems,³⁴ certain forms of patent sharing are not well-supported. If patent owners want to waive their rights unilaterally, for example they can do so by announcement, blog post, or other informal mechanism, but the legal status of their commitments is uncertain.³⁵ Does Musk’s blog post represent his personal commitment or does it bind the company if he departs? What if Tesla changes its mind, is bought, or goes bankrupt? The lack of answers to these questions has the potential to substantially limit the uptake of Tesla’s

²⁹ Ashish Arora, Wesley M. Cohen, & John P. Walsh, *The Acquisition and Commercialization of Invention in American Manufacturing: Incidence and Impact* (Nat’l Bureau of Econ. Res., Working Paper No. 20264, 2014).

³⁰ See, *infra*, Figure 1, and related cites.

³¹ Survey, The Boston Consulting Grp., 2014 Biopharmaceutical Partnering Survey (Jan. 9, 2015), <http://www.slideshare.net/TheBostonConsultingGroup/2014-biopharmaceutical-partnering-survey> (reporting 559 deals x \$57M upfront deal value, slides 5 and 6).

³² 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. 255 (2009).

³³ Described *supra*, at Part _ (reference section in which Ordoover is discussed)

³⁴ The importance of inclusion, and social uses of property has been discussed e.g. in THOMAS W. MERRILL & HENRY E. SMITH, *PROPERTY: PRINCIPLES AND POLICIES* 449 (2d ed. 2012) (“[I]t is important not only to be able to exclude other persons from the thing, but also to be able to include other persons in the use and enjoyment of the thing...”); J.E. PENNER, *THE IDEA OF PROPERTY IN LAW* 75 (1997) (“[U]nderstanding the social use of property . . . must be as fundamental to understanding property as understanding the way in which property excludes.”). See also Daniel Kelley, *The Right to Include*, 63 EMORY L.J. 857 (2014).

³⁵ For discussions of the challenges of enforcing patent promises, see Robert P. Merges & Jeffery M. Kuhn, *Estoppel Doctrine for Patented Standards, An*, 97 CAL. L. REV. 1 (2009); Jorge L. Contreras, *A Market Reliance Theory for FRAND Commitments and Other Patent Pledges*, __ UTAH L. REV. __ (forthcoming 2015).

technology. Neither are there easy ways for innovators to put their technologies in the public domain and ensure that they won't be patented by others, nor let the world know that their technologies are available for licensing.³⁶

As such, there is a risk that innovation by diffusion – innovation in which the invention, or other key input to the innovation process, is spread from one source to another– is happening less than would be socially optimal. The economic evidence already shows that, while patents are generally sought for exclusion, they are less important than other means, like lead-time and secrecy, for appropriating returns to innovation.³⁷ As innovation becomes increasingly collaborative, spurred by a reduction in the cost of communication and computing and an increase in the technological complexity of products,³⁸ there may be a significant opportunity to enlarge the innovation-inducing role of the patent system by enhancing its support for collaboration, with profound social consequences as well.³⁹

Part I explores the theory, doctrine, and evidence regarding the role of exclusion in the patent system and how it exclusionary and diffusory motives. Part II explores non-exclusionary modes of innovation, and “innovation by diffusion,” which is based on the sharing of ideas. Three case studies– of open innovation in manufacturing based on important work done by Ashish Arora and his colleagues, of markets for technology, and of defensive patenting– illustrate the growing significance of innovation by diffusion, and the equally important role of the patent system in supporting these forms of innovation. Part III articulates a novel “diffusion” framework and applies it to three diffusive mechanisms of the patent system – disclosure, transfer, and freedom to operate.

Building upon Parts II and III, Part IV discusses largely overlooked ways that the patent system could be reformed to support the greater diffusion of technical information and permissions. For example, removing legal barriers to reading patents, making it easier to place inventions in the public domain through effective defensive publication, encouraging greater

³⁶ Discussed *infra*, at Part III.D. Accord Michael Risch, *Licensing Acquired Patents*, _____ (emphasizing the importance of timing to the disclosure of such information),

³⁷ See *infra*, Table 1 (showing lead time and sales/service as ranking above patents as means of appropriation).

³⁸ Described, e.g., in *Patents and Innovation: Trends and Policy Challenges*, OECD (2004)

<http://www.oecd.org/science/sci-tech/24508541.pdf>, at 16.

³⁹ Discussed *infra*, at Part II.D.

disclosure of patent-product relationships through the marking requirement, and changing the default for provisional patent applications to be open rather than closed, and for utility applications to publish upon filing, rather than after an 18-month delay, but with the right of inventors to opt-out of this default, would enhance patent disclosure. Improving reporting and discovery of patent information, including ownership, availability for licensing, licensing status in the case of publicly funded inventions in accordance with existing law, patent licenses, and standards commitments, could boost markets for technology. Making it easier to waive patent rights and rely on waivers of patent rights, through the creation of a government registry of patent rights, and creating a “freedom to operate” option that allows patentees to pay discounted maintenance fees in exchange for promising to use their patents only defensively, akin to “license of right” schemes in the UK and Germany, would increase freedom to operate. Part V concludes.

Part I: The Role of Exclusion in the US Patent System

A patent is a legal instrument that bestows a set of exclusive rights to its owner upon successful application to the patent office. It is also a social bargain.⁴⁰ Society gets the innovation, and, in the patent document, a complete description of a novel invention that others can learn from.⁴¹ This, all in exchange for one thing – a set of rights to exclude others. Supported by this basic legal framework, the patent system has created opportunities to foster innovation through exclusion and diffusion. In this first part of this paper, I discuss the role of exclusion in the patent system, in theory and in practice, to be followed by an exploration of the role of the patent system in facilitating innovation through diffusion.

Granting patents has always been associated with taking away the rights of others. The Venetian Patent Act of 1474, the first of its kind,⁴² promised patentees that it would be “forbidden into every other person in any of our territories and towns to make any further device conforming with [the patented device]...”⁴³ The first American patent law gave patentees “the

⁴⁰ See, e.g., *Pfaff v. Wells Elecs.*, 525 U.S. 55, 63 (1998) (“the patent system represents a carefully crafted bargain that encourages both the creation and the public disclosure of new and useful advances in technology, in return for an exclusive monopoly for a limited period of time”)

⁴¹ Penrose & Machlup, *supra* note ____, at 10-11.

⁴² Fritz Machlup, *Report to Subcomm. on Patents, Trademarks, and Copyrights of the Senate Judiciary Comm.: An Economic Review of the Patent System, Study No. 15*, 85th Cong., 2d Sess. 1 (1958).

⁴³ Giulio Mandich, *Venetian Origins of Inventors’ Rights*, 42 J. PAT. OFF. SOC’Y 378, 379 (1960).

sole and exclusive right and liberty of making, constructing, using and vending to others to be used, the said invention or discovery.”⁴⁴ The statute conferred the full suite of property rights – to use and possess, as well to exclude.⁴⁵ However in the 20th century, property theory, under the influence of legal realists and prominent thinkers like Wesley Hohfeld, evolved to support the concept of property as a “bundle of rights.”⁴⁶ The right to exclude (one stick) became separable from the other sticks of use, possession and enjoyment.⁴⁷

Today, the law gives patent owners the rights to exclude others from making, using, selling, offering to sell, and importing the patented invention.⁴⁸ Many aspects of the patent system, both in theory and in practice, flow from this exclusionary focus.

A. Patent Law’s Exclusionary Focus

1. Theory

Patent law’s exclusionary bent follows from patents as a form of property. According to Locke’s oft-cited “Labour Theory of Property,” man has a natural property right over his person, and by extension, the fruits of his labor.⁴⁹ When man takes from nature, and mixes his labor with it, he removes it from the common state and “excludes the common right of man” from it.⁵⁰ Natural rights justifications have been applied to intellectual property, which is shaped out of facts, ideas, and scientific, technical and other insights that belong to all,⁵¹ though not without criticism.⁵² Securing exclusive rights to inventors, who serve society through their creations, is also fair and just;⁵³ preventing others from free-riding off the work of inventors.⁵⁴

⁴⁴ Patent Act of 1790, Ch. 7, § 1, 1 Stat. 109, 110 (repealed 1793).

⁴⁵ See e.g., 1 WILLIAM BLACKSTONE, COMMENTARIES *134 (defining property as that which “consists in the free use, enjoyment, and disposal of all his acquisitions”); see Mosoff, *supra* note ___ at 350-360 (tracing the history of such conceptions of property).

⁴⁶ For a description of this evolution, see Kelley, *supra* note ___, at 863-865.

⁴⁷ *Id.*

⁴⁸ 35 U.S.C. §271(a) (enacted as part of the 1952 Patent Act).

⁴⁹ JOHN LOCKE, SECOND TREATISE ON GOVERNMENT ___ (1689)

⁵⁰ *Id.*

⁵¹ See ROBERT P. MERGES, JUSTIFYING INTELLECTUAL PROPERTY 21 (2011).

⁵² Chief among is these is the characteristic of ideas as cumulative, making it difficult to delineate the fruits that are directly attributable to one’s labor, and the inability of independent inventors to practice their own inventions. See, e.g., WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 4-5 (2003).

⁵³ See, e.g. Machlup & Penrose, *supra* note ___, at 10.

The dominant, utilitarian account of the system justifies patents on the basis that exclusion incents investment in the creation of new knowledge.⁵⁵ Knowledge has properties that distinguish it from tangible property – first that it is nonrival; as Thomas Jefferson explained in a famous letter, “he who receives an idea from me, receives instruction himself without lessening mine.” Second, knowledge is “nonexcludable,” or in Jefferson’s words, made by nature “expansible over all space...and, like the air...incapable of confinement or exclusive appropriation.”⁵⁶ These “public good” characteristics mean that the gains associated with new knowledge can’t be reserved to its producers.⁵⁷ Protection against imitators, is necessary because “he who has no hope that he shall reap will not take the trouble to sow.”⁵⁸ The right to exclude hedges against the underproduction of knowledge.⁵⁹

Finally, exclusive rights are thought to promote the efficient use of resources, once created. According to Demsetz, exclusive rights in property provide incentives to maintain and improve property, in response to market signals that reflect social welfare.⁶⁰ Patents also create “prospects” that facilitate efficient investments in innovation, Kitch has written.⁶¹ For inventions that can be easily imitated, they enable the expenditures needed to bring the product to market.⁶²

2. Motives to Patent

The exclusionary thrust of the US patent system is reflected not only in theory, but also in practice. When asked why they patent, companies consistently answer, to prevent copying and block patenting by others. Figure 1 shows the responses of two surveys. 96% of the 1,474 R&D managers surveyed by Cohen and his colleagues indicated that preventing copying motivated the

⁵⁴ See, e.g. Sigrid Sterckx, *The Moral Justifiability of Patents*, 13 J. EUR. ETHICS NETWORK 249, 255 (2006) (“The establishment of a patent system is justified because it would be unfair to allow people a ‘free ride’ at the expense of others who apply themselves to the act of inventing.”)

⁵⁵ SUZANNE SCOTCHMER, *INNOVATION AND INCENTIVES* 38 (2004) (“Intellectual property protection gives innovators an incentive to invest in new knowledge.”).

⁵⁶ *Letter from Thomas Jefferson to Isaac McPherson* (Aug. 13, 1813), in 6 THE WRITINGS OF THOMAS JEFFERSON 175, 181 (H.A. Washington ed., New York, Riker, Thorne & Co. 1855).

⁵⁷ Joseph E. Stiglitz, *Knowledge as a Global Public Good*, in GLOBAL PUBLIC GOODS: INTERNATIONAL COOPERATION IN THE 21ST CENTURY 308, 308 (1999).

⁵⁸ Jeremy Bentham, *A Manual of Political Economy*, in THE WORKS OF JEREMY BENTHAM, VOL. III 71.

⁵⁹ Stiglitz, *supra* note ____, at 311.

⁶⁰ Demsetz, *supra* note ____, at 354-459.

⁶¹ Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 271-75 (1977).

⁶² *Id.*

acquisition of their last product innovation patent,⁶³ while 82% of respondents elected the next highest-ranked answer, the prevention of patenting by others, or “blocking.”⁶⁴ 86% of the 7,933 American inventors surveyed by Nagaoka and Walsh⁶⁵ selected as a reason to patent, enhancing exclusive exploitation of the invention, the top answer, followed by “blocking,” which was selected as by 70% of respondents.⁶⁶ Likewise, among reasons for getting patents, the Berkeley Patent Survey, of young technology firms, found that “prevent[ing] others from copying our

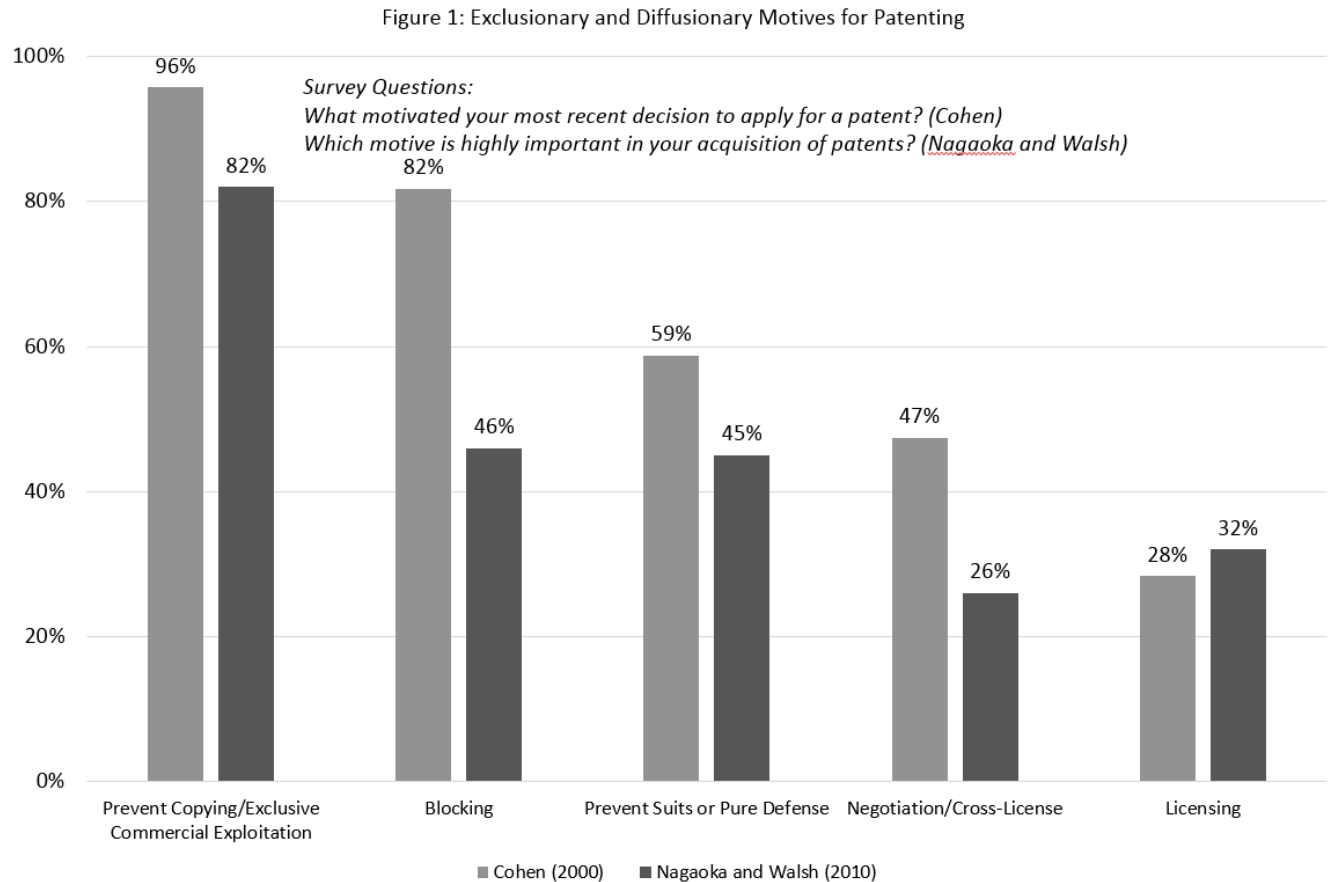
⁶³ Wesley M. Cohen et al., *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (Or Not)* (Nat'l Bureau of Econ. Research, Working Paper No. 7552, 2000), at Figs. 7-8.

⁶⁴ Patent blocking can be motivated by a desire to exclude competitors from a particular area, or done in order to facilitate cross-licensing and create greater freedom to operate. *Id.* at 21-23. Preventing copying and blocking were the top answers, respectively, for process invention patents too. *Id.* at Figs. 7-8

⁶⁵ Sadao Nagaoka & John P. Walsh, *Commercialization and Other Uses of Patents in Japan and the U.S.: Major Findings from the RIETI-Georgia Tech Inventor Survey*, RIETI, IAA (Mar. 2009) (describing the results of a survey of inventors of “triadic patents” – patents whose applications were filed in both the Japanese Patent Office and the European Patent Office and granted in the United States Patent).

⁶⁶ *See id.* at Figure 13.

products or services” was the most important reason for getting patents.⁶⁷



3. Doctrine – Default to Exclusion

The surveys support the theory – that the purpose of patents is to guard against imitation. So does legal doctrine, primarily by securing to owners of valid and infringed patents with rights to exclude. These rights are only meaningful if they cannot be easily avoided by making slight changes to the product or “designed-around.”⁶⁸ As a result, patent law features a “broad exclusionary rule.”⁶⁹ This means that a successful applicant for a patent injunction (not all

⁶⁷ Graham et al. *supra* note __ at Figs. 2-3; Accord Gaétan de Rassenfosse et al., *Motivations to Patent: Empirical Evidence from an International Survey*, at Table 1 (reporting that, “to prevent imitation by competitors,” was the top motivator for getting patents among 604 respondents to a survey sent to randomly selected applicants of European Patent Office (EPO) patents).

⁶⁸ Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, n47 (1997) (describing the design-around of patents as the use of the claims of a patent “as a guide for deciding what to avoid in producing a competing product.”)

