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Establishing an Island of Patent Sanity

Oskar Liivak[†]

INTRODUCTION

There is a growing, inescapable sense that something has gone terribly wrong with the patent system. Though it was founded with the laudable constitutional goal of “promot[ing] . . . [p]rogress” in the “useful [a]rts . . .,” today, it is hard to find any positive news suggesting progress.¹ Current patent lawsuits are widely described as a “battle”² or a “war.”³ And though litigators often use such allusions,⁴ this time the scale and the feel is different. During the past decade we witnessed an escalating intellectual property cold war where huge sums spiraled into a rapidly growing patent-industrial complex. Companies “stockpil[ed]”⁵ patents in huge numbers,

[†] Associate Professor, Cornell Law School. I would like to thank T.J. Chiang, Kevin Collins, John Duffy, Michael Frakes, Glynn Lunney Jr., Robert Merges, Michael Meurer, Bhaven Sampat, Josh Sarnoff, Henry Smith, and Geertrui Van Overwalle for helpful discussions and encouragement. This article has benefited from presentation at the 2012 Intellectual Property Scholars Conference held at Stanford Law School.

¹ U.S. CONST. art. I, § 8, cl. 8.

² Steve Lohr, *Apple-Samsung Battle Shifts to Trial*, N.Y. TIMES, July 30, 2012, at B1 (describing how Apple “assembled an ‘Android war room,’ where its employees can study Android products”).

³ Laura Sydell, *Samsung Fight Among Many in Apple’s Patent War*, NPR (July 30, 2012, 5:04 AM), <http://www.npr.org/2012/07/30/157571532/samsung-fight-among-many-in-apples-patent-war>.

⁴ See Matthew D. Powers et al., *The Successful Patent Litigator Must Learn the Way of Strategy: The Opportunities and Risks of Claim Construction*, in F. SCOTT KIEFF ET AL., PRINCIPLES OF PATENT LAW: CASES AND MATERIALS 874-76 (4th ed. 2008) (citing both a samurai strategy book as well as Sun Tzu’s THE ART OF WAR, and stating “litigation is a form of warfare”). Note that one of the authors, Matthew D. Powers, is one of the most respected patent litigators, who left his position at Weil, Gotschall, & Manges and is now representing nonpracticing entities. See Ashby Jones, *When Lawyers Become “Trolls,”* WALL ST. J., Jan. 23, 2012, at B1.

⁵ Andy Baio, *A Patent Lie: How Yahoo Weaponized My Work*, WIRED (Mar. 13, 2012, 3:44 PM), <http://www.wired.com/business/2012/03/opinion-baio-yahoo-patent-lie/> (“Yahoo assured [its programmers] that their patent portfolio was a precautionary measure, to defend against patent trolls and others who might try to attack Yahoo with their own holdings. It was a cold war, stockpiling patents instead of nuclear arms, and every company in the valley had a bunker full of them.”).

not because those patents brought with them useful technology, but rather because they granted the patent holders devastating rights of exclusion.⁶ Patents, like some legal strain of anthrax, have been “weaponized.”⁷ With those stockpiles, patent holders have gone “thermonuclear”⁸ on their rivals.⁹ In the tech world, we are witnessing “World War III.”¹⁰ The patent threat even extends beyond the industrial superpowers, as patents from failed start-ups are compared to “loose nukes” that are finding their way into the hands of patent trolls intent on patent “terrorism.”¹¹ Though someone *might* be left standing at the end, the rest of us cannot imagine how the resulting economic fallout counts as the “progress” promised and demanded by the Constitution. From Silicon Valley engineers, to economists, to legal scholars, and now to judges, the patent system is thought to be “in crisis,”¹² “broken,”¹³ a “failure,”¹⁴ “an unnecessary evil,”¹⁵ and “dysfunctional.”¹⁶ So what has happened? Who is to blame?

⁶ Susan Decker & Brian Womack, *Google Buys 1,023 IBM Patents to Bolster Defense of Android*, BLOOMBERG NEWS (Sept. 14, 2011), <http://www.bloomberg.com/news/2011-09-14/google-purchases-1-023-patents-from-ibm-to-bolster-portfolio.html> (describing how Google acquired “17,000 [patents] with its \$12.5 billion acquisition of Motorola Mobility Holdings Inc.”).

⁷ Baio, *supra* note 5.

⁸ Philip Elmer-DeWitt, *Could Steve Jobs Actually Win His Thermonuclear War?*, CNN (June 30, 2012, 6:53 AM), <http://tech.fortune.cnn.com/2012/06/30/could-steve-jobs-actually-win-his-thermonuclear-war/> (describing how Steve Jobs told his biographer that “Google has ‘f***ing ripped off the iPhone’ . . . , promising to go ‘thermonuclear’ to destroy Android”).

⁹ See Philip Elmer-DeWitt, *Apple v. Samsung: The Patent Trial of the Century Starts Today*, CNN (July 30, 2012, 8:02 AM), <http://tech.fortune.cnn.com/2012/07/30/apple-v-samsung-the-patent-trial-of-the-century-starts-today/>.

¹⁰ Sydell, *supra* note 3. As Albert Einstein famously stated, “I do not know how the Third World War will be fought, but I can tell you what they will use in the Fourth—rocks!” See THE NEW QUOTABLE EINSTEIN 173 (Alice Calaprice ed., 2005).

¹¹ John Brandon, *Fark.com Founder Links Patent Trolls with “Terrorists.”* FOX NEWS (Apr. 18, 2012), <http://www.foxnews.com/tech/2012/04/18/farkcom-wins-patent-dispute-by-not-negotiating-with-terrorists/> (“[P]atent troll [was described as] a company established . . . solely to make cash through patent lawsuits Drew Curtis, the founder of Fark.com, calls them terrorists to be avoided at all costs. ‘It boils down to one thing: don’t negotiate with terrorists,’ Curtis said during a talk at the TED 2012 conference.”).

¹² DAN L. BURK & MARK A. LEMLEY, THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT 3 (2009).

¹³ See generally ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT 1-24 (2004).

¹⁴ JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK 45 (2008).

¹⁵ MICHELE BOLDRIN & DAVID K. LEVINE, AGAINST INTELLECTUAL MONOPOLY 7 (2008).

¹⁶ Richard A. Posner, *Capitalism*, BECKER-POSNER BLOG (June 3, 2012), <http://www.becker-posner-blog.com/2012/06/capitalismposner.html> (“The institutional

Some blame the patent system, calling for it to be dismantled.¹⁷ Some blame patent trolls for their overly aggressive patent assertion practices. Some blame the Patent and Trademark Office for its shoddy quality control. Some blame the Court of Appeals for the Federal Circuit for its overzealous support of patent holders. Yet I am not sure we can so easily place blame on any one group. Despite the widespread discontent, we cannot prove that something is actually amiss. As far as current patent theory goes, we aren't sure anything has gone wrong, but the theory is so indeterminate that we also aren't sure anything has gone right either.

The embarrassing fact of the matter is that although the current theory of patents has been around for roughly the past two hundred years, it has never been able to justify the patent system as it exists. The patent system is explained as a general program for encouraging technological progress. By granting valuable rights of exclusion to patent holders, the system aims to divert rents to patent holders so as to induce the socially optimum level of technological advances. Though this underlying purpose is simple to state, it has created an intractable cost-benefit analysis that resists either justification or, alternatively, falsification.

Once framed as inducing behavior through artificial incentives, we know there are benefits, and we know there are costs—but we don't have reliable tools to quantify them. As a result, we cannot prove that the patent system is or is not socially beneficial. The result is patent policy that is based on “guesswork”¹⁸ as patent proponents and critics are buoyed by “faith” alone.¹⁹ The indeterminacy has produced two hundred years of “patent controversy.”²⁰ Sixty years ago, Learned Hand lamented that the patent debate is “approach[ed] . . . with

structure of the United States is under stress We have a . . . dysfunctional patent system Our capitalist system needs a lot of work to achieve proper capitalist goals.”)

¹⁷ See BOLDRIN & LEVINE, *supra* note 15, at 12.

¹⁸ *American Patent System: Hearing on S. Res. 92 Before the Subcomm. on Patents, Trademarks, and Copyrights of the S. Comm. on the Judiciary*, 84th Cong. 116, 120 (1959) (statement of Judge Learned Hand) [hereinafter *Hand on Patent Reform*].

¹⁹ See JAMES BOYLE, SHAMANS, SOFTWARE, AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY 253 (1996) (describing support for the “current system” as “an article of religious faith”); see also BESSEN & MEURER, *supra* note 14, at 74 (quoting James Boyle as grounding IP policy not on empirical evidence but instead on “faith-based” reasoning”).

²⁰ Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. ECON. HIST. 1-2 (1950) (“[T]he controversy about the patent of invention is very old”).

enormous passion but without enlightenment.”²¹ One side argues that the system is essential for “American industry,” while the other side calls the system “a beastly method.”²² “No one really knows. Each side is beating the air.”²³ A great deal of research has been directed at the patent system,²⁴ yet the underlying intractability remains.

Is there really no terra firma within this “slough of despond”?²⁵ Is there no core, no matter how small, around which consensus could begin to build? This article argues that the current patent dysfunction is not the fault of any one group, but rather that the fault lies with patent theory and the way it has framed the patent debate. Not only does patent theory’s intractable analysis preclude acceptance (or falsification), but it also provides no direction for patent reform. As will be argued below, the problem is that the theory has asked too much from the system. A more narrowly focused theory can provide needed solid ground on which to build a patent system.

