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COMMUNITIES OF INNOVATION

Michael Mattioli

ABSTRACT—This Article examines and evaluates the theory that patent holders privately self-correct the government's excessive apportionment of patent rights by means of various cooperative efforts including patent pools, research consortia, and similar licensing collectives. According to some experts, these efforts are proof that market participants have the wisdom and the will to collectively disarm their patent arsenals in order to advance long-term innovation. But until now, this theory of market self-correction has not been evaluated through empirical study. Drawing on interviews and original research, this Article provides an ethnographic view of collective patent licensing episodes. Amidst these stories of success and failure, cooperation and conflict, the picture that emerges is more complex than theory alone predicts: government policies, the backward-looking concern of litigation over existing products, and various social goals significantly influence collective patent licensing. This study suggests some important refinements to theory and points the way forward for industry, lawmakers, and the public to begin a new discussion about the role of collective behavior in our patent system.

AUTHOR—Microsoft Research Fellow, U.C. Berkeley School of Law (Boalt Hall). The author would like to thank Microsoft Corporation for its generous support. The author extends his deep thanks to Rebecca Eisenberg, whose insights, suggestions, and valuable criticism made this Article possible. This Article also benefited from the comments and criticism of Gideon Parchomovsky, Arti Rai, Peter Menell, Robert Barr, Mark Janis, Joe Miller, Mark McKenna, and Avishalom Tor.

INTRODUCTION

This Article examines the bold and puzzling theory that self-governed communities of patent holders are spurring innovation through patent sharing.[1] The hope that markets can effectively shed excess patent rights to enhance dynamic efficiency sits at the crossroads of several avenues of contemporary legal and economic thought. Whether this emerging theory is supported, however, by the recent rise of high-profile patent-sharing efforts led by firms, universities, and governments remains an open and urgent question. By applying theoretical insights to a unique ethnographic study, this Article examines whether patent sharing is properly understood as a form of market self-regulation.[2]

Patents embody a bargain. In exchange for the promise of useful innovations, society grants inventors an exclusive chance to profit from their ideas. Thomas Jefferson, America's first patent examiner, once wrote to a Boston mill owner engaged in a patent dispute, "I know well the difficulty of drawing a line between the things which are worth to the public the embarrassment of an exclusive patent, and those which are not."[3] With these words, Jefferson concisely and candidly framed the central challenge

[1] *See generally* Jonathan M. Barnett, *Property as Process: How Innovation Markets Select Innovation Regimes*, 119 YALE L.J. 384, 387–91, 432–37 (2009) (proposing that patent holders purposefully share their assets under certain circumstances to further collective innovation).

[2] The idea that intellectual property naturally evades excessive appropriation was expressed by Thomas Jefferson. *See* Letter from Thomas Jefferson to Isaac McPherson (Aug. 13, 1813), *in* 6 THE WRITINGS OF THOMAS JEFFERSON 175, 180 (H.A. Washington ed., 1861) ("That ideas should be freely spread from one to another over the globe, for the moral and mutual instruction of man, and improvement of his condition, seems to have been peculiarly and benevolently designed by nature, when she made them, like fire, expansible over all space, without lessening their density at any point, and like the air in which we breathe, move, and have our physical being, incapable of confinement.").

[3] *Id.*

behind patent law: crafting a property regime that does not overreach its purpose.

Today, a rising chorus of critics argues that the U.S. patent system has become too big for its own good.[4] The past thirty years have been marked by steep rises in the number of patent applications, issuances, and lawsuits.[5] From 1990 to 2009 alone, the number of U.S. patent filings nearly tripled.[6] Studies indicate that these increases do not stem from greater innovation, but rather from the deliberate attempts of firms to increase the size and reach of their patent holdings.[7]

The trouble with excessive patent coverage lies in the layered nature of innovation. Just as Isaac Newton once spoke of seeing further by "standing on the shoulders of giants," today's innovators must continually build upon the work of their predecessors and peers.[8] Inventions are not islands. Excessive patent coverage, however, can lead to situations where research and development projects infringe multiple patents held by different owners. Even for large firms and institutions, identifying and licensing such multitudes of patents is often too expensive and uncertain to justify. As a

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[4] Many books and academic articles on the subject of patent overbreadth have been published in recent years. *See* ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS 2 (2004) ("[T]he patent system—intended to foster and protect innovation—is generating waste and uncertainty that hinders and threatens the innovative process."); *see generally*, *e.g.*, JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK (2008) (arguing that the costs of the patent system outweigh its benefits, in part because mechanisms that might prevent patent proliferation are not working properly); DAN L. BURK & MARK A. LEMLEY, THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT (2009) (discussing, *inter alia*, the proliferation of dubious patents and the harms of excessive patent litigation); NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., A PATENT SYSTEM FOR THE 21ST CENTURY 81–129 (Stephen A. Merrill et al. eds., 2004) [hereinafter NRC, 21ST CENTURY] (recommending improvements to the current patent system).

[5] JAFFE & LERNER, *supra* note 4, at 11–17 (characterizing these shifts as "the patent explosion").

[6] In 1990, there were 176,264 patent filings, compared to 482,871 in 2009. PATENT TECH. MONITORING TEAM, U.S. PATENT & TRADEMARK OFFICE, U.S. PATENT AND STATISTICS CHART, CALENDAR YEARS 1963–2010 (2011), *available at* http://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm. The number of patents issued during the period also grew from 99,077 to 191,927. *Id.* The rate of patent litigation may also be on the rise. *See, e.g.*, Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1, 56 (2005) ("[T]he rate of [patent] litigation is rising among small firms and firms with smaller total patents."). *But see* Jean O. Lanjouw & Mark Schankerman, *Enforcing Intellectual Property Rights* 3 (Nat'l Bureau of Econ. Research, Working Paper No. 8656, 2001), *available at* http://www.nber.org/papers/w8656 ("[T]he growth in patenting has been comparable to the growth of litigation . . . .").

[7] *See, e.g.*, Ian Ayres & Gideon Parchomovsky, *Tradable Patent Rights*, 60 STAN. L. REV. 863, 868–69 (2007).

[8] Ironically, Newton's famous quote is adapted from a similar metaphor used by Bernard of Chartres. *See* THE METALOGICON OF JOHN OF SALISBURY 167 (Daniel D. McGarry trans., Univ. of Cal. Press 1955) (1159) ("Bernard of Chartres used to compare us to [puny] dwarfs perched on the shoulders of giants. He pointed out that we see more and farther than our predecessors, not because we have keener vision or greater height, but because we are lifted up and borne aloft on their gigantic stature." (alteration in original)).

result, cumulative innovation is discouraged—a condition Michael Heller and Rebecca Eisenberg famously dubbed "The Tragedy of the Anticommons"[9] and which this Article terms "patent gridlock."[10]

Two government institutions are typically blamed for this state of affairs: The United States Court of Appeals for the Federal Circuit and the United States Patent and Trademark Office (USPTO).[11] Since its founding in 1982, the Federal Circuit—the sole venue for U.S. patent appeals from district courts—has steadily increased the scope and power of patents. The court has succeeded, for instance, in expanding the range of patentable subject matter to include business methods, software, and human genes.[12] The Federal Circuit has also developed and cultivated a high bar for proving patents invalid for obviousness, and has made it easier than ever for patent holders to shut down competitors' businesses.[13] The Supreme Court, however, has curtailed this jurisprudence in a series of reversals.[14]

But the Federal Circuit may not be the only institution responsible: some commentators believe that the USPTO's patentee-friendly practices have likewise contributed to the rise in patenting. Commentators estimate that the percentage of patent applications eventually granted is high—

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[9] Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCI. 698, 698–99 (1998) (discussing that a "specter of rights" surrounding patents may discourage investment in product development).

[10] This term was directly inspired by Michael Heller's use of the term "gridlock" to describe transactional failures caused by excessive propertization. MICHAEL HELLER, THE GRIDLOCK ECONOMY: HOW TOO MUCH OWNERSHIP WRECKS MARKETS, STOPS INNOVATION, AND COSTS LIVES xiii–xiv (2008).

[11] *See, e.g.*, JAFFE & LERNER, *supra* note 4, at 1–24 (summarizing trends under the Federal Circuit and at the USPTO that have resulted in a greater apportionment of patent rights).

[12] *Compare* State St. Bank & Trust Co. v. Signature Fin. Grp., Inc., 149 F.3d 1368, 1373–75 (Fed. Cir. 1998) (establishing the "useful, concrete, and tangible result" test for patentable subject matter), *and In re* Bilski, 545 F.3d 943, 959–60 (Fed. Cir. 2008) (disavowing the "useful, concrete, and tangible" test and replacing it with the "machine-or-transformation" test), *with* Bilski v. Kappos, 130 S. Ct. 3218, 3226 (2010) (stating that the "machine-or-transformation" test is not the sole indicium of patentability and refusing to categorically exclude software patents or business methods).

[13] *See, e.g.*, Brief of Intellectual Property Law Professors as Amici Curiae in Support of Petitioner at 10–11, KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398 (2007) (No. 04-1350) (arguing that the Federal Circuit has made obviousness too difficult to prove); Rebecca Eisenberg, *Obvious to Whom? Evaluating Inventions from the Perspective of PHOSITA*, 19 BERKELEY TECH. L.J. 885, 889–902 (2004) (documenting diminished consideration of PHOSITAs in the Federal Circuit and proposing a new approach).

[14] *See, e.g.*, *KSR Int'l*, 550 U.S. at 418–19 (disapproving of the rigid use of the "teaching-suggestion-motivation" or "TSM" test to determine nonobviousness); eBay Inc. v. MercExchange, L.L.C., 547 U.S. 388, 393–94 (2006) (announcing that injunctions should not be automatically granted in patent cases, but rather, that courts should grant injunctions only upon careful consideration of an equitable "four-factor" test); Transcript of Oral Argument, Microsoft Corp. v. i4i Ltd. P'ship, 131 S. Ct. 2238 (2011) (No. 10-290) (considering the appropriateness of the "clear and convincing" evidentiary standard for proving patent invalidity).

roughly in the neighborhood of 75%–85%.[15] Reflecting on these trends, some leading commentators believe that the USPTO and Federal Circuit have together led the U.S. patent system into a crisis of excess.[16]

As one might expect, scholars have advanced a variety of proposals for reforming these institutions. Some potential solutions would make patent grants harder to obtain—for instance, through increasing application fees,[17] fortifying the standard for obviousness,[18] and increasing the rigor with which patent applications are reviewed at the USPTO.[19] Another set of proposals would make it easier to prove patents invalid after they have issued. Such ex post suggestions include removing or weakening the presumption of validity that patents enjoy in court,[20] revising appellate standards of review, and expanding reexamination procedures at the USPTO.[21] Even bolder proposals abound, such as crafting a technology-

[15] *See* Mark A. Lemley & Bhaven Sampat, Essay, *Is the Patent Office a Rubber Stamp?*, 58 EMORY L.J. 181, 201 (2008) (stating that the USPTO "grants patents to more than 70% of those who apply"); Cecil D. Quillen, Jr. & Ogden H. Webster, *Continuing Patent Applications and Performance of the U.S. Patent and Trademark Office—One More Time*, 18 FED. CIR. B.J. 379, 394–96 & tbls. 4–5 (2009) (reporting an overall rise in the USPTO's grant rate since the founding of the Federal Circuit that, when adjusted to account for Refiled Continuing Applications, ranged between 77% and 92% during the years 1995–2007 and ranged between 67% and 78% during the year 2008); Cecil D. Quillen, Jr., Ogden H. Webster & Richard Eichmann, *Continuing Patent Applications and Performance of the U.S. Patent and Trademark Office—Extended*, 12 FED. CIR. B.J. 35, 38 (2002) (discussing different methods of estimating grant rate and estimating adjusted grant rate in which patents were granted on both parent and continuing applications at 85%).

[16] *See, e.g.*, BURK & LEMLEY, *supra* note 4, at 3 ("The patent system is in crisis.").

[17] *See, e.g.*, Jonathan S. Masur, *Costly Screens and Patent Examination*, 2 J. LEGAL ANALYSIS 687, 727–28 (2010) (proposing the argument that higher prices will work to filter less valuable patents).

[18] *See, e.g.*, John H. Barton, *Non-Obviousness*, 43 IDEA 475, 492–93 (2003) (suggesting stricter nonobviousness standards in some industries).

[19] *See, e.g.*, Nancy T. Gallini, *The Economics of Patents: Lessons from Recent U.S. Patent Reform*, J. ECON. PERSP., Spring 2002, at 131, 147–48 (citing negative consequences of weak review standards).

[20] *See* Microsoft Corp. v. i4i Ltd. P'ship, 131 S. Ct. 2238 (2011) (hearing arguments on this issue). *But see* Mark D. Janis, *Reforming Patent Validity Litigation: The "Dubious Preponderance,"* 19 BERKELEY TECH. L.J. 923 (2004) (doubting that the presumption of validity should be altered).

[21] Two forms of post-grant reexamination procedures are available in the United States: (1) ex parte reexaminations, in which third-party challengers do not participate, 35 U.S.C. §§ 302–307 (2006), and (2) inter partes reexamination, in which they do, *id.* §§ 311–318. The types of evidence that can be used in these procedures are limited and the requirements for instituting post-grant challenges are strict. *See id.* § 312 (requiring that challengers offer prior art that presents "a substantial new question of patentability"). Some commentators have suggested that more meaningful review could be provided though, *inter alia*, allowing post-grant challenges to be based on novelty, nonobviousness, written description, enablement, and utility. *See* NRC, 21ST CENTURY, *supra* note 4, at 101. The America Invents Act fortifies these provisions. Leahy–Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (to be codified in scattered sections of 35 U.S.C.).

specific patent system,[22] offering a limited number of tradable patent rights,[23] or even providing a menu of various types of patents.[24]

But a new theme in legal scholarship advances a fundamentally different solution to patent gridlock. In recent publications, leading commentators have suggested that the patent system can be remedied not by the institutions that govern it, but by the very constituents it serves. The answer to patent gridlock, these scholars believe, is patent sharing. In a recent contribution to the Yale Law Journal, Jonathan Barnett proposed that, given sufficiently low coordination costs, firms will invest in various mechanisms to lower the effective level of patent protection in overpropertized markets.[25] One of the chief mechanisms Barnett discusses is private "sharing regimes" in which rights holders formally pledge nonassertion to facilitate cumulative innovation.[26] In a similar vein, Robert Merges has recently written of the market's self-regulating "impulse" to depropertize, as evidenced by research consortia and Creative Commons.[27] These and similar arguments point to the alluring possibility that, at least to some extent, innovation losses caused by patent gridlock can be overcome by coordinated private action. This theory, termed herein the "Market Correction Hypothesis," could be a paradigm-shifting revelation: if innovation markets require only time and favorable conditions, rather than government intervention, then policymakers may not need to "fix" the patent system at all.

The Market Correction Hypothesis poses an urgent question that demands empirical study. Existing scholarship on this topic, while immensely valuable, is based in large part on economic theory and generalized examples, but not on the complex and often confusing realities

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[22] *See* Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1662 (2003).

[23] *See generally* Ayres & Parchomovsky, *supra* note 7, at 881–93 (proposing a system of tradable patent rights and explaining how such a system might work).

[24] *See generally* Gideon Parchomovsky & Michael Mattioli, *Partial Patents*, 111 COLUM. L. REV. 207 (2011) (introducing two new types of patent rights dubbed "quasi-patents" and "semi-patents" that, if incorporated into the legal system, would expand the menu of intellectual property protections available to investors beyond the current binary one-size-fits-all system).

[25] Barnett, *supra* note 1, at 412 (positing that, under certain conditions, "[t]he market will tend to adjust excessive allocations of intellectual property entitlements in order to maximize the cumulative stream of innovation gains net of transaction costs").

[26] *Id.* at 389 (introducing the term "sharing regimes").

[27] Robert P. Merges, *A New Dynamism in the Public Domain*, 71 U. CHI. L. REV. 183, 184 (2004) ("[T]he increasing importance of the public domain may represent a partial self-correcting impulse in the IP system."). Creative Commons is a nonprofit organization that provides copyright licenses designed to allow and encourage intellectual property owners to retain some, but not all, rights to their work. *See About*, CREATIVE COMMONS, http://www.creativecommons.org/about (last visited Mar. 9, 2012) (describing how Creative Commons's "some rights reserved" model works).

of patent sharing.[28] Through empirical study, the Market Correction Hypothesis can be evaluated, refined if necessary, and used to inform policymakers. The value in examining property-sharing regimes has already been vividly demonstrated in the field of natural resource sharing. Nobelist Elinor Ostrom, for instance, sought to understand why shared natural resources such as rivers and grazing land do not always suffer from chronic overuse, as the proverbial "tragedy of the commons" predicts.[29] This inquiry led Ostrom to study natural-resource-sharing communities around the globe—from remote Japanese villages to Swiss mountain towns.[30] Ostrom found that the structure and workings of property-sharing communities are often highly contextual and cannot be adequately described by theory alone.[31]

In a comparable way, this Article evaluates the Market Correction Hypothesis by studying technological communities that share inventions—"communities of innovation."[32] Unlike traditional "patent pools,"[33] which lower the costs of manufacturing *existing* products by bundling patent licenses together, communities of innovation are primarily aimed at facilitating the development of *future* products.

This Article's method of inquiry is ethnographic rather than data-driven. Information was gathered from a variety of sources, including firsthand interviews with experts at key companies and research institutions, press reports, legislative records, and historical documents.[34] By synthesizing this information into a series of case studies, this Article aims

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[28] *See* Arti K. Rai & Rebecca S. Eisenberg, *Bayh-Dole Reform and the Progress of Biomedicine*, 66 LAW & CONTEMP. PROBS. 289, 297–98 (2003) ("A standard response to [the concern about an anticommons]—that market forces will motivate the emergence of patent pools and other institutions for bundling intellectual property rights, thereby reducing transaction costs and permitting the parties to realize gains from exchange—is an empirical claim that has not yet been borne out by the experience of the biomedical research community." (footnote omitted)).

[29] *See, e.g.*, ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION 182–85 (1990) (analyzing research findings and concluding, *inter alia*, that the Tragedy of the Commons is sometimes useful as a generalized model but that it does not always accurately characterize the behavior of communities).

[30] *Id.*

[31] *Id.*

[32] In a recent contribution to the Columbia Law Review, Gideon Parchomovsky and I discussed the rise of communal patent sharing and explored how "communities of innovation" could be finely tuned to better serve their constituents. *See* Parchomovsky & Mattioli, *supra* note 24, at 233–43.