⁶⁹ Liivak, *supra* note __, at 1662.

applicants are)⁷⁰ can exclude others from practicing not just what the patentee herself did, but what she describes and claims in the patent, even as that scope changes and enlarges over time and comes to encompass technology that did not exist at the time of the invention.⁷¹

A preference for exclusion also means that a product that incorporates thousands of patents may be excluded on the basis of the infringement of a single one.⁷² “Patent hold-up,” when the patentee has undue bargaining power based not on the value of the patented technology, but the high cost of replacing it, once it has been embedded into a product,⁷³ has also concerned policymakers.⁷⁴ “Proportionality” concerns in property are not unique to patent law. As Nozick famously asked “If own a can of tomato juice and spill it in the sea...do I thereby come to own the sea?”⁷⁵

Patent law’s default to exclusion has created other paradoxes. Though patent law requires inventors to put details about their inventions in their patents, it discourages others from reading these details. Under the doctrine of “willfulness,” infringers owe up to triple damages when they act “despite an objectively high likelihood,”⁷⁶ of infringement, and that the “objectively-defined risk [] was... known.”⁷⁷ Actual knowledge of the patent enhances the penalty for infringement.⁷⁸ This leads many to avoid reading patents,⁷⁹ in effect “undermin[ing] the disclosure function that is at the foundation of the patent system.”⁸⁰

⁷⁰ Chien and Lemley, *supra* note ___, at 268

⁷¹ See Kitch, *supra* note ___, at 268 (providing an illustration of this breadth based on a fat separation process); see also Kevin Collins, [add cite].

⁷² See, e.g. Colleen V. Chien & Mark A. Lemley, *Patent Holdups, the ITC, and the Public Interest*, 98 CORNELL L. REV. 1,6 (2011). (discussing the harm to consumers that comes from blocking many lawful features, and among them, one infringing one)

⁷³ Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991 (2007)

⁷⁴ See, e.g. FED. TRADE COMM’N, *THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION*, 137-212 (2011)

⁷⁵ Nozick, *supra* note ___, at 175. See also, William Fisher, *Theories of Intellectual Property*, HARVARD LAW, <http://www.law.harvard.edu/faculty/tfisher/iptheory.html> (discussing Lockean concerns about proportionality and fairness)

⁷⁶ See *In re Seagate Tech.*, 497 F.3d 1360, 1371 (Fed. Cir. 2007)

⁷⁷ *Id.*

⁷⁹ Compare, e.g., Mark A. Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19, 21 (describing the practice among component technology companies and researchers of ignoring patents), with Lisa Ouellette, *Do Patents Disclose Useful Information*, 25 HARV. J.L. & TECH. 531, 565 (2012) (finding that few academic nanotechnology researchers surveyed indicated that they worried that reading patents could have negative legal effects); see also *infra* Part III.B., regarding the reading of patents across different industry settings, despite willfulness risks.

⁷⁹ Compare, e.g., Mark A. Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19, 21 (describing the practice among component technology companies and researchers of ignoring patents), with Lisa Ouellette, *Do Patents Disclose Useful Information*, 25 HARV. J.L. & TECH. 531, 565 (2012) (finding that few academic nanotechnology researchers

B. Structural Limits to Excluding

In theory and by design, then, the patent system offers exclusion as a way for inventors to recoup investments in R&D and commercialization. But how does it fare in practice? For a patent to prevent or deter copying of the patent owner's product, the stars must align in several ways. First, the patent must be in force at the same time that it is being practiced. The match between patent and infringer's product must be discernable. The patent must be credibly enforceable – which, in turn, turns on the owner's willingness and ability to bring a suit. All of these facts influence the extent to which patents can be used for their intended purpose, to exclude. In the paragraphs that follow I describe the structural limits to using patents to exclude.

1. Timing

Once issued, a patent gives its owner up to 20 years of exclusivity starting from the time of filing.⁸¹ As a legal instrument, then, patents naturally support the “linear model of innovation,” according to which a single actor conceives of and takes all the steps necessary to bring an idea to market.⁸² Invention, the conceptualization of a new and nonobvious product or process, starts the process. Innovation, taking an invention, and developing, improving, adopting and commercializing it follows. Once there is a product, it can be sold and diffused through the market.⁸³

The exclusive rights of patents can hasten progress along several stages of the linear model.⁸⁴ But innovation is often much more chaotic and unpredictable.⁸⁵ Novel ideas may prove

surveyed indicated that they worried that reading patents could have negative legal effects); *see also infra* Part III.B., regarding the reading of patents across different industry settings, despite willfulness risks.

⁸⁰ Mark A. Lemley & Ragesh K. Tangri. *Ending Patent Law's Willfulness Game*, 18 BERKELEY TECH. L.J. 1085, 1125 (2003).

⁸¹ US Patents are generally eligible for up to 20 years of protection, though extensions may be available to compensate for regulatory or processing delays. However, owners may also forgo protection by simply failing to pay their “maintenance fees,” which are required to keep their patents in force. Maintenance fees are due at 3 ½, 7 ½ and 11 ½ years after the patent has issued. *Maintain Your Patent*, USPTO, available at <http://www.uspto.gov/patents-maintaining-patent/maintain-your-patent> (last visited ____).

⁸² *See, e.g.*, Kline & Rosenberg, *supra* note __, at 285-289.

⁸³ JOSEPH A. SCHUMPETER, *BUSINESS CYCLES, A THEORETICAL, HISTORICAL, AND STATISTICAL ANALYSIS OF THE CAPITALIST PROCESS* 149 (2d ed. 1947) (describing the three phases of innovation).

⁸⁴ *Id.*

⁸⁵ Kline & Rosenberg, *supra* note __, at 283 (describing the view that innovation is a well-defined, predictable, homogeneous process, “serious[ly] mistake[n].”)

to be economic dead-ends.⁸⁶ The path to the market often includes interruptions and delays. 35, 153, 29 years, respectively, elapsed between the first patentability and commercialization of the television, jet engine, and helicopter.⁸⁷ It took 264 years for the insight that scurvy, a common disease among sailors that caused gum decay and often, death, could be prevented by vitamin C, to fully diffuse.⁸⁸ Many lives were lost in the interim. But the patent clock, once started, cannot be stopped, and the incentive to diffuse the invention may also get lost in the interim. Scholars have blamed the 20-year fixed patent-term as being too short to support the development, for example, of therapies to prevent or treat early stage cancer.⁸⁹

2. Matching Products to Patents

Even when patents are timely, they can only exclude when there is something to exclude. Yet the majority of patents is not practiced.⁹⁰ Even when they are, they must be matched to products, a task that can be challenging. For example, it is easier to tell whether a competitor is selling a particular product than whether they are using a particular process, making product patents more effective than process patents for appropriating value from invention.⁹¹ Because the ease of detection is not necessarily correlated with social value, the comparative excludability of patents introduces potentially undesirable distortions into the innovation ecosystem.⁹²

3. Enforceability and Enforcement of Patents

To exclude, patentees not only be able to detect infringement but also, have the resources and will to enforce their patents. To enforce a patent is expensive,⁹³ with reputational

⁸⁶ *Id.* at 283 (contrasting the intellectual nature of invention with the economic nature of innovation); Michele Boldrin, & David K. Levine, *Rent-Seeking and Innovation*, 51 JOURNAL OF MONETARY ECONOMICS 127 (2004) (calling the idea that pure or disembodied “ideas” have economic and productive value “patently false”).

⁸⁷ Kitch, *supra* note ___, at Table 1.

⁸⁸ Frederick Mosteller, *Innovation and Evaluation* 211 SCIENCE, No. 4485, 881, 882 (Feb. 27, 1981)

⁸⁹ Eric Budish, Benjamin Roin, & Heidi Williams, *Do Fixed Patent Terms Distort Innovation?*, (Nat’l Bureau of Econ. Res., Working Paper No. 19430, 2013).

⁹⁰ Kline & Rosenberg, *supra* note ___, at 276 (the “overwhelming majority” of patented inventions is never commercialized), accord Ted Sichelman, *Commercializing Patents*, 62 Stan. L. Rev. 341, 343.

⁹¹ See, e.g., Cohen et al., *supra* note ___, at Table 1 reporting lower across the board numbers for process as opposed to product patents as sources of appropriability.).

⁹² Syed & Kapczynski, *supra* note ___, at 1942.

⁹³ Am. Intell. Prop. Law Ass’n, Law Practice Mgmt. Comm., Report of the Economic Survey I-129-I-132 (2013). (reporting that the average cost of a patent infringement suit where less than \$1 million is at risk is \$968,000 inclusive of all costs, per side and more for higher value disputes).

consequences.⁹⁴ Because a patent’s validity can be questioned even after it is granted, patentees subject their patents to attacks when they try to enforce – losing 42% of the time in court,⁹⁵ and around 77% of the time, on all claims at issue, in certain proceedings before the USPTO.⁹⁶ Given these expenses and odds, it’s no wonder the patent system is said to be characterized by “pervasive noncompliance and nonenforcement.”⁹⁷

C. Patents as Mechanisms of Appropriation

None of the evidence reviewed thus far supports that patents are never effective at deterring imitation. In fact, the data shows that patentees believe the opposite, and are seeking patents to do so.⁹⁸ The literature nonetheless identifies several limits to using patents as intended, as described above.

⁹⁴ Colleen V. Chien, *From Arms Race to Marketplace: The Complex Patent Ecosystem and Its Implications for the Patent System*, 62 HASTINGS L.J. 297, 291 (describing the economics of patent enforcement).

⁹⁵ John R. Allison, Mark A. Lemley & David L. Schwartz, *Understanding the Realities of Modern Patent Litigation*, 92 TEX. L. REV. 1769 (Figure 4) (2014).

⁹⁶ Brian J. Love & Shawn Ambwani, *Inter Partes Review: An Early Look at the Numbers*, 81 U. CHI. L. REV. 93 (2014) (based on the first two years of adjudications).

⁹⁷ Rebecca Eisenberg, *Patent Costs and Unlicensed Use of Patented Inventions*, 78 U. CHI. L. REV. 53, 59 (2011).

⁹⁸ See *supra*, Part I.A.1.2.

Table 1: How Important are Patents, Relative to Other Mechanisms, for Appropriating or Protecting Competitive Advantages? (Relative Rank)

Levin (1987) ⁹⁹	Cohen (2000) ¹⁰⁰	NSF 2008 ¹⁰¹ (R&D firms)	Nagaoka and Walsh (2010) ¹⁰²
1. Sales/Service Efforts	1. Lead Time	1. Trade Secret	1. First Mover Advantage
2. Lead time	2. Secrecy	2. Trademark	2. Complementary Manufacturing
3. Learning	3. Complementary Manufacturing	3. Copyright	3. Complementary Sales/Service
4. Patents to prevent duplication	4. Complementary Sales/Service	4. Utility Patent	4. Secrecy
5. Patents to secure royalties	5. Patents	5. Design Patent	5. Patent Enforcement
6. Secrecy	6. Other Legal		6. Collaboration
			7. Product/Process complexity

The data on how patents are actually used, as compared to the reasons that patents are sought, reinforce these limits. A number of studies have probed the relative importance of patents to companies. These studies have generally found the answer to be, less important than other means of appropriation (Table 1) although with some industry variation. In the Berkeley Patent Survey, young biotechnology company respondents rated patents as more important than other forms of appropriation,¹⁰³ however, Cohen’s survey in 2000 of companies found that in no industry were

⁹⁹ Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 18 BROOKINGS PAPERS ON ECONOMIC ACTIVITY 783 (1987), Table 1 and 792-793. (showing the mean ratings given to patents and other mechanisms for protecting products, based on a survey of 650 public companies with R&D expenses in excess of 1% or \$35M).

¹⁰⁰ Cohen et al., *supra* note ____, at Fig.1 (showing the mean percentage of product innovations for which a variety of mechanisms, including patents, were considered effective).

¹⁰¹ John E. Jankowski, *Business Use of Intellectual Property Protection Documented in NSF Survey*, INFOBRIEF NATIONAL CENTER FOR SCIENCE AND ENGINEERING STATISTICS (Feb. 2012), Figure 2 (showing the share of businesses that reported that a form of intellectual property right was very or somewhat important, based on a survey of firms with R&D activity).

¹⁰² Nagaoka & Walsh, *supra* note ____, at Fig. 11 (showing the share of survey respondents who rated the appropriation strategy highly).

¹⁰³ Graham et al, *supra* note ____ at Figure 1.

patents more important than secrecy or lead-time, including drugs, basic chemicals, and miscellaneous chemicals.¹⁰⁴

D. Revisiting the Balance of Exclusion and Diffusion in the Patent System

Taken together, the theory and evidence present an acknowledged paradox.¹⁰⁵ According to the dominant, utilitarian rationale, the reason we have a patent system is to incent the cultivation and disclosure of innovation. The right to exclude – the only right that a patent holder gets – is the mechanism by which the system stimulates this innovation. Because they think patents can deter copying, innovators file for patents. (Figure 1).

But a funny thing can happen on the path between the patent office and the market. Many, likely most patented inventions aren't ever commercialized. Existing products are often not covered by patents. And whether a competitor is actually infringing may be hard to detect, or not within a company's interest or business plan to determine, and then act upon. And so, during the lifetime of a patent, the objective of excluding others with patents can recede, and other objectives can emerge, in importance.

Tesla's experience fits this pattern. Tesla originally got patents, "out of concern that the big car companies would copy our technology,"¹⁰⁶ reinforcing the instinct shared by most innovators– to use patents to prevent imitation.¹⁰⁷ However, over time, Tesla discovered "[w]e couldn't have been more wrong. The unfortunate reality is the opposite: electric car programs [] at the major manufacturers are small to non-existent."¹⁰⁸ However, just because Tesla is abandoning the desire to prevent copying, it isn't abandoning its patents. Instead, it is using them to encourage adoption of its technology and for defensive purposes.¹⁰⁹ In the meantime, Tesla

¹⁰⁴ Cohen et al, 2000, *supra* note ___ at Table 1 and 2.

¹⁰⁵ See, e.g., Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1, 2 (2005) (describing the "patent paradox" as the dramatic rise in "patent intensity—patents obtained per research and development dollar" ... "even as the expected value of individual patents has diminished"); Bronwyn H. Hall and Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study Of Patenting In The U.S. Semiconductor Industry, 1979-1995*, 32 RAND J. ECON. 101 (2001) (studying the "patent paradox" of "the gap between the relative ineffectiveness of patents (as reported in surveys) and their widespread use").

¹⁰⁶ See Musk, *supra* note ___.

¹⁰⁷ See *supra*, Part I.A.1.

¹⁰⁸ See Musk, *supra* note ___.

¹⁰⁹ *Patent Pledge*, TESLA MOTORS, <https://www.teslamotors.com/about/legal> (last visited ___) (defining what it means for a party to not act in good faith as asserting patents against Tesla, challenging Tesla patents, or knocking off Tesla's trademark).

has also used its patents to secure financing.¹¹⁰ Though not the primary reason Tesla acquired patents, these non-exclusionary uses promote innovation at the company.

In the next section I consider the economic importance of “innovation by diffusion,” which depends on the spread of technical knowledge from one setting to another, as another important way in which the patent system can support innovation.

Part II: The Case for Supporting Innovation by Diffusion

The innovation by exclusion story in which patents are used to exclude rivals fits well the “linear model of innovation” in which the stages of innovation happen within the boundaries of a single firm.¹¹¹ But this model has been described as increasingly “less accurate.”¹¹²

A. Defining Innovation by Diffusion

If innovation doesn’t always follow a linear path, what path does it follow? In this Part, I explore nonexclusionary models of innovation, or what I call “innovation by diffusion.” What is “innovation by diffusion”? Diffusion is the spread of an idea, product, practice, or other cultural element as it disseminates or “takes off” throughout society.¹¹³ Or more precisely, “the process by which an innovation is communicated through certain channels over time among members of a social system.”¹¹⁴ I define innovation by diffusion, then, as innovation in which the invention, or other key input to the innovation process, comes from an external source.

As new innovations drive economic growth and promote social welfare, understanding the mechanisms and organization of innovation and its diffusion are of broad interest.¹¹⁵ An

¹¹⁰ Jack Ellis, *Despite the patent ‘giveaway,’ Tesla has been Monetising its Portfolio All Along*, IAM (June 27, 2014), <http://www.iam-magazine.com/Blog/Detail.aspx?g=b6ef62d3-99a7-4637-bea6-c696c61810b1> (last visited ____).

¹¹¹ *Supra* Part I.B.2; see also Benoît Godin, *The Linear Model of Innovation: The Historical Construction of an Analytical Framework* (Project on the History and Sociology of S&T Statistics, Working Paper No. 30, 2005).

¹¹² See Arora et al., *supra* note __, at 2.

¹¹³ See, e.g., Diffusion – Definition, MERRIAM-WEBSTER, <http://www.merriam-webster.com/dictionary/diffusion> (defining diffusion as “the spread of cultural elements from one area or group of people to others by contact”); THOMAS W. VALENTE, NETWORK MODELS OF THE DIFFUSION OF INNOVATIONS [pincite needed] (1995) (defining the diffusion of innovation as “how ideas, products and opinions ‘take off’ and spread throughout society”).

¹¹⁴ EVERETT M. ROGERS, DIFFUSION OF INNOVATIONS (3d ed., The Free Press 1983), 5 (1962).

¹¹⁵ Studies of innovation have not been limited to a single discipline, but attempted by scholars in a number of fields. As British economist Christopher Freeman has said “Innovation is far too important to be left to scientists and technologists. It is also far too important to be left to economists or social scientists.” See CHRISTOPHER FREEMAN, THE ECONOMICS OF INDUSTRIAL INNOVATION 309 (Penguin Books) (1997). For a description of this literature, see

extensive literature has considered the inputs to innovation provided by particular outside sources, for example universities,¹¹⁶ users,¹¹⁷ and customers.¹¹⁸ When these actors are not well-positioned to commercialize their technologies, they must seek external partners to get the job done. Chesbrough's work on "open innovation" explains how looking outside has become an imperative for commercializing firms as well.¹¹⁹ In this part I discuss three case studies of innovation by diffusion, and the role of patents in facilitating the spread of both technical ideas and the permission to use them. Although drawn from variety of contexts, these case studies share two characteristics. First, innovation is happening, not because the inventor retained exclusive rights, but the opposite – because the invention spread from one setting to another. And second, the patent system is facilitating this diffusion.