In particular, current patent theory assumes that patents are designed to directly create incentives that will induce the optimum amount of inventive activity. In other words, the system grants, to inventors, fairly absolute rights of exclusion of some predesigned breadth and length. To justify and evaluate that system, patent theorists then enumerate all the *behaviors* that these rights induce. In essence they are identifying all the ways in which patent holders can monetize these exclusive rights. The empirical case for that incentive-based system then amounts to accounting for the costs and benefits of all these enumerated behaviors. Not only do we hope that the benefits outweigh the costs but we also hope that we can maximize the benefits minus the costs. This grand accounting has proven to be intractable and its optimization is even more so.

To establish patent theory’s more solid grounding, this article departs from the standard incentive-creating narrative where patents are seen as directly creating incentives. Rather than starting with absolute rights and then listing induced behaviors, this article begins by identifying specific socially beneficial behavior and then determining the exclusive rights

²¹ *Hand on Patent Reform*, *supra* note 18, at 116.

²² *Id.*

²³ *Id.*

²⁴ See Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 TEX. L. REV. 1031, 1035 & n.8 (2005).

²⁵ John M. Golden, *Principles for Patent Remedies*, 88 TEX. L. REV. 505, 525 (2010).

(no longer necessarily absolute) needed as instrumental support for that beneficial behavior. In particular, this article identifies private decision-making in the creation and market distribution of *inventions* (rather than information or technology) as socially beneficial behavior. It then identifies the minimal patent system necessary to support, but not directly incentivize, those particular activities. That exclusion provided by the patent system is the instrumental means to serve the higher purpose of getting inventions from their creators to potential users. Exclusion, then, is not aimed at creating incentives per se, but rather at preventing particular third-party acts that would disrupt (that is, harm) the social benefits of creating and distributing inventions. The result is an island, certainly a small one, of justifiable activity and patent exclusion. In other words, patent holders who undertake the hard, but socially beneficial, tasks of creating and disseminating inventions deserve the protection of the patent system and, in particular, deserve protection from third party acts that harm that socially beneficial activity. And though controversy may well continue to hound the patent system, this article argues that, no matter what reforms are proposed, those that are diligently marketing and disseminating their patented inventions should receive robust protection from the patent system.

Though real progress establishing even such a limited island of justified patent activity is welcome, the specifics of this proposal may be greeted with suspicion, as it surely raises an important and obvious challenge. Even if agreeing with the need for a new patent theory, many will doubt that a straightforward voluntary market exchange of inventions could provide a workable patent narrative. After all, such a market is quite familiar from the tangible free market: if it could be done, why hasn't it been done before? Indeed, the conventional view is that such a market narrative is doomed to fail when applied to public goods, such as technology. Technological information is thought to be too different from the well-understood world of tangible goods and, as a result, it is generally thought that a market model is not suitable for the patent system.

In fact, highly influential economic thinking has regarded such a market for technology to be ill-advised. The work of two of the twentieth century's greatest economists appears to argue against such a market. In economist Kenneth Arrow's influential paper, he argued that a market would be

unable to achieve an optimal allocation of resources for inventions.²⁶ Since its publication in 1962, that paper has formed one of the core objections to a strictly market-based solution for innovation.²⁷

In addition, Paul Samuelson's work on public goods, in which he describes what has become known as the "Samuelson condition," also stands as an obstacle.²⁸ After deriving a top-level condition for the optimal allocation of resources toward creating public goods like technology,²⁹ Samuelson addressed whether private decision-making could ever lead to that optimal allocation of resources. He concluded that it could not³⁰: consumers for the public good would systematically underrepresent their valuation of the public good and this would then prevent the optimal allocation of resources toward creating public goods.³¹ Arrow and Samuelson's arguments are largely accepted as correct, standing as truly formidable obstacles to a market-based theory of patents.

This article argues that Arrow and Samuelson were generally correct, but that they did not consider certain specific, exceptional cases that could provide a stable core for the current patent system. Those exceptional cases have remained unexplored because we have generally thought their scope too narrow. In a sense we have been asking the patent system to do too much. We have assumed that the patent system must be some universal technological information generation machine. With that broad purpose then, the above-mentioned economic worries do indeed rightfully block a market-driven narrative for the patent system and we are likely stuck with our current indeterminate narrative. Yet what if we asked for less? What if we aimed for a more manageable objective? This article argues that the patent system should not focus on technological information generation generally; instead, it should focus on something

²⁶ See Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in NAT'L BUREAU OF ECON. RESEARCH, THE RATE AND DIRECTION OF INVENTIVE ACTIVITY 609, 619 (1962), available at <http://www.nber.org/books/univ62-1>.

²⁷ Michael J. Burstein, *Exchanging Information Without Intellectual Property*, 91 TEX. L. REV. 227, 228-29 (2012).

²⁸ RICHARD CORNES & TODD SANDLER, THE THEORY OF EXTERNALITIES, PUBLIC GOODS, AND CLUB GOODS 23 (2d ed. 1996).

²⁹ See Paul A. Samuelson, *The Pure Theory of Public Expenditure*, 36 REV. ECON. & STAT. 387, 387-88 (1954).

³⁰ *Id.* at 388.

³¹ *Id.* at 388-89.

narrower and more concrete: the creation and dissemination of *inventions*.

In earlier research, I have focused on the invention in patent law as a doctrinal and conceptual matter.³² I have argued that the invention is an important substantive concept that is currently under-utilized and under-theorized.³³ My work, along with others, has shown that we can solve a number of pressing doctrinal problems by using a substantive vision of the invention in patent law.³⁴ This article adds to that work by emphasizing the invention's fundamental role in directing the patent system to focus only on those technological artifacts that can be exchanged in an open market. It will show that inventions are in fact exceptions to the more general arguments of Arrow and Samuelson.

Though general technological information may be ill-suited for market commodification, this article will show that inventions are exceptional—they can be commodified. Inventions are completed solutions to relevant technological problems wherein that solution is refined enough that it is ready to be practiced by “any” person of skill in the art.³⁵ In economic terms, an invention can be thought of as a production plan,³⁶ a package of technological information that can effectively interface with neoclassical firms via the existing price system. By solving a relevant technological problem and by expanding a firm's production possibilities, an invention (as opposed to technological information generally) is a “thing” that can be valued by the neoclassical firm. This article will

³² See Oskar Liivak, *Rescuing the Invention from the Cult of the Claim*, 42 SETON HALL L. REV. 1, 4-6 (2012) [hereinafter Liivak, *Rescuing the Invention*]; Oskar Liivak, *Finding Invention*, 40 FLA. ST. U. L. REV. 57, 63-68 (2012) [hereinafter Liivak, *Finding Invention*] (uncovering the historic understanding of the invention as the set of embodiments disclosed in the patent and applying that understanding to explain a variety of claim scope decisions).

³³ See Liivak, *Rescuing the Invention*, *supra* note 32, at 4-6; Liivak, *Finding Invention*, *supra* note 32, at 63-68.

³⁴ See Liivak, *Rescuing the Invention*, *supra* note 32, at 4-6; Liivak, *Finding Invention*, *supra* note 32, at 59-60; see also Christopher A. Cotropia, *What Is the “Invention”?*, 53 WM. & MARY L. REV. 1855, 1862-63 (2012) (developing an “external” definition of the invention and contrasting that against a “claim-centered” definition of the invention and ultimately arguing for the “external” definition as better fitting patent law and policy).

³⁵ See, e.g., 35 U.S.C. § 112 (2006) (requiring that a patent “specification” contain sufficient detail “to enable any person skilled in the art to which it pertains . . . to make and use the same . . .”).

³⁶ Cf. WILLIAM J. BAUMOL & ALAN S. BLINDER, *ECONOMICS: PRINCIPLES AND POLICY* 371-72 (7th ed. 1998); see also *infra* note 166 and accompanying text (further discussing production plans).

show that a critical aspect of the patent system's modular design architecture is achieved by limiting patent protection to inventions, and that such a system can support an economically justified market in those inventions even though a more general market for information may well prove problematic. In other words, we can justify the patent system when we view it as providing the legal support for a socially beneficial market for the voluntary exchange of inventions.

There are three relatively high-level ways to theoretically view the intervention suggested here: a property-based intervention, an economic intervention, and an adjudicatory intervention. As to property, in previous work, I highlighted how traditional property evolved during the 1800s—from an institution that aimed to prevent competition to an institution that now sits at the core of fostering competition.³⁷ The theory emphasized here similarly shifts our notion of patents from a type of industrial policy toward a species of property for undergirding a market for inventions.³⁸

As an economic matter, this reorientation of patent theory also bears some structural resemblance to Robert Lucas's criticism of macroeconomics.³⁹ The so-called Lucas critique called into question macroeconomic models and their policy prescriptions because they were not built on policy invariant microeconomic foundations.⁴⁰ Patent law's current narrative focuses on macroeconomic parameters such as the optimal amounts of innovation and other such aggregate quantities. Many of its current policy prescriptions for specific issues—e.g., remedies—are recognized as having elements of circular reasoning.⁴¹ In contrast, the market narrative developed here aims to build the patent system up from individual transactions between inventors and those that can use those inventions. In line with Lucas's broader critique, this new market narrative focuses the patent system on more concrete

³⁷ See Oskar Liivak, *Maturing Patent Theory from Industrial Policy to Intellectual Property*, 86 TUL. L. REV. 1163, 1180-81 (2012).

³⁸ See *id.*

³⁹ See generally Robert E. Lucas, Jr., *Econometric Policy Evaluation: A Critique*, 1 CARNEGIE-ROCHESTER CONFERENCE SERIES ON PUBLIC POLICY 19-46 (1976), reprinted in *THEORY, POLICY, INSTITUTIONS: PAPERS FROM THE CARNEGIE-ROCHESTER SERIES ON PUBLIC POLICY 257-84* (Karl Brunner & Alan Meltzer eds., 1983).

⁴⁰ *Id.* at 258, 261-62, 267, 273, 277.

⁴¹ See Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991, 2044 (2007); John M. Golden, Commentary, *"Patent Trolls" and Patent Remedies*, 85 TEX. L. REV. 2111, 2115 (2007).

microeconomic behavior, which opens the door to a more thorough microeconomic analysis and hopefully, to consensus.