[33] *See infra* note 107.

[34] This study stems from personal experience. In 2010, I served as outside pro bono patent counsel to Creative Commons when it designed a general purpose open patent license. Our license directly influenced the practices of The GreenXchange (GX)—a large patent-sharing initiative led by Nike, Yahoo!, and Best Buy. In the course of our work, our group carefully studied the successes and failures of similar communities of innovation, many of which have emerged in just the past few years. Using this experience as a seed, I embarked on a broader study of patent-sharing efforts worldwide. My goal was to evaluate the extent to which communal patent licensing is properly understood as a market "correction" that will facilitate cumulative innovation.

to provide a deep and nuanced view of the complex motivations, behaviors, and contextual factors implicated by the Market Correction Hypothesis.[35] Unlike a more exhaustive data-driven analysis, this study does not strive to independently formulate a model of how markets behave. Rather, the inquiry attempts to probe the applicability of an existing hypothesis.

The discussion unfolds in three parts: Part I introduces the dilemma of patent gridlock and the controversial notion that self-governed communities of patent holders can overcome this problem. Part II is an original ethnographic study of patent-sharing communities infused with historical insights. These episodes challenge the Market Correction Hypothesis by revealing that cooperation among patent holders has been significantly motivated by government policies and programs, by litigation over existing technologies, and by charitable goals. Part III discusses the normative implications of this study and offers a policy recommendation. A brief conclusion follows.

I. OVERCOMING THE ANTICOMMONS

A powerful and puzzling theory is emerging among legal scholars: the threat to innovation caused by the government's excessive provision of patent rights can be remedied through private cooperation. The hope that technology markets will shed excess patents to encourage the research and development of new inventions finds theoretical support from leading scholars and, quite possibly, evidentiary support in a set of patent-licensing coalitions led by large corporations.[36] But perhaps this optimistic vision is oversimplified. Drawing on legal and economic theory, the following discussion explains the underpinnings of patent gridlock and the emerging Market Correction Hypothesis.

A. The Dilemma of Patent Gridlock

The director of patent licensing at a major U.S. research institution interviewed for this Article disclosed a surprising fact: most scientific researchers at universities ignore patents.[37] The director explained that the

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[35] *See, e.g.*, OSTROM, *supra* note 29, at 55–56 (explaining how in-depth case studies can be abstracted in order to examine and advance theoretical understandings of collective behavior).

[36] For a description of the theoretical support, see *infra* Part I.B. For a discussion of the possible empirical support, see *infra* Part II.

[37] Telephone Interview with Anonymous Source #5 (Oct. 7, 2010). Many of the individuals interviewed for this Article only commented on condition of anonymity. As a result, some of the interviews in this Article avoid references to specific individuals. This anecdotal comment made by Source #5 is supported by well-documented evidence. *See, e.g.*, John P. Walsh, Ashish Arora & Wesley M. Cohen, *Effects of Research Tool Patents and Licensing on Biomedical Innovation*, *in* PATENTS IN THE KNOWLEDGE-BASED ECONOMY 285, 305–07 (Wesley M. Cohen & Stephen A. Merrill eds., 2003) (documenting the impact of patents on early-stage research and reporting that patents often go unlicensed at early stages); John P. Walsh, Ashish Arora & Wesley M. Cohen, *Working Through the Patent Problem*, 299 SCI. 1021 (2003) (same); *see also* Rebecca S. Eisenberg, *Noncompliance,*

cost of locating and licensing the potential multitude of patents that might cover any single avenue of research is often too high to justify.[38] As a result, the director explained, research is often pursued with disregard for patents. If and when patents later come to light, product development is sometimes abandoned altogether.[39] Michael Heller recently reported an even more distressing story from the halls of the pharmaceutical industry: Heller's anonymous source, the CEO of a large drug company, stated that his researchers have developed an effective treatment for Alzheimer's disease that remains shelved because it likely infringes numerous patents.[40] Going public with the drug, the CEO explained, would likely drown his company in litigation.[41] Similar reports have surfaced in other industries.[42]

Patent gridlock of this kind was first predicted over a decade ago by Michael Heller and Rebecca Eisenberg, who called the phenomenon "the tragedy of the anticommons."[43] The proverbial "tragedy of the *commons*"[44] often turns up in the press. If a resource—a lake containing fish, for instance—is commonly held, individuals will use it as much as possible because no single user will bear the full costs of overuse. Fishermen will tend to ignore the collective long-term costs of their activities, drop their nets en masse, and render the waters barren.[45] Heller and Eisenberg, by contrast, were concerned with the converse dilemma: the underutilization of property that results from an excessive distribution of exclusionary rights among multiple owners.[46]

The tragedy of the anticommons is not limited to the realm of patents.[47] In fact, the effects of this problem are an everyday sight in some developing cities. After Hurricane Katrina struck New Orleans in 2004, for example, real estate developers leapt at the opportunity to purchase parcels of land while prices were low.[48] Despite these investments, however, large swaths

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Nonenforcement, Nonproblem? Rethinking the Anticommons in Biomedical Research, 45 HOUS. L. REV. 1059, 1063–66 (2008) (summarizing earlier studies); *id.* at 1098 ("Within the academy, scientists generally ignore patents and rarely face patent enforcement.").

[38] Telephone Interview with Anonymous Source #5, *supra* note 37.

[39] *Id.*

[40] HELLER, *supra* note 10, at xiii.

[41] *Id.*

[42] *See, e.g.*, BURK & LEMLEY, *supra* note 4, at 31.

[43] Heller & Eisenberg, *supra* note 9.

[44] This concept was introduced in an influential article in *Science* written by the ecologist Garrett Hardin in the late 1960s. Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243, 1244 (1968).

[45] *See* Peter Passell, *One Answer to Overfishing: Privatize the Fisheries*, N.Y. TIMES, May 11, 1995, at D2 (discussing the problem of overfishing as a prime example of the tragedy of the commons).

[46] *See* Heller & Eisenberg, *supra* note 9, at 699.

[47] *See, e.g.*, Michael A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621 (1998) (utilizing the theory of the anticommons to explain the phenomenon of empty storefronts in Socialist countries where property rights are highly disaggregated).

[48] William Carlos Spaht, Note, *Overcoming Another Tragedy in New Orleans: Rebuilding in the Wake of* Kelo *and Act No. 851*, 60 VAND. L. REV. 1599, 1613–14 (2007).

of the city remained in ruins for years. This was in part because many construction projects could not begin without the permission of property owners who had fled the city following the disaster.[49] The challenge of identifying and coordinating so many individual rights holders made rebuilding costly and slow.[50] Quite literally, houses "divided" could not stand.[51]

Excessively fragmented property rights can also lead to holdup problems. In China, property developers use the term "nail house" to describe uncooperative homeowners who, like stubborn nails stuck in a wall, refuse to be uprooted.[52] Dramatic photographs of single homes surrounded by bulldozers commonly appear in Chinese magazines and newspapers.[53] To the general public, nail houses are symbols of defiance in the face of sweeping industrialization.[54] To economists, they reflect hardnosed bargaining: the longer these homeowners hold out, the better their bargaining positions with developers become.

Heller and Eisenberg showed that tragedies of the anticommons can also strike intellectual property markets. Long ago, manufacturing a product—a steam engine, say—typically required licensing one or two patents.[55] But as technologies have grown more complex, so too have webs of patent coverage. Today, the products that fuel our economy, such as software, drugs, financial services, and the like may be covered by dozens or hundreds of patents owned by a multitude of different inventors.[56] As a result, the relationships between patents, patent owners, and products are

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[49] *Id.* at 1614.

[50] *Id.* at 1614–15.

[51] A reference to Abraham Lincoln's famous "houses divided" speech, given in Springfield, Illinois on June 16, 1853. *See* 2 THE COLLECTED WORKS OF ABRAHAM LINCOLN 461 (2008) ("A house divided against itself cannot stand."). Lincoln derived this phrase from a Biblical passage. *See Mark* 3:25 (King James) ("And if a house be divided against itself, that house cannot stand.").

[52] *See, e.g.*, Howard W. French, *Homeowner Stares Down Wreckers, at Least for a While*, N.Y. TIMES, Mar. 27, 2007, at A4 (reporting on a homeowner who had attracted media attention for holding out against land developers, despite significant pressure from private stakeholders and the Chinese government itself); Richard McGregor & Sun Yu, *China's 'Nail House' Floors Developers*, FT.COM (Mar. 27, 2007 3:00 AM), http://www.ft.com/cms/s/0/f1c5bc28-dbff-11db-9233-000b5df10621.html (reporting that the owner of the nail house demanded a price from developers that exceeded local market rates).

[53] *Homeowner Stands Down*, N.Y. TIMES, Apr. 3, 2007, at A3, *available at* http://query.nytimes.com/gst/fullpage.html?res=9A04EFDC1F30F930A35757C0A9619C8B63 (reporting that the same property owner eventually reached an agreement with land developers).

[54] *See, e.g.*, French, *supra* note 52; McGregor & Yun, *supra* note 52.

[55] *See* Robert P. Merges, *Institutions for Intellectual Property Transactions: The Case of Patent Pools*, *in* EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY 123, 124 (Rochelle Cooper Dreyfuss, Diane Leenheer Zimmerman & Harry First eds., 2001) ("A patent, for example, was conceived as a property right over a single, coherent product occupying a distinct economic market.").

[56] *See* Oren Bar-Gill & Gideon Parchomovsky, *The Value of Giving Away Secrets*, 89 VA. L. REV. 1857, 1868 (2003) ("Cumulative innovation is the hallmark of high-tech industries such as computer software, semiconductors, molecular biology, and pharmacology." (footnotes omitted)).

often nuanced and complex. Patent gridlock can occur horizontally—e.g., when multiple patents would cover a final product[57]—or vertically—e.g., when multiple patents would be infringed during different stages of a research and development process.[58] In both cases, assembling such fragmented rights into useful mosaics of patent coverage can impose steep transaction costs on would-be innovators.[59]

Ronald Coase showed that "transaction costs" are a natural and necessary consequence of any property regime.[60] In his classic article, *The Problem of Social Cost*, Coase explained that transferring property always costs more than a purchase price alone:

> In order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on.[61]

But beyond such ordinary transaction costs, additional costs arise when a single product can only be developed by gathering various parts owned by multiple monopolists, as is currently the case in technology fields where excessive patent rights exist.[62] This fact was revealed by the French mathematician, Antoine Augustin Cournot. In an 1838 essay titled *Theory of the Mutual Relations of Producers*, Cournot proved that the total cost of purchasing complementary goods from multiple monopolists is always greater than the cost of purchasing the same goods from a single monopolist.[63] Coase's and Cournot's enduring insights explain why

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[57] *See* Heller & Eisenberg, *supra* note 9, at 699 ("A proliferation of patents on individual fragments held by different owners seems inevitably to require costly future transactions to bundle licenses together before a firm can have an effective right to develop [future commercial products].").

[58] *See id.*

[59] *See id.*; BURK & LEMLEY, *supra* note 4, at 76–77 (discussing the horizontal–vertical divide).

[60] *See* Yochai Benkler, *Coase's Penguin, or, Linux and* The Nature of the Firm, 112 YALE L.J. 369, 372 (2002) (discussing transaction costs).

[61] R. H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 15 (1960).

[62] *See* Rai & Eisenberg, *supra* note 28, at 297 ("Transaction costs mount quickly when the basic research discoveries necessary for subsequent work are owned not by one entity, but by a number of different entities.").

[63] AUGUSTIN COURNOT, RESEARCHES INTO THE MATHEMATICAL PRINCIPLES OF THE THEORY OF WEALTH 103–04 (Nathaniel T. Bacon trans., Augustus. M. Kelley 2d ed. 1971) (1838) (noting "the composite commodity will always be made more expensive, by reason of separation of interests than by reason of the fusion of monopolies. . . . [T]he more there are of articles thus related, the higher the price determined by the division of monopolies will be, than that which would result from the fusion or association of the monopolists."); *see also* BURK & LEMLEY, *supra* note 4, at 76 (discussing Augustin Cournot's Theory of Complements).

developing products that require patent licenses from multiple owners is often inefficiently expensive.[64]

Like the nail houses that stall the development of China's growing metropolises, complementary patents can also allow their owners to demand exorbitant "holdout" fees.[65] If multiple patent holders each attempt this negotiating strategy, the cost of developing new products can become prohibitive.[66] This observation, considered along with Cournot's insights on complementary goods, reveals a subtle but important point: patent gridlock results from the *distribution* of complementary patent rights among different owners, not just the sheer *number* of patents in a given market.

Patent gridlock is difficult to measure and quantify directly, but experts have documented its existence.[67] Stephen Maurer, for instance, described the failure of a genetic patent exchange initiative led by research institutions in the late 1990s.[68] After years of negotiations and planning, the effort was abandoned because the participants reached a patent licensing impasse.[69] In the field of biotechnology, Rebecca Eisenberg looked into similar patent-bargaining failures that she learned of during her time as chair of the National Institutes of Health (NIH) Working Group on Research Tools.[70] Likewise, Janet Hope reported on patent bargaining failures impeding drug innovation.[71] Among other anecdotes, Hope quoted a biotechnology executive's description of a decade-long effort to pool intellectual property as resulting in "complete and total constipation."[72]

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[64] BURK & LEMLEY, *supra* note 4, at 76 ("[T]he price of the integrated product will be inefficiently high—and output inefficiently low . . . ."). This problem is distinct from, and potentially more harmful than, the static efficiency costs of underproduction and supracompetitive pricing that are part and parcel of any patent regime. *See id.* at 76–77.

[65] *See* Thomas F. Cotter, *Patent Holdup, Patent Remedies, and Antitrust Responses*, 34 J. CORP. L. 1151, 1160 (2009) (describing the holdup or holdout phenomenon in economic terms); Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, *in* 1 INNOVATION POLICY AND THE ECONOMY 119, 124–26 (Adam B. Jaffe et al. eds., 2001) (discussing the patent holdup problem).

[66] *See, e.g.*, BURK & LEMLEY, *supra* note 4, at 76 (noting that holdouts can stifle product research and development when multiple patent holders are involved).

[67] *But see, e.g.*, Chester J. Shiu, *Of Mice and Men: Why an Anticommons Has Not Emerged in the Biotechnology Realm*, 17 TEX. INTELL. PROP. L.J. 413, 450–54 (2009) (denying the existence of an anticommons in the biotechnology industry based on empirical study).

[68] Stephen M. Maurer, *Inside the Anticommons: Academic Scientists' Struggle to Build a Commercially Self-Supporting Human Mutations Database, 1999–2001*, 35 RES. POL'Y 839 (2006).

[69] *Id.* at 847–48.

[70] Rebecca S. Eisenberg, *Bargaining Over the Transfer of Proprietary Research Tools: Is This Market Failing or Emerging?*, *in* EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY, *supra* note 55, at 223, 223–50 (discussing factors that led to bargaining failures in the realm of biomedical research and concluding that institutions to bring down transaction costs do not always arise).

[71] JANET HOPE, BIOBAZAAR: THE OPEN SOURCE REVOLUTION AND BIOTECHNOLOGY 28–67 (2008) (reporting on patent bargaining failures in the biotechnology industry).

[72] *Id.* at 66 (internal quotation marks omitted).

How did this situation arise? Experts believe that the answer is clear: the government has made patents too plentiful and too powerful. Since the Federal Circuit's founding in 1982, commentators have documented the court's decisions extending the range of patentable subject matter to include, *inter alia*, software, business methods, and genes.[73] The court has also been faulted for making it harder for defendants to prove invalidity due to obviousness.[74] But the Federal Circuit is not the only institution to blame: Critics also believe the USPTO's patentee-friendly practices (as reflected by the high grant rates cited in the Introduction to this Article) have contributed to significant increases in patent applications and issuances.[75] Legislation has likely played a part as well. Congress's passage of the 1980 Bayh-Dole Act, for instance, opened up publicly-funded research to patenting.[76] By freeing university researchers to seek patents over genes and other research building blocks, and by limiting the ability of funding agencies to mandate licensing, this law likely contributed to the patent gridlock that commentators believe has impeded biomedical innovation.[77] The significant rise in patent applications, issuances, and litigation in recent decades has become a major theme of contemporary patent scholarship.[78]

Tracing the problem back to its sources, scholars have proposed a variety of institutional reforms. Most proposals fall into one of three categories: The first set of reforms focuses on enhancing "costly screens" that act before or after patents are issued.[79] The second set of reforms focuses instead on enhancing the "quality screens" that act during the initial prosecution stage or following patent issuance.[80] The third category of reforms focuses on reducing the power of patents in the courtroom. Such proposals include, for example, abandoning or lowering the presumption of validity that patents carry.[81]

More radical proposals have long been debated as well. Compulsory licensing, for example, could reduce coordination costs to manageable

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[73] *See supra* note 12 and accompanying text.

[74] *See supra* note 13 and accompanying text.

[75] *See supra* note 5 and accompanying text.

[76] *See* Bayh-Dole Act, Pub. L. No. 96-517, §§ 200–211, 94 Stat. 3015, 3019–28 (1980) (codified as amended at 35 U.S.C. §§ 200–11 (1994)).

[77] *See* Rai & Eisenberg, *supra* note 28, at 291 (noting that the Bayh-Dole Act likely contributed to significant increases in research patenting that may hinder scientific progress).

[78] *See, e.g.*, *supra* note 4 and accompanying text (listing several contemporary books and articles on this topic).

[79] *See, e.g.*, Masur, *supra* note 17, at 688–91 (discussing the application of a costly screening model to the procedures used by the USPTO).

[80] *See, e.g.*, JAFFE & LERNER, *supra* note 4, at 184 (discussing post-grant reexaminations).

[81] *But see* Janis, *supra* note 20, at 923 (calling into question arguments for altering this presumption).

levels by vesting the right to set license fees in an independent body.[82] Some scholars have even suggested doing away with patents altogether and instead introducing a set of government prizes or auctions for new inventions.[83] While such proposals continue to stir debates among scholars and lawmakers, patent gridlock may only continue to limit potential technological advances.