B. Open Innovation in Manufacturing

Open innovation is the use of inflows of knowledge to accelerate internal innovation and the use of outflows of knowledge to expand markets for the external use of innovation.¹²⁰ It is the "antithesis of the traditional vertical integration model," where the ideas that are developed come from within a firm.¹²¹

In 2000, Proctor and Gamble (P&G), found itself in an innovation rut. R&D productivity remained flat even while innovation costs were increasing.¹²² Under the leadership of a new CEO, the company launched a new strategy, based on the insight that some of the company's best new ideas came from connecting ideas across business lines.¹²³ Insights from candles were

id. and Bronwyn Hall, *Innovation and Diffusion* (Nat'l Bureau of Econ. Res., Working Paper No. 10212, 2004) (providing an overview of the determinants of diffusion of innovation).

¹¹⁶ Edwin Mansfield, *Academic Research Underlying Industrial Innovations: Sources, Characteristics, and Financing*, 77 REV. ECON. & STAT. 55 (1995).

¹¹⁷ Eric Von Hippel, *Lead Users: a Source of Novel Product Concepts*, 32 MGMT. SCI. 791 (1986).

¹¹⁸ For an overview, see, e.g. Jacques Bughin et al. *The Next Step in Open Innovation*, 4 MCKINSEY QUARTERLY 112 (June 2008).

¹¹⁹ HENRY WILLIAM CHESBROUGH, *OPEN INNOVATION: THE NEW IMPERATIVE FOR CREATING AND PROFITING FROM TECHNOLOGY* (2005).

¹²⁰ *Id.*, at 2. (defining open innovation as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively.")

¹²¹ *Id.*

¹²² Huston & Sakkab, *supra* note ____, at 2.

¹²³ *Id.*

relevant to soap, and from soap (which is high in fat) to vegetable shortening.¹²⁴ Under this new strategy, the company would look even further, beyond the boundaries of the firm, and retool its processes to increase ideas coming not “from” their labs, but “through” their labs, including from customers and other partners.¹²⁵

Based on their novel “connect-and develop” (C&D), versus the traditional “research-and-development” (R&D), approach to innovation,¹²⁶ P&G has reported increasing the share of its product portfolio with externally sourced key elements to 45% by 2006.¹²⁷ One example is Magic Erasers, which were discovered by a technology entrepreneur within the firm who found a stain-removing sponge in a Japanese supermarket. This sponge was, in turn, based on a resin foam developed by German chemical company BASF and marketed for different uses, insulation and sound-proofing.¹²⁸ Following this initial “discovery” the product was evaluated and launched in new markets, and then used as the basis of new products developed by P&G and BASF.¹²⁹

In the transformation of its approach to innovation, P&G took advantage of the same insight that the Lego Corporation did when it embraced open innovation – that “99.99 % of the world’s most talented individuals” do not work there.¹³⁰ In Lego’s case they had the additional advantage, however, that this 99.9% “probably grew up with and continue to have a relationship with the Lego brand.”¹³¹ Lego’s turn to open innovation was driven in part by necessity – in the 1990s, the company faced threats from the growing popularity of video games and the

¹²⁴ Mark Dodgson, et al., *The Role of Technology in the Shift Towards Open Innovation: The Case of Procter & Gamble*, 36 R&D MGMT. 333, 337 (2006).

¹²⁵ See Huston & Sakkab, *supra* note __, at 2.

¹²⁶ See Dodgson et al., *supra* note __, at 337.

¹²⁷ See Huston & Sakkab, *supra* note __, at 3.

¹²⁸ See Dodgson et al., *supra* note __, at 337.

¹²⁹ *Id.*

¹³⁰ Steven Kerestegian, *Open Innovation at the LEGO Group*, PIONEERS, <http://pioneers.io/blog/2013/11/21/open-innovation-lego-group/> (last visited ____).

¹³¹ *Id.*; see also Karim R. Lakhani & Jill A. Panetta, *The Principles of Distributed Innovation*, 2 INNOVATIONS 97 (2007) (citing the maxim in business attributed to Sun co-founder Bill Joy, “No matter who you are, most of the smartest people work for someone else.”).

Internet.¹³² Lacking experience in interactive toys, they worked with outside partners to develop Lego Mindstorms – programmable bricks equipped with sensors.¹³³

Open innovation programs in the private and public¹³⁴ sectors have blossomed in recent years. But until recently, it has been unclear whether or not these examples are at the periphery of mainstream innovation or indicative of broader trends.

This question was addressed by Arora and his colleagues when they asked manufacturers about the extent to which they innovated, and their sources of their ideas.¹³⁵ Probing the innovations of the 43% of firms that had recently innovated,¹³⁶ their survey focused on “new to market” innovations, such as, in food, antioxidant chocolates; in chemicals, bio-solvents; in electronics, a new sort of LCD panel.¹³⁷ The surveyors asked who originated the new to the market product. Strikingly, 49% of respondents reported that their most important new product had come from an outside source.¹³⁸ Respondents then designated the source as being either a supplier, a customer, another firm in the industry, or a technology specialist, defined as either an independent inventor, a consultant or engineering service provider, or a university or government lab.¹³⁹ While 53% of outside innovations came from customers, 37% of outside innovations were sourced from specialists, whose contributions were more economically significant.¹⁴⁰ While only a quarter of outside inventions overall were patented, specialists were much more likely to patent their inventions.¹⁴¹

¹³² David Oliver & Johan Roos, *Decision-Making in High-Velocity Environments: The Importance of Guiding Principles*, 26 ORG. STUD. 889 (2005)

¹³³ *Id.*

¹³⁴ The Obama Administration has embraced open innovation through prizes and challenges. Between September 2010 and February 2015, 72 federal agencies ran 390 challenge and prize competitions, spanning inventions ranging from super-fuel-efficient cars to quiet, practical, Green aircraft (*see, e.g., Introduction to Challenge.gov*, CHALLENGE.GOV, <http://www.challenge.gov/about>, & <http://www.challenge.gov/list/> (list of competitions) (last visited March 7, 2015)).

¹³⁵ Ashish Arora, Wesley M. Cohen & John P. Walsh, *The Acquisition and Commercialization of Invention in American Manufacturing: Incidence and Impact* (Nat'l Bureau of Econ. Res., Working Paper No. w20264, 2014).

¹³⁶ *Id.*, 3, 9-10.

¹³⁷ *Id.*, Table 1.

¹³⁸ *Id.*, Table 3.

¹³⁹ *Id.*, 13-14.

¹⁴⁰ *Id.*, 1.

¹⁴¹ *Id.* at 16. 52% of independent inventor generated inventions, and 42% of university inventions, were patented.

These findings suggest that the diffusion of ideas and inventions across firms is having a sizeable effect on innovation, and that the patent system is playing an important role. It is reinforced by markets for technology, described next.

C. Markets for Technology

In a market for technology, an inventor or technology owner transfers her invention to another setting, by licensing, partnering, or otherwise contracting for it to be exchanged.¹⁴² The growth of such technology markets is another indicia of the economic significance of including rather than excluding others in the practice of a patent during its term. While markets for technology are not new,¹⁴³ they have been growing faster than world GDP since the mid-1990s.¹⁴⁴ The total value of technology transactions from 1985-1997 was about \$27 billion per year, the equivalent of about 9% of total nondefense R&D spending in developed countries.¹⁴⁵ By 2002, the annual market for technology was about \$66B in the US, and about \$100B worldwide.¹⁴⁶

The bulk of technology transactions has been concentrated in a few sectors, namely chemicals, software, machinery, and engineering and professional services.¹⁴⁷ In chemicals, the licensing of products and processes has been widespread, according to various strategies.¹⁴⁸ Take the approach of BP Chemicals, for example. In an area where it is a market leader, acetic acid, it has licensed very selectively, into markets in which it would otherwise not be able to enter. But in an area characterized by more competition, polyethylene, it has licensed more extensively.¹⁴⁹ The biopharmaceutical industry has also had a long record of partnerships, signing an estimated

¹⁴² See Arora et al., *MARKETS* *supra* note __, at 78. (defining trade in technology as excluding organizational acquisitions (as in M&A), human capital, or products)

¹⁴³ Naomi Lamoreaux & Kenneth Sokoloff, *Inventors, Firms, and the Market for Technology in the Late Nineteenth and Early Twentieth Centuries*, in *LEARNING BY DOING IN MARKETS, FIRMS, AND COUNTRIES* 19 (1999).

¹⁴⁴ Ashish Arora & Alfonso Gambardella, *Ideas For Rent: an Overview of Markets for Technology*, 19 *INDUSTRIAL AND CORPORATE CHANGE* 775 (2010) (reporting that technology royalty payments have increased an average 10.7% per year from 1980 to 2003, faster than the growth in world GDP, based on OECD data).

¹⁴⁵ See Arora et al., *supra* note __, at ____.

¹⁴⁶ See Arora et al., *supra* note __, at ____.

¹⁴⁷ See Arora et al., *supra* note __, at ____.

¹⁴⁸ Ashish Arora & Alfonso Gambardella, *The Evolution of Industry Structure in the Chemical Industry*, in *CHEMICALS AND LONG TERM ECONOMIC GROWTH* (1998).

¹⁴⁹ See Arora, *supra* note __, at ____.

\$32B worth of licensing deals in 2014.¹⁵⁰ In the semiconductor industry, the growth of fabless or chipless design companies has also created opportunities to license.¹⁵¹

Universities have been an important source of technology. Earlier work estimates that 15% of new industrial products, including 31% of new pharmaceutical products, and 22% of new instrumentation products, could not have been introduced on time without university research.¹⁵² Though the university research often does not originate the invention, it leads to it. For example, research on the organic chemical properties of silicon is credited with leading to the development of industrial silicones.¹⁵³ Since 1980, when the Bayh-Dole Act was passed, making it easier for universities to patent their inventions,¹⁵⁴ partnerships with universities have reportedly created over 4,000 startups.¹⁵⁵ In 2012, university alliances reportedly led to \$36.8 billion of net product sales at 70 startups, and employed 15,741 full-time employees.¹⁵⁶ In 2003, universities originated 330 startups, and 647 in 2012.¹⁵⁷

Patents can be instrumental in such partnerships, giving patentees something to trade, and a cheaper way to transact than trade secrets afford, due to the risk of inadvertent disclosure or unprovable theft.¹⁵⁸

D. Defensive Patenting Strategies

A third way patents encourage the spread of ideas is through supporting of freedom to operate.¹⁵⁹ While it often seems that there are only two approaches for supporting innovation

¹⁵⁰ See *Boston Consulting Grp.*, *supra* note __, at 5-6.

¹⁵¹ Rosemarie Ham Ziedonis, *Don't Fence Me In: Fragmented Markets for Technology and the Patent Acquisition Strategies of Firms*, 50 *MGMT. SCI.* 804 (2004).

¹⁵² Edwin Mansfield, *Academic Research and Industrial Innovation: An Update of Empirical Findings*. 26 *RES. POL'Y* 773, Table 1 (1998).

¹⁵³ Edwin Mansfield, *Academic Research Underlying Industrial Innovations: Sources, Characteristics, and Financing*, 77 *Review of Econ. and Stat.* 55, 55. (1995).

¹⁵⁴ For an overview of the Bayh-Dole Act, see e.g., David C. Mowery & Bhaven N. Sampat, *The Bayh-Dole Act of 1980 and University-Industry Technology Transfer: a Model for Other OECD Governments?*, in *ESSAYS IN HONOR OF EDWIN MANSFIELD* 233 (2005).

¹⁵⁵ *The Bayh- Dole Act: It's Working*, AUTM, http://www.autm.net/AM/Template.cfm?Section=Bayh_Dole_Act&Template=/CM/ContentDisplay.cfm&ContentID=11603 (last visited __) *but see id.* (arguing that the Act was neither necessary nor sufficient for stimulating university spinoffs).

¹⁵⁶ *Id.* at __.

¹⁵⁷ Walter D. Valdivia, *University Start-Ups: Critical for Improving Technology Transfer*, CENTER FOR TECHNOLOGY INNOVATION AT BROOKINGS. WASHINGTON, DC: BROOKINGS INSTITUTION 13 (2013)/

¹⁵⁸ Landes & Posner, *supra* note __ at 329.

with patents – to opt-in and exclude, or to opt-out and share, intellectual property,¹⁶⁰ a widely-used approach between them is to acquire patents *in order to share*, or “defensive patenting.”

Defensive patenting is the practice of acquiring patents in order to trade with or deter assertions by others whose patents you may be practicing.¹⁶¹ In complex technology areas where advances build upon one another, competitors will often practice each other’s patents. The result is a sort of *détente*, in which each is free to access the technology of the other without having to clear the rights first. Defensive patenting gives those who need it the security to share freely about their technology, and those who want it, the ability to access and incorporate features that are patented by others.¹⁶² These freedoms come at a cost, however. The diversion of resources to patenting and the transactions costs required to support defensive patent portfolios have been called a drag on innovation, and raise the cost of entry for smaller firms without the resources to develop large, defensive portfolios.¹⁶³

Still, the importance to firms of being able to access others’ technology is reflected in survey results about the reasons for patenting previously discussed. (Figure 1) Respondents selected among a number of motives for patenting reflecting the pursuit of “freedom to operate”:¹⁶⁴ to prevent suits,¹⁶⁵ negotiate or cross-license,¹⁶⁶ and for “pure defense.”¹⁶⁷ 59% of companies in the Cohen study selected the prevention of suits, and 47% chose negotiations as a reason for patenting.¹⁶⁸ Likewise, Nagaoka and Walsh found “pure defense” to be the third most “highly”

¹⁵⁹ See 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 (2012) (providing an overview of various approaches companies have used to preserve freedom to operate).

¹⁶⁰ WALTER ISAACSON, *THE INNOVATORS*, ___ (2014). (contrasting the open source, public domain model that dominated the Internet and web, with the proprietary model followed by the hardware and semiconductor industries)

¹⁶¹ Chien, *Arms Race*, *supra* note ___, at 321.

¹⁶² See, e.g., Wesley M. Cohen et al., *R&D Spillovers, Patents and the Incentives To Innovate in Japan and the United States*, 31 RES. POL’Y 1349, 1361 (2002) (describing the acquisition of patents to secure “player” status, with access to rivals’ technology).

¹⁶³ Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in *INNOVATION POLICY AND THE ECONOMY*, VOLUME 1, 125, 127-130 (2001).

¹⁶⁴ See Rassenfosse, *supra* note ___, at Table 1.

¹⁶⁵ See Cohen et al., *supra* note ___, at Figures 7-8; see Graham et al., *supra* note ___, at Figure 2; see Rassenfosse, *supra* note ___, at Table 1.

¹⁶⁶ See Cohen et al., *supra* note ___, at Figures 7-8; see Graham et al., *supra* note ___, at Figure 2; see Nagaoka & Walsh, *supra* note ___, at Figure 13.

¹⁶⁷ See Nagaoka & Walsh, *supra* note ___, at Figure 13.

¹⁶⁸ See Cohen et al., *supra* note ___, at ___ Figures 7-8.

important reason for patenting,¹⁶⁹ after exclusive commercial exploitation and blocking. 51% of the respondents to a European Patent Office study agreed with the statement “I patent mainly to preserve my freedom of operation,” just 15% less than agreed with the statement “I patent mainly to prevent imitation by competitors.”¹⁷⁰

Exactly how many patents are primarily held for reasons of access, rather than exclusion, is unknown. But among the top 50 owners of patents,¹⁷¹ many if not most of them can be considered “high-tech” companies that depend on freedom of action in order to keep up with the rapid pace of competition. Five out of the top ten¹⁷² have taken steps to commit some or all of their patents to defensive uses, as described below.

In a quiet revolution, for example, LG Electronics has opened up tens of thousands of patents to small and medium-sized companies,¹⁷³ and Samsung, Daewoo Shipbuilding & Marine Engineering, Hyundai Motor, and Panasonic have taken similar steps.¹⁷⁴ Google, whose patent portfolio ranks eighth in the world, and Canon, which has the third most patents, have both committed to restricting the transfer of any of their patents to entities focused on patent litigation.¹⁷⁵ IBM, which has been the top filer for patents for years, as well as Sony, Google, LG Electronics, Canon, and over 1,300 other companies¹⁷⁶ are signatories to the Open Invention Network’s (OIN) “non-aggression” pact, which commits them to granting royalty-free patent licenses over Linux technology to other signatories.¹⁷⁷ OIN’s pact is true to spirit of “copyleft” licenses, which share the aim of creating a software commons, and also do so through reciprocity – requiring those who benefit from others’ forbearance to also forbear.¹⁷⁸

¹⁶⁹ See Nagaoka & Walsh, *supra* note __, at __ Figure 13.

¹⁷⁰ See Rassenfosse, *supra* note __, at Table 1.

¹⁷¹ *IFI CLAIMS 2014 Top 50 US Patent Assignees*, IFI CLAIMS PATENT SERVICES (Jan. 29, 2015), http://www.ificlaims.com/index.php?page=misc_top_50_2014 (last visited ____).

¹⁷² IBM (1st), Canon (3rd), Sony (4th), Google (8th), and LG Electronics (9th). *Id.*

¹⁷³ Ellis, *supra* note ____.

¹⁷⁴ <http://www.iam-media.com/Blog/Detail.aspx?g=0a884580-e30f-4d5a-a827-786dd0b10316>

¹⁷⁵ *LOT Agreement*, GOOGLE, <http://www.google.com/patents/licensing/lot/> (last visited ____) (activating the pledge upon any transfer, but carving out transfer to Non-Assertion Entities).

¹⁷⁶ *The OIN Community*, OPEN INVENTION NETWORK (2015), <http://www.openinventionnetwork.com/community-of-licensees/> (listing 1,279 licensees as of 3/15/2015).

¹⁷⁷ *OIN License Agreement*, OPEN INVENTION NETWORK (May 1, 2012), <http://www.openinventionnetwork.com/joining-oin/oin-license-agreement/> (last visited ____).

¹⁷⁸ Lydia P. Loren, *Building a Reliable Semicommons of Creative Works: Enforcement of Creative Commons Licenses and Limited Abandonment of Copyright*, 14 *Geo. Mason L. Rev.* 271, 284-285 (2006).