Lastly, the shift also aids the adjudication of patent law. In the current theory, judges are forced to decide cases, yet they rarely see whether those decisions in fact lead to aggregate benefits for innovation. With our current incentive narrative, that causal connection is fraught with confounding factors and judges may feel at sea in these cases. Although the technological component of patent cases is blamed for the judicial dislike of patent cases at times, I suspect that this decoupling of judicial decision-making from clear societal benefit and justice may actually be the more disagreeable aspect of patent cases. Learned Hand noted this disconnect in his testimony before the Senate. Based on his extensive “experience . . . from the many cases that came to [his] attention,”⁴² he was asked, “Did [patents] on the whole promote the arts and sciences?” Learned Hand lamented, “That is just what a judge never gets . . . , how essential [the patent] was for the progress of the arts [Judges] have no idea . . . whatever . . . as to how the system itself is in fact influencing the production of inventions.”⁴³ In the current narrative, judges are forced to decide without any real ability to see the decision’s impact on the overall purpose of the system. In contrast, the system’s purpose with the market narrative is narrower—to enable specific socially beneficial transactions between patent holders and users of those inventions.⁴⁴ For that system, a judge makes a quite different type of decision, which takes place in far more familiar territory. It allows the judge to use institutional competence and experience from other areas of commercial and private law in regulating and channeling behavior in this market as well. All three of these conceptual views of the market narrative show how its adoption would benefit the patent system.

Part I of this article describes current patent theory and its emphasis on balancing access against exclusion. It then details patent theory’s unresolved indeterminacy and other problematic features. Part II explores an enticing alternative where private decision-making alone, without government inducement, guides the allocation of resources in the

⁴² *Hand on Patent Reform*, *supra* note 18, at 116.

⁴³ *Id.*

⁴⁴ In this sense, this market narrative focuses much closer on actual innovation rather than just the act of invention. See JOSEPH A. SCHUMPETER, *THE THEORY OF ECONOMIC DEVELOPMENT* 88-89 (4th prt. 1951) (discussing the distinction between invention and innovation).

production and dissemination of technology. That section describes the conventional view that such a straightforward market for technology would be fatally flawed. It details work by both Kenneth Arrow and Paul Samuelson, which cautions against relying on such a simple market for technology. Despite those widely held reservations, the section ends by providing an intriguing counter example—a specific package of technology, a cost-saving process—that can overcome both Samuelson and Arrow’s objections. Part III takes that example and generalizes its exceptional properties in order to build a patent system that supports the voluntary exchange of inventions. Surprisingly, though this new normative theory is different in kind from existing theories, the patent system that is needed to back such a theory is not very different at all from our existing patent statute. Though our existing patent *statute* can serve this new normative goal, the section will highlight how our *interpretation and emphasis* of those statutory features will have to change. Section V describes some implications of this new normative view and describes future research questions.

I. PATENT INCENTIVE THEORY AND ITS FAILURE

This section describes the current normative framework for patent law. Right now, patent law is seen as a necessary intervention in the existing free-market economy where patents aim to grant “above-market” rewards to inventors such that society as a whole undertakes the optimal amount of inventive activity. This section then describes how that normative framework has failed to provide a tractable, determinate narrative. The section further lists a number of related deficiencies in addition to that primary failure.

A. *Patent Incentive Theory*

As to intellectual property and innovation policy, there is one point of agreement: technological advancement matters.⁴⁵

⁴⁵ See Peter S. Menell, *Intellectual Property: General Theories*, in CIVIL LAW AND ECONOMICS 134 (Boudewijn Bouckaert & Gerrit De Geest eds., 2000) (citation omitted) (“Robert Solow demonstrated that technological advancement and increased human capital of the labor force accounted for most (between 80 and 90 percent) of the annual productivity increase in the US economy between 1909 and 1949, with increases in the capital/labor ratio accounting for the remainder. . . . It is now widely recognized that technological advancement and enhanced human capital are the principal engines of economic growth in the United States and other industrialized countries.”); see also Peter S. Menell & Suzanne Scotchmer, *Intellectual Property*, in 2

In a free market with its emphasis on competition (i.e., copying the success of others), there is agreement that we need to “do something,”⁴⁶ since “a competitive market may not give enough incentive to invest in knowledge”⁴⁷ With competitors aggressively copying ideas, the market price for technological information will plummet to its near-zero marginal cost.⁴⁸ The resulting market revenue for the original creator “will not cover the costs of developing the [information], and therefore the market will not work.”⁴⁹ Without “do[ing] something . . . , everyone will want to be an imitator, not an inventor.”⁵⁰

Yet, while there is agreement that we should do something, agreeing on *what* we should do is much more controversial. Broadly speaking, this underproduction problem has engendered a number of alternative solutions—e.g., prizes, research contracts, patent regimes, and, more recently, commons-based production.⁵¹ Of these, some worry about the “principal drawback” of such government prizes and contracts: “that they require the government to value innovation, or to decide which projects are likely to produce value in the future.”⁵² It is thought that a system of exclusive rights can avoid some of these informational problems. Indeed, the U.S. Constitution explicitly authorizes Congress to provide for a patent system that promotes progress in the “useful [a]rts” by granting exclusive rights to inventors for their discoveries.⁵³ As a result, much of the legal commentary has focused only on such exclusive rights regimes.⁵⁴ This article is no exception.

HANDBOOK OF LAW AND ECONOMICS 1476-1570 (A. Mitchell Polinsky & Steven Shavell eds., 2007) (discussing Solow’s work); F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 699 & n.4 (2001) (same).

⁴⁶ BURK & LEMLEY, *supra* note 12, at 8.

⁴⁷ SUZANNE SCOTCHMER, *INNOVATION AND INCENTIVES* 58 (2004).

⁴⁸ *Id.* at 35.

⁴⁹ *Id.*

⁵⁰ BURK & LEMLEY, *supra* note 12, at 8.

⁵¹ See Brian D. Wright, *The Economics of Invention Incentives: Patents, Prizes, and Research Contracts*, 71 AM. ECON. REV. 691, 696 (1983); see also Amy Kapczynski, *The Cost of Price: Why and How to Get Beyond Intellectual Property Internalism*, 59 UCLA L. REV. 970, 985-87 (2012) (revisiting those alternate options and Brian Wright’s earlier work).

⁵² Roger D. Blair & Thomas F. Cotter, *Rethinking Patent Damages*, 10 TEX. INTELL. PROP. L.J. 1, 45 (2001).

⁵³ U.S. CONST. art. I, § 8, cl. 8 (“The Congress shall have [p]ower . . . [T]o promote the [p]rogress of [s]cience and useful [a]rts, by securing for limited [t]imes to [a]uthors and [i]nventors the exclusive [r]ight to their respective [w]ritings and [d]iscoveries”).

⁵⁴ Though further below it has some thoughts on the suitability of these alternatives. See SCOTCHMER, *supra* note 47, at 58 (concluding that “reward” is to “some degree” “linked to the social value of the invention”); WARD S. BOWMAN, JR.,

Though there are a number of normative theories explaining this exclusive rights approach for patent law,⁵⁵ they are all variations on one basic story.⁵⁶ The “classic utilitarian theory of patent law,”⁵⁷ a narrative that we have used “for 200 years,”⁵⁸ aims to “encourage [inventors] to invest in research and development by the prospect that their invention will be patented.”⁵⁹ In other words, “the government issues you a patent; the patent gives you the right to exclude; you can use that right to exclude competitors in order to raise your price, and therefore make more money; and that fact in turn gives you an incentive to create.”⁶⁰

That story is quite “simple.”⁶¹ We aim to get the optimal amount of innovation by artificially making it more profitable through granting patents.⁶² Our normative aim is “inducement”⁶³ by way of exclusive rights with occasional “limited market power.”⁶⁴ Patent policy debates revolve around the modulation of patent scope and duration so as to produce that correct amount of reward and inducement.

In 1934, economist Arnold Plant described this narrative and the patent system generally as “a subsidy for invention.”⁶⁵ And now, eighty years later, we still think about the patent system that way. Recent work alternatively describes the system as

a mechanism the State uses to induce innovation . . . , property-like rights used by inventors to collect payment from society as

PATENT AND ANTITRUST LAW: A LEGAL AND ECONOMIC APPRAISAL 38 (1973) (“The patent system has an advantage over a system of government grants in that it is consumer oriented. There is no payoff unless consumers deem the invention worth paying for.”).

⁵⁵ See KIEFF ET AL., *supra* note 4, at 66.

⁵⁶ BURK & LEMLEY, *supra* note 12, at 68 (observing that the various theories of patent law “are not so much alternatives to this classic incentive-to-invent story as they are efforts to understand how the incentive works in practice and to balance the costs and benefits in the light of economic evidence about how innovation and patent incentives work.”).

⁵⁷ *Id.*

⁵⁸ Mark A. Lemley, *Reconceiving Patent in the Age of Venture Capital*, 4 J. SMALL & EMERGING BUS. L. 137, 139 (2000).

⁵⁹ BURK & LEMLEY, *supra* note 12, at 68.

⁶⁰ Lemley, *supra* note 58, at 139.

⁶¹ *Id.*

⁶² See BURK & LEMLEY, *supra* note 12, at 66; see also BOWMAN, *supra* note 54, at x (“Without patent protection, patent law assumes, rapid copying by others (who have not incurred the cost) would greatly diminish wealth-creating activity, to the detriment of the community. Invention would be underrewarded.”).

⁶³ Kapczynski, *supra* note 51, at 986 & n.57 (referring to the patent system as inducing works).

⁶⁴ SCOTCHMER, *supra* note 47, at 58.