B. The Market Correction Hypothesis

Can private cooperation increase the level of innovation in society? This idea, termed herein the "Market Correction Hypothesis," is the synthesis—and in my view, the natural conclusion—of several converging themes in legal scholarship and industry practice. If sound, the Market Correction Hypothesis could have an important impact on innovators, policymakers, and even patterns of industrial organization.[84]

In his writings on patent exchanges, Carl Shapiro helped lay the theoretical economic underpinnings of this idea. Drawing inspiration from Cournot's research on monopolies, Shapiro argued that some forms of transactional gridlock could be overcome by licensing multiple patents under unified arrangements.[85] By reducing the number of individual patent licenses needed, such arrangements could lower transaction costs and encourage efficiencies similar to those that Cournot identified under monopoly conditions.[86] Shapiro presented patent pools (wherein multiple patents are licensed as a single package) and cross licenses (i.e., reciprocal patent license agreements) as the two mechanisms that could achieve such efficiencies.[87]

Oren Bar-Gill and Gideon Parchomovsky examined a slightly different way that property holders can collectively stimulate future innovation—

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[82] *See generally* Martin J. Adelman, *Property Rights Theory and Patent-Antitrust: The Role of Compulsory Licensing*, 52 N.Y.U. L. REV. 977, 1001–02 (1977) (explaining a compulsory licensing system); Cole M. Fauver, Comment, *Compulsory Patent Licensing in the United States: An Idea Whose Time Has Come*, 8 NW. J. INT'L L. & BUS. 666, 668–74, 683–85 (1988) (same).

[83] *See, e.g.*, John F. Duffy, *The Marginal Cost Controversy in Intellectual Property*, 71 U. CHI. L. REV. 37 (2004) (proposing and analyzing a scheme of intellectual property subsidies).

[84] Industrial organization is a branch of economics dedicated to the study of the structure of markets and the strategies of firms that operate within markets. *See, e.g.*, Note, *Dissent, Corporate Cartels, and the Commercial Speech Doctrine*, 120 HARV. L. REV. 1892, 1902 (2007) (defining industrial organization).

[85] *See* Shapiro, *supra* note 65, at 123, 127–29 (viewing patent pools and cross licenses through the lens of the "complements" problem Cournot identified).

[86] *Id.* at 123–24. Importantly, Shapiro recognized that the excessive balkanization of patent rights threatened not only the production of *existing* products, but also the research and development of *future* innovations. *Id.* at 124 ("[T]he prospect of paying such royalties necessarily reduces the return to new product design and development, and thus can easily be a drag on innovation and commercialization of new technologies.").

[87] *Id.* at 123, 126–27.

through publishing, rather than patenting, scientific research.[88] Challenging conventional wisdom, Bar-Gill and Parchomovsky explained that the publication of research data, combined with the pursuit of narrow patent rights, could benefit upstream and downstream inventors alike by fostering cumulative innovation.[89] Like Shapiro, Parchomovsky and Bar-Gill's position was primarily normative: they cogently explained the social and economic advantages of information sharing, rather than describing it as a behavior that markets necessarily display.

Robert Merges posited that the phenomenon of collective licensing may reflect a limited market capability to "correct" for excessive property entitlements. Merges first discussed this idea in an article that explored how patent pools have sometimes arisen to break bottlenecks that prevent the production of existing products.[90] Citing several episodes of collective IP licensing—including one examined in Part II of this Article—Merges concluded that the distribution of intellectual property entitlements among multiple owners can sometimes encourage investments in private exchange regimes that lower the costs of repeat bargaining.[91] In subsequent work, Merges viewed patent licensing regimes as "private-ordering response[s]" to anticommons dilemmas.[92] For support, Merges cited two notable patent contributions to the public domain: Merck's decision to forgo enforcement of its gene fragment patents and IBM's investments in open-source software.[93] Merges suggested that such episodes "may reveal a self-regulating aspect of the IP world that is just now coming into focus."[94] Merges cautioned, however, that there is no reason to believe that private exchange regimes will always arise to perfectly offset the costs of excessive patent rights.[95]

Jonathan Barnett recently developed Merges's suggestion into a formal theory that innovation markets sometimes correct the government's errors of overpropertization by, among other things, collectively ceding some of

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[88] *See generally* Bar-Gill & Parchomovsky, *supra* note 56 (examining the trend toward unprotected publishing of patentable material).

[89] *Id.* at 1860, 1872 (discussing this strategy).

[90] Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations*, 84 CALIF. L. REV. 1293, 1340–58 (1996).

[91] *Id.* at 1391–92 ("Where firms are involved in such transactions repeatedly, institutions for regularized IPR exchange tend to emerge.").

[92] Merges, *supra* note 27, at 186.

[93] *Id.* at 188–94 (discussing these two examples).

[94] *Id.* at 186.

[95] *Id.* at 203 (expressing qualified optimism); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 896 (1990) (recognizing that "[t]here is . . . no reason to assume that when blockages arise industries will always turn to the deadlock-breaking solutions we have seen, patent pooling and cross licensing" and noting that government pressure has been an impetus in at least one case of patent pooling).

the rights patent law affords.[96] Barnett's theory is founded on the possibility that "large resource holders do not simply seek to maximize initial innovation gains . . . rather, they self-interestedly seek to maximize the cumulative stream of initial plus subsequent innovation gains."[97] Building on public choice literature, Barnett posited that market self-correction is most likely to arise in technology fields defined by cumulative innovation and in markets that enjoy low coordination costs.[98]

Barnett's position draws on selected anecdotes. He cites a set of historical episodes of invention sharing as evidence that markets indeed are capable of encouraging future innovation by ceding patent protections. These include: the pooling of automotive patents in the early twentieth century, AT&T/Bell Labs' decision to license transistor patents for low royalty fees, the publication of knowhow and research data by large corporate research firms including IBM, instances in which firms opted neither to seek nor to enforce patents in the fields of biotechnology, open-source software and financial services, and various patent pools.[99] Although Barnett does not suggest that markets always work perfectly to overcome all imperfections, he suggests, like Merges, that the patent anticommons is not as "tragic" as conventional belief holds.[100]

These hopeful insights find something of an analogue in the work of famed political economist Elinor Ostrom. As mentioned in the Introduction, Ostrom's firsthand studies of natural-resource-sharing communities around the world revealed that rational economic actors are surprisingly capable of developing private collective action solutions to problems of overuse.[101] Ostrom's work contradicted widely accepted theories on collective action and spawned an important body of empirical literature on sharing "common pool resources."[102]

The notion that intellectual property markets are capable of curing the converse problem of chronic underuse is appealing. Tragedies of the commons and anticommons spring from the same source: the government's initial misallocation of property rights.[103] As every first-year law student knows, "property" includes rights to use and rights to exclude. When rights to use are shared among many individuals, such as with fishing waters,

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[96] Barnett, *supra* note 1, at 442–43 (discussing investment in "transactional arrangements" designed to lower patent protections and increase cumulative innovation).

[97] *Id.* at 432 (emphasis omitted).

[98] *Id.* at 424.

[99] *Id.* at 434–37.

[100] *Id.* at 431.

[101] OSTROM, *supra* note 29 (discussing natural resource sharing).

[102] *See, e.g.*, Charlotte Hess & Elinor Ostrom, *Ideas, Artifacts, and Facilities: Information as a Common-Pool Resource*, 66 LAW & CONTEMP. PROBS. 111 (2003) (analyzing scholarly information as a common pool resource).

[103] *See* Heller, *supra* note 47, at 625–26, 667 (referring to the paucity of commentary on the symmetrical relationship between commons and anticommons property).

overuse (i.e., tragedies of the commons) can result. When rights to exclude are fragmented among multiple owners, as in the case of post-Katrina New Orleans, underuse (i.e., tragedies of the anticommons) can result.

Shapiro, Merges, Parchomovsky, Bar-Gill, and most recently Barnett, have each contributed to a new vision of the relationship between intellectual property holders and the public institutions that form our patent system. The Market Correction Hypothesis posits that private actors will sometimes respond to the government's excessive provision of patent rights through collective nonenforcement. Although it has been known since the time of Cournot that aggregating complementary goods can lower production costs, the crucial new insight distinguishing the Market Correction Hypothesis from previous theories is its focus on future products rather than existing ones. The Market Correction Hypothesis proposes that, under the right circumstances, collective nonenforcement can lay the groundwork for innovation.

To what extent does the Market Correction Hypothesis describe and explain the behavior of patent holders? None of the scholars who have contributed to this theory posit that markets are always capable of perfectly correcting for excessive property rights. Moreover, a set of experiments conducted by economists in 2006 revealed that in practice, rational actors have far more trouble extracting themselves from anticommons dilemmas than from tragedies of the commons.[104] The study concluded: "[I]t is inadequate to extrapolate findings from the commons to the anticommons dilemma."[105] While these experiments do not directly contradict the Market Correction Hypothesis, they call attention to the relative paucity of empirical literature on invention sharing as compared to the far more extensive empirical literature on real property sharing. As it stands, the Market Correction Hypothesis is rooted in economic theory but has not yet benefitted from the color, nuance, and complexity that only an empirical examination can reveal.[106]

II. CURRENT AND HISTORICAL EXAMPLES

This Part examines communities of innovation by drawing on interviews, independent research, and firsthand observations made during my time as pro bono outside counsel to an emerging patent-sharing initiative. The collaborations discussed in the paragraphs that follow are ideal test cases for the Market Correction Hypothesis. Unlike traditional patent pools, these institutions do not exist solely to lower the cost of

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[104] Sven Vanneste, Alain Van Hiel, Francesco Parisi & Ben Depoorter, *From "Tragedy" to "Disaster": Welfare Effects of Commons and Anticommons Dilemmas*, 26 INT'L REV. L. & ECON. 104 (2006).

[105] *Id.* at 118.

[106] *See* Rai & Eisenberg, *supra* note 28 (stating that, in the biomedical research community, the Market Correction Hypothesis "is an empirical claim that has not yet been borne out").

producing existing products, but rather, they purport to encourage the research and development of products that do not yet exist.[107] Contributors to these initiatives include corporate juggernauts such as HP, IBM, Ericsson, Nokia, Sony, Nike, Yahoo!, Best Buy, and GlaxoSmithKline (GSK), as well as several major research institutions and the governments of the United States and South Africa. This study provides a rare look at collective patent licensing from the perspectives of those involved.

Three themes emerge from this investigation, each of which is elaborated upon below. First, government often plays an important role in encouraging communities of innovation. This fact challenges the Market Correction Hypothesis's depiction of private actors correcting government propertization errors. Second, some patent-sharing efforts are, contrary to public statements, focused more on the near-term goal of avoiding or settling litigation over existing products than on the more forward-looking goal of encouraging research and development. Third, some communities of innovation are charitable in nature, suggesting that, contrary to the Market Correction Hypothesis, they are motivated more by social goals than by private profits. These themes shed new light on the role of collective action in technology markets.

A. Government-Influenced Communities

The Market Correction Hypothesis posits that sometimes patent holders respond to the government's excessive distribution of patents by cooperating. But the following episodes tell a different story. Here, through exhortations, interventions, and the provision of incentives, the "visible hand" of public policy guides patent holders toward cooperation and away from patent gridlock.[108]

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[107] The term "patent pool," as it is commonly used by legal scholars, describes a set of patent licenses that facilitate production or assembly of an end-product that has already been invented. *See, e.g.*, Merges, *supra* note 90, at 1340; Shapiro, *supra* note 65, at 127. The first widely documented patent pool in the United States arose in the sewing machine industry in 1856. *See* Merges, *supra* note 90, at 1342. In the late twentieth century, patent pools arose to facilitate the assembly of digital standards, including MPEG video. *See* Letter from Joel I. Klein, Acting Assistant Attorney Gen., DOJ, to Gerrard R. Beeney, Esquire, Sullivan & Cromwell (June 26, 1997) [hereinafter MPEG-2 Business Review Letter], *available at* http://www.usdoj.gov/atr/public/busreview/215742.pdf. For an analytical discussion of the antitrust implications of patent pools, see Josh Lerner & Jean Tirole, *Efficient Patent Pools*, 94 AM. ECON. REV. 691 (2004).

[108] Economist Adam Smith coined the term "invisible hand" as a metaphor to describe how atomistic, self-interested actors can unintentionally achieve efficiency in the aggregate. *See* ADAM SMITH, THE THEORY OF MORAL SENTIMENTS 215–16 (Knud Haakonssen ed., 2002) (1759) ("They are led by an invisible hand to make nearly the same distribution of the necessaries of life, which would have been made, had the earth been divided into equal portions among all its inhabitants, and thus without intending it, without knowing it, advance the interest of the society, and afford means to the multiplication of the species." (footnote omitted)). The Market Correction Hypothesis can be distinguished from Smith's "invisible hand" because it posits the conscious and deliberate pursuit of shared goals by small groups of private actors.

1. The Medicines Patent Pool.—Today, the public sector is tackling a patent gridlock dilemma that is quite literally a matter of life and death. Experts believe that in the developing world, the health of millions of HIV sufferers depends on the creation of new pediatric antiretroviral drugs (ARVs) and so-called "fixed dose" ARVs that combine several medications into a single pill.[109] A former director of the World Health Organization has called the ongoing lack of these drugs a "global health emergency."[110]

Developing fixed-dose ARVs presents a textbook case of "horizontal" patent gridlock: each pill contains multiple drugs, usually patented by different companies.[111] Because licensing the necessary patents presents high transaction costs and opportunities for holdouts, the demand for fixed-dose ARVs in developing countries remains unfulfilled.[112] Aggravating the challenge is the fact that pharmaceutical companies are often reluctant to license their patents at lower rates in developing nations because the reverse importation of cheap generic drugs into wealthy nations can undercut primary market sales.[113]

Pediatric ARVs, by contrast, face a "vertical" form of patent gridlock. Multiple patented research tools sit upstream, blocking the path to downstream drug development. The difficulty of identifying and licensing these patents, combined with the low demand for childhood HIV drugs in

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[109] *See* 152 CONG. REC. 14,436 (daily ed. July 14, 2006) (statement of Sen. William H. Frist) (discussing why single-pill fixed-dose treatments will have a "profound" impact on HIV–AIDS patients); ALL-PARTY PARLIAMENTARY GRP. ON AIDS, THE TREATMENT TIMEBOMB 25 (2009) [hereinafter TREATMENT TIMEBOMB], *available at* http://www.thebody.com/content/art52841.html ("There is an urgent need for new formulations of HIV medicines for children and for drugs that are easier to use such as small tablets."); Amir Attaran, *AIDS Medicine Patents Cause a Problem*, FIN. TIMES (London), June 21, 2004, at 10 (explaining that "[u]nreliable supply chains in Africa make it" difficult for patients to receive regular, unbroken, and simultaneous doses of the three or more necessary medicines, and that combining the drugs into a single pill could solve this problem).

[110] Lee Jong-wook, Former Dir.-Gen., World Health Org., Speech at Press Conference on AIDS Treatment Global Health Emergency (Sept. 22, 2003), *available at* http://www.who.int/dg/lee/speeches/2003/AIDS_treatment_pressconference/en ("Our failure to deliver antiretroviral treatment for AIDS to the millions of people who need it is a global health emergency.").

[111] *See supra* note 59 and accompanying text (explaining horizontal and vertical patent gridlock).

[112] While this problem affects developed countries as well, unreliable supply chains make it even more difficult to aggregate necessary drugs in Africa. *See, e.g.*, Attaran, *supra* note 109 (explaining how the failure of pharmaceutical patent holders to cooperate has impeded the production of fixed-dose pills).

[113] The threat is so great that, in 2001, thirty-nine drug firms (and one individual) instituted a legal action to stop the government of South Africa from passing a law that would allow imports of generic HIV–AIDS drugs. *See* Pharm. Mfrs.' Ass'n of S. Afr. v. Mandela, High Court of South Africa, Transvaal Provincial Division, No. 4183/98 (2001), *available at* http://www.tac.org.za/Documents/MTCTPrevention/pharmace.txt. Only in the face of immense public pressure did the companies withdraw the suit in 2001. Ben Hirschler, *Glaxo Gives Up Rights to AIDS Drugs in South Africa*, REUTERS NEWMEDIA (Oct. 6, 2001), http://www.aegis.com/news/re/2001/RE011009.html ("39 pharmaceutical companies backed down in a landmark court battle with the South African government.").

wealthy nations (where most drug research takes place), have significantly hindered research.[114] In poor nations, this transactional blockade has had grave consequences: The humanitarian organization Médecins Sans Frontières claims that the scarcity of pediatric ARVs significantly contributes to the high mortality rates of HIV sufferers under age two.[115]

In 2008, a group of policymakers within the World Health Organization—The Intergovernmental Working Group on Public Health, Innovation, and Intellectual Property—suggested a solution: If pharmaceutical companies could be convinced to collectively license their patents, AIDS-related drugs could be researched, developed, and manufactured for use in poor countries.[116] The plan was starkly simple. In exchange for royalties on product sales, patent holders would be asked to extend licenses to drug developers to facilitate research and development on pediatric ARV formulations and production of fixed-dose pills.[117] Soon after the idea was proposed, UNITAID, an independent agency hosted by the World Health Organization, made plans for launching and administering the effort.[118]

U.K. politicians and officials were supportive. In January 2009, over 150 members of the U.K. Parliament (MPs) signed a parliamentary petition applauding UNITAID's proposed patent pool and calling on pharmaceutical

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[114] In the United States and Europe, there is a nearly 0% rate of HIV infections among children under age fifteen. UNAIDS, UNICEF, A CALL TO ACTION: CHILDREN: THE MISSING FACE OF AIDS 6 (2005); *see also* TREATMENT TIMEBOMB, *supra* note 109, at 25 ("There is a lack of investment into medicines that are appropriate for children, because of the very limited commercial, developed country market for them."); Brenda Waning et al., *The Global Pediatric Antiretroviral Market: Analyses of Product Availability and Utilization Reveal Challenges for Development of Pediatric Formulations and HIV/AIDS Treatment in Children*, 10 BMC PEDIATRICS 2010 74, 75 (2010) (highlighting the near-elimination of HIV in children from the United States and Europe and the corresponding minimal demand for pediatric ARVs in these markets as a strong disincentive to the development).

[115] *See Children Being Neglected in AIDS Fight, Says MSF*, MÉDECINS SANS FRONTIÈRES/DOCTORS WITHOUT BORDERS (July 13, 2004), http://www.doctorswithoutborders.org/news/article.cfm?id=712&cat=field-news; Press Release, Médecins Sans Frontières/Doctors Without Borders, Drug Companies Leave Children with AIDS to Fend for Themselves (Nov. 28, 2005), *available at* http://www.doctorswithoutborders.org/press/release.cfm?id=1628.