The economic footprint of Linux is economically significant. The Linux kernel serves as the basis for Android, which as of 2014 captured 75% of the smartphone market,¹⁷⁹ and the Chrome web browser, which has 60% of the browser market.¹⁸⁰ Linux is used by 53% of websites that use UNIX, which in turn powers about 60% of all websites.¹⁸¹ Linux dominates super computer operating systems,¹⁸² although it lags Microsoft Windows and Apple's IOS among desktop operating systems.¹⁸³

E. Patents and Innovation by Diffusion

The three case studies just described describe ways in which patents further innovation through diffusion rather than exclusion. Instead of keeping their ideas and knowhow to themselves, firms are strategically sharing them, in order to find partners, or to enable greater access to the ideas of others. Patents are an integral part of this exchange, with consequences for the social organization of innovation, and the personal autonomy of creative professionals.¹⁸⁴

If MIT can provide its ideas to Lego, and see them flourish, it can continue doing what it's best at— educating and innovating, while Lego can do what is best at – developing, marketing, and selling great products. If individual inventors can come up with ideas like biosolvents, and partner with companies to bring these ideas to market, they can share in the benefits of seeing a successful product come to the market without themselves having to acquire or develop the expertise that commercialization requires. Property rights, and the ability to trade them, enable creative people to work autonomously, Robert Merges has argued, with greater freedom to work on what they want to, with whom they want to, and in the way they want to.¹⁸⁵ Robust markets for innovation create gains from trade and benefits from specialization, which from the time of Adam Smith have been perceived as drivers of modern economic growth.

¹⁷⁹ *Smartphone OS Market Share, Q4 2014*, IDC, <http://www.idc.com/prodserv/smartphone-os-market-share.jsp> (last visited ____).

¹⁸⁰ *Browser Statistics*, W3SCHOOLS.COM (2015), http://www.w3schools.com/browsers/browsers_stats.asp (last visited ____).

¹⁸¹ *Usage Statistics and Market Share of Unix for Websites*, W3TECHS, <http://w3techs.com/technologies/details/os-unix/all/all> (last visited ____).

¹⁸² Steven J. Vaughan-Nichols, *Linux dominates supercomputers as never before*, ZDNET (June 24, 2014, 12:21 PM), <http://www.zdnet.com/article/linux-dominates-supercomputers-as-never-before/>.

¹⁸³ *Measuring Desktop Adoption*, WIKIPEDIA (Mar. 3, 2015, 3:35 PM), http://en.wikipedia.org/wiki/Linux_adoption#Desktop_and_Nettop_computers_and_Laptops (last visited ____).

¹⁸⁴ Merges, *supra* note ____, at 192-95.

¹⁸⁵ *Id.* at 212.

The result is a more participatory, inclusive innovation ecosystem that does not discriminate on the basis on where an idea is born, but enables the best ideas to find their way to the market through any of variety of pathways. The next section builds upon these examples to articulate a diffusion-focused framework for viewing the patent system.

Part III: Towards a Diffusion Framework for the Patent System

In this part I articulate a novel diffusion framework for viewing the patent system. Traditionally, patents are thought to impact the diffusion of technology in two ways. Patents induce the disclosure of technical secrets and information that the public can learn from and be inspired by.¹⁸⁶ But increased protection also means less competition, higher prices, and slower diffusion during the patent's term.¹⁸⁷ According to this pattern of exclusion, followed by diffusion, patents mediate the tradeoff between dynamic and static efficiency.¹⁸⁸ Patents encourage initial investments to be undertaken, supporting dynamic efficiency. Post-expiration, the patent system facilitates the widest possible dissemination of the inventor's knowledge, furthering static efficiency.¹⁸⁹

But as the examples in Part II show, technical knowledge need not be spread only through patent documents, nor must permission to practice inventions be relegated to the post-patent period. Open innovation and markets for technology enable inventors to transfer their technology and ideas to other settings, on exclusive and non-exclusive bases. Defensive patenting strategies allow firms to more freely access each other's technologies before a patent expires.

Nor must innovation by diffusion be at odds with innovation by exclusion. Indeed, a careful reading of the history of patent law shows that just as exclusion has always been the means, the diffusion of innovation has always been the desired end. The purpose of the first patent law was to attract artisans and printers from other territories to Venice.¹⁹⁰ The early novelty requirement had a distinctly nationalistic flavor— a patent would be justified only if the skill was new to the country,¹⁹¹ and British patents, which were just one sort of privilege that

¹⁸⁶ See, e.g. Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 541 (2009) (describing the role of patent disclosures in stimulating innovation during and after the patent term).

¹⁸⁷ Ove Granstrand, *Innovation and Intellectual Property Rights*, in THE OXFORD HANDBOOK OF INNOVATION 266 (2005).

¹⁸⁸ See Ordover, *supra* note __, at 44.

¹⁸⁹ *Id.*

¹⁹⁰ Mandich, *supra* note __, at 171-173.

¹⁹¹ Douglass North & Robert Paul Thomas, *Patents, Property Rights, and Economic History: The "Statute of Monopolies" Era in Great Britain*, in ROBERT MERGES & JANE GINSBERG, FOUNDATIONS OF INTELLECTUAL PROPERTY 14 (2004).

was routinely granted throughout Western Europe,¹⁹² extended only to actually produced “manufactures.”¹⁹³ A number of studies have documented the positive link between intellectual property and the geographical diffusion of technology,¹⁹⁴ though, broader or faster diffusion does not necessarily lead to greater social welfare if that diffusion is achieved at a higher than necessary social cost.¹⁹⁵ And although US patent law does not currently require practice of the patent, it continues to reward it in several ways.¹⁹⁶

The status quo creates space for an alternative lens through which to view the patent system, based on the ability to simultaneously promote innovation by diffusion and exclusion. I begin by describing a framework for patent diffusion, and then apply this framework to three mechanisms of patent diffusion: disclosure, transfer, and the pursuit of freedom to operate.

A. A Framework for Patent Diffusion

¹⁹² See Machlup, *supra* note __, at 2-3.

¹⁹³ Michael Risch, *America’s First Patents*, 64 FLA. L. REV. 1279, 1297–8 (2012) (describing the English Statute of Monopolies).

¹⁹⁴ See, e.g., Lee Branstetter, Raymond Fishman, & C. Fritz Foley, *Do Stronger Intellectual Property Rights Increase International Technology Transfer? Empirical Evidence from US Firm-Level Data*, 12 Q.J. ECON. 321 (2006) (concluding that U.S. multinationals respond to stronger IPR regimes abroad by “significantly increasing technology transfer to reforming countries” and documenting an increase in royalty payments and R&D expenditures by multinationals after IP reforms were adopted in sixteen countries); Mercedes Delgado et al., *Intellectual Property Protection and the Geography of Trade*, 3 J. INDUS. ECON. 733 (2006) (finding increased trade flows in IP-intensive sectors following the implementation of international IP treaty provisions).

¹⁹⁵ See, e.g., James Bessen, *Patents and the Diffusion of Technical Information*, 86 ECON. LETTERS 121 (2005).

¹⁹⁶ For example, the nonobviousness doctrine prevents routine or marginal technological developments from getting patents. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007). Commercial success, licensing, copying of the invention by others, and public recognition of the patentee are relevant to obviousness determinations,¹⁹⁶ almost always favoring the patentee. Daralyn J. Durie & Mark A. Lemley, *A Realistic Approach to the Obviousness of Inventions*, 50 WM. & MARY L. REV. 989–992. But only if a patent has been practiced does it have a chance of demonstrating these factors. Likewise, the written description doctrine requires that the patent specification convey to a person of skill in the art that the inventor was in “possession” of the invention. *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (*en banc*). Details from practice make this requirement easier to satisfy. Remedies are also more readily available when the patentee practices the invention. In order to get the legal remedy of lost profits, the patentee must demonstrate foreseeable loss. *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1550 (Fed. Cir. 1995) (*en banc*) Lost sales due to the infringement can suffice, but are only available if the patentee is selling the product; damages are otherwise limited to a reasonable royalty. 35 USC 284. In the past years, requests for injunctions by non-practicing entities have been routinely denied, not granted. Chien & Lemley, *supra* note __ at Figure 1 (showing a 7% grant rate to patent assertion entities on their contested requests for injunctions.) And, the federal government can take compulsory licenses to patents according to 28 U.S.C. § 1498, a provision which has been relied upon hundreds of times (Colleen Chien, *Cheap Drugs at What Price to Innovation: Does the Compulsory Licensing of Pharmaceuticals Hurt Innovation?*, 18 BERKELEY TECH. L.J. 853, 862-3 (2003) and has the right to “march-in” and compel the licensing of federally-funded patents in certain cases.¹⁹⁶ 35 U.S.C. § 203(1).

As discussed, diffusion is the spread of ideas and knowledge from one setting to other settings through specific channels over time.¹⁹⁷ In this section, I describe a framework of patent diffusion based on the multiple channels by which knowledge of patented or patentable inventions and the permission to use that knowledge is spread from one setting to another. (Table 2)

Table 2: A Framework for Patent Diffusion

Mechanism of Diffusion	Channel of Diffusion	Specifics/Examples
Disclosure	Patents and Related Disclosures	Utility patents, practice of the patent
	Patent Applications	Utility and provisional patent applications
	Defensive Publication	Disclosures intended to preempt patenting of the invention and put the invention in the public domain
Transfer	Technology Licenses and Agreements	Technology transfer, exclusive or non-exclusive technology licensing, patent standards
Sharing	Defensive Patent Strategies	Holding patents to provide access to technology and freedom from suit/patent trading
	Patent Waivers/ Pledges	Tesla's patent pledge, OIN patent non-assertion promise, and others to forbear, humanitarian or related waivers, expiration of patents

The patent system can encourage the spread of technical information and permissions, not only through patents themselves, but through, for example, patent applications, patent practice, defensive publications, and technology licenses. Each of these channels of diffusion can be associated with one of three patent-related mechanisms for spreading technical knowledge and the permission to use it from one setting to another:

- Disclosure encompasses the diffusion of information about patented or patentable inventions from the inventor to the world. The diffusion of this knowledge can take place through patent documents and products, without the permission to practice the invention until the patent is out of force. However, the patent system also encourages disclosures in

¹⁹⁷ See Everett, *supra* note ____, at 5.

the form of patent applications and defensive publications. When they succeed, defensive publications put the invention into the public domain, enabling all to use them.

- Technology Transactions convey information about and permission to practice the invention, from the patentee to one or more commercializers of the technology. This diffusion can take place, e.g. through exclusive technology licenses that transfer technology from one setting to another, or non-exclusive patent licenses that provide rights to multiple technology implementers. The patent rights are often just one component of the transfer, which may also include know-how, personnel, and related resources needed to implement the technology.
- Acts that facilitate sharing of patented or patentable technologies enable the freer spread of information and permissions within the innovation ecosystem. These whitespace creating acts can take place before or during the term of a patent, and can be initiated by innovators who seek freedom to operate or patentees who want to share their inventions with others. Before a patent is issued, defensive publication can be used to put technologies into the public domain. During the term of a patent, permission to practice can be provided by the patentee through mechanisms like selective patent waiver or promises to forbear, and extended through practices like defensive patenting. The patentee may also put the invention in the public domain through patent non-renewal.

Embracing diffusion does not require rejecting exclusion. In fact, in each of the primary mechanisms of patent diffusion, the right to exclude plays an important role. For example, to the extent that patent exclusivities motivate the disclosure of useful information,¹⁹⁸ they are needed to have something to diffuse in the first place. In the case of technology transfer from a patentee to a commercializer of the patentee's technology, the patentee's rights to exclude can be vital to her willingness to engage in discussions with a potential partner,¹⁹⁹ who may in turn only be interested in an exclusive license. And defensive patenting to enable freedom to operate depends critically on the patentee's ability to retaliate if attacked. Certainly, diffusionary and exclusionary priorities can be at odds, for example, when patentees forbear from patenting due to the secrets they must reveal.²⁰⁰ But in many cases, the exclusive right against the world that patents confer is more than what a patentee needs or wants.

Focusing on patent diffusion does require the patent system to change its orientation, however, and to reconsider levers that have largely been overlooked by patent scholars and policymakers. For example, the patent system's current bias towards exclusion has arguably

¹⁹⁸ The relatively low importance of patents as sources of technical knowledge is discussed *infra*, at Part III.B.

¹⁹⁹ See *infra*, at Part III.C.1. (describing the role of patents in overcoming Arrow's information paradox).

²⁰⁰ See *infra*, at fn. ____.

installed certain defaults, to “closed” rather than “open,” that a new focus on diffusion would revisit. In addition, the patent system does not make it easy for patentees to choose a “diffusion” or “pure defense”²⁰¹ option. In addition, those who want to purposefully put their technologies in the public domain have no guarantee of being able to do so. A diffusion focus would change that.

In the following sections, I draw upon three disparate strands of patent theory, and extend them by applying the diffusion framework described above to reveal largely neglected levers of patent diffusion.

B. Diffusion by Disclosure

“The disclosure required by the Patent Act is ‘the quid pro quo of the right to exclude,’”²⁰² the Supreme Court has said. The patent document must disclose the invention, “in sufficient detail to enable one skilled in the art to practice the invention,”²⁰³ and “stimulate ideas and the eventual development of further significant advances in the art.”²⁰⁴ This view makes patent documents the primary instrument of patent disclosure, and indeed, the measure of whether exclusive rights are warranted.

A focus on diffusion requires looking beyond the four corners of a patent. The patent system induces disclosure, not only in the patent, but also through practice and defensive publications. The terms on which this storehouse of information can be accessed also matter. The mere production of knowledge does not guarantee that others will be able to exploit it.²⁰⁵ In this section, I extend disclosure theory to consider both “content” and “access” levers that can boost the diffusion of technical information to society through the patent system.

1. Disclosure Theory – Diffusion by Patent Document

²⁰¹ See Fig. 1, Nagaoka & Walsh, *supra* note ___ at Table 13. (indicating that 45% of US inventor survey respondents indicated that holding patents for “pure defense” was an important or very important motive for getting patents).

²⁰² *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int’l, Inc.*, 534 U.S. 124, 142 (2001) (quoting *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 484 (1974)).

²⁰³ *Universal Oil Prods. Co. v. Globe Oil & Refining Co.*, 322 U.S. 471, 484 (1944) (“the quid pro quo” required of the patentee “is disclosure of a process or device in sufficient detail to enable one skilled in the art to practice the invention”).

²⁰⁴ *Kewanee Oil Co.*, 416 U.S. at 484.

²⁰⁵ JOEL MOKYR, THE GIFTS OF ATHENA: HISTORICAL ORIGINS OF THE KNOWLEDGE ECONOMY, 8-15 (2003).

To mature into a patent, each patent application must contain a description of the invention, how it can be made and used, and the best way of practicing the invention, and demonstrate possession by the applicant.²⁰⁶ The main question has been whether or not the “additions to the general store of knowledge” patents provide in accordance with these legal requirements, are in fact worth the “high price of...exclusive use” as the Supreme Court has claimed.²⁰⁷ Critics argue that they often do not.²⁰⁸ First, patents today are badly written, because they serve both legal and technical aims²⁰⁹ in the hybrid language of “patentes.”²¹⁰ Second, firms have incentives to omit important technical details, and may provide legally insufficient disclosure.²¹¹ Third, the disclosed secrets are not real secrets, but are already revealed in the case of self-disclosing inventions, ending up in the gratuitous grant of a patent.²¹² Patents can actually retard disclosure as well, by preventing the publication of ideas that a researcher might later want to patent.²¹³

The available survey evidence appears to reinforce a dim view of patents as sources of information. For example, in a survey of 650 publicly-traded firms, patents placed sixth out of seven types of disclosures.²¹⁴ When asked, small and medium enterprises in the UK ranked patents eighth out of nine sources,²¹⁵ behind customers, suppliers, competitors, and other information sources.²¹⁶ In a survey of R&D labs, patents also rated as less important than

²⁰⁶ 35 U.S.C. § 112 (requiring patents to satisfy the enablement, written description, definiteness, and best mode requirements of patent law); ROBERT P. MERGES & JOHN FITZGERALD DUFFY, PATENT LAW AND POLICY: CASES AND MATERIALS 265-366 (5th ed. 2012) (describing the four “disclosure doctrines” of patent law).

²⁰⁷ *Kewanee Oil Co.*, 416 U.S. 484.

²⁰⁸ See, e.g., Benjamin Roin, Note, *The Disclosure Function of the Patent System (or Lack Thereof)*, 118 HARV. L. REV. 2007 (2005); Bessen, *Diffusion*, *supra* note ____.

²⁰⁹ Fromer, *supra* note __, at 564 (discussing the two layers: technical and legal, within the patent document and arguing that they should be demarcated).

²¹⁰ Sean B. Seymore, *The Teaching Function of Patents*, 85 NOTRE DAME L. REV. 621, 633-641 (2010). For an example, see U.S. Patent No. 6,004,596 (filed Dec. 8, 1997) (in which a piece of bread becomes, “a first bread layer having a first perimeter surface coplanar to a contact surface.”).

²¹¹ See, e.g., Subhashini Chandrasekharan, et. al, *Proprietary Science, Open Science and the Role of Patent Disclosure: The Case of Zinc-Finger Proteins*, 27 NATURE BIOTECHNOLOGY 140 (2009) (describing the problem of non-enabling disclosures in IT, and how in the particular biotechnology context of zinc-fingered proteins, patents confer “‘practical excludability’ because they do not meet the statutory obligation of enabling scientists to practice the inventions that the patents cover.”).

²¹² Katherine J. Strandburg, *What Does the Public Get? Experimental Use and the Patent Bargain*, 2004 WIS. L. REV. 81 (2004), Roin, *supra* note __, at 2015, 2017. See also Machlup, *supra* note __, at 32.

²¹³ Machlup, *supra* note __, at 32.

²¹⁴ Levin et al., *supra* note __, at Table 6.

²¹⁵ Stuart Macdonald, *What the Patent System Offers the Small Firm*, Summary Report for the Economic and Social Research Council 5 (1998).

²¹⁶ *Id.* at 5-6.

publications and informal exchanges.²¹⁷ As the opportunities for exchange grow exponentially, through communication platforms such as social media and the Internet, and search technologies makes it easier to find relevant information, patents may fall even further behind.

But even if patents aren't the most important sources, that does not mean that they do not have value. This point is underscored in a forthcoming study. Inventors were asked to quantify the time saved in their respective invention processes when patent information was and was not available.²¹⁸ The responses showed considerable differences across industry. Though the median value of the time savings was 5.9 hours and the mean, 12.2 hours, in the field of organic chemicals, on average, readers of patents saved 36 hours of time. In contrast, digital communication technology patents only saved their readers 1.0 hour, on average. That patents are likely to disclose more useful details in certain industries than others is reflected in concerns about patenting that have been expressed in other contexts. For example, 59% of biotechnology startups responding to a survey stated that their last decision not to patent was motivated by their desire not to disclose the invention.²¹⁹ Only 25% of software startups shared this concern.²²⁰ Even if the invention is disclosed elsewhere, patents often contain details that aren't otherwise available.²²¹

Thus, the answer to the question, do patents provide technical teaching seems to be, sometimes, but generally less than other sources of information. But there are a number of other disclosures, besides patents, that the patent system can encourage.