⁶⁵ BOWMAN, *supra* note 54, at 19 (describing Arnold Plant’s view of patent law).

inducement for their innovative efforts, . . . [or] a mode of cataloguing which third-parties should provide recompense to the inventor so as to guarantee the appropriate level of R & D and commercialization incentives⁶⁶

Patent law purposefully grants patent holders the ability to set up a toll,⁶⁷ whose aggregate revenue will optimally incentivize inventive activity.

Yet though facially simple, that narrative creates serious costs as patent law aims to cure this supply-side problem.⁶⁸ Because of the nonrival nature of information, it is widely thought that “there is no efficiency reason to deprive anyone of use . . . [and if the price for the information were zero,] everyone would be served, and access would be efficient.”⁶⁹ If the price for a piece of information were non-zero (as it must be if patent law hopes to provide any incentive), then an inefficient use of the information would be assumed. Nobel Prize-winning economist Kenneth Arrow described such exclusive rights schemes:

[I]nformation obtained, say a new method of production, should, from the welfare point of view, be available free of charge (apart from the costs of transmitting information). This insures optimal utilization of the information but of course provides no incentive for investment in research In a free enterprise economy, inventive activity is supported by using the invention to create property rights; *precisely to the extent that it is successful, there is an underutilization of the information.*⁷⁰

This Gordian knot is the incentive versus access paradox.⁷¹ As Clarissa Long nicely put it, “[t]he result is that without legal protection, not enough information will be produced; but with legal protection, not enough information will be used.”⁷²

Patent policy is a balancing of the benefits of the incentive scheme against the costs of exclusion. A great deal of hand-wringing has focused on whether patent law has made this

⁶⁶ Ted M. Sichelman, *Purging Patent Law of “Private Law” Remedies*, 92 TEX. L. REV. (forthcoming 2013), (manuscript at 18-19), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1932834.

⁶⁷ See SCOTCHMER, *supra* note 47, at 34 (describing patents as a toll).

⁶⁸ *Id.* at 35-36.

⁶⁹ *Id.*

⁷⁰ Arrow, *supra* note 26, at 616-17 (emphasis added). Arrow won the Nobel Prize in 1972. See *The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 1972*, NOBELPRIZE.ORG, http://www.nobelprize.org/nobel_prizes/economics/laureates/1972/ (last visited Feb. 15, 2013).

⁷¹ See Glynn S. Lunney, Jr., *Reexamining Copyright’s Incentives-Access Paradigm*, 49 VAND. L. REV. 483, 488-89 (1996) (providing a thorough exploration of the incentive versus access debate).

⁷² Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 632 (2002).

compromise wisely.⁷³ It is, as put by economist Suzanne Scotchmer, “a tortured solution to the problem of providing a public good.”⁷⁴ It is not thought to fit nicely with the rest of the market system: “[T]he whole point of the patent system is to provide legal rights that alter the market and thereby induce changes in resource allocations.”⁷⁵ The patent system is a “deliberate government intervention[] in the market—a sort of mercantilist economic policy for artificially stimulating innovation.”⁷⁶

B. *The Failure and Oddities of the Incentive Narrative*

The above-described normative theory, though it serves as the basis for all utilitarian patent theories,⁷⁷ is a failure on many different levels. As detailed below, its primary failure is its inability to justify the patent system. Related to that failure, this section further describes other curious features of that system relevant for contrasting the normative theory against the market for inventions narrative developed in later sections. In particular, the incentive narrative is an absolutist system of infringement, devoid of both a concept of harm and the potential for a more nuanced system. In addition, this narrative develops a very curious concept of *patent* transactions where naked exclusion and permission, as opposed to useful technologies, are the heart of the exchange.

1. Intractable Indeterminacy

The biggest failure of the incentive narrative is its inability to provide a satisfactory justification for the patent system. As described above, the existing normative theory aims to balance the costs and benefits of exclusion. Yet, identifying and then quantifying both the benefits and the costs of the exclusion has turned out to be nearly impossible. It is a

⁷³ See BOWMAN, *supra* note 54, at 50-51; *id.* at xi (focusing on “the patent reward system in terms of whether it is likely to underreward or overreward invention.”).

⁷⁴ SCOTCHMER, *supra* note 47, at 34.

⁷⁵ Golden, *supra* note 25, at 508-09.

⁷⁶ BURK & LEMLEY, *supra* note 12, at 8.

⁷⁷ Prospect theory and its related commercialization variants are sometimes seen as distinct from the more reward-oriented theories. See Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 266 (1977); see also KIEFF ET AL., *supra* note 4, at 68 n.170. Yet these are often seen as incentive theories where the incentive is the incentive to commercialize as opposed to incentive to invent or disclose. *Id.* As such they suffer from the same intractability as the more dominant incentive to invent and disclose theories.

problem that “is peculiarly unsusceptible to empirical proof,”⁷⁸ where “the trade-offs . . . are much more extreme and difficult to measure. No one knows what the optimal duration of patent . . . protection should be, or whether there should be different periods of protection in different areas of enterprise. Some even doubt whether we need any protection at all.”⁷⁹ The economics of the patent system and information more generally has remained “extraordinarily indeterminate.”⁸⁰ The fact is that the current patent narrative “has never developed a consistent, usable theory for determining the appropriate duration and scope of IP rights. . . . Determining the optimal amount of IP protection is exceedingly difficult.”⁸¹ Fritz Machlup famously provided the following disheartening conclusion:

If we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had [one] for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it.⁸²

In short, the basic incentive narrative “has some serious problems,”⁸³ and it is time “to question the classic incentive theory.”⁸⁴ One solution would be to just try harder⁸⁵ to work out the cost-benefit balance, but “finding the right balance between [appropriation versus access] has proven to be one of the most difficult questions that government policy has ever had to face.”⁸⁶ In fact, I, along with others, fear it may be impossible.⁸⁷ As a result, “[w]e don’t, in fact, know for sure what impact patents have on innovation.”⁸⁸ Without proof, many question

⁷⁸ BOWMAN, *supra* note 54, at 48-51.

⁷⁹ HERBERT HOVENKAMP & CHRISTINA BOHANNON, CREATION WITHOUT RESTRAINT 46 (2012).

⁸⁰ BOYLE, *supra* note 19, at 41.

⁸¹ HOVENKAMP & BOHANNON, *supra* note 79, at 7.

⁸² STAFF OF S. COMM. ON THE JUDICIARY, 85TH CONG., AN ECONOMIC REVIEW OF THE PATENT SYSTEM 80 (Comm. Print 1958) [hereinafter ECONOMIC REVIEW OF THE PATENT SYSTEM] (prepared by Fritz Machlup).

⁸³ Lemley, *supra* note 58, at 148.

⁸⁴ *Id.* at 142.

⁸⁵ See Lemley, *supra* note 24, 1067 (noting that “[h]ard as it is to get the balance right, we will never do it if we simply stop trying”).

⁸⁶ HOVENKAMP & BOHANNON, *supra* note 79, at 404.

⁸⁷ See Liivak, *supra* note 37, at 1173-76; ROBERT MERGES, JUSTIFYING INTELLECTUAL PROPERTY 2-3 (2011).

⁸⁸ Lemley, *supra* note 58, at 139.

the patent system and stress alternatives.⁸⁹ Others have even called for outright abandonment of the system.⁹⁰

2. Behavioral Coarseness without a Concept of Harm

In addition to its intractable indeterminacy, the current narrative is conspicuously coarse. Though certainly the narrative involves a complex balancing of interests in *designing the system*, it provides little nuanced behavioral guidance to patent holders *once those patents are issued*. In fact, the current narrative gives the patent holder rather blunt and direct instruction: use the exclusion in the patent to make money. Justice Douglas noted that “[a] patent empowers the owner to exact royalties as high as he can negotiate with the leverage of that monopoly.”⁹¹ In other words, “once a patent has been issued the patentee can be expected to utilize the exclusive rights he has been granted to maximize his reward.”⁹² There is a similar absolutism regarding infringement. Conceptualized as a toll that produces incentives, excusing any infringer threatens to upset Congress’s balance of incentives. The result is a patent narrative that inherently portrays enforcement and infringement in an absolute and non-contextual light.

Though many might lament the rise of patent trolls, the current narrative provides little ability to criticize that *behavior*. The only recourse is to criticize the patents as improperly issued. But for properly issued patents, the current narrative expects aggressive assertion. In their recent book on intellectual property, Bohannon and Hovenkamp highlight this coarse nature of the current narrative. As a reform, they focus on the lack of a harm requirement in patent infringement actions. They suggest, “[a]s a first step in their own reform journeys, drafters of the IP laws need to develop a more disciplined conception of IP injury . . . which would require . . . demonstrable injury”⁹³ Not only would a harm requirement enable the fine-tuning of patent exclusion and remedies, it would also produce a narrative with better public relations than the current aggressive assertion mode of the

⁸⁹ See Kapczynski, *supra* note 51, at 973 n.7 (revisiting the alternative modes previously explored by Wright).

⁹⁰ See BOLDRIN & LEVINE, *supra* note 15, at 7.

⁹¹ *Brulotte v. Thys Co.*, 379 U.S. 29, 33 (1964).

⁹² BOWMAN, *supra* note 54, at 22.

⁹³ HOVENKAMP & BOHANNON, *supra* note 79, at 51 (internal quotations omitted).

incentive narrative.⁹⁴ As long as we are using the current incentive narrative, however, I doubt there is conceptual room for a nuanced concept of harm.