[116] *Cf.* World Health Assembly, WHO, Global Strategy and Plan of Action on Public Health, Innovation and Intellectual Property, WHA61.21, annex 14 (May 24, 2008), *available at* http://apps.who.int/gb/ebwha/pdf_files/A61/A61_R21-en.pdf (recommending examining "the feasibility of voluntary patent pools of upstream and downstream technologies to promote innovation of and access to health products and medical devices").

[117] *See* TREATMENT TIMEBOMB, *supra* note 109, at 28 (discussing patent sharing as a vehicle for facilitating the development of drugs that do not yet exist).

[118] *The Medicines Patent Pool Initiative*, UNITAID (Mar. 2009), http://www.unitaid.eu/images/projects/PATENT_POOL_ENGLISH_15_may_REVISED.pdf (describing how the UNITAID pool would work); *see also* Donald G. McNeil, Jr., *Effort for Lower Drug Prices Would Focus on Gaining Patents*, N.Y. TIMES, July 8, 2008, at F6 ("[UNITAID] is endorsing the creation of a panel of experts to explore the feasibility of a 'patent pool.'").

companies to participate.[119] In a March 2009 parliamentary hearing, an MP urged pharmaceutical companies "to respond positively" to the proposed initiative and to cooperate in order to improve access to HIV/AIDS drugs.[120] In a BBC interview conducted that summer, the United Kingdom's International Development Minister echoed that sentiment, stating: "The pharmaceutical industry has an opportunity to act now to help prevent future human catastrophe. It is time for them to state their clear commitment to make new HIV medicines affordable to those who need them most, by working with [UNITAID] to develop a patent pool."[121]

Leading up to the pool's launch, industry support was weak.[122] GSK, the holder of several key ARV patents, told a group within the U.K. parliament in 2009 that it did not plan to contribute its patents to the project.[123] (As of this writing, GSK continues to refuse to participate in the effort despite mounting public pressure.)[124] ViiV Healthcare, a joint venture between GSK and Pfizer, also responded coldly.[125] Citing these holdouts, commentators from the fields of law and medicine urged world governments to more actively push patent holders to share.[126]

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[119] *Early Day Motion 1553—HIV Treatments and Children*, PARLIAMENT.UK (Jan. 6, 2009), http://www.parliament.uk/edm/2008-09/1553.

[120] 25 Mar. 2009, PARL. DEB., H.C. (6th Ser.) (2009) 289 (U.K.), *available at* http://www.publications.parliament.uk/pa/cm200809/cmhansrd/cm090325/debtext/90325-0001.htm#column_289.

[121] *Drug Firms 'Must Pool Patents*,*'* BBC NEWS (July 15, 2009, 15:30 GMT), http://news.bbc.co.uk/2/hi/health/8150457.stm (internal quotation marks omitted).

[122] Some drug companies have made positive statements to the press. For example, pharmaceutical company Gilead Sciences stated: "We believe if structured appropriately, UNITAID's patent pool can play a critical role in expanding access to antiretroviral treatments for patients around the world." Andrew Jack, *HIV 'Pool' Adds to Pressure on Drug Groups*, FIN. TIMES (London), Dec. 16, 2009, at 16 (internal quotation marks omitted), *available at* http://www.ft.com/intl/cms/s/0/561186aa-e998-11de-9f1f-00144feab49a.html#axzz1cgYKXB7c.

[123] TREATMENT TIMEBOMB, *supra* note 109, at 28–29 (noting GSK's refusal in the face of "strong political pressure").

[124] *See, e.g.*, Philippe Douste-Blazy & Jorge Bermudez, Correspondence, *GSK: Please Extend Patent Pool to AIDS Drugs*, 373 LANCET 1339 (2009) ("We invite . . . GSK to contribute to the UNITAID medicines patent pool initiative and really join the sea change in the provision of medicines to people in developing countries."); Kate Kelland, *Some Drug Firms Keen, Others Reluctant on AIDS Pool*, REUTERS (July 21, 2010, 2:28 PM), http://www.reuters.com/article/2010/07/21/us-aids-drugs-pool-idUSTRE66K2ZP20100721.

[125] Kelland, *supra* note 124 (reporting on ViiV Healthcare's statements opposing the Medicines Patent Pool).

[126] *See, e.g.*, E. Richard Gold & Jean-Frédéric Morin, Correspondence, *The Missing Ingredient in Medicine Patent Pools*, 374 LANCET 1329, 1330 (2009); *cf.* Ellen 't Hoen, Correspondence, *Pharmaceutical Companies and the UNITAID Patent Pool*, 375 LANCET 30 (2010) (purporting to correct some of the statements made by Richard Gold and Jean-Frédéric Morin). In an editorial, *The Lancet* urged MPs to offer more vocal support for the idea of aggregating AIDS-related patents. Editorial, *Political Activism Needed for Patent Pools for HIV Drugs*, 374 LANCET 266 (2009).

UNITAID launched the Medicines Patent Pool (MPP) in December 2009,[127] and the MPP became an independent, nonprofit foundation in September 2010.[128] Press materials on the MPP's website stated that the project's goal was to facilitate the cheap production of existing drugs, as well as the development of new fixed-dose formulations and pediatric drugs.[129] In this way, the resulting pool would straddle the divide between lowering the cost of producing existing drugs and encouraging research on drugs that do not yet exist. The MPP's first step toward this goal was to focus public and political pressure on the pharmaceutical industry. In December 2010, the MPP sent public letters to ten pharmaceutical companies asking for licenses on specific target drugs.[130] Some of these drugs were patented in wealthy nations where patents hold greater relative economic value, leading a WIPO official interviewed for this Article to opine, "The MPP might be more successful if it focused on [soliciting patented drugs in] only the least developed nations, rather than pushing hard for Brazil and India."[131]

As of this writing, the MPP still lacks widespread support from patent holders but there are signs of progress. In October 2010, the National Institutes of Health (NIH) agreed to contribute a set of patents covering the drug darunavir to the MPP on a royalty-free basis.[132] Ellen 't Hoen, the MPP's Executive Director, applauded this action but noted that "[t]he practical usefulness in the short term of this particular license is not very big" because the necessary patents covering distribution of the drug are still held by outside entities.[133] (All of the donated patents were granted in

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[127] *UNITAID Approves Patent Pool*, UNITAID (Dec. 14, 2009), http://www.unitaid.eu/en/resources/news/237-unitaid-approves-patent-pool.html.

[128] Memorandum of Understanding between the World Health Org. and the Medicines Patent Pool Found. (Sept. 17, 2010), *available at* http://www.medicinespatentpool.org/content/download/208/1199/version/3/file/MemorandumOfUnderstanding_MedicinesPatentPoolFoundation_14Sept2010.pdf (detailing the World Health Organization's commitment to a five-year funding obligation).

[129] *See, e.g.*, *The Medicines Patent Pool: Stimulating Innovation, Improving Access*, MEDICINES PATENT POOL (Jan. 2011), http://www.medicinespatentpool.org/content/download/311/2031/version/1/file/FACTSHEET+FINAL+EB.pdf (stating that the MPP aims to lower the prices of existing drugs and foster "the development of better-adapted formulations for developing country contexts, such as medicines for children" and fixed-dose formulations).

[130] *Medicines Patent Pool in Negotiations with Key HIV Medicines Patent Holders*, MEDICINES PATENT POOL (July 2011), http://www.medicinespatentpool.org/LICENSING/Company-Engagement ("On 1 December 2010, the Medicines Patent Pool sent out letters to key patent holders inviting them to formally begin negotiations to license their HIV/medicines patents to the Pool . . . .").

[131] Telephone Interview with Anonymous Source #9 (Feb. 22, 2011).

[132] *See* Donald G. McNeil, Jr., *National Institutes of Health Licenses Its Patent on a New Drug for AIDS*, N.Y. TIMES, Oct. 5, 2010, at D6; *see also* MEDS. PATENT POOL FOUND., *Public Health Service Non-Exclusive Patent License Agreement* (Sept. 20, 2010), http://www.medicinespatentpool.org/content/download/214/1227/version/1/file/MPPF+Patent+License+Full+Executed+%28Sept+2010%29-NS.pdf (reflecting that the NIH license is royalty-free).

[133] Asher Mullard, *Straight Talk with. . . Ellen 't Hoen*, 16 NATURE MED. 1351, 1351 (2010), *available at* http://www.nature.com/nm/journal/v16/n12/pdf/nm1210-1351.pdf.

nations where research, development, and manufacturing have traditionally taken place, including the United States, Canada, Australia, Japan, and nineteen high-income member states of the European Patent Office.)[134] Hoen added, however, that the license does allow licensees "to do some research with the protease inhibitor darunavir."[135]

In July 2011, the pharmaceutical company Gilead Sciences agreed to license patents covering four HIV drugs—tenofovir, emtricitabine, cobicistat, and elvitegravir—to the MPP.[136] The license allowed for production of the four drugs in over one hundred low-income nations. Officials in the United Kingdom and the United States applauded Gilead and encouraged other drug companies to follow suit. The Minister of International Development for the United Kingdom remarked, "The United Kingdom has been a strong supporter of the Medicines Patent Pool from day one. We welcome the news of their first pharmaceutical company licence."[137] An advisor within the White House Office of Science and Technology commented, "We hope additional public and private patent holders will explore voluntary licenses with the Medicines Patent Pool as one of many innovative ways to help improve the availability of medicines in developing countries."[138]

As of this writing, it is too early to tell if the MPP will facilitate meaningful drug research and development. But in view of this initiative's origins and ongoing support in the public sector, it seems likely that continued governmental support will play an important role in the MPP's future.

2. The Pool for Open Innovation Against Neglected Tropical Diseases.—As the Medicines Patent Pool continues to take form, another patent licensing initiative, The Pool for Open Innovation Against Neglected Tropical Diseases (NTD Pool), reveals a different interplay between public policy and private patent licensing. Unlike the MPP, the NTD Pool is not motivated directly by policymakers but rather is designed to leverage government vouchers to encourage participation.

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[134] *See Current Licenses*, MEDS. PATENT POOL, http://www.medicinespatentpool.org/LICENSING/Current-Licences (last visited Mar. 9, 2012).

[135] Mullard, *supra* note 133 (discussing the need to get Johnson & Johnson on board, as they possess patents necessary to manufacture the drug).

[136] Press Release, Medicines Patent Pool, Medicines Patent Pool Signs License Agreement with Gilead to Increase Access to HIV/AIDS Medicines (July 12, 2011), *available at* http://www.medicinespatentpool.org/content/download/484/2863/version/1/file/FINAL+Press+Release+-+Medicines+Patent+Pool+First+Pharma+Licence%5B1%5D.pdf.

[137] *Id.* (internal quotation mark omitted).

[138] Hillary Chen, *Medicines Patent Pool Agreement with Gilead a Key Milestone*, OFF. SCI. & TECH. POL'Y BLOG (July 12, 2011, 11:12 PM), http://www.whitehouse.gov/blog/2011/07/12/medicines-patent-pool-agreement-gilead-key-milestone.

Originally formed by GSK in 2009 and currently administered by the nonprofit BIO Ventures for Global Health (BVGH), the NTD Pool is targeted at creating new treatments for sixteen tropical diseases, including malaria, leprosy, and tuberculosis.[139] Executives and lawyers within BVGH who were interviewed for this Article explained that the NTD Pool is entirely aimed at encouraging the development of new drugs—unlike the MPP, which is aimed at drug production as well as research.[140] In part, the need for this research reflects the fact that the targeted diseases have a low incidence in wealthy nations where drug research typically takes place.[141]

The NTD Pool's focus on researching new drugs, rather than on lowering the cost of manufacturing drugs that already exist, may explain why the effort has already gathered significant support from major research institutions, including MIT, University of California, Berkeley, and California Institute of Technology. As the director of technology licensing at a participating institution noted, patents are asserted less frequently during early-stage research than during later stages of product development.[142] Another lawyer interviewed noted that there is likely low commercial demand fueling the research of tropical diseases in the targeted nations.[143] Similar observations have led some pundits to criticize the NTD Pool as solving a problem that does not exist. A founder of a prominent nonprofit drug campaign commented to the *New York Times* that assembling a patent pool of drugs on neglected diseases was "a bit silly" because patent suits over those rights are rare.[144]

Setting such criticisms aside, insiders interviewed for this Article revealed an interesting and subtle motivation that may draw licensees to the NTD Pool: the promise of obtaining FDA Priority Review Vouchers (PRVs). Since 2007, the FDA has offered PRVs to companies that obtain FDA approval for products aimed at tropical diseases.[145] The vouchers

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[139] Press Release, BIO Ventures for Global Health, BIO Ventures for Global Health Chosen to Administer the GSK and Alnylam Intellectual Property Pool (Jan. 20, 2010), *available at* http://ntdpool.org/news/releases/bio-ventures-global-health-chosen-administer-gsk-a. The full list is "tuberculosis, malaria, blinding trachoma, buruli ulcer, cholera, dengue/dengue haemorrhagic fever, racunculiasis, fascioliasis, human African trypanosomiasis, leishmaniasis, leprosy, lymphatic filariasis, onchocerciasis, schistosomiasis, soil transmitted helminthiasis and yaw." *Id.*

[140] Telephone Interview with Anonymous Source #7 (Feb. 7, 2011).

[141] *See* Audrey Huang & Chris Weber, *The Health of Nations: Open-Source Research and the Economics of Life and Death in the Developing World*, 7 BERKELEY SCI. REV., Fall 2004, at 45, 47, *available at* http://sciencereview.berkeley.edu/articles/issue7/disease.pdf ("Of the 1,393 new drugs approved in the United States between 1975 and 1999, only 13 treat tropical diseases.").

[142] Telephone Interview with Anonymous Source #4 (Oct. 7, 2010).

[143] Telephone Interview with Anonymous Source #5 (Oct. 7, 2010).

[144] Donald G. McNeil, Jr., *Ally for the Poor in an Unlikely Corner*, N.Y. TIMES, Feb. 9, 2010, at D1 (internal quotation marks omitted).

[145] FDA Amendments Act of 2007, Pub. L. No. 110-85, § 1102, 121 Stat. 823, 972–74 (codified at 21 U.S.C. § 360n (2006)). Significantly, the USPTO recently sought public comments on a similar plan that would extend fast-track reexamination vouchers for companies that pursued "technologies and

could be used to obtain expedited FDA review on future products of the holder's choosing, or alternatively, they could be transferred.[146] One lawyer from a participating research institution stated, "By shaving months off of FDA approval wait times, the vouchers can be worth hundreds of millions of dollars to drug developers."[147] The NTD Pool's designers hoped that by taking some of the legal uncertainty out of conducting drug research, the effort would make it easier for researchers to apply for PRVs. Emphasizing the significant draw that such vouchers could hold for the NTD Pool itself, one lawyer opined, "The whole pool is geared toward FDA Priority Review Vouchers."[148] Administrators at BVGH confirmed this view, noting that the effort was "certainly designed with PRVs in mind," and calling them "an important incentive" for potential licensees to participate.[149]

As with the MPP, it remains to be seen whether the NTD Pool will facilitate valuable drug research and development. On the one hand, the effort has gathered hundreds of patents from several important academic research institutions.[150] On the other hand, despite its branding, this pool for "open innovation" is not truly open to all takers. The NTD Pool's guidelines explain that the licensed patents may not be used without the explicit permission of BVGH, which will conduct formal inquiries before granting permission.[151] Ultimately, then, the pool's future may depend in large part on whether it can effectively piggyback on the FDA's voucher program aimed at encouraging cures for rare and tropical diseases.

3. The SNP Consortium.—The SNP Consortium, a private project launched in the late 1990s that complemented the U.S. government's preexisting efforts to build a database of valuable genetic information, illustrates yet another form of interplay between government actors and private industry.[152] During the mid- to late-1990s, medical researchers hoped to unlock the secrets to human disease and responsiveness to drugs by comparing small variations in DNA—the tight coils of chemical blueprints found in human cells.[153] These DNA variations, called "single nucleotide polymorphisms" (SNPs), however, are useful research tools only

licensing behavior that addresses humanitarian needs." Request for Comments on Incentivizing Humanitarian Technologies and Licensing Through the Intellectual Property System, 75 Fed. Reg. 57,261 (filed Sept. 17, 2010).

146 § 1102 (discussing priority review and transferability of the vouchers).

147 Telephone Interview with Anonymous Source #4 (Oct. 7, 2010).

148 *Id.*

149 Telephone Interview with Anonymous Source #7 (Feb. 7, 2011).

150 *See How the Pool Works: User FAQs*, POOL FOR OPEN INNOVATION, http://www.ntdpool.org/pages/for-users/faqs (last visited Mar. 9, 2012).

151 *See id.* (discussing eligibility for licensing).

152 *See generally* GARY ZWEIGER, TRANSDUCING THE GENOME 177–89 (2001) (discussing the formation of the SNP Consortium and the 1990s-era of SNP scientific research more generally).

153 *See id.*

when aggregated in large numbers.[154] Recognizing this fact, researchers and business leaders alike feared that, by making collection of the requisite large numbers of SNPs difficult and costly, the widespread patenting of SNPs could spawn a new research anticommons that would stifle drug research and development.[155]

Private companies weren't the only ones concerned. In 1996, the NIH publicly discouraged the biomedical industry from seeking patents on human genes altogether.[156] The NIH also stressed to grant applicants "the importance of making information about SNPs readily available to the research community."[157] Going further, the NIH advised that it would factor the adequacy of applicant data-sharing plans into grant decisions and that it would monitor the patenting behavior of grantees.[158]

The U.S. government also took direct steps to avoid the rise of an SNP anticommons by creating a database to catalog SNPs. In December 1997, the NIH funded and managed the formation of a new database called "dbSNP," which was designed to hold between 60,000 and 160,000 SNPs.[159] A respected biologist who helped design the database stated at the time that the effort aimed to prevent researchers from becoming "ensnared in a mesh of patents and licenses."[160] By 1999, various NIH agencies had contributed approximately $30 million to the project.[161]

Following on the heels of the government's initiative and the NIH's hortatory messages regarding gene patenting, private firms launched a similar effort in 1999. The plan called for the creation of a new entity, the "SNP Consortium," that, like the dbSNP, would place SNPs in the public domain and thereby defeat third-party patent claims.[162] The SNP

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[154] *See id.* at 177, 186.

[155] *See id.* at 177–78 (noting that private pharmaceutical companies were concerned about the propertization of SNPs); *see also, e.g.*, Fiona Murray & Scott Stern, *Do Formal Intellectual Property Rights Hinder the Free Flow of Scientific Knowledge? An Empirical Test of the Anti-Commons Hypothesis* 25, 27 (Nat'l Bureau of Econ. Research, Working Paper No. 11465, 2005) (finding detrimental impact of patents on scientific publishing).