2. Diffusion by Patent Application

Although studies generally do not do so, it is important to distinguish patent applications from patents as sources of technical information. This is underscored by the relatively lower

²¹⁷ Wesley M. Cohen et al., *R&D Spillovers, Patents, and the Incentives to Innovate in Japan and the United States*, 31 RES. POL'Y 1349 (2002). See also Ouellette, *supra* note ____ at n.11 (30% of surveyed academic nanotechnology researchers reported finding useful technical information in patents; a subset of those surveyed failed to even look at patents)

²¹⁸ Bronwyn H. Hall & Dietmar Harhoff. *Recent Research on the Economics of Patents* (Nat'l Bureau of Econ. Res., Working Paper No. 17773, 2012) and Correspondence with D. Harhoff (on file with the author), describing forthcoming publication by Gambardella, Harhoff, and Nagaoka.

²¹⁹ Graham et al., *supra* note ____ at Table 2, p. 1313.

²²⁰ *Id.*

²²¹ See, e.g. Ouellette, *supra* note ____, at 561 (describing the detailed protocols and recipes available in patents but not academic publications.)

patent grant rate in other countries. For example, only 56% of Japanese applications turn into patents, versus a rate of 87% in the US.²²² This means that about 44% of applications to the Japanese Patent Office will stay in the public domain where others may imitate them. Patent applications teach the public in the same way that patents do, but the world is not prevented from practicing the invention if the application never becomes a patent. This may explain, in part, the number one ranking that Japanese innovators give to patent disclosures, as compared to other sources of information.²²³ In the same survey, US firms ranked patents only third, behind publications and informal exchanges. 85% of Japanese firms indicated that patents were moderately or very important sources of information, while 49% of US firms did.²²⁴

Despite the USPTO's high patent grant rate, large numbers of US patent applications do not mature into patents. "Provisional" patent applications are informal documents that describe the invention. Although they do not become patent applications until a "formal" application is filed, applicants have incentives to include full, enabling descriptions in their provisional submissions.²²⁵ According to current law, provisional patent applications are not published by the Patent Office.²²⁶ But filers of provisional applications may want to disclose them, at least for the reason that this will decrease the chances that others will secure patents over the same inventions. This calls into question the patent system's policy of the nonpublication of provisionals.

3. Diffusion by Defensive Publication

Another overlooked way in which the patent system encourages technical disclosure is through its ability to provide freedom to operate in return for the disclosure of an idea through "defensive publication." Because only new and nonobvious inventions can get patents, creating a public disclosure that describes an invention, yet is not accompanied by a patent application, creates "prior art" against subsequent applications and therefore thwarts the ability of others to

²²² Christopher A. Cotropia, et al., *Patent Applications and the Performance of the U.S. Patent and Trademark Office as of FY 2014* (Richmond School of Law, Working Paper No. 2015-01, 2015), Table 5 – Comparative Patent Allowance Rates (1996-2013).

²²³ Cohen et al., *supra* note ____, at Figure 6.

²²⁴ *Id.*

²²⁵ Drew Harris et al., *Strategies For Resolving Patent Disputes Over Nanoparticle Drug Delivery Systems*, 1 NANOTECH. L. & BUS. 372 (2004).

²²⁶ 35 U.S.C. §112 (b)(2)(A) (An application shall not be published if that application is— (iii) a provisional application.)

later claim the invention.²²⁷ This means that the discloser, and the rest of the world, will not be precluded from practice by a later-issued patent. The disclosure avoids the cost of patenting, but secures freedom of action. It also increases the quality of patents that do issue, as it raises the bar by which new applications will be evaluated.²²⁸ From a diffusion perspective, this represents, perhaps, the best of both worlds – society gets the content of the disclosure but, also, the permission to practice it.

Innovators use a number of outlets to defensively publish. Companies like IBM and Xerox have historically published and distributed their own technical journals, detailing developments in their research to patent offices.²²⁹ There are also “known” outlets for defensive publication including the website IP.com, which bills itself as “the world’s first and largest online prior art disclosure service,”²³⁰ and *Research Disclosure*, a defensive publishing journal that has been around since the 1960s.²³¹ These are disclosures that happen because of the patent system. However, while defensive publications are reportedly used widely in places like Germany,²³² and have been used successfully in several US biotechnology contexts,²³³ they are not generally seen as strategic tools by United States intellectual property owners. Only 2% of intellectual property owners strongly agreed, and 26% agreed, with the statement, “[d]efensive publication is an important strategic tool for my company,” while 55% of respondents disagreed and 14% of respondents strongly disagreed.²³⁴ Given defensive publication’s significant advantages for diffusion, it is worth considering why this is the case and whether or not changes are warranted.

²²⁷ Gideon Parchomovsky, *Publish or Perish*, 98 MICH. L. REV. 926 (2000).

²²⁸ Douglas Lichtman, Scott Baker, & Kate Kraus, *Strategic Disclosure in the Patent System*, 53 VAND. L. REV. 2175 (2000).

²²⁹ *Id.* at ____.

²³⁰ *Prior Art Database*, IP.COM, <http://ip.com/prior-art-database/> (last visited ____).

²³¹ Bill Barrett, *Defensive use of publications in an intellectual property strategy*, 20 NATURE BIOTECHNOLOGY 191 (2002).

²³² Joachim Henkel, *Defensive Publishing – An Empirical Study*, TUM SCHOOL OF MANAGEMENT (2008) (unpublished study) (reporting that 70 percent of sampled companies, taken from the German DAX 30 stock index used defensive publications, for up to one-third of their invention).

²³³ Robert P. Merges, *A New Dynamism in the Public Domain*, 71 U. CHI. L. REV. 183 (2004) at 186-191 (describing the publication of databases to prevent the patenting of gene sequences and genomic data).

²³⁴ 2003 IPO Survey on Strategic Management of Intellectual Property, I.1.

4. Access Levers in the Disclosure of Patent Information

Another dimension of patent diffusion concerns the terms of access to patent texts. Though they have received scant attention, access levers in the disclosure of patent texts, including timing, search costs, and legal penalties, can accelerate (or retard) the spread of the ideas described in patents. For example, patent applications are typically published 18 months after they are filed. However, unlike in most of the rest of the world, US applicants can keep their patent applications secret, for their entire pendency.²³⁵ This is based on the assumption that patentees want to keep their secrets for as long as possible. If the application does become a patent, as most US applications do, it will be released to the world, if it has not already been published. However, that typically will be years after the application date.²³⁶

The timing of patent publications matters and impacts the diffusion of patented information. A recent study compared biomedical patent inventions published 18 months after the patent application with inventions that were not disclosed until the patent issued. Inventions that were published earlier were licensed, on average, 8.5 months earlier. The shorter licensing cycle was attributed to the earlier clarification of the inventor's rights.²³⁷

Another variable that impacts access to patented information is the ability to sift through large quantities of patents and find the relevant ones. Numerous commentators have lamented the high costs of searching for relevant patents in fields of cumulative information.²³⁸ But there is no easy way to tell who owns what patents,²³⁹ which patents are being practiced, or to discern other indicia of relevance.

²³⁵ Stuart Graham & Deepak Hegde, *Do Inventors Value Secrecy in Patenting? Evidence From the American Inventor's Protection Act of 1999*, 3 (2014) available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2170555

²³⁶ USPTO 2014 Performance and Accountability Report, 2 (showing the average total pendency of a patent to be 2 years and 3 months)

²³⁷ Deepak Hegde & Hong Luo, *Imperfect Information, Patent Publication, and the Market for Ideas* (Harvard Business School Strategy Unit, Working Paper no. 14-019, 2013).

²³⁸ See, e.g., Christina Mulligan & Timothy B. Lee, *Scaling the Patent System*, 68 NYU ANN. SURV. AM. L. 289 (2012) (discussing the high discovery costs of finding relevant patents); Eisenberg, *supra* note ____, at 55 (2011) ("Information costs and transaction costs may dwarf potential gains to users from identifying and clearing rights...").

²³⁹ See Colleen V. Chien, *The Who Owns What Problem in Patent Law* (Santa Clara Univ. School of Law, Legal Studies Research Paper no. 03-12, 2012) (explaining the lack of an ownership recording requirement and the disambiguation challenge that results from the non-uniform use of assignee information)

Finally, as discussed earlier, the legal doctrine of willfulness creates strong disincentives for inventors to read patents.”²⁴⁰ This structural problem to enabling effective diffusion of patented knowledge has been widely recognized.²⁴¹ In addition, while no penalty accompanies the reading and practice of patents that have entered the public domain, it is very difficult to tell whether or not a patent has done so, or is still in force.²⁴²

In sum, applying a diffusion framework to the issue of patent disclosure reveals a number of largely ignored levers for influencing the content, timing, and uptake of disclosures encouraged by the patent system. These include pre-grant publication of patents applications (including provisionals), the willfulness doctrine, and the effectiveness of defensive publication. These levers are explored in Section IV.

C. Diffusion by Transfer

Another justification for the patent system is that it facilitates the diffusion of technology from one setting to another through technology licensing. With some notable exceptions,²⁴³ “commercialization” justifications for the patent system have received less attention than the classic, reward for invention and disclosure, rationale for the patent system. But the changing nature of innovation justifies paying more attention to the ways in which the patent system supports technology transactions.

1. Commercialization Theory – Diffusion Through Trust

According to commercialization theory, patents make transacting easier in several ways. First, they increase trust between patent owners and potential partners, providing a solution to Arrow’s information paradox. This is the idea that in the absence of legal protection, an owner

²⁴⁰ See Part I.A..

²⁴¹ See, e.g., Fromer, *supra* note ____, at 588; Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. REV. 123, 142 (2006).

²⁴² A number of factors limit the ability of the public to find patents that are no longer in force. First, while the status of an individual patent can be determined by looking at the USPTO website, there is no ability to search among expired patents. In addition, when a patent is no longer in force due to the failure to pay maintenance fees, rather than the end of its term, it can be revived at any time during its potential term upon a showing that the patent was “unintentionally abandoned,” spawning the term, “zombie patent.” See John M. Griem, Jr. and Theodore Y. McDonough, *Zombie Patents: Stronger Than Ever*, CARTER LEDYARD & MILBURN LLP (May 14, 2014), <http://www.clm.com/publication.cfm?ID=489>.

²⁴³ See, e.g. the works of Edmund Kitch, John Duffy, Michael Abramowicz, Scott Kieff, and Ted Sichelman, described *infra*.

cannot sell information to someone who can make better use of it, because in the process of selling the information, he will have to disclose it, and the buyer won't need to pay for it anymore.²⁴⁴ Patents, according to the theory, give inventors the security they need to engage in discussions with potential partners, with less risk that their ideas will be appropriated.²⁴⁵ Trade secrets are practically harder to transact in, because disclosing a secret destroys it.²⁴⁶ Patents are also theorized to encourage transactions by helping prevent duplicative investments. Once an inventor has a patent, in certain scenarios, she has an incentive to seek out and license the technology to others.²⁴⁷ Patents can play a coordination role, drawing together complementary users.²⁴⁸

Yet, reality is more complicated. For technology to actually be transferred from one setting to another through a technology license requires a number of steps. One study, of Canadian and US technologies, traced the pipeline. It found that, out of 100 licensable technologies, a potential licensee was found in 25 cases, negotiations were started in 6 to 7, and licensing deals were eventually concluded in 3-4.²⁴⁹ Not only must the parties trust and be willing to talk to each other, but they first need to find each other, and then go through a series of other steps, including agreeing on scope, price, and term, before a deal can be signed. Corporate patentholders are willing to license 70% more patents than are currently licensed;²⁵⁰ the number is likely even higher among university patentholders.

There is room for reducing duplicative research. The European Union estimates that \$20 billion is spent every year to develop innovations and technologies that have already been

²⁴⁴ Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in *The Rate and Direction of Inventive Activity*, in *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS* 609, 615 (1962); *but see* Michael J. Burstein, *Exchanging Information Without Intellectual Property*, 91 *TEXAS L. REV.* 227 (2012) (criticizing the conventional premise that intellectual property can be justified on the basis of its limited ability to resolve Arrow's paradox).

²⁴⁵ *Id.*

²⁴⁶ Kitch, *supra* note ____, at 278.

²⁴⁷ *Id.* at 271-75, 277-78.

²⁴⁸ F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 *MINN. L. REV.* 697, 705 n. 27 (2001).

²⁴⁹ Richard Razgaitis, *US/Canadian Licensing in 2006: Survey Results*, 42 *NOUVELLES-JOURNAL OF THE LICENSING EXECUTIVES SOCIETY* 641 (2007).

²⁵⁰ Gambardella, Giuri, & Luzzi, *supra* note ____ (reporting that while 18% of European patents are offered for licensing, only 11% are actually licensed)

built.²⁵¹ But to prevent this duplication, the parties need to be aware of each other and willing to transact, and they must agree on the terms of transfer.

To address undercommercialization, some have proposed more and stronger patent rights.²⁵² But stronger patents rights, by themselves, will not make it more likely that parties will find each other, or agree to transact. In fact, stronger rights can have the opposite effect, when they cause rights holders to overvalue their technology. In transactions with universities, for example, companies often complain that universities aggressively patent, overvalue their intellectual assets, and issue unreasonable licensing terms.²⁵³

A diffusion lens for viewing the patent system picks up where commercialization theory leaves off. Rather than focusing only on trust and the theoretical ability to reduce duplicative research, a diffusion framework also takes into account existing barriers to technology-diffusing transactions.

2. Diffusion Through the Reduction of Search and Transaction Costs

Why aren't technology transactions happening more readily? Those who have studied this question have identified a number of reasons. A persistent problem across both commercial and academic partnership settings is inherent uncertainty about the value of the technology.²⁵⁴ Patent values are so skewed that they have been analogized to lottery tickets.²⁵⁵ In the university technology transfer context, for example, the 2007 revenue leader was New York University, which had made more than \$794 million, the vast majority from one pharmaceutical license for one single commercially successful drug.²⁵⁶ Only 0.5% of license agreements actually generate more than \$1 million in royalty income, and from 1983 to 2013, 87% of technology transfer

²⁵¹ Arora et al., *supra* note __, at 419-451.

²⁵² Michael Abramowicz & John Duffy, *Intellectual Property for Market Experimentation*, 83 N.Y.U. L. REV. 337, 405-408 (2008) (recommending consideration of a commercialization patent "where the hurdles to commercialization seem particularly daunting"); Sichelman, *supra* note __, at 397-412 (proposing a commercialization patent that would be granted in exchange for the commitment to make and sell a substantially novel product).

²⁵³ MANAGING UNIVERSITY INTELLECTUAL PROPERTY IN THE PUBLIC INTEREST, __ (Stephen A. Merrill & Anne-Marie Mazza, eds.) 29, 31 (2011).

²⁵⁴ Arora & Gambardella, *supra* note __, at 14-15.

²⁵⁵ Parchomovsky & Wagner, *supra* note __, at 24 (explaining the lottery theory of patents).

²⁵⁶ Merrill & Mazza, *supra* note __, at 22.

offices did not break even.²⁵⁷ Uncertainty about the freedom to operate can play a role,²⁵⁸ as can certainty about patent right also matters. This is because, prior to the issuance of the patent, the parties have asymmetric information about the likelihood of its grant. The buyer may want a discount to account for the risk that a patent will not issue, or issue with adequate scope.²⁵⁹

Culture and lack of experience with licensing are also barriers to technology transactions. Large firms are less willing to license than small firms, and are also less willing to license when they themselves are practicing an invention.²⁶⁰ But they also likely have the greatest stock of uncommercialized patents.

But in addition to these variables, many of which are beyond the scope of this discussion, some of the most frequently cited obstacles to licensing include the search costs in finding a technology partner, and friction in the licensing transaction. There is no “universal marketplace” for technology in which patentees can signal their willingness to license their technology or patents and potential buyers can express their desire to purchase technology or patents.²⁶¹

Deal friction is also a problem. Within commercial contexts, Arora and Gambardella cite fear of a “winner’s curse” because technology sellers can negotiate with a number of potential technology buyers at the same time, leading the winner to overpay. While this dynamic is not necessarily limited to technology transactions, because of the unique nature of intangible goods and the lack of an agreed-upon approach to technology valuation, the parties lack a common price anchor, and therefore may be separated by an unbridgeable distance in negotiations.²⁶²

Technology agreements in university settings have similar, and distinct, issues. The asymmetries between technology buyer and seller are compounded by the fact that the party negotiating on behalf of the university seller is the technology transfer office (TTO), rather than

²⁵⁷ *Id.* at 22; *see also* Valdivia, *supra* note ____, at 9.

²⁵⁸ See, e.g. Testimony of venture capitalist Don Ellson, in Colleen V. Chien, *Patent Assertion and Startup Innovation*, Appendix B: Views from the Trenches (New America Foundation Open Technology Institute) (2013) (patent litigation risks “creat[e] friction in the acquisition process. Buyers are warier because they are worried about buying a company and getting sued.”)

²⁵⁹ Joshua Gans, et al., *The Impact of Uncertain Intellectual Property Rights on the Market for Ideas: Evidence from Patent Grant Delays*, 54 *MGMT. SCI.* 982-997 (2008).

²⁶⁰ Arora & Gambardella, *supra* note ____, at 9.

²⁶¹ See, e.g. Michael Risch, *Patent Portfolios as Securities* [fill out footnote, add parenthetical]

²⁶² *Id.* at 15-17.

the university inventor with subject matter expertise.²⁶³ University negotiations are known to be accompanied by friction and delays, with the parties having a hard time agreeing on terms.²⁶⁴ When the buyer is an investor in a university spinoff, not only must the university trust that the investor won't steal its idea, but the investor must also trust that the spinoff to perform. This creates what Cooter and Scafefer call a "double trust dilemma"²⁶⁵ that is challenging because "the investor distrusts the innovator with her money, and the innovator distrusts the investor with his ideas."²⁶⁶ The National Academy of Sciences has recommended that universities seeking to encourage entrepreneurship should consider instituting more standardized terms for licensing university-generated technology,²⁶⁷ with several universities following suit.²⁶⁸

To make a deal, the parties must want to sell or buy technology, to be able to locate relevant opportunities, to be willing to talk to each other, and to agree to the terms of the deal. Companies need to be willing to come to the table in the absence of an impending lawsuit. In Part IV, I consider ways that the patent system may be able to reduce some of the information and search costs that accompany each of these transactions.