3. Markets for Exclusion Rather than for Technology

Another oddity of the current narrative is the nature of its transactions. As a general matter, “market transactions are arms-length, anonymous, and typically involve an exchange of a good for money.”⁹⁵ Surely, when we make the leap from tangible property to intellectual property, we expect the “goods” to become less tangible and more ephemeral, but, in the current narrative, the “goods” vanish altogether.⁹⁶ Transactions in the incentive narrative are exchanges of money, not for a useful “thing,” but instead for a promise not to sue.⁹⁷ This outcome is a direct result of viewing the patent system as a mechanism that sets up tolls to provide incentives, and those transactions are becoming a highly visible part of the modern patent system. This has led to “the development of what [Mark Lemley] call[s] ‘licensing shops,’ that is, significant corporate entities with little or no business purpose other than to accumulate and license patents . . . what they mostly seem to ‘produce’ are patents and patent licenses.”⁹⁸

Such a market in “naked exclusion” should strike us as quite odd. Despite ultimately aiming to “promote the progress of the useful arts,” technology exchange is not an obligation placed on patent holders.⁹⁹ In fact, the transactions need not include any technological exchange. Nonetheless, some have aimed to improve the patent system by reducing the frictions in

⁹⁴ See Liivak, *supra* note 37, at 1176-79 (describing inherent animosity created by current incentive narrative).

⁹⁵ ASHISH ARORA ET AL., *MARKETS FOR TECHNOLOGY* 4 (2001).

⁹⁶ See generally Robert P. Merges, *A Transactional View of Property Rights*, 20 *BERKELEY TECH L.J.* 1477, 1499 (2005) (quoting Thomas W. Merrill & Henry Smith, *What Happened to Property in Law and Economics?*, 111 *YALE L. J.* 357, 359 (2001)) (drawing a conceptual picture of “normal” market transactions where goods are exchanged and where the legal rights that protect those goods automatically move with the goods).

⁹⁷ Mark A. Lemley & Carl Shapiro, *Probabilistic Patents*, 19 *J. ECON. PERSP.* 75, 95 (2005) (concluding that a patent gives the holder “a right to try to exclude”).

⁹⁸ Lemley, *supra* note 58, at 140-41.

⁹⁹ See *Cont'l Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405, 423 (1908); see also Oskar Liivak & Eduardo Penalver, *The Right Not to Use in Property and Patent Law*, *CORNELL L. REV.* (forthcoming 2013).

that market.¹⁰⁰ Indeed, one of the primary defenses of patent trolls has been their injection of liquidity into this “market.”¹⁰¹

Meanwhile, markets in technology and inventions look and feel quite different. In these latter two markets, patent exclusion surely plays a critical background role. Yet, their central focus is transactions, where payment is exchanged for technological information or inventions, respectively. They surely involve an exchange of legal relations as well, but these are a consequence of (and background features of) the exchange of the useful technological “thing.” Such markets look much more like traditional property rather than some industrial policy that induces wealth transfers.¹⁰² These markets and their transactions involve a “thing”—the technology or the invention—and they involve property rights, which surround that asset and provide a “field of legal protection” around it.¹⁰³

The current “thing”-less market for exclusion has created a system where interest in the patent system may stem not from any real interest in inventions or progress in the useful arts, but instead in rent-seeking via exclusion. As relayed by Colleen Chien, there is growing sense that “[i]nvesting in invention is for schmucks.”¹⁰⁴ The implication is that the smart money no longer invents but rather just collects and asserts patents. It is hard to imagine a functioning patent system where such a disconnect can exist, yet that disconnect is the natural result of our coarse patent narrative.

Consequently, the current narrative leads to a patent system with an absolutist focus on exclusion, devoid of a focus on useful technology and its dissemination. If, indeed, the economic case could be made for that strange system, I would learn to live with it; but as shown above, the patent system certainly cannot make such claims of justification and I doubt it ever will. Beyond failing to provide a stable theoretical

¹⁰⁰ See Mark A. Lemley & Nathan Myhrvold, *How to Make a Patent Market*, 36 HOFSTRA L. REV. 257, 258 (2007).

¹⁰¹ See Colleen V. Chien, *From Arms Race to Marketplace: The Complex Patent Ecosystem and Its Implications for the Patent System*, 62 HASTINGS L.J. 297, 311, (2011) (noting that “growth in the patent marketplace, accompanied by an increase in liquidity, transactions, and business models for buyers, sellers, and intermediaries”).

¹⁰² See Liivak, *supra* note 37, at 1179-82.

¹⁰³ Merges, *supra* note 96, at 1499 (internal quotation marks omitted).

¹⁰⁴ Colleen V. Chien, *Startups and Patent Trolls* 19-20 (Santa Clara Univ. Sch. Law Working Paper No. 09-12, 2012) (quoting Nicolas White, Comment to *Now that IP Is Mainstream, Let's Not Mess This Once in a Lifetime Opportunity Up*, INTELL. ASSET MGMT. (July 6, 2012, 10:23 PM), <http://www.iam-magazine.com/blog/Detail.aspx?g=b0610bab-d371-4401-bd6f-6b12368b8eb0>) (internal quotation marks omitted), available at <http://ssrn.com/abstract=2146251>.

foundation, the *current* incentive narrative leaves ample room for patent trolls to plausibly deny societal harm and blame.

II. A MARKET FOR INVENTIONS, NOT FOR TECHNOLOGY AND NOT FOR NAKED EXCLUSION

Intractability, though disheartening, does not doom the *patent system* (though it should doom the incentive-based narrative). There is an alternative: if the cost-benefit balance is impossible to resolve, then maybe we should just stop trying to solve it (at least directly). Instead, we should try to design our patent system around a narrative where this elusive optimal allocation is an outcome of the system, rather than as a necessary but unknowable policy input.

Certainly such a wish list seems fanciful; yet, consider for a moment that despite its own imperfections, our private property market system performs exactly this feat every day. The private property system does not need to know the right amount of shoe stores or Thai restaurants to build as a policy *input*; those levels are an *output*, a result of system design.¹⁰⁵ Furthermore, though every item of tangible property comes with a powerful exclusionary shield, that exclusion ultimately should not prevent the highest-valued user from utilizing the tangible resource. These are strong exclusive rights, but we don't suffer the same exclusion costs as in intellectual property. Finally, while the traditional property system is certainly not perfect,¹⁰⁶ especially considering distributional issues, it does enjoy something that has eluded patent law: strong economic justification, stability, and, perhaps most important for a property system, widespread acceptance.

This section explores the possibility of building a patent narrative along lines similar to that employed for the private property market: socially beneficial behavior driven not by government-created incentives, but rather by private decision-making backed by property rights.¹⁰⁷ Despite its allure and simplicity, there are thought to be long-standing obstacles to

¹⁰⁵ See Paul J. Heald, *Optimal Remedies for Patent Infringement: A Transactional Model*, 45 HOUS. L. REV. 1165, 1174 (2008) (arguing that a transactional model “permit[s] the exposition of a model that need not rely on ex ante assumptions about optimal R&D expenditures”).

¹⁰⁶ In addition to distributional issues, there are also problems associated with optimality and the theory of the second best. See Glynn S. Lunney, Jr., *Copyright's Price Discrimination Panacea*, 21 HARV. J.L. & TECH. 387, 390 (2008).

¹⁰⁷ In earlier work I began sketching a research plan for searching for such a system. See generally Liivak, *supra* note 37, at 1167-68.

such a simple institution for information exchange. Though agreeing with those objections generally, this section presents an example where in fact those objections do not hold and concludes that a system of socially beneficial resource allocation can result from private decision-making and voluntary exchange. As will be explored in greater detail in the next section, that exceptional example is one member of a general set, where the aim is not market exchange of technological information generally, but rather the narrower (and critically different) goal of voluntary exchange of inventions.

A. *Structuring an Economic Narrative for a Technology Market*

Others have already developed foundational work, pointing out the important benefits the patent system provides in enabling markets for technological exchange.¹⁰⁸ Robert Merges,¹⁰⁹ Asish Arora,¹¹⁰ Paul Heald,¹¹¹ Henry Smith,¹¹² and others¹¹³ have all put emphasis on the patent system's role in supporting a market for technology. In summarizing much of this work, Merges lauds intellectual property rights for "serv[ing] as the starting points for negotiations and exchange,

¹⁰⁸ See generally MERGES, *supra* note 87, at 154; ARORA ET AL., *supra* note 95, at 261 ("[I]ntellectual property rights encourage the rise of a market for technology.").

¹⁰⁹ See generally Merges, *supra* note 96 (emphasizing the role intellectual property rights play in encouraging transactions).

¹¹⁰ See generally Ashish Arora & Robert P. Merges, *Specialized Supply Firms, Property Rights and Firm Boundaries*, 13 INDUS. & CORP. CHANGE 451 (2004).

¹¹¹ See Paul J. Heald, *A Transaction Costs Theory of Patent Law*, 66 OHIO ST. L.J. 473, 489 (2005) (arguing from a transaction cost perspective that "[t]he patent form enables the potential transferor to share an information asset without fear of misappropriation while assembling the complex team necessary to commercialize a new product").

¹¹² Henry E. Smith, *Intellectual Property as Property: Delineating Entitlements in Information*, 116 YALE L.J. 1742, 1795 (2007).

¹¹³ See, e.g., David J. Teece, *Technological Know-How, Property Rights, and Enterprise Boundaries: The Contribution of Arora and Merges*, 14 INDUS. & CORP. CHANGE 1237, 1239 (2005) ("For far too long, the debate about the patent system has neglected consideration of how patents enable enterprises and individual inventors to specialize and capture the economies of specialization.") (parenthetical omitted); Nancy T. Gallini & Ralph A. Winter, *Licensing in the Theory of Innovation*, 16 RAND J. ECON. 237, 238 (1985) ("[T]he role of patents in our model is not the traditional role of creating monopoly monopolies by prohibiting exploitation of informational spillovers. Rather, by protecting property rights, patents here open the market for trading technological information."); ARORA ET AL., *supra* note 95, at 262 ("Point to the role of patents in facilitating transactions in technology. This role of patents has largely been ignored in informal economic analysis, where the focus has been on the trade-off between the ex-ante incentives to innovate the ex post advantages of innovation diffusion.").