[156] *See NHGRI Policy Regarding Intellectual Property of Human Genomic Sequence*, NAT'L HUM. GENOME RES. INST. (Apr. 9, 1996), http://www.genome.gov/10000926; *see also* Eliot Marshall, *'Playing Chicken' Over Gene Markers*, 278 SCI. 2046, 2047 (1997) (noting that academics were "worried that private companies wielding new technologies for scanning the genome [would] snap up the SNPs . . . and patent them").

[157] Rai & Eisenberg, *supra* note 28, at 307.

[158] *Id.*

[159] *See* ZWEIGER, *supra* note 152, at 177; Eliot Marshall, *Drug Firms to Create Public Database of Genetic Mutations*, 284 SCI. 406, 406 (1999) [hereinafter Marshall, *Drug Firms*]; Marshall, *supra* note 156.

[160] ZWEIGER, *supra* note 152, at 178 (internal quotation marks omitted).

[161] *Id.* (noting that the project's founder had solicited $30 million from a consortium of eighteen NIH agencies).

[162] *Id.* at 177–78 (indicating that both projects aimed to prevent researchers from being "held hostage to commercial databases" (internal quotation marks omitted)).

Consortium officially launched in April 1999 with the support of ten large pharmaceutical companies.[163] At the time, the Director of the National Human Genome Research Institution described this private effort as "nicely complementary" to the NIH's preexisting database created in 1997.[164]

Paradoxically, the SNP Consortium defeated the threat of patents by embracing the patent system. Rather than merely publishing SNPs, the group obtained SNP patents that it then transferred to the public domain.[165] The SNP Consortium did this by drafting patent applications with statutory invention registrations (SIRs) to disclaim rights.[166] Robert Merges has noted the advantages of this approach over publishing innovations to the public. For example, the SIRs are more likely to meet the "enablement" requirement of prior art because they are drafted by patent attorneys.[167] As Jorge Contreras has observed: "This approach ensured that the Consortium's discoveries would act as prior art defeating subsequent third-party patent applications, with a priority date extending back to the initial filings."[168]

By most accounts, the SNP Consortium was a success. By February 2001, the organization had placed 1.42 million SNPs in the public domain.[169] Instead of spending an estimated $250 million to identify 150,000 SNPs, the shared cost of the SNP Consortium amounted to $44 million and yielded 1.8 million SNPs.[170] All of these SNPs were later merged with those in the dbSNP database and made freely available to the public.[171]

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[163] *Id.* at 177.

[164] Marshall, *Drug Firms, supra* note 159 (internal quotation marks omitted).

[165] In this way, the SNP Consortium was different from a traditional patent pool or patent commons—rather than licensing patents, the group defeated them.

[166] *See* Rebecca S. Eisenberg, *The Promise and Perils of Strategic Publication to Create Prior Art: A Response to Professor Parchomovsky*, 98 MICH. L. REV. 2358, 2365–69 (2000) (discussing the SNP Consortium's use of SIRs, including the organization's novel strategy of delaying release of SNPs as long as possible to create uncertainty for those seeking to propertize related data).

[167] Merges, *supra* note 27, at 194–95.

[168] Jorge L. Contreras, *Bermuda's Legacy: Policy, Patents, and the Design of the Genome Commons*, 12 MINN. J. L. SCI. & TECH. 61, 97 (2011).

[169] Thomas A. Hemphill, *Preemptive Patenting, Human Geonomics, and the US Biotechnology Sector: Balancing Intellectual Property Rights with Societal Welfare*, 25 TECH. SOC'Y 337, 345 (2003).

[170] J.H. Reichman & Paul F. Uhlir, *A Contractually Reconstructed Research Commons for Scientific Data in a Highly Protectionist Intellectual Property Environment*, LAW & CONTEMP. PROBS., Winter–Spring 2003, at 315, 458; *see also* Marshall, *Drug Firms*, *supra* note 159 (reporting the initial goal); Merges, *supra* note 27, at 190 (reporting the ultimate figures).

[171] *See dbSNP Data Origins*, NAT'L CENTER. FOR BIOTECHNOLOGY INFO., http://www.ncbi.nlm.nih.gov/books/NBK9691 (last visited Mar. 9, 2012) (reporting that the SNP Consortium's database is "no longer growing," and that the dbSNP "should contain all of their SNPs"); *see also* S.T. Sherry et al., *dbSNP: The NCBI Database of Genetic Variation*, 29 NUCLEIC ACIDS RES. 308, 308–11 (2001).

Like the MPP and the NTD Pool, the SNP Consortium emerged amidst public and private efforts aimed at the same goal of facilitating research. Challenging the Market Correction Hypothesis, which envisions collective patent licensing as an entirely private response to the government's provision of patent rights, this episode shows that government actors have played a meaningful role in motivating private industry to collectively depropertize the patent landscape.[172]

4. The Manufacturers' Aircraft Association.—A glimpse even further backward in time to the fierce aerial battles of World War I demonstrates an even more direct example of government-inspired patent sharing. In the first decade of the twentieth century, several different companies held the multiple patents necessary to manufacture airplanes.[173] Protracted litigation between the primary patent holders, Orville Wright and Glenn Curtiss, began in 1909 and dragged into the summer of 1914 when combat in Europe erupted.[174] In the view of some historians, the patent gridlock that resulted from this dispute significantly impeded innovation in the American avionics industry.[175] Reluctant to take on new contracts, nearly all aircraft manufactures raised their prices in anticipation of potential future lawsuits.[176] As fighting in Europe worsened and America's involvement seemed likely, the U.S. government's demand for airplanes increased. The patent blockade cried out for a solution.

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[172] One individual directly involved with the SNP Consortium who was interviewed for this Article reported that the project was not patterned after the government's preexisting initiative. Rather, the source opined that the SNP Consortium was private industry's response to design shortcomings in the government's SNP database. Telephone Interview with Anonymous Source #9 (July 11, 2011). This viewpoint contrasts somewhat with the statements that the director of the governmental effort made to *Science* magazine that the SNP Consortium was "nicely complementary." *See supra* note 164 and accompanying text. Both sources agree, however, that the SNP Consortium was motivated by the government's earlier efforts.

[173] *See, e.g.*, George Bittlingmayer, *Property Rights, Progress, and the Aircraft Patent Agreement*, 31 J.L. & ECON. 227, 230–31 (1988).

[174] *Id.* at 231–32 (explaining that the Wrights sued Curtiss in 1909 and eventually won the suit in the summer of 1914). The suit began when the Wrights read an article in *Scientific American* describing Curtiss' flight of an experimental aircraft he called "June Bug." CECIL R. ROSEBERRY, GLENN CURTISS 115 (1991). On July 20, Orville Wright wrote Curtiss a letter explaining that June Bug's design likely infringed their U.S. Patent No. 821,393. *Id.*

[175] *See, e.g.*, Bittlingmayer, *supra* note 173, at 232 ("[S]ome firms were reluctant to take contracts because of the threat of patent infringement suits."); Merges & Nelson, *supra* note 95, at 890–91 (noting the corrosive impact of the Wright patent on innovation).

[176] *See* Nat'l Advisory Comm. on Aeronautics, THIRD ANNUAL REPORT OF THE NATIONAL ADVISORY COMMITTEE ON AERONAUTICS (1918), *in* 8 AERIAL AGE WKLY. 128, 129 (Sept. 30, 1918) ("In January, 1917, the War and Navy Departments called the attention of the Advisory Committee to the prohibitive prices of aircraft charged by the various aircraft manufacturers, attributing these prices to the extra item of royalty added by each firm in anticipation of infringement suits by owners of alleged basic aeronautic patents . . . .").

In January 1917, three months before America declared war, a small committee of experts appointed by President Wilson looked into the patent problem and proposed a novel solution: The holders of all necessary aircraft patents would transfer their rights to a licensing corporation called the Manufacturer's Aircraft Association (MAA).[177] The MAA would be open to anyone who wished to use the Wright–Curtiss designs for a $1000 initiation fee and a nominal licensing fee of $200 per aircraft built.[178] These funds were to be distributed primarily between the Wright and Curtiss interests until each received a sum of $2,000,000 or their key patents expired.[179] In this respect, the pool effectuated a settlement agreement between the Wright and Curtiss interests that would permit airplanes to be constructed.

To encourage future innovation, the MAA also included a grant-back provision that applied to after-acquired patents.[180] Members of the association that developed and patented new designs were compensated at a rate determined by an internal Board of Arbitration.[181] By the terms of the MAA, royalties on after-acquired patents were only available for an invention that:

> secures the performance of a function not before known to the art, or constitutes an adaptation for the first time to commercial use of an invention known to the industry to be desirable of use but not used because of lack of adaptation, or is otherwise of striking character or constitutes a radical departure from previous practice, or if either the price paid therefor or the amount expended in developing the same is such as to justify such compensation . . . .[182]

When disputes arose, they were handled internally—there would be no recourse to the courts.[183]

As with the present-day MPP, initial industry support for the MAA was weak.[184] The parties opposed the plan vehemently, asserting that they deserved higher royalties, but "patriotic impulses" and government pressure

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[177] *See, e.g.*, *id.* (discussing the government's crucial role in identifying the aircraft patent problem and a government advisory committee's suggestion of the cross-licensing association that became the MAA); *End Patent Wars of Aircraft Makers*, N.Y. TIMES, Aug. 7, 1917, at 5 (discussing the history and operation of the Manufacturers' Aircraft Association).

[178] *See, e.g.*, Bittlingmayer, *supra* note 173, at 232–33.

[179] *Id.*

[180] A copy of the original agreement was reproduced in *A Bill Providing for the Recording of Patent Pooling Agreements and Contracts with the Commissioner of Patents: Hearing on H.R. 4523 Before the H. Comm. on Patents*, 74th Cong. App. 3 at 3058–125 (1935) [hereinafter *MAA License Agreement*].

[181] *Id.* at 3065.

[182] *Id.*

[183] *Id.* at 3078.

[184] *See Aircraft Builders Deny Monopoly Aim*, N.Y. TIMES, Aug. 12, 1917, at 11 (discussing criticisms of the MAA).

eventually led both Wright and Curtiss to agree.[185] Even so, gaining the support of major industry stakeholders remained a challenge all its own. Some within the industry believed that the MAA was not designed to enhance cumulative innovation in the industry, but rather only to privately benefit Wright and Curtiss.[186]

These and similar protests led the Attorney General of the United States to conduct a deep investigation of the MAA pool with the assistance of lawyers skilled in patent and antitrust law.[187] After careful review, the Attorney General issued an official opinion that the MAA was "not in contravention of the antitrust laws of the United States."[188] This assessment was based on several factors, chief of which were that anyone could license the key Wright–Curtiss patents on reasonable terms and that members of the association were free to license outside the pool if they wished.[189] With many of its concerns dispelled, industry support developed, and the MAA patent pool quickly gathered steam.[190] Overnight, the government had helped transform an industry into a unit.

Antitrust regulators continued to give the MAA clean bills of health for decades.[191] In 1972, however, a court determined that, just as some initial detractors had feared it might, the association was slowing innovation in the aircraft business and benefiting only its owners.[192] In 1975, the MAA was dismantled in accordance with a consent decree.[193]

The MAA episode challenges the Market Correction Hypothesis's depiction of patent sharing as a private response to government "errors" in the initial apportionment of patent rights. What this episode shows, rather,

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[185] *Manufacturers Aircraft Association, Inc., Organized*, 3 AVIATION & AERONAUTICAL ENGINEERING 43, 43 (1917) ("When these negotiations were started the task of bringing all of the parties interested together seemed insurmountable, but actuated by patriotic impulses it was finally agreed . . . that the [MAA agreement would] be completed.").

[186] Interestingly, Leon Cammen, the Vice President of the Aeronautical Society of America, argued that the MAA would impede innovation and would "keep the airplane in its present state of imperfection." *Aircraft Builders Deny Monopoly Aim*, *supra* note 184. The topic of patent pooling as a cure for litigation is discussed in greater depth *infra* Part II.B.

[187] *See* Mfrs. Aircraft Ass'n. v. United States, 77 Ct. Cl. 481, 488–89 (1933) (recounting this history).

[188] Mfrs. Aircraft Ass'n—Antitrust Laws, 31 Op. Att'y. Gen. 166 (1917).

[189] *Id.* at 170–71.

[190] *See* Michael J. Madison, Brett M. Frischmann & Katherine J. Strandburg, *Constructing Commons in the Cultural Environment*, 95 CORNELL L. REV. 657, 660–61 (2010) ("Largely because of this functioning commons of patented inventions, airplanes were built, and the war was won.").

[191] *See* Bittlingmayer, *supra* note 173, at 234–35 (noting that the MAA received "numerous clean bills of health").

[192] *See Plane Makers Hit by Antitrust Suit over Inventions*, WALL ST. J., Mar. 30, 1972, at 3 (reporting on a Justice Department civil suit alleging antitrust violations).

[193] *See* United States v. Mfrs. Aircraft Ass'n, No. 72-Civ-1307, 1975 WL 814, at *4 (S.D.N.Y. Nov. 12, 1975) (ordering the termination of cross-licenses); *see also Airplane Makers Agree to Settle '72 Antitrust Suit*, WALL ST. J., July 16, 1975, at 15 (discussing agreement to end the MAA).

is how various government efforts, from the committee assembled by the President, to the Attorney General's dismissal of antitrust concerns, succeeded in encouraging a reluctant industry to cooperate. Robert Merges's earlier scholarship on the MAA supports this characterization.[194]

When the MAA is compared to the other episodes discussed in this Part, a range of government involvement in collective patent licensing is apparent. The MAA was purely a government creation. The MPP, by contrast, emerged at the encouragement and prodding of policymakers and officials. The SNP Consortium was a private response to the government's preexisting efforts to overcome a genomic anticommons. Finally, the NTD Pool was designed to piggyback on—and in so doing, further the goals of—an FDA voucher program aimed at promoting drug development.

B. Collective Responses to Litigation

Just as government can influence patent sharing, so too can litigation. Patent holders seeking to settle or avoid costly lawsuits sometimes turn to collective invention sharing as a solution. The following initiatives are inherently concerned more with products that already exist (and are therefore vulnerable to patent assertion) than with those that have not yet been developed. As a result, some collective responses to overpropertization are driven more by avoidance of immediate litigation than by long-term promotion of innovation.

1. The Open Invention Network.—The use of collective patent sharing to defend software products from litigation is rooted in the open-source computing movement of the 1980s.[195] The introduction of affordable home computers such as the Apple Macintosh inspired a generation of hobbyists to explore the craft of writing software code.[196] The risk of software copyright infringement, however, discouraged the development of any useful large-scale projects.[197] To overcome this threat, a grassroots

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[194] As early as 1999, Robert Merges observed that some patent pools have only formed with the help of government assistance. Merges, *supra* note 55, at 145–46. Other notable historical cases of government-inspired patent sharing exist. Following the First World War, the U.S. Navy encouraged the pooling of radio patents into what became the Radio Corporation of America (RCA). *See* Merges & Nelson, *supra* note 95, at 891–93 (discussing the formation of the RCA patent pool).

[195] The open-source computing movement embraced a set of methods and philosophies about software development that focused on collaboration. *See generally* ERIC S. RAYMOND, THE CATHEDRAL & THE BAZAAR: MUSINGS ON LINUX AND OPEN SOURCE BY AN ACCIDENTAL REVOLUTIONARY (rev. ed. 2001) (extolling the benefits of the open-source software movement including its importance as a driver and facilitator of innovation). Most open-source licenses eschew (and in fact prohibit) any restrictions on use or redistribution based on the belief that the benefits of sharing one's innovations outweigh any costs. *Id.* at 132–34.

[196] *Id.* at 10–14 (discussing the rise of "microcomputers" during the 1980s).

[197] *See* SIVA VAIDHYANATHAN, COPYRIGHTS AND COPYWRONGS 154 (2001) (discussing programmer Richard Stallman's belief that "the rise of proprietary software systems [w]as a severe

movement arose around the idea of so-called "free software"—i.e., software freed from most copyright protections.[198] Key to the movement was an innovative type of copyright license that granted broad use rights to licensees who agreed to distribute the original work and any derivative works on the same terms.[199] This "viral" nature of so-called open public licenses led to a flourishing of sophisticated "open-source" software programs on which businesses and consumers continue to rely—most notably, the Linux operating system.[200]

In the late 1990s, open-source projects like Linux faced a new threat in the form of patent infringement litigation. Starting in 1998, a line of Federal Circuit decisions established that software is eligible for patent protection.[201] Because Linux was founded on an open public license that did not contemplate patent infringement, the new possibility of patent infringement suits cast a shroud of uncertainty over the operating system's legal viability.[202]

Experts believed that litigation was inevitable. As early as November 1998, a key figure in the free software community predicted that "corporations hostile to open source will band together on this issue and form an organization to enforce their intellectual property rights against open source software."[203] In the years that followed, this fear was galvanized by the saber-rattling of large patent holders adverse to the open-source movement. Microsoft Corporation representatives called open-source software "a threat to our very system of capitalism," and ominously noted, "The effect of patents and copyright in combating Linux remains to

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threat to freedom and creativity" and his contention that copyright law "impeded the development of the best possible software").

[198] *See, e.g.*, JONATHAN ZITTRAIN, THE FUTURE OF THE INTERNET—AND HOW TO STOP IT 77, 94, 189 (2008) (discussing the free software philosophy, the potential complications posed by intellectual property protections, and the possible solutions generated by "open source" software development).

[199] *See, e.g.*, Mark H. Webbink, *Understanding Open Source Software*, NEW S. WALES SOC'Y FOR COMPUTERS & L., https://www.nswscl.org.au/index.php?option=com_content&view=article&id=95:understanding-open-source-software&catid=23:march-2003-issue&Itemid=31 (last visited Mar. 9, 2012) (explaining how open-source licensing under the original GNU Public License works).

[200] *See, e.g.*, Benkler, *supra* note 60, at 371–74 & n.3 (discussing the power and potential of open-source software development).