D. Diffusion Through Sharing

A final way that technological knowledge is spread is by sharing it. By affirmatively giving up rights to exclude, patent owners spread permissions to access and use technical knowledge. Freedom to operate motivates 45-60% of companies to patent. (Figure 1) But for patents to serve this purpose, they must be shared with, rather than held back from others. The more that others practice one's patents, the freer one is to practice the patents of others.

²⁶³ Merrill & Mazza, *supra* note ____ at 50 (describing TTOs as having "little knowledge of the invention and, generally speaking, inadequate knowledge of the marketplace for it").

²⁶⁴ *Id.* at 9 (recommendation 10).

²⁶⁵ Robert Cooter & Hans-Bernd Schaefer in *The Double Trust Dilemma of Development*, in SOLOMON'S KNOT: HOW LAW CAN END THE POVERTY OF NATIONS. CONTEMPORARY (2012).

²⁶⁶ *Id.*

²⁶⁷ Merrill & Mazza, *supra* note ____, at 9 (recommendation 10).

²⁶⁸ See, e.g. *Carnegie Mellon University Greenlighting Startups*, CARNEGIE MELLON UNIVERSITY, <http://www-test.cmu.edu/startups/go/index.html> (describing the university's "Five Percent, Go in Peace" model for technology transfer); Mark Kamlet, *Supporting Innovation in the 21st Century Economy: Perspectives on the Carnegie Mellon Experience*, testimony before the Committee on Science and Technology, March 24, 2010 (describing UNC's "Carolina Express License"). The University of Minnesota, UCSD, and Penn State all have similar programs.

Sharing may be done for humanitarian reasons as well. With patent licenses it has secured from the NIH, Roche, Bristol Meyers Squibb, Abbvie and others, the Medicines Patent Pool has expanded access to HIV medicines in over a hundred developing and emerging countries, where the majority of people with HIV live.²⁶⁹ Sharing can serve any of a variety of corporate or personal interests.

Scholars have tended to look at particular vehicles of patent sharing in isolation.²⁷⁰ But a diffusion lens looks more broadly at the potential gains and costs of more formally supporting sharing. That is because, although acts of sharing generally confer private benefits to patentees, they have social benefits as well, through greater diffusion and freedom of action, and the two aren't always aligned.²⁷¹ A company may receive positive press from promising that it will share its technology with others, but society does not get its benefit if this promise isn't kept. There may be social gains then, to formalizing such commitments, as long as it does not deter initial commitment-making.

The next subsection considers the various ways in which companies have tried to share their patents. The strong desire and even need to share patents, in complex, interdependent technologies, combined with the lack of easy ways to do so, present opportunities to enhance the patent system's diffusive role.

1. Diffusion through Inclusion – Property Theory

How to square the exclusive rights of property with the inclusive desires of property owners has, over time, captured the attention of property scholars. The right to exclude does not obligate, but allows property owners to exclude,²⁷² leading to descriptions of property owners as gatekeepers, who can exclude, or include others based on the circumstances.²⁷³ Under Coasian

²⁶⁹ *Advancing Innovation, Access and Public Health*, MEDICINES PATENT POOL, <http://www.medicinespatentpool.org/> (last visited ____).

²⁷⁰ See, e.g., Jorge Contreras, *Patent Pledges* (UNIVERSITY OF UTAH, Working Paper No. 93) (discussing patent promises); Rebecca S. Eisenberg, *Noncompliance, Nonenforcement, Nonproblem? Rethinking the Anticommons in Biomedical Research*, 45 HOUS. L. REV. 1059, 1075–76 (2008) (discussing patent nonenforcement); Schultz & Urban, *supra* note __ (describing the use of a “defensive patent license” for sharing patented inventions).

²⁷¹ Kelley, *supra* note __, at 859.

²⁷² See, e.g., Henry E. Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691, 1710 (2012) (“The right to exclude does not require an owner, whether it be an individual, a group, or the state, to actually exclude others; the gatekeeper can decide to include.”).

²⁷³ *Id.* at 1709.

conceptions of property, well-defined property rights are start, not end, points in the allocation of rights and relations between firms and people.²⁷⁴

In advancing the idea of a “right to include” alongside the “right to exclude” Kelley has cataloged the various ways in which property owners can include others, and their costs and benefits.²⁷⁵ Informal mechanisms like nonenforcement and waivers have the benefit of relative ease of administration and low transactions costs – no other party needs to be consulted or negotiated with. They also have flexibility, property owners can specify themselves the range of rights that they are giving up, and reveal their intentions according to their own timing.²⁷⁶ But this also makes such mechanisms less reliable and certain. Contracts between one or more parties giving up rights provide more certainty, but are costly to administer and vulnerable to defects in formation.²⁷⁷ Because they commit only those who enter into them, rather than the properties that they impact, contracts can also be, like informal mechanisms, vulnerable to changes in ownership and other future events,²⁷⁸ and leave the rights of third party beneficiaries uncertain.²⁷⁹ Recognized restrictions on property, including covenants, leases, and servitudes, may confer rights to enter and use someone else’s land without interference from the property owner.

Each of these mechanisms has been used to share patents – the largest number through non-enforcement, but also, increasingly, through waiver and contract mechanisms. Each has its advantages and drawbacks, as described below.

2. Diffusion through Nonenforcement

Most patents are not enforced.²⁸⁰ Unlike other means of sharing, nonenforcement is passive, and *ex post*, effected through the failure of a patentee to bring a suit, once infringement has

²⁷⁴ See, e.g. Thomas W. Merrill & Henry E. Smith, *What Happened To Property In Law And Economics?*, 111 YALE L.J. 357, 359-360 (2001) (attributing to Coase the concept that “property has no function other than to serve as the baseline for contracting or for collectively imposing use rights in resource”).

²⁷⁵ See Kelley, *supra* note ____, at 882-918.

²⁷⁶ *Id.*, at 886.

²⁷⁷ *Id.*, at 890.

²⁷⁸ Molly S. Van Houweling, *The New Servitudes*, 96 GEO. L.J. 88, 900 (2008) (describing this limitation in contracts as “the problem of the future”).

²⁷⁹ Kelley, *supra* note ____, at 890-891.

²⁸⁰ Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1496 (2001) (asserting that the “overwhelming majority” of patents is never enforced).

occurred. In many cases, nonenforcement is also not deliberate, but an artifact of the low commercialization rate of patents and the high cost of enforcement versus uncertain and/or low damages.

However, some nonenforcement is deliberate. As described earlier, the largest portfolios of patents are held by companies that rely crucially on freedom of action.²⁸¹ Sharing is facilitated by the mutually assured destruction that would result if parties exercised the overlapping rights they had in court. Nonenforcement is so pervasive that it has been suggested that the large proliferation of patents, and their potential harm to innovation has effectively become a “nonproblem.”²⁸²

However, in a number of cases patents that companies acquired for the sake of defensive purposes have “turned offensive.” Triggers include changes to the patentee’s business model, or the transfer of the patents to patent “trolls” that face lower costs and constraints on assertion.²⁸³ These transfers bring into focus the largest drawback to nonenforcement as a tool of sharing – its lack of durability. There is no reason, once a patent has changed hands, to expect that nonenforcement will continue.

3. Diffusion through Waiver

A more proactive way of promoting sharing is through affirmative waiver.²⁸⁴ The number of public commitments to waive patent rights has proliferated in recent years, leading a nonprofit entity to memorialize such pledges in a single, online database.²⁸⁵ This counteracts two limitations of waivers: their impermanence, and the costs of searching for them, given the multiple forms that they can take.²⁸⁶ Cisco and Yahoo have used blog posts²⁸⁷ and Congressional

²⁸¹ See, *supra*, Part II.D.

²⁸² Rebecca S. Eisenberg, *Noncompliance, Nonenforcement, Nonproblem? Rethinking the Anticommons in Biomedical Research*, 45 HOUS. L. REV. 1059, 1075–76 (2008) (asserting that problems with patent clearance are not seriously affecting downstream product development).

²⁸³ Chien, *Arms Race*, *supra* note ____, at 342-343. (describing the phenomenon of once defensive patents “turning offensive”).

²⁸⁴ James Bessen & Alessandro Nuvolari, *Knowledge Sharing Among Inventors: Some Historical Perspectives* (LEM Working Paper No. 2011/21).

²⁸⁵ *Non-SDO Patent Statements and Commitments*, AMERICAN UNIVERSITY WASHINGTON COLLEGE OF LAW (Oct. 15, 2014), <http://www.pijip.org/non-sdo-patent-commitments/> (last visited ____).

²⁸⁶ *Id.* at 19-21.

²⁸⁷ Mark Chandler, *Good News for the Innovation Economy: The Tide’s Turning Against Patent Trolls*, FORBES (Oct. 20, 2013), <http://www.forbes.com/sites/ciocentral/2013/10/20/goodnews-for-the-innovation-economy-the->

testimony,²⁸⁸ respectively, to announce promises not to sell patents to trolls. AirBnB, Dropbox, and other companies have signed on to YCombinator founder Paul Graham’s “Patent Pledge,” which commits each firm listed on a website to refrain from enforcing software patents against companies with less than 25 employees.²⁸⁹

Patent holders have used waivers to drive technology adoption.²⁹⁰ For example, commitments made in the context of technical standards, protocols that provide a common design for a product or process,²⁹¹ are meant to clear the way for uptake of the standard. The WCDMA standard, which covers 3G mobile telecommunications, for example, is covered by an estimated 1,000 patent families.²⁹² A commitment to make these patents available on “fair, reasonable, and non-discriminatory” (FRAND) terms reassures standards adopters that they won’t be subject to surprise attacks after adoption.²⁹³ Standards-setting organizations (SSOs) commonly include these commitments in their bylaws, which patentholders agree to comply with when they submit membership applications in exchange for participating during the standards process.²⁹⁴

Promises not to enforce patents have also been used to respond to public concerns. Following scrutiny of a broad patent Southern California Edison held on communications between utility companies and their customers, the company released it to the public.²⁹⁵ Myriad Genetics, a company whose practices led the American Civil Liberties Union to file a suit to invalidate its highly controversial DNA patents, pledged to give free access to the patents to academic

tides-turning-against-patent-trolls/ (last visited ____) (“Cisco in the past sold a small number of patents to two NPEs ... But we won’t do it again”).

²⁸⁸ Written Testimony of Kevin T. Kramer, VP and Dep. Gen. Counsel, IP, Yahoo! Inc. Before the House Committee on the Judiciary, at 5 (Oct. 29, 2013) (“We act responsibly when selling patents. Our policy has been to sell patents only to operating entities rather than to non-practicing entities. We do not want our patents to be obtained by a troll and irresponsibly asserted against others in the Internet industry.”)

²⁸⁹ Paul Graham, *The Patent Pledge* (Aug. 2011), <http://paulgraham.com/patentpledge.html> (last visited ____).

²⁹⁰ See, e.g., *supra*, Introduction, Part II.D. (describing efforts to promote Linux and electric vehicle technologies).

²⁹¹ Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CALIF. L. REV. 1889, 1896 (2002).

²⁹² Knut Blind et al., *Study on the Interplay between Standards and Intellectual Property Rights (IPRS)*, Final Report 62 (2011), available at http://ec.europa.eu/enterprise/policies/european-standards/files/standards_policy/ipr-workshop/ipr_study_final_report_en.pdf.

²⁹³ *Id.* at 12.

²⁹⁴ Contreras, *Market Reliance*, *supra* note ____, at Table 2.

²⁹⁵ Described in Contreras, *Patent Pledges*, *supra* note ____, at 8.

researchers. This allowed the company to bolster the claim that it was not an aggressive enforcer of patents.²⁹⁶

But while relatively easy to make, promises are hard to enforce under the law, except under certain circumstances. Those who have made representations to standards bodies have been criticized for deviating from their public commitments.²⁹⁷ Under the theory of promissory estoppel, though, only promises that lead to reasonable reliance are actionable against the promisor.²⁹⁸ Showing reliance would be challenging in the case of pledges to “not sell patents to trolls” – what action can a company reasonably point to taking as a result of just this specific promise? But even in cases where a company adopts a patented technology, and can prove that the patentee’s promise not to sue factored into the decision, showing that the company otherwise would *not* have adopted the technology can be hard. In addition, in some cases the promisee is not the implementer, but a third-party organization, for example, that sets up the standard. But third-party promissory estoppel claims are generally harder to prove. Patent promises are often vague, failing to identify the patents that they cover.²⁹⁹ Whether a court would find that a promise that doesn’t specify the scope of its own rights is reasonable to rely upon is difficult to predict. Finally, if the patent changes hands, enforcement becomes far more challenging because promissory estoppel binds the promisor, but not the promisor’s successors in interest.³⁰⁰

4. Diffusion through Contract

Contract would seem to address some of limitations of waivers and nonenforcement. Some companies have memorialized their promises to share patents through formal contracts with their employees³⁰¹ and other companies,³⁰² for example. These deals yield reciprocal

²⁹⁶ *Id.*

²⁹⁷ See, e.g., Merges & Kuhn, *supra* note ____, at 1. (describing the use of “bait-and-switch” and “snake-in-the-grass” tactics by patentholders).

²⁹⁸ Restatement (Second) of Contracts §90. (“A promise which the promisor should reasonably expect to induce action or forbearance on the part of the promisee or a third person and which does induce such action or forbearance is binding if injustice can be avoided only by enforcement of the promise. The remedy granted for breach may be limited as justice requires.”).

²⁹⁹ Contreras, *Patent Pledges*, *supra* note __, at Table 2.

³⁰⁰ See, e.g., Juliet P. Kostriksy, *The Rise and Fall of Promissory Estoppel or is Promissory Estoppel Really as Unsuccessful as Scholars Say It Is: A New Look at the Data*, 37 WAKE FOREST L. REV. 531, 546 (2002).

³⁰¹ Adam Messinger, *Introducing the Innovator’s Patent Agreement* April 17, 2012, available at <https://blog.twitter.com/2012/introducing-innovators-patent-agreement> (last visited March 20, 2015)

³⁰² See OIN non-aggression pact, described *supra* at II.D.

benefits, or consideration, and access to contract remedies. Yet they entail coordination and formation costs, sometimes extensive, raise antitrust concerns, and are vulnerable to some of the same problems that apply to waivers.

For example, the Inventor Protection Agreement (IPA) that Twitter uses promises its employees that it will only use their patents for “defensive purposes,”³⁰³ a commitment that has been used to attract talent and build culture at the firm.³⁰⁴ But while innovators outside the company are the main beneficiaries of the agreement, they are mere third-parties to the contract, leaving them on shaky legal ground.³⁰⁵

Patent pools, in which companies get together to offer patents over a technology, illustrate some of the issues that can beset patent contracts. Though they have been around since the mid-1800s, pools were disfavored by antitrust regulators in the 1940’s and 50’s,³⁰⁶ regaining popularity only in 1995 when the Department of Justice and the Federal Trade Commission began issuing guidelines to support pools.³⁰⁷ But while pro-competitive, patent pools can also entail significant formation costs. Setting up a patent pool requires figuring out which patents belong in the pool.³⁰⁸ The parties need to agree on royalties. To capture the greatest efficiency gains, the pool must attract key patentholders, but often the included patents represent a small fraction of the relevant patents.³⁰⁹ And patent pools are subject to antitrust scrutiny because restrictive licensing terms can raise competitive concerns.³¹⁰

This Part has articulated and applied a diffusion lens to the patent system. Promisingly, it has uncovered a largely overlooked set of levers that the patent system has for promoting the

³⁰³ Benjamin Lee, *Brewing our First IPA Patents, and New Adopters*, TWITTER BLOG (May 21, 2013) <https://blog.twitter.com/2013/brewing-our-first-ipa-patent-and-new-adopters>.

³⁰⁴ See, e.g., Joe Brockmeier, *Why Every Company Should Adopt Twitter's Innovator's Patent Agreement*, READWRITE, (April 17, 2012) (describing the recruiting benefits of Twitter’s move); <http://readwrite.com/2012/04/17/why-every-company-should-adopt>

³⁰⁵ David M. Summers *Third Party Beneficiaries and the Restatement (Second) of Contracts*, 67 CORNELL L. REV. 880 (1981) (describing past and current challenges of non-parties in securing benefits from contracts).

³⁰⁶ Anne Layne-Farrar & Josh Lerner, *To Join or Not To Join: Examining Patent Pool Participation and Rent Sharing Rules*, 29 INT’L J. INDUS. ORG. 291, 295-297 (2011) (describing the long history of patent pools in the United States).

³⁰⁷ *Id.*

³⁰⁸ Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, In *INNOVATION POLICY AND THE ECONOMY, VOLUME 1*, 119. (2001).

³⁰⁹ Layne-Farrar & Lerner, *supra* note ____, at 298

³¹⁰ Richard J. Gilbert, *Antitrust For Patent Pools: A Century of Policy Evolution*. 2004 *STAN. TECH. L. REV.* 3, 17 (2004).

diffusion of technical knowledge and the rights to practice this knowledge. But not surprisingly, many of these levers are currently set to default to exclusion. The changing nature of innovation make it timely to reconsider these policies.

Part IV: Diffusionary Patent Levers

In this Part, I explore some ideas for how our patent system could be made more supportive of innovation by diffusion. In some cases, I borrow from suggestions others have advanced while in others, the suggestions below are starting rather than end points for further discussion. However, there are some potential concerns to address at the outset.

First, it is important that new options for diffusion represent true options, rather than hard-coded presets, at least to start. For certain inventions, the current patent system strikes just the right balance between exclusion and diffusion. Giving innovators more options to diffuse their technologies should not be an attempt to disrupt the balance where it is working. But by giving inventors options and incentives to select, for example, earlier publication, or defensive patenting, the options here can further both private and public interests in the diffusion of technology and permissions, when they are aligned.

Second, some may question why the patent system should be responsible for ensuring that innovators can diffuse technology to rivals and others, when its Constitutional mandate, after all, is to promote the progress by securing “*exclusive right(s)*.” This is a fair question, with several responses. First, securing exclusive rights to inventors arguably requires giving control of these rights to inventors, to loosen or tighten at their discretion. Providing inventors with more options to share their inventions and the practice them with others even during the term of the patent is tantamount to giving them finer-grained controls over their rights to exclude. Second, a diffusion lens largely enhances, rather than displaces, existing rationales for the patent system. Diffusionary levers can be used to further the disclosure function of the patent system. When the patent system makes it easier to transfer technology, it serves existing commercialization aims. And when inventors can use their patent rights to access the technology of others, that also promotes the progress.