[and] setting in motion the great resource-allocating machinery so heartily lauded by theorists such as McCloskey and Sen.”¹¹⁴

Though I agree with those earlier works, there is still one critical element that is missing. Many of us *think* that such transactions are likely socially beneficial, yet that optimistic outlook is still ultimately grounded in “faith”¹¹⁵—and that just doesn’t seem to be good enough anymore. Despite identifying positive aspects of the patent system, the simple fact is that we still cannot make a strong argument that supports such a system¹¹⁶: “try as we might, law and economics scholars have never established an efficiency-based (or utilitarian) justification for the field. There is no lock-solid proof that overall social welfare would decline if IP protection were suddenly removed.”¹¹⁷

The patent system just does not have an accepted economic framework like the one used to justify the market in tangible goods. As Hovenkamp and Bohannon recently noted, there is substantially “more consensus about the legal framework for encouraging traditional competition than about the framework for facilitating optimum innovation.”¹¹⁸ In particular, they write that the relative incoherence of intellectual property (in relation to antitrust and price competition) stems from the well-accepted “basic outline of the requirements for competition” and intellectual property’s lack of such a model and consensus.¹¹⁹

One problem is that much of existing transaction-based discussion still situates itself in the incentive-based narrative. In other words, beneficial technological transactions are seen as *one* of the many positive behaviors that are induced by the patent. This article aims to look at the transactions on their own, rather than having its benefits burdened by the intractable costs associated with the incentive view and its absolute view of exclusion. By doing so, the article hopes to make claims about the transaction model for patents that can alone justify at least part of the patent system.

The purpose of the following sections (and, indeed, the purpose of this article) is to develop that economic framework

¹¹⁴ MERGES, *supra* note 87, at 155.

¹¹⁵ See BOYLE, *supra* note 19, at 253.

¹¹⁶ See ARORA ET AL., *supra* note 95, at 279 (“Intellectual property rights are a *sine qua non* for the development of such markets. But given the nature of knowledge, property rights (such as patents) in knowledge can create problems.”).

¹¹⁷ MERGES, *supra* note 87, at 6.

¹¹⁸ HOVENKAMP & BOHANNON, *supra* note 79, at 45.

¹¹⁹ *Id.* at 45-47.

for a market of inventions and then to identify the patent system necessary to support such a market. Yet, the aim is more than to build an accepted framework for the patent system that is *modeled* on the traditional market. Rather, the aim is to *integrate* the patent system as a natural extension of the price system and the traditional market, and to end patent system exceptionalism.¹²⁰

To fully integrate the patent system into the broader economic framework, it is worth recalling the overall purpose of economics. As put by Lionel Robbins, “Economics is the science which studies human behaviour as a relationship between ends and scarce means which have alternate uses.”¹²¹ As has long been recognized, both the traditional market and the patent system share the same basic goal: “the efficient allocation of scarce resources for those products and services consumers value.”¹²² For patent law, though technological knowledge itself is not rivalrously consumed, scholars have emphasized for some time that the patent system—as a form of private property—needs to focus on the efficient allocation of the scarce resources—e.g., time and lab equipment consumed in creating the invention.¹²³

To understand the form of the patent system’s economic justification and how it fits into the broader economic framework, it is also worth recalling the form of the economic support for the free market in tangible goods. Economists have used a two-stage argument to justify the allocation of scarce *tangible* goods through the voluntary market.¹²⁴ First, economists developed the notion of efficiency, an overall “top-level” condition describing the optimal allocation and distribution of those tangible scarce resources.¹²⁵ Second, economists have shown that this optimal allocation can be reached through voluntary, private exchanges guided by the price system.¹²⁶ Based on this socially beneficial and voluntary exchange narrative, property rights aim to prevent any harmful acts that would interfere with that voluntary exchange. Though most think it cannot be

¹²⁰ See Liivak, *supra* note 37, at 1169-73 (arguing for ending the patent exceptionalism where patents are seen as interfering with the existing market rather than naturally extending that market).

¹²¹ LIONEL ROBBINS, AN ESSAY ON THE NATURE AND SIGNIFICANCE OF ECONOMIC SCIENCE 16 (2d ed. 1945).

¹²² BOWMAN, *supra* note 54, at 13.

¹²³ See Kitch, *supra* note 77, at 266; Smith *supra* note 112, at 1745.

¹²⁴ See BAUMOL & BLINDER, *supra* note 36, at 62.

¹²⁵ CORNES & SANDLER, *supra* note 28, at 23.

¹²⁶ See BAUMOL & BLINDER, *supra* note 36, at 62.

done, this article argues that the same methodology can be extended to structure and justify at least part of the current patent system.

B. Allocating Scarce Resources Toward Creating Information

In building an economic model for allocating scarce resources toward creating and distributing useful technology, the first question is whether there exists an analogous “top-down” condition that can identify when and where scarce resources should be consumed; and indeed, economists have defined that condition. Beginning in the 1920s and 1930s, economists like Howard Bowen and Erik Lindahl worked on the more general problem of allocating resources toward production of public goods. In the 1950s, Paul Samuelson continued that work and described the proper allocation of resources for the creation of a public good, now known as the “Samuelson condition.” It states that resources should be directed toward production and dissemination of a public good up to the optimal point—that is, when the collective preference for that last increment of public good equals the preference for the private good that could have been made from the scarce resources consumed in creating that last increment of the public good.¹²⁷ Just as the efficiency condition for tangible goods could guide a benevolent social planner in the allocation of private goods, so could the Samuelson condition for public goods. Thus, as a theoretical matter, we can describe when scarce resources should be consumed for creating and disseminating technological public goods. The critical question is whether private decision-making can arrive at those socially beneficial allocations. In Samuelson’s words, “The solution ‘exists’; the problem is how to ‘find’ it.”¹²⁸

Economic theory has shown that voluntary exchange of tangible goods in equilibrium leads to the optimal use of those

¹²⁷ Samuelson, *supra* note 29, at 388. The Samuelson condition is often written as:

$$\sum_{i=1}^n MRS_{zy}^i \geq MRT_{zy}$$

where MRT_{zy} is the alternative uses for the scarce resources that will be consumed in creating the invention z and MRS_{zy}^i is the i th person’s preference for the public good z relative to those alternative uses (i.e., relative to private good y); see also CORNES & SANDLER, *supra* note 28, at 23 (using the notation adopted here).

¹²⁸ Samuelson, *supra* note 29, at 389.

goods.¹²⁹ Could a similar narrative be developed for the creation and distribution of technology? As to finding such a voluntary mechanism for satisfying the Samuelson condition, the structure of the condition itself offers a tantalizing possibility that private decision-making could be the answer. Assume some private actor with the capability to create a public good and to estimate the scarce resources that will be consumed in creating the public good. If the private actor could collect the benefit provided to each user of the public good, then a profit-motivated private decision-maker would undertake projects creating public goods only when it would be the socially beneficial use of those resources. Such a scheme, driven by private profit motives and private decision-making, could lead to a Pareto optimal production of public goods.¹³⁰ But, as will be detailed below, most have concluded that this possibility is a mirage and that such private decision-making for the creation and sale of information will be fatally defective. So what is the problem?

C. *Objections to Private Decision-Making and Markets for Information*

Though private decision-making is an alluring solution to the public goods problem, there are a number of objections, including towering, Nobel Prize-winning objections. Indeed, the conventional view is that such a market for technological information would not work. It is thought that the exotic world of nonrival ideas is just too different from tangible goods, making the tangible market's relatively simple and accepted narrative inapposite. In fact, as one comprehensive survey acknowledged, "there is very little on how a market in knowledge would function, other than the appreciation that such markets would be characterized by a number of imperfections."¹³¹ While Paul Samuelson broadly objected to a private market for public goods, Kenneth Arrow presented more specific objections to a private market for the public good of information.

¹²⁹ See BAUMOL & BLINDER, *supra* note 36, at 62 (discussing tangible goods such as "food, clothing, and shelter").

¹³⁰ See *id.*

¹³¹ ARORA ET AL., *supra* note 95, at 1; see also David J. Teece, *Towards an Economic Theory of the Multiproduct Firm*, 3 J. ECON. BEHAV. & ORG. 39, 49 (1982) ("Markets do not work well as the institutional mode for trading knowhow."); Teece, *supra* note 113, at 1237 (focusing attention of problems with the transfer of tacit knowledge).

In the initial articulation of the Samuelson condition, Samuelson noted that for *private goods*, there is indeed a decentralized “analogue calculating machine”—that is, the private market with price competition that reaches the optimality condition for *private goods*.¹³² Immediately thereafter, though, he forcefully argued that as to *public goods* and the Samuelson condition, “no decentralized pricing system can serve to determine optimally these levels of collective consumption.”¹³³ He argued, “it is in the selfish interest of each person to give false signals, to pretend to have less interest in a given collective consumption activity than he really has”¹³⁴ Those false signals prevent the public goods’ aggregate revenue from reflecting its true collective value and thwart an optimal private decision-making system. As a result of this motivation “to snatch some selfish benefit in a way not possible under the self-policing competitive pricing of private goods . . . it [is] impossible for [the theory of public goods] . . . to have that special pattern . . . which makes laissez-faire competition even theoretically possible as an analogue computer.”¹³⁵ Though alternatives have been explored, the inability “to induce consumers to reveal their marginal valuations”¹³⁶ remains the primary obstacle and continues to “make[] it all but impossible to determine the optimal level of production for any public good.”¹³⁷

To make matters worse, Samuelson’s objections are not the only obstacle. In one of the most influential articles to examine the economics of information, Kenneth Arrow gave several additional rationales for doubting the feasibility of the market mechanism to provide optimal levels of investment in information production. His article focused on “the determination of optimal resource allocation for invention” by “perfect competition.”¹³⁸ Though using the term “invention,” his analysis was very broad, examining “the production of knowledge” generally.¹³⁹ The focus of the analysis was on “the special nature of information”¹⁴⁰ as compared to private goods, and he concluded that “a free enterprise economy [would] underinvest in invention

¹³² Samuelson, *supra* note 29, at 388.