[201] *See, e.g.*, State St. Bank & Trust Co. v. Signature Fin. Grp., Inc., 149 F.3d 1368, 1375 (Fed. Cir. 1998) (affirming the "useful, concrete, and tangible result" test for analyzing patentable subject matter and permitting software previously considered "too obvious" to be patented (quoting *In re* Alappat, 33 F.3d 1526, 1544 (Fed. Cir. 1994))); *see also* BESSEN & MEURER, *supra* note 4, at 187, 201, 210–13 ("Unfortunately, the Federal Circuit has set software-specific precedents that essentially remove most restrictions on abstract claims in software."); *cf.* Bilski v. Kappos, 130 S. Ct. 3218, 3226 (2010) (stating that "machine-or-transformation" test is not the sole indicum of patentability).

[202] *See, e.g.*, *GNU General Public License, Version 1*, FREE SOFTWARE FOUND. (Feb. 1989), http://www.gnu.org/licenses/gpl-1.0.html (containing no reference to patents).

[203] Bruce Perens, *Preparing for the Intellectual Property Offensive*, LINUXWORLD (Nov. 11, 1998), http://web.archive.org/web/19990225093703/http://www.linuxworld.com/linuxworld/lw-1998-11/lw-11-thesource.html.

be investigated."[204] The open-source community took these threats seriously.[205]

Amidst these looming concerns, a patent-sharing community was born. In 2005, IBM, which held a vested interest in Linux, approached the Novell software company with a strikingly simple plan to reduce the threat of litigation: They would convince a community of Linux-based software companies to agree not to sue one another for using Linux.[206] This promised to create a community of nonassertion. At the same time, the organization itself would build a portfolio of Linux patents through targeted acquisitions.[207] This portfolio would have defensive and offensive potentials. It would prevent key Linux patents from falling into the wrong hands and would simultaneously serve as a potential legal weapon against "those who attack Linux."[208] This sword-and-shield plan was officially launched as the Open Invention Network (OIN) in 2005.[209]

The prominent Linux distributor Red Hat was one of the first companies to pledge its support to OIN.[210] An attorney involved with the effort and interviewed for this Article noted, "Panic is a good motivator. Red Hat saw [OIN] as the fastest way to develop a defensive shield. They also [believed the effort would] reassure the open source community."[211] For Linux distributors like Red Hat, "circling the wagons" in this manner had distinct appeal. Red Hat held only five patents at the time of OIN's launch.[212] Teaming up with larger patent holders such as Novell and IBM, the lawyer explained, gave Red Hat and its investors a much-needed sense of security.[213] By contrast, IBM, which at the time was the single largest patent holder in the United States, saw the OIN as an opportunity to promote Linux as a viable competitor to the powerful incumbent, Microsoft Windows.[214]

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[204] *See* Christian H. Nadan, *Open Source Licensing: Virus or Virtue?*, 10 TEX. INTELL. PROP. L.J. 349, 371–72 (2002) (internal quotation marks omitted).

[205] *Id.*; *see also* Roger Parloff, *Microsoft Takes On the Free World*, FORTUNE, May 28, 2007, at 77 (discussing Microsoft's patent infringement claims).

[206] Telephone Interview with Anonymous Source #2 (Oct. 7, 2010).

[207] *Id.*

[208] *See Frequently Asked Questions*, OPEN INVENTION NETWORK, http://www.openinventionnetwork.com/press_faq.php (last visited Mar. 9, 2012).

[209] Steve Lohr, *Company to Start Offering Free Use of Patents It Holds*, N.Y. TIMES, Nov. 10, 2005, at C8.

[210] Telephone Interview with Anonymous Source #2 (Sept. 27, 2010). These founding members had different interests: IBM and Novell held many patents. Red Hat did not, so its reasons were mostly defensive. Sony and Philips, on the other hand, were shipping devices with Linux embedded. *Id.*

[211] Telephone Interview with Anonymous Source #2 (Oct. 7, 2010).

[212] *Id.*

[213] *Id.*

[214] *Id.*

Today, OIN has the support and membership of over 200 companies, including Google, IBM, Novell, Philips, Red Hat, and Sony.[215] In the first fiscal quarter of 2010, the group reported that the number of new licensees was growing at a fast pace.[216] Beyond the many patents held by its members, the group itself has purchased patents as well. Most notably, OIN acquired an important set of twenty-two Linux-related patents in early 2010.[217] Experts believe that these patents, which Microsoft sold to another organization in 2009, could have posed a significant threat to Linux had they fallen into the possession of patent trolls.[218]

The OIN patent license, to which all members must agree, is primarily designed to prevent litigation rather than to increase innovation.[219] This is reflected in the agreement's broad scope. As mentioned earlier, OIN establishes a network of reciprocal nonassertion promises by which every member of the collective is permitted to use all Linux-related patents of any other member.[220] Moreover, the agreement licenses to all members the patents owned by OIN itself.[221] Under the terms of the license, members promise to "grant to each Licensee . . . a royalty-free, worldwide, nonexclusive, non-transferable license under [their] Patents for making, having made, using, importing, and Distributing any *Linux System*."[222] In return, OIN promises: "Open Invention Network® acquires patents and makes them available royalty-free to any company, institution or individual that agrees not to assert its patents against *the Linux System*."[223] As OIN

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[215] *See OIN Community of Licensees*, OPEN INVENTION NETWORK, http://www.openinventionnetwork.com/licensees.php (last visited Mar. 9, 2012).

[216] *Open Invention Network Reports Increase in Licensing Program in First Quarter*, WIRELESS NEWS, Apr. 18, 2010, *available at* Factiva, Doc. No. WLNW000020100430e64i0001h (reporting that OIN signed forty new licensees during this period).

[217] *See* Nick Wingfield, *Group of Microsoft Rivals Nears Patent Deal in Bid to Protect Linux*, WALL ST. J., Sept. 8, 2009, at B1.

[218] *Id.* (defining "patent trolls" as entities "that don't typically make products and exist primarily to earn money from lawsuits and settlements in patent cases" (internal quotation marks omitted)); *see also* BESSEN & MEURER, *supra* note 4, at 3, 159 (discussing patent trolls).

[219] Readers should take note that Linux is not itself a collective effort to further innovation in the field of computer science by depropertizing the IP landscape. Rather, Linux is a freely available computer operating system designed to allow users to run software applications. Thus, the OIN's mission to protect Linux users and distributors from patent litigation is not inherently innovation-enhancing.

[220] *License Agreement*, OPEN INVENTION NETWORK, http://www.openinventionnetwork.com/pat_license_agreement.php (last visited Mar. 9, 2012) [hereinafter *OIN License Agreement*].

[221] *Id.*

[222] *Id.* (emphasis added).

[223] *Open Invention Network—Patents*, OPEN INVENTION NETWORK, http://www.openinventionnetwork.com/patents.php (last visited Mar. 9, 2012) (emphasis added).

defines the term, "The Linux System" does not include future software releases with new functionality.[224]

This language has subtle but significant implications for OIN's power to encourage innovation. As a lawyer who helped draft the agreement explained, by encompassing all member patents that relate to "the Linux System," the agreement aims to defend Linux users and distributors from patent infringement.[225] The license does not, however, require licensors to identify specific patents that fall within this broad definition.[226] As a result, OIN does not deliver clear guidance to would-be innovators on their freedom to practice specific patents. Moreover, the definition of the "The Linux System" does not relate to future products with functionality that does not exist.[227] When asked about this difference, the attorney interviewed candidly stated, "Some communities are freedom-to-operate driven, while others are driven by defensive needs."[228] Thus, in discord with the Market Correction Hypothesis, OIN seems designed to protect an existing product rather than to encourage the development of new ones.

2. The Bessemer Association.—An earlier patent-sharing regime that facilitated the production of existing products rather than the development of future technologies arose in the American steel industry following the Civil War.[229] In 1865, railroad companies were the most important purchasers of steel in the United States.[230] Despite high demand, however, very few American companies understood the science of steelmaking well enough to produce it efficiently.[231] As an apparent consequence, American steel was expensive and in short supply.[232]

An enterprising young American named Alexander Holley traveled to England in 1862 in search of solutions.[233] There, Holley met with an English

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[224] *See Linux Definitions*, OPEN INVENTION NETWORK, http://www.openinventionnetwork.com/pat_linuxdef.php (last visited Mar. 9, 2012) [hereinafter *OIN Linux Definitions*].

[225] Telephone Interview with Anonymous Source #2 (Oct. 7, 2010).

[226] *See OIN License Agreement*, *supra* note 220.

[227] *See OIN Linux Definitions*, *supra* note 224.

[228] Telephone Interview with Anonymous Source #2 (Oct. 7, 2010).

[229] *See* Alessandro Nuvolari, *Collective Invention During the British Industrial Revolution: The Case of the Cornish Pumping Engine*, 28 CAMBRIDGE J. ECON. 347, 360 (2004) (including the Bessemer Association in a discussion of patent pools that furthered collective innovation).

[230] *See* THOMAS J. MISA, A NATION OF STEEL xx (1999) (stating that railroads were "the single most important consumer[s] of steel in the era before automobiles").

[231] *See* Peter B. Meyer, *Episodes of Collective Invention* 7 & fig.1, 8–10 (U.S. Dep't of Labor, Bureau of Labor Statistics, Working Paper No. 368, 2003), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=466880 (noting that imperfect knowledge of metallurgy in the United States during this period hindered production).

[232] *See, e.g.*, JOHN O'SULLIVAN & EDWARD F. KEUCHEL, AMERICAN ECONOMIC HISTORY 81 (1993) (stating that during this period, "[s]teel was expensive and available only in relatively small quantities").

[233] SIR HENRY BESSEMER, SIR HENRY BESSEMER, F.R.S. 338 (1905).

inventor named James Bessemer who had patented a method of passing air through molten iron that cheaply yielded large volumes of high quality steel.[234] Holley licensed Bessemer's patents, returned to New York, and established a plant to bring Bessemer steel to the American market.[235]

Holley's efforts were derailed, however, when American inventor William Kelly won an interference proceeding against the Bessemer patents and received a U.S. patent covering the key method of oxidizing molten steel.[236] All the while, Holley still held the rights to practice other essential aspects of the Bessemer method. As a result, no single company possessed all of the necessary rights to produce Bessemer steel in the United States. It seemed, in Holley's words, that "[l]itigation of a formidable character was imminent."[237]

But Holley and Kelly ultimately avoided a lengthy legal battle by cooperating. Out of court, the two patent holders agreed to pool their blocking patents under a new corporation called "the Pneumatic Steel Association," or the Bessemer Association.[238] For a licensing fee and a promise to grant back licenses to all follow-on innovations, any company could join the organization and gain the rights to produce Bessemer steel free from the risk of litigation.[239]

In subsequent decades, the quality and quantity of American steel dramatically increased—proof, some may surmise, of the Bessemer Association's power as an engine for cumulative innovation.[240] But a deeper look tells a different story. First, historians have noted that important advances in steelmaking during this period likely stemmed from the rich culture of information sharing that existed outside of the Bessemer Association.[241] Notably, the American Institute of Mining Engineers (TAIME) began publishing a journal in 1871 devoted to the science and practice of steelmaking.[242] The journal, to which notable scientists and engineers contributed, contained detailed descriptions of new steelmaking

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[234] *Id.* at 156–61 (giving a detailed firsthand description of this process and its genesis).

[235] *Id.* at 337–39.

[236] MISA, *supra* note 230, at 19–21.

[237] *Id.* at 20 (internal quotation marks omitted).

[238] *See id.*

[239] Meyer, *supra* note 231, at 11 (discussing the licensing structure and membership requirements of the Bessemer Association).

[240] *But see* Leonard H. Lynn, N. Mohan Reddy & John D. Aram, *Linking Technology and Institutions: The Innovation Community Framework*, 25 RES. POL'Y 91, 95 (1996) (explaining that, while the Bessemer Association lowered production costs of steelmaking, it likely impeded technological innovation).

[241] *See, e.g.*, Meyer, *supra* note 231 (noting the role of trade journals in disseminating technical information during this period).

[242] *See generally* 1 TRANSACTIONS OF THE AMERICAN INSTITUTE OF MINING ENGINEERS (1871) (providing information about the creation and purpose of the journal).

processes as well as discussions of experimental successes and failures.[243] Second, the high rate of job turnover among engineers in the steel industry naturally led to a great deal of valuable information sharing. As one historian noted, "the five or six top engineers of the industry [met frequently] to discuss common problems."[244] Third, Alexander Holley himself, considered by many to have been a brilliant and prolific engineer, independently published important technical information that likely spurred cumulative innovation.[245]

There is no evidence showing that any significant advances in steelmaking during this period were the direct result of the Bessemer Association. In fact, some historians posit that the Bessemer Association was responsible for slowing innovation in the steel industry.[246] Moreover, any innovation arguably facilitated by the Bessemer Association was short-lived. By 1877, the Bessemer Association effectively stopped new members from joining and refused to renew the licenses of many existing members.[247] Licensing rates were raised, and the small number of remaining members collected huge profits and effectively controlled the market price of steel.[248] Ultimately then, it appears that like the OIN, the Bessemer Association was not designed to facilitate cumulative innovation but rather to clear a legal impasse that prevented the production of an existing product.[249] As such, this example does not match the Market Correction Hypothesis, which predicts that private actors faced with an anticommons situation will collectively forgo the short-term benefits of patent ownership in exchange for the long-term benefits that flow from innovation.

3. The Mines of Cornwall.—In the Earth's ancient geological past, the slow collision of two continents formed a belt of mountains that today reaches from Portugal to the county of Cornwall on England's

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[243] *See* Meyer, *supra* note 231, at 8–10 (detailing exemplary contributions made to the journal). At the time, a similar periodical was also in wide circulation in England. *See* 1 J. IRON & STEEL INST. (1874).

[244] Meyer, *supra* note 231, at 12 (alteration in original) (quoting PETER TEMIN, IRON AND STEEL IN NINETEENTH-CENTURY AMERICA 133 (1964)) (internal quotation marks omitted).

[245] *See, e.g.*, Meyer, *supra* note 231, at 11.

[246] *See, e.g.*, Lynn, Reddy & Aram, *supra* note 240, at 95 ("The U.S. industry lagged, however, when it came to product innovation, quality, and price to consumers. This too may have been an outcome of the strength of the Bessemer Association.").

[247] *See* MISA, *supra* note 230, at 20–21; Thomas J. Misa, *Controversy and Closure in Technological Change: Constructing "Steel," in* SHAPING TECHNOLOGY/BUILDING SOCIETY 124 (Wiebe E. Bijker & John Law eds., 1999); Meyer, *supra* note 231, at 12.

[248] *See* MISA, *supra* note 230, at 21 (discussing the deep and lasting anticompetitive impact of the Bessemer Association on steel pricing).

[249] From an economic perspective, this conclusion is not surprising. In the words of Carl Shapiro, "As a matter of economic theory, there is no reason to expect [that] two parties' collective interests in settlement, and especially in the form of settlement they adopt, to coincide with the public interest, which includes consumer interests." Shapiro, *supra* note 65, at 142 (emphasis omitted).

southernmost tip.[250] In the late 1700s, the ridge of valuable minerals below Cornwall birthed a high-tech mining industry that made the region one of the most advanced engineering centers in the world.[251] It was the Silicon Valley of its day.[252]

Mining in Cornwall was lucrative but often unpredictable.[253] Due to the region's proximity to the English Channel, operations were frequently disrupted by underground floods.[254] In a quest to safeguard profits and lives, the owners and operators of Cornwall's mines (called "adventurers" at the time) searched for efficient ways to remove water from their tunnels.[255]

For nearly seventy years, the most important technology used for draining mines in the region was the Newcomen steam engine.[256] Designed and patented by Thomas Newcomen in 1712, the device was reliable, worked by a simple principle, and was relatively easy to maintain.[257] The Newcomen engine's high fuel consumption, however, made it very difficult to use in mines where natural fuel sources, such as coal, were not readily available.[258] In 1769, Scottish inventor James Watt solved this problem with an ingenious modification to Newcomen's design that drastically cut fuel consumption.[259] Watt patented his modified engine and licensed it to mine adventurers in Cornwall on agreeable terms.[260]

Before long, however, some mine owners felt that Watt's licensing fees had become unfairly high.[261] Frustrated, they enlisted local engineers to construct pirate engines that they put to work throughout the region.[262]

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[250] *See, e.g.*, B.E. Leveridge & A.J. Hartley, *The Variscan Orogeny: The Development and Deformation of Devonian/Carboniferous Basins in SW England and South Wales*, *in* THE GEOLOGY OF ENGLAND AND WALES 225 (Patrick J. Brenchley & Peter F. Rawson eds., 2d ed. 2006) (discussing the geologic history of the region).

[251] *See, e.g.*, *Nation on Film—Drill and Blast*, BBC HOME, http://www.bbc.co.uk/cornwall/uncovered/stories/sept2003/nationonfilm.shtml (last updated Oct. 2003) (previewing the BBC television broadcast, *Nation on Film—Drill and Blast*, that originally aired on October 7, 2003 (discussing the importance of Cornwall as an engineering center in the nineteenth century)).

[252] This analogy has been made by a number of scholars. *See, e.g.*, CHARLES LEADBEATER, WE-THINK 54 (2d ed. 2009).

[253] *See* Nuvolari, *supra* note 229, at 351–59.

[254] *See id.* (discussing mine flooding).

[255] *Id.* at 352–56.

[256] *See id.* at 352 (stating that the Newcommen engine was invented in 1712 and that Watt's design, which replaced the Newcommen as the state of the art in mine-draining technology, came into use beginning in 1777).

[257] *Id.*

[258] *Id.*

[259] *Id.* (emphasizing the incredible value gained by Watt's addition of a separate condenser).

[260] *Id.* at 352–53.

[261] *Id.* at 353.

[262] *Id.*

Following a lengthy legal challenge, the courts affirmed the validity of Watt's broad patent and enjoined use of the pirate devices.[263]

After Watt's victory in 1799 and the expiration of his patent in 1800, Cornwall mining entrepreneurs collectively organized against the patent system.[264] In 1811, a group of mine "captains" agreed to place new steam engine designs in the public domain by way of a new trade journal.[265] At the same time, most engineers stopped patenting their new designs—in part because business owners were boycotting patented designs and also because placement in the trade journal was good advertising for aspiring engineers.[266]

Over the next thirty years, the average efficiency of steam engines steadily increased—a direct result, historians believe, of the decision among inventors in Cornwall to share designs and related technical information, rather than to litigate.[267] Historical records from the period also reflect this view. As one mine entrepreneur wrote in 1830:

> [A]s, since the time of Boulton and Watt, no one who has improved our engines has reaped pecuniary reward, it is at least fair that they should have credit for their skill and exertion. We [adventurers] are not the partisans of any individual [engineer or engine maker], we avail ourselves of the assistance of many; and the great scale upon which we have to experiment, makes the result most interesting to us.[268]

To conclude that the tale of Cornwall supports the Market Correction Hypothesis is appealing. Facially, this episode does appear to show "long-term industry players rationally seek[ing] to constrain property rights protections in order to maximize the cumulative stream of innovation gains net of transaction costs,"[269] as the theory predicts. But the peculiar economics of Cornwall's mining industry reveal a more nuanced tale. Most mining entrepreneurs owned shares in their competitors' operations.[270] As a result, many adventurers directly profited from the aggregate performance of their local district as a whole as compared to the performance of neighboring mining districts.[271] In the absence of this unique incentive

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[263] *Id.*

[264] *See id.* at 353–55 ("The case of the Cornish pumping engine seems to be indeed an 'exemplary' case of collective invention.").