Institutional choice questions are also relevant. It’s important to consider what Congress, the courts, the USPTO, the Department of Justice, and other government institutions of the patent

system,³¹¹ can and should do, within their mandates, to promote innovation by diffusion, and what should be left to the non-governmental sector. For example, the nonprofit Creative Commons offers a number of licenses that reduce the costs of sharing copyrightable content,³¹² potentially offering a greater range of choices than a Congressionally sanctioned option.

Finally, all of the policy levers described below could be implemented in many ways. The USPTO has a history, for example, of encouraging, through fee discounts or other favorable treatment in examination, certain applicant behavior.³¹³ The specific design of any intervention is crucial to its successful implementation, but is beyond the scope of this paper. The implementation options presented would all need further fleshing out and vetting. With these provisos in mind, below I describe a few diffusionary levers of the patent system for potential readjustment.

A. Diffusion by Disclosure

Some patent disclosures contain useful information but there are currently a number of barriers to diffusing this information, on the earliest schedule possible. Removing these could enhance the disclosure function of the patent system.

1. Default to Early Publication

US patentholders can keep their US-filed patent applications secret during the entire pendency of the patent life. When Congress was debating what would become the American Inventors Protection Act (AIPA), the provision requiring US inventors to publish their applications received harsh criticism. A group of 24 Nobel laureates declared that the policy would be “very damaging to American small inventors and thereby discourage the flow of new inventions that have contributed so much to America's superior performance in the advancement

³¹¹ Tejas N. Narechania, *Patent Conflicts*, 103 GEO. L.J. (forthcoming 2015) (describing the wide range of administrative actors with patent equities).

³¹² Loren, *supra* note ___, at 273.

³¹³ For example, the USPTO offers discounted fees for small entities and micro-entities, to encourage widespread participation in the patent system (described, e.g. at *New Fees and Micro Entity Status Take Effect March 19*, USPTO (Feb. 2013) <http://www.uspto.gov/custom-page/inventors-eye-advice>), and accelerated treatment of applications over environmental, energy conservation, and counter-terrorism technologies (*see 37 C.F.R. 1.102 Advancement of Examination*).

of Science and technology.”³¹⁴ As a result, American inventors retain the option of electing secrecy if they do not file for international protection. Provisional patents are never published, also presumably to keep inventors’ secrets.³¹⁵

But despite the strong rhetoric, it’s unclear that patentees actually desire secrecy. According to a recent study, the majority of inventors with the option of keeping their patent applications secret chose not to,³¹⁶ and even paid to have their secrets revealed.³¹⁷ Small inventors, who critics were particularly concerned about, were actually more willing to have their applications published than large inventors.³¹⁸

To the extent patent disclosures are useful, earlier disclosure benefits the public, as it leads to the earlier dissemination of technology to the world, including through related publications. But it also can benefit patentees, enabling them to stake out their position in a technological area³¹⁹ and leading to earlier licensing.³²⁰ It also allows the patent application to serve as prior art to and limit the applications of others. These benefits, in many cases, may outweigh any costs associated with earlier transparency.

The insight that inventors do not always want to keep their inventions secret, especially in the face of advocacy asserting the opposite, has broader implications for patent publication policy. Right now, utility patent applications are published with an 18-month delay. 48%³²¹ of an estimated 2M provisional patent applications³²² are never even released to the public³²³ because

³¹⁴ *An Open Letter to the U.S. Senate*, EAGLE FORUM, http://www.eagleforum.org/patent/nobel_letter.html (last visited ____).

³¹⁵ *37 C.F.R. 1.219 Early Publication*, USPTO (Mar. 27, 2014), <http://www.uspto.gov/web/offices/pac/mpep/s1129.html> (last visited ____).

³¹⁶ Graham & Hegde, *supra* note ___, at 2.

³¹⁷ Courtenay C. Brinckerhoff, *Can You Wait to Take Advantage of USPTO Fees Decreasing January 1, 2014?*, FOLEY & LARDNER LLP, <http://www.pharmapatentsblog.com/2013/10/23/uspto-fees-decreasing-january-2014/> (reporting the \$300 fee that, until 2014, accompanied publication of a patent).

³¹⁸ Graham & Hegde, *supra* note ___, (reporting that large inventors choose disclosure over 50 percent of the time and U.S. small inventors choose disclosure over 60 percent of the time).

³¹⁹ Baker & Mezetti, *supra* note ___, at 3.

³²⁰ Hegde & Luo, *supra* note ___, at 3.

³²¹ Dennis Crouch, *Abandoning Provisional Applications*, PATENTLYO (Jan. 2, 2013), <http://patentlyo.com/patent/2013/01/abandoning-provisional-applications.html> (last visited ____) (reporting a 48% provisional abandonment rate in 2011).

³²² Dennis Crouch, *Claiming Priority to Provisional Applications*, PATENTLYO (Apr. 8, 2014), <http://patentlyo.com/patent/2014/04/priority-provisional-applications.html> (last visited ____).

³²³ When a patent application claims benefit to a provisional application, the provisional application is accessible through the public electronic record of the application, however such applications are not available in bulk.

they do not mature into patent applications. It is worthwhile to consider changing these defaults. While early publication technically exists for utility applications, according to a little known provision of the law,³²⁴ explicitly giving patentees the choice could have great social benefits. A diffusionary alternative would be to adjust the default for provisionals to be open rather than closed, and for utility applications to publication upon filing, rather than after an 18-month delay, but with the right of inventors to opt-out of these choices.

2. Remove Disincentives to Reading Patents

It is also worth revisiting the current, willfulness disincentive for reading patents.³²⁵ The criteria of “knowledge of the patent” that it is connected to is arguably both overinclusive and underinclusive, with respect to what the patent system is trying to deter. For example, why should an innovator who studies and reverse engineers a patentee’s product or website be less subject to willfulness than one who happens to read a patentee’s patent, along with many others, in the course of doing routine research? At the same time, why should an innovator be punished for being comprehensive about checking different sources of technical knowledge, including patents, which are free to access unlike many technical journals, if there is no evidence that the patentee actually derived anything from the patent?

One solution, suggested by Lemley and Tangri, would be to substitute the current willfulness standard with one that would penalize not knowledge of a patent but adopting a technology with knowledge that it was derived from the patentee, from any source.³²⁶ Mere knowledge of a patent would not raise the likelihood that an infringer be assessed triple damages. Rather, there would also need to be some indicia that the patentee took advantage of the knowledge within the patent, in order to trigger the penalty.³²⁷ Another, administrative solution, would be to enable patentees to search among expired and lapsed patents, where no willfulness penalty applies. While reading these patents would not subject the reader to enhanced willfulness, there is no easy way to access just these patents.³²⁸

3. Remove Barriers to Putting Technology in the Public Domain

³²⁴ See 37 C.F.R. 1.219 Early Publication.

³²⁵ As described *supra*, at I.A.3.

³²⁶ Lemley & Tangri, *supra* note ____, at 1116.

³²⁷ *Id.*

³²⁸ Described *supra*, at Part III.C.

It is worth considering how to remove barriers to innovators putting technology in the public domain. Defensive publication offers an important way, but for it to work, it requires the USPTO to be aware of the publication and to apply it to block the grant of a related application. While this process can be successful, patent examiners tends to rely on patents, not publications, for prior art,³²⁹ and have limited time to search for new references,³³⁰ when they examine patents. At times, defensive publications have been considered to fall short of preempting because they do not contain sufficient technical disclosures,³³¹ or the PTO process has tended to skip over them.³³² These realities may be contributing to the low rate of defensive publication in the US.³³³

Replacing the PTO's Defensive Publication Program,³³⁴ beginning in 2000, the USPTO maintained a statutory invention registry containing the specifications of a regularly filed application for a patent without examination.³³⁵ A statutory invention registration (SIR) was not a patent, but because it was filed with the PTO, and was prepared like a patent, it was more likely to be seen and applied by examiners.³³⁶ However, the SIR program was unpopular, likely due to the cost of preparing registrations, and was abandoned in 2011.³³⁷

³²⁹ John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AIPLA Q.J. 185, Table 5 (1998) (reporting that the median number of non-patent references cited by an examiner is zero).

³³⁰ Michael D. Frakes & Melissa F. Wasserman, *Is the Time Allocated to Review Patent Applications Inducing Examiners to Grant Invalid Patents?: Evidence from Micro-Level Application Data* 11 (Nat'l Bureau of Econ. Res., Working Paper No. 20337, 2014) (reporting that, on average, an examiner spends nineteen hours "reviewing an application, including reading the patent application, searching for prior art, comparing the prior art with the patent application, writing a rejection, responding to the patent applicant's arguments, and often conducting an interview with the applicant's attorney").

³³¹ Wendell R. Guffey, *Statutory Invention Registration: Defensive Patentability*, 16 GOLDEN GATE U. L. REV. 291, 293 (2010).

³³² *Id.* at 294.

³³³ *Described supra*, at Part III.B.3.

³³⁴ MPEP 711.06 *Abstracts, Abbreviations, and Defensive Publications* (the effectiveness of the program was limited by USPTO decisions that delayed the effective date of the references to after they were reviewed and published by the USPTO.) Guffey, *supra* note __ at 295-297.

³³⁵ USPTO Website Archive, USPTO (Nov. 24, 1999), <http://www.uspto.gov/web/offices/com/sol/notices/fr991124.htm> (last visited ____).

³³⁶ *See* Guffey, *supra* note __, at 294, 297.

³³⁷ Jim Pravel, *US Patent and Trademark Office (USPTO) Repeals Statutory Invention Registration (SIR)*, INTELLALEGAL (Mar. 14, 2013), <http://www.intellalegal.com/2013/03/us-patent-and-trademark-office-repeals-statutory-invention-registration/> (last visited ____).

Recently, the USPTO has taken a number of executive actions to improve the quality of patents by using crowdsourced prior art.³³⁸ International patent practices may be instructive to consider as it does so. The Patent Cooperation Treaty requires “mandatory search” of certain patents databases that the public can submit prior art to.³³⁹ This provides greater reassurance that submitted documents will actually be reviewed. The European Patent Office (EPO) has also worked to integrate technical databases of practice with patent search databases.³⁴⁰ The USPTO has been urged to do the same.³⁴¹ But to ensure a thorough search, it would also need to give examiners adequate time to search non-patent references.

4. Remove the Marking Requirement’s Penalty for Practice

As described earlier, patent law has long rewarded the practice of patents.³⁴² Descriptions of the early US patent system circumscribed the subject of a patent as “something that has been reduced to practice; it is not enough that it is merely practicable or possible.”³⁴³ But there are other ways in which patent law has come to penalize the practice, rather than non-practice, of patents. The “marking doctrine” in patent law requires those who practice their inventions to put the world on notice by marking products or their packaging in order to recover damages during the full period of infringement.³⁴⁴ The purpose of the marking requirement is to prevent innocent

³³⁸ *USPTO-led Executive Actions on High Tech Patent Issues*, USPTO, <http://www.uspto.gov/patent/initiatives/uspto-led-executive-actions-high-tech-patent-issues> (last visited ____) (describing two initiatives to make greater use of external inputs to decide which inventions are truly novel and deserve patents, improved examiner training and “crowdsourcing prior art”).

³³⁹ *Research Disclosure Website*, RESEARCH DISCLOSURE, <http://www.researchdisclosure.com/> (last visited ____) (“Patent examiners are required to search Research Disclosure by PCT statute”).

³⁴⁰ *Patent Challenges for Standard-Setting in the Global Economy: Lessons from Information and Communication Technology*, NATIONAL RESEARCH COUNCIL, 32 (2013) (describing collaborations between the EPO and a standards setting organization to include technical, non-patent documents in its search).

³⁴¹ Linda Kahl, *Comments to the USPTO on Crowdsourcing*, (Apr. 18, 2014), http://www.uspto.gov/sites/default/files/patents/law/comments/cr_f_kahl_20140418.pdf (last visited ____) (recommending that the USPTO ensures that existing registries of biological parts are available to and searchable by USPTO examiners).

³⁴² See *supra*, note ____, and accompanying cites.

³⁴³ WILLARD PHILLIPS, *THE LAW OF PATENTS FOR INVENTIONS* 110–11 (Boston, Am. Stationers’ Co. 1837), cited by John Duffy, *Reviving the Paper Patent Doctrine*, 98 Cornell L. Rev. 1359, fn 28 (2012).

³⁴⁴ 35 U.S.C. § 287(a) (“Patentees...may give notice to the public that the same is patented [by marking the patented product...] In the event of failure so to mark, no damages shall be recovered by the patentee in any action for infringement, except on proof that the infringer was notified of the infringement and continued to infringe thereafter, in which event damages may be recovered only for infringement occurring after such notice.”). For an example of a marked item, see *False Marking: Lobbying against the Senate Bill* article. Dennis Crouch, *False Marking: Lobbying*

infringement and encourage patentees to give notice of the existence of their patents.³⁴⁵ However, according to case law, the requirement does not apply to those who do not practice their patented inventions³⁴⁶ or to process patents.³⁴⁷ This interpretation of the law discriminates in favor of non-practicing patentees and owners of process patents, who are automatically entitled to damages as of the time of infringement.³⁴⁸ Closing these loopholes, as others have called for,³⁴⁹ would remove the current biases against practiced and product patents, further contributing to enhanced disclosure to the public.

B. Diffusion by Transfer

Commentators have identified a number of challenges in current markets for technology. While few would argue that the government is in the best position to “make markets,” there may be ways for the patent system to nevertheless reduce the search and information costs of transacting in technology that have been identified as obstacles to technology transfers.

One of the USPTO’s two enumerated duties, for example, is to “be responsible for disseminating to the public information with respect to patents and trademarks,”³⁵⁰ and the USPTO, by virtue of its position within the patent system, is well positioned to collect, and disseminate, a number of types of information. It could use this power in a few ways.

1. Enable Public Recordation of Licensing Offers, without Litigation Impact

The USPTO could make it easier for potential technology partners to find each other by enabling patentees to indicate, and the public to discover, the availability of the technology for licensing. This could take place through a program like the licensing feature that the World

against the Senate Bill, PATENTLYO (Mar. 21, 2010), available at <http://patentlyo.com/patent/2010/03/false-marking-lobbying-against-the-senate-bill.html>. (last visited ____)

³⁴⁵ *Nike Inc. v. Wal-Mart Stores*, 138 F.3d 1437, 1443 (Fed. Cir. 1998)

³⁴⁶ *Wine R. Appliance Co. v. Enterprise R. Equipment Co.*, 297 U.S. 387, 398 (1936) (the law does “not require a patentee who did not produce to give actual notice to an infringer before damages could be recovered”).

³⁴⁷ *Bandag, Inc. v. Gerrard Tire Co.*, 704 F.2d 1578, 1581 (Fed. Cir. 1983)

³⁴⁸ *Wine R. Appliance Co. supra* note __, at 398.

³⁴⁹ See, e.g. Roger D. Blair & Thomas F. Cotter, *Strict Liability and Its Alternatives in Patent Law*, 17 BERKELEY TECH. L.J. 799, 808, 834-835 (2002) (calling the marking statute “incoherent” and “problematic” including because it leaves “innocent” infringers vulnerable to substantial damages liability); Christina Sharkey, *Strategic Assertions: Evading the Patent Marking Requirement*, 12 NW. J. TECH. & INTELL. PROP. 103 (2014) (calling for closing the process patent marking loophole); François deVilliers, *Curbing Trolls by Reforming the Patent Marking Statute*, PATENTLYO (April 16, 2014) available at <http://patentlyo.com/patent/2014/04/curbing-reforming-marking.html> (last visited ____) (calling for removing the marking penalty against those who practice their patents)

³⁵⁰ 35 U.S.C. §2(a)(2).

Intellectual Property Organization (WIPO) has offered since 2012.³⁵¹ Applicants to international patents can report licensing information and terms to international patent authorities, to be disseminated to the public in order to promote voluntary licensing.³⁵² In November 2013, WIPO introduced the WIPO GREEN online marketplace, which enables sellers and buyers to more readily find each other, in order to promote the innovation and diffusion of green technologies.³⁵³

One persistent concern with these programs, however, is that if patentees list patents for licensing, they may lose the ability to later seek exclusive rights. In the US, courts consider the inadequacy of legal damages to decide whether or not to grant injunctions.³⁵⁴ But that can be harder to prove if the patentee has an “open licensing” policy. To address this concern, courts should recognize that such listings do not mean that patentees are not giving up exclusion, even as they also seek diffusion, through transfers.

Another issue has been the lack of dissemination of information regarding the availability of patents for license, once disclosed. US patent owners can technically already provide “notice of the availability of an application or a patent for licensing or sale” to the USPTO,³⁵⁵ however, this information is not disseminated except through a little-read weekly publication of the PTO, the Official Gazette, and not searchable by patent number. A small administrative change, enabling licensing offers to be searchable and recorded within the patent record, could greatly enhance the discoverability of license information.

Taking such steps could reduce the costs of ensuring that willing buyers and willing sellers can find each other.

2. Enhance Patent Information Infrastructure & Create Registries of Licensing Data

³⁵¹ *New PCT Licensing Feature*, PCT NEWSLETTER NO. 12/2011 (Dec 2011).

³⁵² *PCT Request for Indication of Availability for Licensing Purposes*, http://www.wipo.int/export/sites/www/pct/en/forms/ib/editable/ed_ib382.pdf (last visited ____).

³⁵³ *About WIPO Green*, WIPO <https://www3.wipo.int/wipogreen/en/about/> (last visited ____) (describing the goal of the WIPO Green marketplace as the acceleration of green technology information and transfer.)

³⁵⁴ As described *supra*, at note ____.

³⁵⁵ See MPEP 1703. For examples of such listings, see *Patents and Serial Numbers Available for License or Sale*, US PATENT AND TRADEMARK OFFICE (Jan. 10, 2012), <http://www.uspto.gov/web/offices/com/sol/og/2012/week02/TOC.htm#ref18> and *Serial Numbers and Patents Available for License or Sale*, US PATENT AND TRADEMARK OFFICE (Dec. 11, 2007), <http://www.uspto.gov/web/offices/com/sol/og/patlics.htm> (last visited ____).