¹³³ *Id.* (emphasis omitted).

¹³⁴ *Id.* at 388-89 (emphasis omitted).

¹³⁵ *Id.* at 389.

¹³⁶ See Christopher S. Yoo, *Copyright and Public Good Economics: A Misunderstood Relation*, 155 U. PA. L. REV. 635, 639 (2007).

¹³⁷ *Id.*

¹³⁸ Arrow, *supra* note 26, at 609.

¹³⁹ *Id.*

¹⁴⁰ BOWMAN, *supra* note 54, at 23; see also Arrow, *supra* note 26, at 609.

and research (as compared with an ideal)”¹⁴¹ He reached that conclusion by highlighting that information possesses, among other problems, characteristics that challenge the market model: “inappropriability[] and uncertainty.”¹⁴²

As to inappropriability, Arrow concluded that “[i]n the absence of special legal protection, the owner cannot . . . simply sell information on the open market.”¹⁴³ On this point he made two observations. First, “[a]ny one purchaser can destroy the monopoly”¹⁴⁴ This is the standard point about the threat posed by pirates. Second, remaining one of the most well-known arguments in the article, Arrow noted that efforts to sell information entail “a fundamental paradox in the determination of demand for information; its value for the purchaser is not known until he has the information, but then he has in effect acquired it without cost.”¹⁴⁵ This point is widely cited and is now known as “Arrow’s Information Paradox.”¹⁴⁶

In light of these problems with inappropriability, Arrow suggested something should be done—i.e., “suitable legal measures” involving “property rights.”¹⁴⁷ Though they help, Arrow argued that even with those property rights, the market would remain suboptimal because of remaining problems of inappropriability, intractability, and uncertainty.¹⁴⁸ Arrow argued, “there are obviously enormous difficulties in defining in any sharp way an item of information and differentiating it from other similar sounding items.”¹⁴⁹ He lamented that “[p]atent laws would have to be unimaginably complex and subtle to permit such appropriation on a large scale.”¹⁵⁰

Lastly, Arrow argued that uncertainty would plague an information market. He first noted that uncertainty is part of most enterprises and that various risk-shifting mechanisms exist, but then argued that uncertainty would be especially problematic for “highly risky business activities, including invention.”¹⁵¹ He noted that “[i]nformation is not only the product of inventive activity, it is also an input . . . ,” and as a

¹⁴¹ Arrow, *supra* note 26, at 619.

¹⁴² *Id.* at 609.

¹⁴³ *Id.* at 615.

¹⁴⁴ *Id.*

¹⁴⁵ *Id.*

¹⁴⁶ See, e.g., Burstein, *supra* note 27, at 229 n.4.

¹⁴⁷ Arrow, *supra* note 26, at 615.

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ *Id.* at 617.

¹⁵¹ *Id.* at 613.

result, “the value of information for use in developing further information is much more conjectural”¹⁵² These factors together led Arrow to conclude that, even if backed with property rights, “a free enterprise economy [would] underinvest in invention . . . ,” and that there is therefore “a strong case for centralized decision making.”¹⁵³

D. A Market for Inventions: A Constructive Proof

In light of the above objections, if the goal of the patent system is to guide the allocation of resources toward the creation of *technological information* generally, then private decision-making may not work, and patent theory is destined to slog on in its incentive-versus-access indeterminism. Many in fact do see the patent system as a standard incentive to generate technological information. Ward Bowman argued, “[t]he product of a patent is information.”¹⁵⁴ Suzanne Scotchmer described the system as giving “patent holders . . . an almost absolute right to control uses of the knowledge they have created.”¹⁵⁵ Ed Kitch argued patents alleviate the “fear that the fruits of the investment will produce unpatentable *information* appropriable by competitors.”¹⁵⁶ As long as patent theory conceives the goal of the patent system so broadly—as a general system that incentivizes generation of technological information—then, in light of Arrow’s and Samuelson’s objections, a solely market-based narrative may well be problematic. When so broadly conceived, private decision-making will likely not be able to provide the decentralized “analogue calculating machine” necessary for allocating resources to innovation. We are stuck with the incentive-access paradigm despite its indeterminism because we just do not think we have a choice.

But this article argues that we are asking too much of the patent system. Samuelson was considering the public goods problem generally when he “emphasized” the problems with private provision.¹⁵⁷ And Arrow, though using the term “invention,” focused on information generation.¹⁵⁸ Perhaps some narrower view might still work. Might we find some exception

¹⁵² *Id.* at 618.

¹⁵³ *Id.* at 619.

¹⁵⁴ BOWMAN, *supra* note 54, at 17.

¹⁵⁵ SCOTCHMER, *supra* note 47, at 82-83.

¹⁵⁶ Kitch, *supra* note 77, at 276 (emphasis added).

¹⁵⁷ Samuelson, *supra* note 29, at 389.

¹⁵⁸ See Arrow, *supra* note 26, at 619.

that was overlooked? First, Samuelson concluded that “it may turn out to be pure luck that within the general domain [of information,] there happen[s] to be a subsector with the ‘simple’ properties of traditional economics.”¹⁵⁹ Arrow pointed the way, noting that “underinvestment will be greater for basic research.”¹⁶⁰ Rather than focusing on information generally, perhaps we should instead focus on something narrower where the market might work. Fairly late-stage, well-developed technology may be that narrower, workable regime.

Both Arrow’s and Samuelson’s objections to a private provision are, to a large extent, rooted in the difficulty in determining a potential user’s valuation of a public good. For Samuelson it was one of strategic under-revelation of the valuation, and for Arrow it was one of valuation uncertainty of the user. What if this could be overcome? What would happen if creators and users both knew the valuation? Would the outcome of private provision satisfy the Samuelson condition?

Economists have examined this issue and have in fact shown that under such conditions, an optimal allocation of resources can result.¹⁶¹ Furthermore, it should be emphasized that under these conditions, “no potential customers of the public good are denied access”¹⁶² Together, these are two highly appealing characteristics, yet “the informational requirements of [the] model are extremely demanding.”¹⁶³ As a result, “[a]ll are uncomfortable with the assumption . . . [of] complete knowledge . . . and [ability to] tailor . . . different . . . price[s].”¹⁶⁴ Despite worries that such model assumptions are “extremely demanding,”¹⁶⁵ this part provides one relevant example where we can expect those stringent conditions to be satisfied. This part will focus on a particular type of invention: a cost-saving process.

Assume an industry produces a single output—a product—as a result from a single public domain process that transforms a single input. Economists describe such a package of technological know-how as a production plan.¹⁶⁶ Assume the

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

¹⁶¹ See CORNES & SANDLER, *supra* note 28, at 243-47 (discussing the analysis in Earl A. Thompson, *The Perfectly Competitive Production of Collective Goods*, 50 REV. ECON. STAT. 1 (1968)).

¹⁶² *Id.* at 247.

¹⁶³ *Id.* at 248.

¹⁶⁴ *Id.*

¹⁶⁵ *Id.*

¹⁶⁶ See generally DAVID M. KREPS, A COURSE IN MICROECONOMIC THEORY 233-64 (1990). At times economists refer to these production plans as netput vectors. See *id.* at 234.

industry is using a well-known process where α units of input are consumed to produce a single unit of output.¹⁶⁷

Now presume a person knowledgeable about these processes believes, with some expenditure of scarce resources and labor, she can improve this industrial process. This person, whom we will call the inventor, confidently knows that she can consume some of her scarce resources (principally her own time) in order to create a more efficient process for producing the same output. In other words, this new process can create the same unit of output more efficiently using fewer units of input.¹⁶⁸

As discussed above, before addressing private property and commodification for a market, consider the social costs and benefits of this endeavor. Could an omniscient social planner determine when the inventor should consume those scarce resources in order to produce that cost-saving invention? As discussed earlier, the Samuelson condition provides exactly that determination.¹⁶⁹

Now the critical question, which has generally been answered in the negative, is whether a market institution driven by private decision-making could make those same socially beneficial decisions. The critical point is that, though the objections from Samuelson and Arrow likely apply to technological information in general, they do not apply in this case.

Valuation can be confidently made for each industry participant. A firm that produces q_i units of output using the new process will value the newer process as $q_i p_{\text{input}} (\beta - \alpha)$.¹⁷⁰ This is their cost savings from using the new process instead of the older, public domain process.¹⁷¹ Each firm knows that whenever they want to produce a unit of the output, they will benefit by using the newer process. There is no room to strategically underreport their valuation because both the inventor and the firms using the processes know how to value the process. A contract can be drawn up where the inventor can offer the process to anyone who can utilize it and pricing can be set on a royalty per unit of output produced. Though I will

¹⁶⁷ Such a process can be described by the netput vector $(\alpha, 1)$ where $\alpha < 0$. See *id.* at 234-36.

¹⁶⁸ Using the earlier notation, that new process could be described by a new netput vector $(\beta, 1)$ for creating the same output where $\alpha < \beta < 0$.

¹⁶⁹ See *supra* Part II.B.

¹⁷⁰ Using the economic notation from above $MRS_{zy}^i = q_i p_{\text{input}} (\beta - \alpha)$.