[265] *Id.* at 354.

[266] *Id.* at 354, 357.

[267] *See, e.g.*, *id.* at 354.

[268] John Taylor, Letter to the Editor, *On the Duty of Steam-Engines in Cornwall*, 7 PHIL. MAG. 424, 431 (1830).

[269] Barnett, *supra* note 1, at 442.

[270] Nuvolari, *supra* note 229, at 356–57 (discussing the "cost book system," a mode of profit-sharing present in the Cornish mining economy, and noting that "[a]dventurers were usually not tied to the fortunes of a single mine but often acquired shares of different mine ventures").

[271] *Id.*

structure, it is not at all clear that Cornwall would have blossomed into the community of innovation that it became.

C. Charitable Communities

The patent-sharing regimes discussed in this Part have a charitable aspect to them, suggesting that they are motivated more by social goals than by private gain. As with the litigation-inspired episodes discussed earlier, these examples reveal that the aim of a patent-sharing community can govern what it will accomplish. Here, broad philanthropic goals motivate the sharing of diverse sets of patents that are not necessarily interrelated and therefore not the basis for patent gridlock. Thus, while the following initiatives may be of significant social value, they do not support the Market Correction Hypothesis.

1. The Eco-Patent Commons.—On its face, the problem of environmental harm seems almost too vast to tackle. It is a puzzle with political, economic, and social dimensions, the effects of which are as far-reaching as global climate change and yet as immediate as the quality of water and air. Experts believe that behind all this complexity, however, lies a simple promise: cleaner technologies can help. Over the past two decades, world governments have worked in earnest to encourage so-called "green" innovation in the private sector. In the past year alone, the USPTO implemented a "fast track" program under which patent applications for environmentally friendly inventions will be processed more quickly than standard patents.[272] Recognizing the need to encourage green technologies, some nations have called for treaties weakening the enforceability of patents related to ecological sustainability. In the 2008 United Nations Framework on Climate Change, for example, China pushed for weaker

[272] Pilot Program for Green Technologies Including Greenhouse Gas Reduction, 74 Fed. Reg. 64,666 (Dec. 8, 2009); Press Release, U.S. Patent & Trademark Office, The U.S. Commerce Department's Patent and Trademark Office (USPTO) Will Pilot a Program to Accelerate the Examination of Certain Green Technology Patent Applications (Dec. 7, 2009), *available at* http://www.uspto.gov/news/pr/2009/09_33.jsp.

protection of climate-related patents.[273] U.S. lawmakers have introduced bills that explicitly reject this approach, however.[274]

Against this backdrop, an unlikely champion of weaker patent enforcement has recently emerged. In 2008, IBM Corporation, the largest patent holder in the United States, led a collaboration to pool green patents on a royalty-free basis. The same year, the Eco-Patent Commons (EPC) was formally announced as a partnership among IBM, Pitney-Bowes, and Sony, with organizational support from the World Business Council for Sustainable Development.[275]

The EPC is open to any patent holder willing to donate environmentally beneficial innovations to the public without royalties. The EPC website explains the project's mission:

- To provide an avenue by which innovations and solutions may be easily shared to accelerate and facilitate implementation to protect the environment and perhaps lead to further innovation;

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[273] *See* U.N. Framework Convention on Climate Change, Ad Hoc Working Group on Long-Term Coop. Action Under the Convention, Bonn, F.R.G., June 1–12, 2009, Negotiating Text, ¶¶ 187–89, U.N. Doc. FCCC/AWGLCA/2009/8 (May 19, 2009), *available at* http://unfccc.int/resource/docs/2009/awglca6/eng/08.pdf (encouraging the development of "climate-friendly technologies" by proposing the removal of intellectual property "barriers to development and [the] transfer of technologies from developed to developing countr[ies]" or the exemption "from patent protection of climate-related technologies" for the least-developed countries); Lisa Larrimore Ouellette, Comment, *Addressing the Green Patent Global Deadlock Through Bayh-Dole Reform*, 119 YALE L.J. 1727, 1727 (2010) ("During climate treaty negotiations, developing countries like China have argued that patents limit their access to green technologies. Based on these submissions, the May 2009 United Nations climate treaty negotiating text contained proposals that weaken IP rights for green technologies." (footnote omitted)).

[274] *See* H.R. REP. NO. 111-143, at 36 (2009); H.R. amend. 187 to H.R. 2410, H.R. REP. NO. 111-143, at 53 (June 10, 2009) (amending Foreign Relations Authorization Act, Fiscal Years 2010 and 2011, H.R. 2410, 111th Cong. § 1120a (2009)) ("[I]t shall be the policy of the United States that, with respect to the United Nations Framework Convention on Climate Change, the President, the Secretary of State and the Permanent Representative of the United States to the United Nations should prevent any weakening of, and ensure robust compliance with and enforcement of, existing international legal requirements . . . for the protection of intellectual property rights related to energy or environmental technology . . . ."). This amendment reflects the view that patents play an important role in encouraging innovation—an opinion that is generally held by wealthy and developed nations. *See* Tove Iren S. Gerhardsen, *IP Issues May Go to 'Higher Political Level' in Copenhagen Amid Difficulties*, INTELL. PROP. WATCH (Dec. 9, 2009, 5:57 PM), http://www.ip-watch.org/weblog/2009/12/09/ip-issues-may-go-to-%E2%80%98higher-political-level%E2%80%99-in-copenhagen-amid-difficulties (explaining that, by and large, developed countries view patents as an important incentive for innovation, while developing countries view them as an barrier).

[275] *See* Press Release, IBM, IBM and World Business Council for Sustainable Development Team with Nokia, Pitney Bowes and Sony to Establish Eco-Patent Commons (Jan. 14, 2008), *available at* http://www-03.ibm.com/press/us/en/pressrelease/23280.wss (introducing the EPC and explaining how the plan originated); *see also* Marc Sandy Block, *Eco-Patent Commons: Selected Patents Made Available to Benefit the Environment*, IP LITIGATOR, Mar.–Apr. 2009, at 25, 25–26 (discussing the history of the project).

- To promote and encourage cooperation and collaboration between businesses that pledge patents and potential users to foster further joint innovations and the advancement and development of solutions that benefit the environment.[276]

This goal is achieved by requiring contributors to agree to the following patent nonassertion pledge:

> Accordingly, we irrevocably (except as specified below) pledge and covenant to you that we will not assert any of our listed patents (including any worldwide counterparts) against you for any infringing machine, manufacture, process, or composition of matter claimed in such listed patent(s) where such infringing item alone (or when included in a product or service) reduces/eliminates natural resource consumption, reduces/eliminates waste generation or pollution, or otherwise provides environmental benefit(s).[277]

Hence, the pool is aimed at the broad aggregation of patents rather than at any specific avenue of research or product development. Although the EPC pledge is not a binding contract, it is likely enforceable through the doctrine of equitable estoppel.[278]

An obvious question is why patent holders would be at all motivated to participate in the EPC. After all, the group guarantees participants nothing in return for their pledges of nonassertion. An attorney closely involved with the project has suggested that licensors might simply be willing to act for the public good. "[T]he belief behind the Commons," the attorney wrote in a recent journal article, "is that major patent holders in various industries have patents of moderate value that provide an environmental benefit . . . [and] recognize that the resulting value to the world of submitting would greatly outweigh the nominal benefit the patent could derive from a royalty-generating program."[279] This prediction is quite different from the Market Correction Hypothesis's notion of self-interested patent holders rationally seeking the rewards that come from cumulative innovation.

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[276] *Eco-Patent Commons*, WORLD BUS. COUNCIL FOR SUSTAINABLE DEV., http://www.wbcsd.org/work-program/capacity-building/eco-patent-commons.aspx (last visited Mar. 9, 2012).

[277] *Eco-Patent Commons: Joining or Submitting Additional Patents to the Commons, Non-Assert Pledge*, WORLD BUS. COUNCIL FOR SUSTAINABLE DEV. 6, http://www.wbcsd.org/web/projects/ecopatent/EcoPatentGroundRules.pdf (last visited Mar. 9, 2012).

[278] Equitable estoppel is a defense to patent infringement in which an implied license is found in a patent holder's misleading representation of permission. *See, e.g.*, Wang Labs., Inc. v. Mitsubishi Elecs. Am., Inc., 103 F.3d 1571, 1581 (Fed. Cir. 1997) (contrasting legal estoppel from equitable estoppel); AMP Inc. v. United States, 389 F.2d 448, 452–53 (Ct. Cl. 1968) (rejecting equitable estoppel as a basis for finding an implied license to a later-acquired patent because there was no showing that the licensor had made a false representation); AT&T Corp. v. Microsoft Corp., No. 01 Civ 4872 (WHP), 2004 U.S. Dist. LEXIS 1214, at *6 (S.D.N.Y. Feb. 2, 2004) ("It is axiomatic that to assert equitable estoppel, the alleged infringer must have been aware of the patent at issue when it undertook its infringing activities.").

[279] Block, *supra* note 275, at 26.

But why would philanthropically motivated patent holders license their patents under the EPC instead of simply donating the patents to the public domain? Maintaining an active patent requires periodic payment of maintenance fees (which presumably, the EPC's contributors must continue to pay), while a public donation might provide tax breaks.[280] While there is no clear answer to this question, an IBM executive has commented that some companies might see the project as a platform for gaining footholds to sell complementary goods and services or to facilitate the widespread adoption of certain technological standards.[281]

To date, over 100 patents have been donated from 13 participating companies.[282] A recent empirical study indicates that most of these patents are indeed related to the environment and are of at least moderate value.[283] Even so, several patent licensing experts interviewed for this Article doubted the EPC's efficacy.[284] Approximately 20% of inventions donated to the initiative are expired patents and others are patent applications that have not yet been granted.[285] But some lawyers interviewed felt that the EPC's greatest weakness lies in the fact that its success cannot be measured: Because licensees need not identify themselves, it is impossible to determine whether any EPC patents are in fact being used.[286]

2. The GreenXchange.—Even more recently, a second patent community formed around the goal of freely licensing green technologies. This effort, called The GreenXchange (GX), originated from a presentation that NIKE, Inc. (Nike) gave at the World Economic Forum in Davos, Switzerland.[287] The discussion spurred by this presentation on "open-source patents" led to meetings between Nike and Creative Commons, a nonprofit well-known for its widely used public copyright licenses.[288] Soon after,

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[280] *See* I.R.S. Notice 2004-7, 2004-3 C.B. 310 (discussing the tax implications of donating intellectual property, including patents, for charitable purposes).

[281] *See* Bronwyn H. Hall & Christian Helmers, Innovation in Clean/Green Technology: Can Patent Commons Help?, Presentation Before the Workshop on Innovation Without Patents 7 (June 12, 2010), *available at* http://elsa.berkeley.edu/~bhhall/papers/HallHelmers10_ecopats_BW.pdf (quoting IBM's Vice President of Environmental Affairs, Wayne Balta).

[282] *Eco-Patent Commons: Eco-Patents Database*, WORLD BUS. COUNCIL FOR SUSTAINABLE DEV., http://web.archive.org/web/20100108051311/http://www.wbcsd.org/plugins/GENERICDB/result.asp?DBID=8&type=p&MenuId=MTU2MQ&doOpen=1&ClickMenu=LeftMenu&DBEntityTitle=&DBEntityText=&char70=&cbo68=&cbo69=&char71= (last visited Mar. 9, 2012).

[283] *See* Hall & Helmers, *supra* note 281, at 9, 18 (noting that patents pledged to the EPC are "more valuable than the typical patent in a firm's portfolio").

[284] As one executive who was interviewed stated, "[I]t's highly questionable as to whether [the Eco-Patent Commons has] had any impact." Telephone Interview with Anonymous Source #6 (Oct. 7, 2010).

[285] *See* Hall & Helmers, *supra* note 281, at 24 (reporting these statistics).

[286] Telephone Interview with Anonymous Source #1 (Sept. 10, 2010).

[287] Telephone Interview with Anonymous Source #3 (Sept. 28, 2010).

[288] *Id.*

Yahoo! and Best Buy committed their support and the budding effort officially launched in January 2010.[289]

The GX shares the EPC's goal of encouraging green innovation but the group's approach is somewhat more business-minded. Project literature encourages licensors to donate patents for free, for instance, but the GX patent license also permits licensors to charge royalty fees.[290] As John Wilbanks of Creative Commons explained to the *New York Times*, "We don't depend on altruism."[291] The GX license also allows licensors to limit the range of subject matter they may choose to pledge based on geography and fields of use.[292] These licensing "toggles" bank on the idea that there is sometimes a gap between a patent's potential and realized value.[293] For example, Nike might wish to license patented rubber compositions to other footwear makers but might not have a business interest in licensing the same patents to tire manufacturers. A GX spokesperson explained that by facilitating unexpected uses of patents in noncompetitive fields, the GX aims to gather a valuable body of inventions.[294]

As a new effort, the GX's ability to attract patent holders remains unproven. One insider involved from the early stages reported that Nike executives were deeply motivated by the idea that open patent licensing could help the company gain new business footholds: "What Nike liked was the idea that they could create new relationships with companies they might not [otherwise] talk to."[295] What is a bit more puzzling though, is that some insiders hope that GX will succeed in gathering so-called "byproduct patents"—i.e., inventions that are not core to a patent holder's business, but rather, are a tangential product of day-to-day operations.[296] Nike press materials state that many "R&D companies create green technologies that are not core to their business."[297] Insiders did not offer explanations for why a company would pay application and maintenance fees for patents that are not expected to generate any revenues.

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[289] *See* Press Release, Don Tapscott, The GreenXchange, Davos: Nike and Partners Launch the GreenXchange (Jan. 27, 2010), *available at* http://www.greenxchange.cc/info/release/1-27-2010.

[290] *See Pledge and License Types*, GREENXCHANGE, http://www.greenxchange.cc (last visited Mar. 9, 2012) (explaining that the "Standard" license allows for royalty-free use while the "Standard PLUS" license allows the patent holder to charge royalty fees).

[291] *See* Mary Tripsas, *Everybody in the Pool of Green Innovation*, N.Y. TIMES, Nov. 1, 2009, at N5 (comparing the GX and the EPC).

[292] *Pledge and License Types*, *supra* note 290 ("For example, the patent holder may restrict field of use, geography, or require a payment.").

[293] Telephone Interview with Anonymous Source #3 (Sept. 28, 2010).

[294] Telephone Interview with Anonymous Source #6 (Oct. 7, 2010).

[295] *Id.*

[296] *Id.*

[297] NIKE, INC., *Case Study: GreenXchange.*, *in* NIKE, INC. CORPORATE RESPONSIBILITY REPORT, FISCAL YEARS 2007–2009, at 125, *available at* http://www.nikebiz.com/crreport/pdf (last visited Mar. 9, 2012) (discussing Nike's efforts related to the GX).

While these questions remain open, it appears that, like the EPC, the GX is not gathering patents that are complementary or that cover related technologies. As of this writing, 463 patents have been donated to GX from four participating companies.[298] Nike, which contributed a lion's share of 444 patents to the effort, provided a variety of technologies that describe new types of environmentally friendly rubber.[299] Examples of donations from other organizations include a patent covering methods of using certain types of proteins[300] and a patent covering a method of converting printers into cleaning devices.[301]

Ultimately, the EPC and the GX contradict the Market Correction Hypothesis in two respects. First, these efforts are not targeting any specific anticommons problems. That is, they are not purposefully aggregating complementary patent rights whose distribution among multiple rights holders is believed to impede research and development. Second, these efforts appear to be motivated by charitable goals and thus do not reflect, as the theory predicts, patent holders collectively selecting the gains of long-term innovation over the short-term profits that patents confer.[302]

III. IMPLICATIONS FOR THEORY AND POLICY

A. Implications for the Market Correction Hypothesis

The foregoing study suggests some important refinements to theory. To begin, it is helpful to briefly revisit the Market Correction Hypothesis. As explained in Part I, patent gridlock stems from the fact that product research and development often require identifying and licensing multiple patents held by different owners. The potential expense and legal uncertainty of assembling complementary patent rights discourages investments that can spur follow-on innovation.[303] The Market Correction

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[298] *See All Organizations*, GREENXCHANGE, http://www.greenxchange.cc/browse/all_organizations (last visited Mar. 9, 2012) (reflecting these figures); *see also 463 Assets*, GREENXCHANGE, http://www.greenxchange.cc/search (last visited Mar. 9, 2012) (searchable database).

[299] *See, e.g.*, *463 Assets*, *supra* note 298; *Patent: Rubber Compositions with Increased Shelf Life and Reduced Cure Temperatures and Times*, GREENXCHANGE (Sept. 16, 2003), http://www.greenxchange.cc/nike/rubber-compositions-with-increased-shelf-life-and-reduced-cur (documenting Nike's donation of U.S. Patent No. 6,620,871).

[300] *See Patent: US Patent 6,858,213 Mycobacterial Sulfaction Pathway Proteins and Methods of Use Thereof*, GREENXCHANGE (Jan. 26, 2011), http://www.greenxchange.cc/ucberkeley/mycobacterial-sulfation-pathway-proteins-and-methods-of-use-t (documenting U.C. Berkeley's donation of U.S. Patent No. 6,858,213).

[301] *See Patent: Sheet Cleaner in a Multi-Station Printing Machine*, GREENXCHANGE (Aug. 26, 2010), http://www.greenxchange.cc/bestbuy/sheet-cleaner-in-a-multi-station-printing-machine (documenting Best Buy's donation of U.S. Patent No. 6,684,769).

[302] *See* Barnett, *supra* note 1, at 442.