To make a market, accurate, available data is essential. Although the PTO's statutory mandate is to transmit patent information in fulfillment of this mandate,³⁵⁶ the current patent information and reporting infrastructure suffers from gaps in the statutory authority, compliance, and reporting of patent information that could be filled.

The most glaring recent omission concerns who owns a patent. Patent ownership is a critical determinant of the patent's likely path, but currently, reporting ownership to the USPTO is voluntary.³⁵⁷ Though current law protects against certain types of fraud if such updating occurs,³⁵⁸ there is no way to be sure who owns a patent. Although the USPTO, implementing an executive action of the White House, recently undertook an initiative to require recordation of patent ownership, it ultimately concluded that legislative authority was the best way to impose this requirement.³⁵⁹

Even existing rules requiring the production of patent information are not necessarily followed. Trial courts are required by law to let the PTO know when a patent is litigated, and the adjudicated outcome.³⁶⁰ The PTO is required, in turn, to include this information in the file of each patent.³⁶¹ However, only about 65% of patent files contain the requisite information.³⁶² Knowing if a patent has been previously litigated— and the outcome of this litigation— clearly has significance for an invention's dissemination. If the patent's claims are invalidated as a result of the litigation, for example, they essentially enter the public domain, and are no longer the subject of the patentee's exclusive rights.

Patent information has also been underreported in the context of federally-funded inventions. The Bayh-Dole Act allows recipients of federal research funding, such as universities, to take title to inventions created using federal funds. While the Act affords universities with considerable latitude when exercising their patents rights, it contains a number of accountability safeguards to ensure that federally-funded intellectual property is being

³⁵⁶ See *supra* note __ (describing the PTO's dissemination duty).

³⁵⁷ See *supra* note __ (describing the lack of an ownership recordation requirement).

³⁵⁸ 35 U.S.C. §261.

³⁵⁹ Ryan Davis, *USPTO Backs Away From Patent Transparency Rules*, LAW360 (October 24, 2014, 4:48 PM).

³⁶⁰ 35 U.S.C. §290.

³⁶¹ *Id.*

³⁶² Robin Feldman, Tom Ewing & Sara Jeruss, *The AIA 500 Expanded: Effects of Patent Monetization Entities*, 17 UCLA J.L. & TECH. 1, 91 (2014) (reporting on an analysis of 6,000 of patents known to be in litigation.)

disseminated appropriately. Specifically, grantees must report any subject invention³⁶³ developed based on federal funding, and also, periodically report on utilization and efforts at obtaining utilization.³⁶⁴ But an analysis of academic biomedical patents found prima facie evidence of underdisclosure of even the government interest in patents,³⁶⁵ with a reporting rate of 60-90% among known government-funded patents.³⁶⁶ Utilization data, which could be used to drive greater dissemination of federally-funded invention, is even harder to come by.³⁶⁷

Yet this information is essential to several functions of that directly bear on how the invention is disseminated. Without it, it's difficult for the government determine whether or not to compel licensing as it is entitled to in cases where the invention has not achieved practical application.³⁶⁸ More generally, the federal government cannot effectively carry out its oversight role – as it has been said, if you can't measure, you can't manage. Citing a GAO study that found patent information to be incomplete and access-restricted, the National Academy of Sciences has recommended that federal research agencies reinvigorate data reporting by institutions.³⁶⁹ The university community, in turn, has suggested that improving the functionality and usability of databases that contain data about federally funded inventions would enhance compliance.³⁷⁰

Greater information about patent licenses could also be used to facilitate technology transfer. The lack of comparable licensing data contributes to the gulf in licensing terms that parties to a patent transaction must bridge in order for the license to be formed. But two sets of licensing data that are available through governmental processes could help close the gaps: licenses that are reported in the process of litigation and, as long as not sealed, become part of the public litigation record, and licenses that are formed on the basis of US government-funded inventions and are required to be disclosed by law.³⁷¹ Confidential information could be stripped

³⁶³ 35 U.S.C. §202 (c)(1).

³⁶⁴ 35 U.S.C. §202 (c)(5).

³⁶⁵ Arti K. Rai & Bhaven N. Sampat, *Accountability In Patenting Of Federally Funded Research*, 10 *Nature Biotechnology* 953, 954 (2012).

³⁶⁶ *Id.*, at 955.

³⁶⁷ *Id.*

³⁶⁸ *Id.*

³⁶⁹ Merrill & Mazza, *supra* note ____, at 11.

³⁷⁰ *Higher Ed Response to the White House Innovation Strategy RFI 2014*, answer to question 23, available at https://www.whitehouse.gov/sites/default/files/microsites/ostp/compiled_rfi_responses_redacted.pdf.

³⁷¹ Rai, *supra* note ____, at 953. (describing the Bayh-Dole Act's requirement for reporting information regarding the licensing, assignment and practical utilization of federally-funded patents.)

through a redaction protocol, in a way consistent with President Obama’s Open Data policy.³⁷² An industry effort to share sanitized licensing data, which is largely currently under NDA, conducted in a way consistent with antitrust concerns, could also help to narrow the gap in expectations between parties.

C. Diffusion by Freedom to Operate

A final set of diffusionary levers would make it easier for those who want to give away or share their patent rights, and for those who want to rely on these commitments, to do so.

1. Make it Easier to Waive and Rely on Waivers of Patent Rights

Currently, there is no easy way for patent holders to give some of their rights to the public while reserving others to themselves. To address each of these defects, Contreras has proposed creating a public registry of patent pledges, based on building one himself.³⁷³ A public registry would reduce the risk of failure to discover that a patent is encumbered with a pledge, and the cost of finding pledges, which may otherwise “disappear.”³⁷⁴ A promise that is memorialized as an official government record has a better chance of traveling with the patent, even if it changes hands or goes through bankruptcy. Multiple commentators have suggested that courts embrace expanded reliance theories to obligate patentees to keep their promises,³⁷⁵ but an individual defendant has a better chance of prevailing if the promise is actually known to them, which they can more easily prove if the promise is recorded.

I offer two refinements to Contreras’ registration suggestion, which would do much to bolster the legitimacy of patent pledges. First, the recorded pledge should be integrated into the patent record, at the patent level where possible, or the assignee level, if the pledge is not specific enough. Otherwise, the efficiency gains from a centralized repository risk going unrealized. Fortunately, the USPTO already has an existing mechanisms for recording encumbrances on

³⁷² EXECUTIVE ORDER -- MAKING OPEN AND MACHINE READABLE THE NEW DEFAULT FOR GOVERNMENT INFORMATION, MAY 9, 2013 (mandating that agencies make government data open as a default but in a way that safeguards privacy and confidentiality).

³⁷³ Contreras, *Pledges*, *supra* note ____, at 35-44. His database of patent pledges is available at:

³⁷⁴ *Id.* at 37-38 (describing disappeared patent pledge links and content)

³⁷⁵ Merges & Kuhn, *supra* note ____, Contreras, *Market Reliance*, *supra* note ____ (each advocating for the expansion of reliance theories to bind patent promises).

specific patent, its I-1595 form, which allows patentees to record security interests that others have in the patent.³⁷⁶ This form could be modified to include “waivers.” Second, I suggest that members of the public also be allowed to initiate, though not to complete, public recordation of waivers. This can help create a record of reliance for the initiator or recordation (or “recorder”) and also disincentivize shirking by the patentee who might otherwise publicly promise to waive, and receive the public relations benefit of doing so, without actually keeping the promise. Though the actual mechanics would need substantial refinement, patentees could receive protection from opportunistic or false waiver recordation requests. This could be addressed, for example, through the paying of a fine by recorders whose suggestions prove false, to be split between the patent office and the patentee, and upfront bonding before the USPTO undertakes action to verify the claim and record it.

Merges has suggested enacting a statutory scheme that would enable items to be sold with a “Patent Waived” notice. Like existing statutory marking schemes which reward the marking of items with “Patent Pending” or “Patented” notices, such a scheme would create rights, but for the public, which would be able to rely on the public domain status of the item.³⁷⁷ While his idea is promising and would reduce search costs, further proof of the demand for this sort of mark is warranted before investing in a new regime.

2. An “Open” or “Defensive Only” Option

One other option for supporting innovation by sharing is to allow those who want waive certain rights, for example to give up certain rights, for example, to support “green”, educational or noncommercial, uses, or to give up offensive rights and patent defensively only. Although many patent “flavors” could be explored, in the following paragraphs, I explore in depth the idea of an “open” or “defensive only” patent because the broad use of defensive patenting suggests that there is demand for this option.³⁷⁸ While the exact parameters would need to be tested with the patentees and refined, a new version of a patent that is “defensive only,” could have limited enforceability in general, but full enforceability when the patentee is first attacked. Such an election would allow patentholders to signal to the world which patents they are holding not to

³⁷⁶ *USPTO Recordation Form Cover Sheet Form-1595*, available at <http://www.uspto.gov/forms/pto1595.pdf>

³⁷⁷ Merges, *Dynamism*, *supra* note __, at 201.

³⁷⁸ *See* Parts II.D., III.D. (describing efforts of OIN, Google, and Twitter, to reserve defensive only rights in patents)

exclude others, but for defensive reasons, and dramatically reduce the likelihood of litigation by limiting the ability of the patentee to later “change their mind,” in the same way that many of the patent pledges have tried to.³⁷⁹

The class of “proprietary inclusion mechanisms,” including easements and servitudes, to which a defensive-only patent would belong, is associated with a number of benefits and drawbacks. The “defensive-only” status of a patent is likely to be more enforceable than a contract or waiver, because it is attached to the property, rather than to the owner. This puts third-party beneficiaries on equal footing with others and also, in general, makes the “disarmed” status of the patent less vulnerable to changes in ownership.³⁸⁰ The notice costs are also lower than for less formal mechanisms, as long as the limitation of rights is publicly recorded. Standardization reduces information and bargaining costs,³⁸¹ and reduces opportunism, for example as reflected through clever drafting that reserves more rights even while giving the promisee goodwill. Another advantage of sanctioned sharing mechanisms is the availability of remedies that go beyond the traditional compensatory damages that are typically available in contract law, including specific performance.³⁸²

However, proprietary inclusion mechanisms also have their critics. They are less flexible than contracts and waivers, and certainly, a “defensive-only” option would not capture the full range and conditions of desires to share patents that exist. In addition, those who promote the idea that the number of forms of property should be limited, according to the *numerus clausus* (the “number is closed”) principle point to the burdens on third parties that property forms create. The existence of nonstandard property rights increases the cost of transacting in the property regimen.³⁸³ In addition, creating a new property right could require Congressional authorization, an expensive undertaking that may not allow for the continual refinement that would be needed to ensure that a new property form would be appropriate and enduring.

³⁷⁹ See, e.g. *infra* note ____ (describing Tesla and Twitter’s binding commitments.)

³⁸⁰ Kelley, *supra* note __, at 890-1.

³⁸¹ Thomas W. Merrill & Henry E. Smith, *Optimal Standardization in the Law of Property: The Numerus Clausus Principle*, 110 YALE L.J. 1, 40 (2000)

³⁸² Kelley, *supra* note __, at 894.

³⁸³ Smith & Merrill, *supra* note __ at 8-9, 35-36.

However, a number of these objections could be addressed by adoption of a “defensive-only” option for inventors that is reflected, not in a new property form, but the discounting of patent fees based on the voluntary waiver of the exclusive rights held by patentees. Though this idea is novel, it is not completely unprecedented. In several countries, patentholders can pay discounted fees maintenance fees if they voluntarily agree to offer their patents for licensing to all comers. Under Germany’s “License of Right” (LOR) scheme, for example, a patent owner that declares that anyone can practice the invention in return for reasonable compensation receives a 50% discount off their maintenance fees;³⁸⁴ the UK includes a similar scheme.³⁸⁵ The German LOR option is elected in about 6% of cases overall, but the rate varies significantly by technology area: a 2012 study found that 11% of electrical engineering patents had such declarations, but only 1% of biotechnology patents did.³⁸⁶

Again, I believe several modifications would be needed to make such an option viable in the United States. One problem with LOR options is that they curtail the ability of patentees to enforce patents in any context. However, the defensive choices that companies have made demonstrate that, to the contrary, patentees do often want to retain the ability to enforce their patents.³⁸⁷ Thus, a variant of this approach would limit patentholders’ rights to “defensive-only” contexts, in exchange for a discount on the patent’s maintenance fees. Some thinking needs to be devoted to fleshing out what “defensive” really means. However, assuming it can be determined, the savings could be quite considerable. For a medium-sized company with a portfolio of 1,000 patents of various ages, 1/3 of which are being renewed in any given year, a 50% discount in fees could represent a \$1.4M savings in maintenance fee costs.³⁸⁸

Another departure from current practice concerns permissible changes to the patent’s status. In the UK and Germany, patentholders can change the “LOR” status of patents each time a maintenance fee is paid. However, in order to enable patentees to rely upon and make

³⁸⁴ Section 23 of the German Patent Act, described in Ilja Rudyk, *The License of Right, Compulsory Licensing and the Value of Exclusivity*, GOVERNANCE AND THE EFFICIENCY OF ECONOMIC SYSTEMS (2012), <http://www.sfbtr15.de/uploads/media/415.pdf> (last visited _____).

³⁸⁵ <https://www.gov.uk/licensing-intellectual-property> (for “license of right” endorsed patents a patentholder must grant a licence to anyone who wants one; annual renewal fees are cut in half)

³⁸⁶ *Id.*

³⁸⁷ Described *e.g.*, *supra*, at Part II.D.

³⁸⁸ Based on an assumption that each of a third of the renewed patents are paying large-entity maintenance of \$1,600, \$3,600, or \$7,400 per patent (fees listed at: <http://www.uspto.gov/learning-and-resources/fees-and-payment/uspto-fee-schedule#Patent Maintenance Fee>)

investments based on the “defensive-only” status of patents, it is arguably important that patentees not be able to change their mind after a patent has taken on “defensive-only” status. Clearly, that is the intent of companies like Twitter and Tesla, who have said, respectively, that their defensive “promise stays with the patent”³⁸⁹ and “[s]hould Tesla ever transfer a Tesla Patent to a third party, it will do so only to a party that agrees, by means of a public declaration intended to be binding on such party.”³⁹⁰ Of course, the binding nature of a “defensive-only” election must be considered in view of its impact on uptake of the option, especially in light of the changing priorities of companies. One could imagine a one-way ratchet, in which patentees could elect or default to the “defensive-only” option later in a patent’s life, after the patentee has more information about its intent to practice it, but once defensive, a patent could not lose its defensive-only status. Extensive testing and further refinement would be needed. Other important variables to consider include the definition of “defensive-only” uses and size of the discount.

The salutary effects of “disarming” a large number of patents make these details worth considering further. To the extent that society gets the benefit of the patent system— invention and disclosure— without the higher costs that come with exclusive rights, defensive-only patents may represent the best of both worlds. For those who seek to provide and have freedom of action, it would reduce the costs and the risks of participating in the patent system. With a defensive intent provided transparently and on the record, it would provide an easier way for industries to collectively self-correct and make it easier to overcome the prisoner’s dilemma that although, the whole may be better off when all forbear, no individually forbearing firm is better off when it acts by itself.

3. Reconsidering Maintenance Fees

It is worth exploring further how to calibrate the patent fees patentees pay to keep their patents in force after they are issued, to strike the right balance between diffusion and exclusion. US patents are a relative bargain, ranking in the bottom third of both fees paid before and after a patent is granted,³⁹¹ and the lowest in the world in relation to total GDP.³⁹² The USPTO’s

³⁸⁹ Lee, *supra note* ____.

³⁹⁰ Tesla Motors, *supra note* ____.

³⁹¹ Gaétan de Rassenfosse & Bruno van Pottelsberghe de la Potterie, *The Role of Fees in Patent Systems: Theory and Evidence*, Intellectual Property Research Institute of Australia, at 8-9 (2010).

relatively lower fees are correlated with a relatively higher patent renewal rate. Close to 50% of US patents remain in force by their twentieth year, as opposed to about 20% of European patents.³⁹³ But letting patents lapse hastens their diffusion. Although this topic deserves much more discussion than I can afford here, setting USPTO fees based on considerations of diffusion, particularly at the end of a patent's life when the patentee has likely already reaped the reward, could hasten this diffusion without undercutting the benefits of exclusion.

Part V: Conclusion

The US patent system rewards invention and disclosure with exclusion. But its ultimate aim in doing so is to “promote the progress” of the useful arts, through the diffusion of ideas, products, and learnings to the public. The nature of innovation is changing, enabling greater collaboration and fostering interdependence between innovators. The patent system can support the disclosure of technical information, reduce the cost of transacting in technology, and facilitate the exchange of permissions in support of freedom to operate. This paper has articulated and applied a diffusionary lens to these roles, uncovering several overlooked levers for promoting innovation.

Specifically, to enhance patent disclosure, the USPTO could enable patentees to publish their provisional applications, and their utility applications upon filing, rather than waiting until 18-months after filing. Though current policies are meant to protect innovators from diffusing their ideas prior to excluding others, inventors do not always want such protections, the data suggests.³⁹⁴ The USPTO could also make it easier for innovators to put their inventions in the public domain, for example, by better integrating databases of practice and purposive disclosure with patent office searches, and giving patent examiners enough time to search through non-patent references. The courts or Congress could also do their part, by removing barriers to the reading of patents, and the bias against practice embedded in current “marking” law.

The USPTO and private sector could also further support markets for technology, by making it easier for potential patentees and licensees to find each other, and to successfully complete

³⁹² Walter G. Park, “On Patenting Costs,” 2 *WIPO Journal* Volume 38, 42 (2010).

³⁹³ Five IP Offices, *IP5 Statistics Report 2013 Edition*, <http://www.fiveipoffices.org/statistics/statisticsreports/2013edition.html> (2014) (last visited ____).

³⁹⁴ Graham & Hegde, *supra* note ____.

transactions. The USPTO could consider making it easier for patentees who want to waive their rights to do so, by creating infrastructure for the recordation of patent waivers that the courts can in turn uphold, creating a “defensive-only” fee option, and calibrating maintenance fees.

As the needs of innovation change, so should the patent system consider doing so, by creating more options for innovators to individually tailor the patent system to meet their specific needs. By embracing an “all of the above” approach that embraces exclusion and diffusion, the patent system can broaden its support for innovation in all forms.