[303] *See supra* Part I.A. (discussing the theoretical underpinnings of the Market Correction Hypothesis).

Hypothesis posits that, under some circumstances, firms will lower such transaction costs and legal uncertainties by sharing patents. The import of this theory is that, through collective action, private actors "correct" the government's errors in distributing excessive patents to enhance cumulative innovation.[304]

To evaluate this theory, this Article investigated a set of ideal test cases. The examples in Part II include contemporary and historical patent-sharing efforts that all purport to further cumulative innovation. In fact, several of these episodes, including The SNP Consortium, the Open Invention Network (OIN), and the Manufacturers' Aircraft Association (MAA), were explicitly cited in a recent article as support of the theory.[305] Through interviews, firsthand observations, and independent research, this Article revealed that the reality of patent sharing diverges from this theoretical story in important respects.

Some of the communities examined were products of government intervention. The Medicines Patent Pool (MPP) was inspired by the hortatory messages that U.K. politicians expressed in the House of Commons, in official government reports, and in statements to the press.[306] Similarly, the NIH's discouragement of SNP patents created a political atmosphere in which public and private SNP-sharing efforts took hold and succeeded.[307] Along with such statements of encouragement, governments and publicly funded entities have also done the hard work of planning, designing, and implementing invention-sharing regimes. The MPP, for instance, is the creation of UNITAID—an organization funded by European tax dollars and hosted by the World Health Organization.[308] Likewise, the U.S. government's dbSNP, which preceded the SNP Consortium, was funded and administered by the NIH.[309] Reaching further back in time, we find that U.S. politicians designed and implemented the MAA against industry protests.[310]

In other settings, governmental influence is less obvious but no less potent. The Pool for Open Innovation Against Neglected Tropical Diseases (NTD Pool) is illustrative on this point. As the interviews referenced in subpart II.A.2 reveal, this patent-sharing regime was designed, in part, to

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[304] *See supra* Part I.B. (providing scholarship on the Market Correction Hypothesis).

[305] *See* Barnett, *supra* note 1, at 428–30, 429 n.104, 437.

[306] *See supra* Part II.A.1 (discussing the Medicines Patent Pool).

[307] *See supra* Part II.A.3 (discussing the SNP Consortium).

[308] *See supra* Part II.A.1 (discussing UNITAID).

[309] *See supra* Part II.A.3 (discussing the SNP Consortium).

[310] *See supra* Part II.A.4 (discussing the MAA). The MAA is just one historical example of the U.S. government's instigation of a patent pool. Another episode documented by scholars is the U.S. Navy's efforts to aggregate radio patents into what ultimately became RCA Corporation. *See* Merges & Nelson, *supra* note 95, at 892–93 (noting the RCA patent pool).

leverage the preexisting FDA Priority Review Voucher system.[311] One interviewee described the FDA vouchers as a "direct link" between the community and prospective members.[312] From this perspective, the NTD Pool "piggybacks" on an existing policy aimed at encouraging precisely the same kind of innovation. Like the SNP Consortium, the MPP, and the MAA, the NTD Pool does not align with the Market Correction Hypothesis's depiction of private actors correcting government propertization errors. Rather, these examples show the active and visible hand of public policy guiding patent sharing.[313]

In another divergence from the Market Correction Hypothesis, the foregoing study reveals some of the most notable patent-sharing efforts do not aim to encourage future innovations but rather are set on the backward-facing goal of settling or preventing litigation over existing products. The primary purpose of the OIN, for instance, is to serve as a bulwark against long-anticipated litigation over the Linux operating system. This defensive mission is reflected in the OIN patent license, which discourages lawsuits over Linux but does not clearly facilitate the development of future software products or innovations.[314] An historical analogue to this effort is the Bessemer Association, which was devised to settle a bitter litigation over "blocking" patents relating to an existing method of steelmaking.[315] Although the science of steelmaking improved during the late nineteenth century, no historical sources point to the Bessemer Association as an impetus for innovation.

Apart from resolving litigation, some of the communities examined have a charitable aspect to them, suggesting that they may be motivated less by private gain than by social goals. As a lawyer involved with the NTD Pool stated, "GSK's aim . . . was to be a good corporate citizen."[316] Similarly, an executive at Nike described The GreenXchange (GX), which will soon be incorporated as a nonprofit, as driven "by a sense of corporate responsibility."[317]

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311 *See supra* Part II.A.2 (discussing the NTD Pool).

312 Telephone Interview with Anonymous Source #8 (Feb. 7, 2011).

313 The U.S. government has also encouraged "precompetitive" collaboratives by enacting laws that reduce antitrust penalties for such groups. *See* National Cooperative Research & Production Act, 15 U.S.C. §§ 4301–4306 (2006). Some federal agencies such as the FDA and NIH have also collaborated directly with private industry on collaborative biomedical research projects. *See, e.g.*, BIOMARKERS CONSORTIUM, http://www.biomarkersconsortium.org (last visited Mar. 9, 2012). While such projects show the importance of government involvement, they fall outside the scope of this Article because they are not responses to patent gridlock. Rather they are responses to a more generalized lack of innovation in certain industries.

314 *See supra* Part II.B.1 (discussing the OIN).

315 *See supra* Part II.B.2 (discussing the Bessemer Association).

316 Telephone Interview with Anonymous Source #7 (Feb. 7, 2011).

317 Telephone Interview with Anonymous Source #6 (Oct. 7, 2010).

Moving on to the actual substance of patent sharing, not all of the communities examined are aggregating complementary patents. To appreciate this fact, it is helpful to view complementarity as a spectrum. On one end of the spectrum, patent owners can only derive value from their individual inventions through aggregation. SNPs, which are only useful to researchers in large numbers, demonstrate this type of "strict complementarity."[318] Further down the spectrum, individual patents may be valuable on their own but can also be combined in new and useful ways. Cournot's stylized example of the fusion of copper and zinc into brass illustrates this type of relationship.[319] In the context of patents, the fixed-dose antiretroviral drugs (ARVs) that the MPP has targeted for development are a comparable example.[320] Finally, there is sometimes little or no value in combining patents. This describes the relationships among some of the patents sought by the Eco-Patent Commons (EPC) and the GX, many of which relate to different fields of technology.[321] Although these efforts have the backing and participation of large patent holders, the proverbial tragedy of the anticommons cannot be solved simply by aggregating just any patents. This observation is by no means a negative reflection of either effort—the EPC and the GX may make valuable contributions to society. Neither effort, however, seems poised to weaken patent gridlock that blocks the way to new innovations.

This observation highlights an important insight: Unlike tragedies of the commons, tragedies of the anticommons involve property rights that are interrelated. The degree to which patents are interrelated and the resulting degree of patent gridlock that may exist within a given industry can be highly contextual. As the examples discussed in this Article show, complementarity can vary greatly depending on the kind of technology at stake (e.g., SNPs versus drugs), and the stage of technological development (e.g., early research versus late-stage development). Ultimately, a community's ability to overcome patent gridlock is not only a product of the sheer number of patents it collects but also a product of the degree of complementarity among those patents. As a result, although the Market Correction Hypothesis may not apply to innovations that are years or decades away, the theory may be entirely applicable when the contours of a new technology are well-defined and near at hand.

We must be careful to note that these conclusions do not undermine the potential value of collective patent licensing itself. To the contrary, several examples in this Article reveal that, when properly guided by policymakers,

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[318] *See* Merges, *supra* note 55, at 163 (discussing strict complementarity between patents).

[319] *See supra* Part I.A (discussing Cournot's study of monopolies).

[320] *See supra* Part II.A.1 (discussing fixed-dose ARVs).

[321] *See supra* Part II.C (discussing the EPC and the GX).

patent sharing can sometimes effectively mitigate patent gridlock.[322] The SNP Consortium, for instance, effectively warded off a widely anticipated research anticommons through the formation of a publicly accessible genetic database.[323] Likewise, legal commentators have noted that the MAA enabled valuable innovation in the aircraft industry, at least in the organization's early years.[324] In this respect, the Article provides empirical support for the claim that anticommons problems can indeed be counteracted through collective patent licensing. The new insight here relates to how these institutions take form and sustain: Contrary to the prevailing view, communities of innovation must be conceived of as creatures of policy and not purely market forces.

The foregoing analysis can be reduced to a digestible set of insights: This study does not support the hypothesis that innovation markets tend to correct government propertization errors. To the contrary, it suggests that valuable patent sharing can sometimes only occur when policymakers get involved. When private patent holders have collectively organized without government intervention, their goals have often been unrelated to furthering long-term innovation. Defensive patent-sharing communities, for instance, focus more on protecting existing products than on promoting future product development. Charitable patent-sharing communities, as another example, do not necessarily aggregate complementary patents. Those efforts that are carefully targeted at overcoming anticommons problems are largely products of policymaking. A corollary of these observations is that, while the Market Correction Hypothesis may sometimes be accurate—this Article is not an exhaustive study and thus does not foreclose this possibility—the theory is mostly likely to apply only when a product is near at hand. This is because it is easier to identify and gather complementary upstream patents that might cover an identifiable class of products than it is to gather patents that fall under the umbrella of a broad and nebulous problem.

B. Recommendations

That patent gridlock has not been cured through private cooperation alone is not an altogether pessimistic observation. As the foregoing discussion notes, communities of innovation led by policymakers have proven to be effective remedies to anticommons problems. What must be

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[322] *But see* Ryan L. Lampe & Petra Moser, *Do Patent Pools Encourage Innovation? Evidence from the 19th-Century Sewing-Machine Industry* 5 (Nat'l Bureau of Econ. Research, Working Paper No. 15061, 2009), *available at* http://economics.stanford.edu/files/LampeOct15.pdf (discussing how some patent-sharing regimes can actually discourage innovation).

[323] *See supra* Part II.A.3 (discussing the SNP Consortium).

[324] *See, e.g.*, HELLER, *supra* note 10, at 31 (stating that "innovation in American airplane technology resumed" following the formation of the MAA).

considered, then, is how policymakers can most effectively encourage and guide these kinds of institutions.[325]

The most obvious mechanism to encourage patent licensing that has been discussed (and criticized) in the literature is compulsory licensing. This solution lowers transaction costs by transferring the power to set licensing fees from patent holders to neutral third parties—typically, administrative agencies or special tribunals.[326] In a more targeted way, some have argued for mandatory royalty-free cross-licensing of all federally funded inventions for research.[327] While these ideas are valuable and important, compulsory licensing is a relatively extreme form of intervention and not widely available under U.S. law.[328] Thus, solutions involving compulsory licenses may have trouble gathering the necessary political goodwill to get adopted. More moderate solutions are needed.

The communities of innovation examined in this Article point towards alternative policy measures that are at once more moderate and more targeted to address anticommons problems than compulsory licensing is. These solutions define a spectrum of involvement: from issuing hortatory statements, to offering various incentives, to directly designing and implementing patent-sharing communities themselves.[329] The paragraphs that follow provide an overview of how policymakers informed by these case studies can help to establish communities of innovation.

The least intrusive step that regulators can take is to encourage and validate patent-sharing proposals through official statements. The MAA provides a helpful example of how this type of intervention can work. The institution itself was conceived of and endorsed by a committee of experts appointed by President Wilson and was later declared legal under antitrust laws by the U.S. Attorney General. Following this official sanction, the plan took hold within private industry.[330] Similarly, the MPP took form at the urging of well-informed U.K. public servants. As mentioned in Part II, *The Lancet* recently urged policymakers to become even more vocal in

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[325] *See, e.g.*, Merges, *supra* note 90, at 1355 ("[N]ot only should the government exercise restraint in banning pools as violations of antitrust policy, but also . . . the government may consider assisting the creation of patent pools.").

[326] *See, e.g.*, Parchomovsky & Mattioli, *supra* note 24, at 214 (proposing a compulsory licensing scheme).

[327] *See* Gary Pulsinelli, *Share and Share Alike: Increasing Access to Government-Funded Inventions Under the Bayh-Dole Act*, 7 MINN. J.L. SCI. & TECH. 393, 442–43 (2006) (discussing this proposal and its benefits).

[328] *But see* Agreement on Trade-Related Aspects of Intellectual Property Rights, art. 31, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299, 313 (1995) (providing for compulsory licensing of patents under certain conditions).

[329] *See supra* Part II (discussing the interplay between government policies and patent licensing collectives).

[330] *See supra* Part II.A.4.

supporting the effort.[331] These examples illustrate how, working in concert, politicians and regulators can encourage meaningful exchanges through declarations alone.

A second class of measures concerns substantive incentives. The NTD Pool, which was keenly designed to bank off of FDA Priority Review Vouchers (PRV), provides a helpful example of how such incentives could be tailored.[332] In its current design, the FDA PRV system rewards drug developers, but not the patent holders that license intellectual property rights to them. As a result, this incentive may draw licensees to the NTD Pool, but not necessarily licensors.[333] To more directly encourage patent holders to share, the FDA could extend its voucher program to include patent holders. The FDA could make PRVs available not only to drug developers, but to all patent holders whose upstream innovations enabled the downstream products that qualify for PRVs. This suggestion is one example of an administrative "carrot" that could encourage valuable patent community building.[334]

Finally, policymakers can take the bold step of funding and establishing patent-sharing regimes themselves. As the NIH's SNP database shows, communities of innovation run by the public sector can be highly effective at countering anticommons problems. By tailoring the scope of a patent-sharing effort to specific classes of products—e.g., pediatric ARVs—policymakers could target manageable and identifiable sets of patents. Leading commentators have argued that the public sector is actually in a very good position to make these sorts of determinations.[335] Unbound by market pressures and shareholder demands, public entities are well-positioned to administer sharing regimes and to mediate neutrally between various interest groups.

From a political perspective, the government's backing of communities of innovation should not stir controversy. Patents themselves are figments of policy, and—as the case studies in this Article show—patent communities have long been instigated and guided by the public sector. Moreover, these recommendations are modest. Unlike compulsory licensing proposals,[336] these suggestions encourage patent sharing rather than force it. In this respect, they largely preserve incentives to innovate, and at the same

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[331] *See supra* Part II.A.1.

[332] *See supra* Part II.A.2 (discussing the role that FDA Priority Review Vouchers play in the NTD Pool).

[333] In fact, the community discourages licensors from demanding vouchers from licensees.

[334] *Cf.* IAN AYRES, CARROTS AND STICKS: UNLOCK THE POWER OF INCENTIVES TO GET THINGS DONE 24–28 (2010) (discussing the role of contingent rewards and penalties as "the basic building blocks of economic incentives").

[335] Rai & Eisenberg, *supra* note 28, at 304–05 (noting that fund-granting agencies "are well-positioned to take into account the impact of upstream patents on both future product development and future scientific research").

[336] *See* Pulsinelli, *supra* note 327.

time, enable the public sector to play an active and meaningful role in instigating and guiding communities of innovation.

CONCLUSION

It should come as no surprise that the realities of patent sharing are more complex than theory suggests. As Elinor Ostrom and other political economists demonstrated, property sharing is highly dependent on context.[337] Indeed, the shape of each patent-sharing initiative discussed in this Article is as unique as the particular circumstances—technological, economic, and political—that inspired it. These stories of success, failure, cooperation, and conflict provide several important refinements to our understanding of the role of collective action in our patent system.

First, companies sometimes share patents in response to government pressure. The Manufacturers' Aircraft Association, for instance, was the product of direct government intervention. The U.S. government conceived of the pool and pressured the key patent holders, Wright and Curtiss, to cooperate.[338] In a more subtle way, the SNP Consortium formed in the wake of the U.S. government's own effort to gather patentable data.[339] Today, the Medicines Patent Pool is taking form under similar pressures. The effort was conceived of by policymakers and has been spearheaded by a publicly funded organization associated with the U.K. government.[340] These observations do not align with the Market Correction Hypothesis's depiction of private actors correcting government propertization errors.[341]

Second, some patent-sharing communities are focused on facilitating the production and use of existing products, rather than encouraging the development of future technologies. The primary purpose of the Open Invention Network, for instance, is to serve as a bulwark against litigation directed at the Linux operating system rather than to provide fertile ground for future inventions.[342] Likewise, the primary goal of the Bessemer Association was to allow steel mills to practice an existing steelmaking process.[343]

Third, some of the efforts discussed in this Article have a charitable aspect to them, suggesting they are more driven by social goals than economics. Broad charitable missions appear to encourage donations of broad sets of patents, many of which are not complementary. In its most

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[337] *See supra* Part I.B.

[338] *See supra* Part II.A.4.

[339] *See supra* Part II.A.3.

[340] *See supra* Part II.A.1.

[341] This observation accords with Arti Rai's work on patent pools. *See generally* Arti Kaur Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 NW. U. L. REV. 77, 130–33 (1999) (arguing that patent pools often only emerge with difficulty).

[342] *See supra* Part II.B.1.

[343] *See supra* Part II.B.2.

unqualified and optimistic form, the Market Correction Hypothesis assumes that nearly any aggregation of patents is prima facie evidence of a market correction. This view ignores the fact that, unlike a natural resource commons, the patent anticommons is built on assets that are interrelated in complicated ways. We cannot expect that the sharing of patents that are unrelated or only loosely related will cure the dilemma of patent gridlock.

A corollary of this observation is that patent sharing may be most capable of enhancing innovation in settings where specific patents, or at least specific products, can be identified—typically, further toward the "product" end of a development timeline. The Medicines Patent Pool, for instance, targets pediatric antiretroviral drugs.[344] Likewise, the Pool for Open Innovation Against Neglected Tropical Diseases targets a clearly defined set of specific diseases.[345] At the far end of the spectrum, however, efforts like the Eco-Patent Commons are aimed broadly at the problem of environmental harm. Here, at the research stage, patents are more akin to the presence of "dark matter" in the universe: their influence can be felt, but they evade easy identification.

Underlying all of these observations are truths about the role of collective action in our patent system. The Market Correction Hypothesis proposes that patent holders, guided by an enlightened sense of self-interest, will choose to reap the long-term gains of innovation over the short-term gains that patents confer. What this theory overlooks, however, is the fact that cooperation is always shaped by circumstance. Patent sharing regimes are forged on diverse challenges and hopes. They can provide shelter from outside threats as well as foundations on which to build for the future. Perhaps most importantly, though, these communities cannot be expected to form without governmental support.

The results of the ethnographic inquiry conducted in this Article should not be thought of as a conclusion but rather as a first step. From here, academics, policymakers, and the public can begin a new discussion about how to build communities of innovation that will flourish and endure.

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[344] *See supra* Part II.A.1.

[345] *See supra* Part II.A.2.