¹⁷¹ Blair & Cotter, *supra* note 52, at 40 n.194 (noting that “the maximum payment that a willing licensee would pay is the difference between the maximum profit he would earn from using the invention and the maximum profit he would earn without the invention”).

discuss exclusive rights below,¹⁷² negotiations between inventors and users need not run into Arrow's Information Paradox.¹⁷³ As long as firms are assured that the process "works for its intended purpose"—i.e., producing one unit of output for every β unit of input—then firms can form a valuation of the process without knowing exactly how the process works. If a firm wants to use the new process, they must obtain a license from the inventor.¹⁷⁴ The inventor knows that the new process is worth $q_i p_{\text{input}} (\beta - \alpha)$ to each firm, and can expect the industry participants to agree to a license as long as the range of the licensing fee—on a price per unit of output—is within $\gamma p_{\text{input}} (\beta - \alpha)$ where $0 < \gamma < 1$.¹⁷⁵

With that valuation for each firm, the inventor can predict the licensing program's overall revenue. If the industry is producing Q units of output in total, the inventor can expect $\gamma p_{\text{input}} Q (\beta - \alpha)$ total revenue if every user adopts the new process. The inventor will undertake creating this cost-saving process whenever it is her best option—that is, whenever $\gamma Q p_{\text{input}} (\beta - \alpha) \geq c$, where c is the highest price for the alternative uses of those scarce resources that are consumed in creating the new process. That decision-making coincides with society's choice for those resources: a privately motivated inventor will make the decision to allocate resources toward creating inventions only when society would concur with that resource allocation.

This section showed that there exists at least this one example of a special package of technological information that can be valued and exchanged in a market. Importantly for that example, inventors allocate resources to these cost-saving processes when that is the best use of those scarce resources. Such an undertaking is an activity of unambiguous social benefit that is driven by private decision-making, *and* no one is

¹⁷² See *infra* Part III.B.

¹⁷³ See Arrow, *supra* note 26, at 615.

¹⁷⁴ Implicit in this model is the assumption that transactions are money in exchange for the use of the process alone. The model does not reflect or allow for transactions where money is exchanged for promises *not* to license to other competitors. They are non-exclusive licenses for the process alone without the ability to pay in order to prevent others from using the process.

¹⁷⁵ See Darlyn J. Durie & Mark A. Lemley, *A Structured Approach to Calculating Reasonable Royalties*, 14 LEWIS & CLARK L. REV. 627, 640 (2010) (discussing the theoretical default value for, γ). The parameter γ ranges from 0 to 1 and it represents the fraction of the revenue from the acceptable range that goes to the inventor versus the consuming firm. The parameter reflects how successful an inventor is in keeping the surplus for themselves. In the absence of competition from other inventors I think it is safe to assume that the initial inventor will keep the whole surplus (i.e. $\gamma=1$).

denied use of the invention. The next section expands this one specific example to the entire class of inventions and explores the patent system necessary to support such a market in inventions. This result alone is quite interesting. It suggests that, despite our worries, resources dedicated toward creating inventions could be allocated by private decision-making alone, and again, any firm that wants to use the new process can do so. No user is left out.

III. A PATENT SYSTEM FOR BACKING A MARKET FOR INVENTIONS

This part considers two issues: what exclusive property rights are needed to protect this market from third-party harm, and how to generalize the quite small “island” of cost-saving processes (discussed above) to the more substantial “island” of inventions. As to the exclusive rights needs, though the transactions are driven by private decision-making, such behavior “do[es] not arise simply because the benefits of having them outweigh the costs. They require institutions to support them.”¹⁷⁶ This part explores the institution¹⁷⁷—that is, the patent system—necessary to support such socially beneficial activity. In particular, though the incentives for creation and dissemination are derived directly from exchange with those that can use the process, the patent system must structure itself to support that exchange. This section will discuss that system in two parts, which largely coincide with the major components of our existing patent system. It first considers the question of patentability, namely what types of technological packages should be exchanged in this market. Next, it considers the exclusive rights and remedies that should accompany a patent.

In discussing patentability and exclusion, the patent system needed to support such a market will hew quite close to the existing patent system; though, in a number of places the emphasis will vary from current practice. Interestingly, most of those new interpretations involve reforms that have already been individually suggested in the scholarly literature. This

¹⁷⁶ ARORA ET AL., *supra* note 95, at 278-79 (“Further, markets develop over time with these complementary institutions. This development has to be understood as a historical process, with the pace and form of the development influenced by starting conditions and chance.”).

¹⁷⁷ See HANOCH DAGAN, *PROPERTY: VALUES AND INSTITUTIONS* xvii (2011) (providing an extended discussion of property and institutions).

section shows that these seemingly disparate areas of reform can be seen as nudging the patent system toward a substantive vision of the invention as the marketable technological “thing,”¹⁷⁸ and a system where exchange of the invention is the system’s normative heart. This market-oriented narrative provides an economically justified and unified basis for those (until now) separate reforms.

A. *Patentability*

The first role that the patent system plays is gatekeeping. The patent system thus must distinguish between the packages that are and are not appropriate for exchange in this market. Arrow and Samuelson emphasized that most packages of information cannot be easily commodified for simple market exchange. Yet, as shown above, the cost-saving process is an exception to that general rule. The characteristics that made a cost-saving process amenable to this exchange can be generalized since the class of technological “things” that can be exchanged in this market is well captured by patent law’s definition of an invention: a solution to a technical problem that has been refined such that it can be put into practice by any person of skill in the art. I have aimed to solidify this understanding of the invention in my recent work.¹⁷⁹ Furthermore, a quick look to the gatekeeping statutory provisions of 35 U.S.C. §§ 101 and 112 show that the invention and the act of inventing, indeed, are the central features of the patent system.¹⁸⁰

1. The Cost-Savings Process

As discussed above, Arrow argued that both the uncertainty and inappropriability of information made

¹⁷⁸ See generally Michael J. Madison, *Law as Design: Objects, Concepts, and Digital Things*, 56 CASE W. RES. L. REV. 381, 382-87 (2005) (discussing the design of legal things).

¹⁷⁹ See Liivak, *Rescuing the Invention*, *supra* note 32 at 5; Liivak, *Finding Invention*, *supra* note 32, at 3-7.

¹⁸⁰ 35 U.S.C. §§ 101, 112 (2006). In addition, not any invention should be exchanged. The inventions should also be new and nonobvious. An already existing or obvious invention would not be a solution that a person of skill would want to buy. There is no reason to clutter this market with such un-needed inventions. In other words, the requirements for patentability are designed such that only new, nonobvious, and useful invention are patentable and thus available for open exchange in this invention market.

information ill-suited for markets.¹⁸¹ In particular, “the value of information in developing further information is much more conjectural”¹⁸² In the case of the cost-saving process, those issues just do not apply. There, the information—the new process—produces the sought-after product, and as a result, users can value the process itself. That process had reached a level of refinement where it worked and others were ready to employ it. That level of refinement allowed the creator to approach firms and describe what the process would do for them. In an important sense, that cost-saving process—and indeed the whole class of inventions generally—requires refinement so that both technical and economic details come into focus. On the technical side, the inventor can promise that a skilled person can utilize the invention to achieve its intended purpose. On the financial side, the firm can estimate both the costs and benefits of that intended purpose. For the cost-saving process, the inventor and the prospective utilizing firms could place a value on the process.

Insofar as valuation is concerned, a cost-saving process is likely the easiest case. The existing price system for tangible goods should already have relatively well-defined prices for all inputs and outputs of that cost-saving process. As the hypothetical explored above assumed the cost-saving process to be a new process for creating an old product, there was assumed to be a well-established existing process in the public domain. Given all that economic information, the inventor and firms can price the cost-saving process. The ability to make quantitative estimates about cost-saving process invention has actually been highlighted for some time.¹⁸³

Process inventions were an important part of the earliest patent systems,¹⁸⁴ and are certainly still an important

¹⁸¹ See *supra* Part II.C. As to uncertainty, Arrow noted two problems. First, he argued that the value of the information was uncertain. Second, information generation was risky and unpredictable. See *supra* notes 138-52.

¹⁸² *Id.*

¹⁸³ See, e.g., ECONOMIC REVIEW OF THE PATENT SYSTEM, *supra* note 82, at 61 (“There is some possibility of estimating in money terms social benefit rendered by a cost-saving invention [The benefit] can be estimated by the competitive prices of the resources economized in the production of the original output.”); see also WILLIAM D. NORDHAUS, INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE 6 (1969).

¹⁸⁴ See JUSTINE PILA, THE REQUIREMENT FOR AN INVENTION IN PATENT LAW 24 (2010) (“[A]n invention in 1623 is [thus] understood to have been an ingenious *method* of working pre-existing materials to produce a useful result in the industrial arts. Put differently, it was an industrial art, with ‘art’ in this context requiring an ingenious purposive human action on the physical world.” (emphasis added)).

part of patentable subject matter.¹⁸⁵ Due to their potential for valuation, the market narrative described in Part II can provide justification for a patent system covering processes. Nonetheless, the important question arises whether, beyond process inventions, these same arguments can extend to the other types of traditional patentable subject matter: “machine[s], manufacture[s], or composition[s] of matter.”¹⁸⁶ Beyond process inventions, many have argued that valuation becomes harder. Fritz Machlup, among others, argued that “[t]here is little possibility, however, of estimating the social benefit of a quality-improving invention, and almost no possibility in the case of inventions of new products.”¹⁸⁷

2. Inventions Beyond the Cost-Saving Process

Despite those worries, it really is not clear that the valuation of a process and valuation of a machine, manufacture, or composition of matter is so different. After all, the inventor of a new machine, manufacture, or composition of matter must also disclose both how to make that “thing” and how to use it. In particular, in disclosing *how to use* the invention, the inventor is disclosing a process for solving some problem, and the utility of the “thing” is directly keyed to the utility of that method of use. The main difference between valuation of the cost-saving process and the process of using some new, nonobvious “thing” is that normally, there will be less information about the demand for the new use of that “thing.”

In addition to valuation uncertainty, Arrow also pointed out that the creation of information has other aspects of uncertainty.¹⁸⁸ He noted that information production was uncertain on the cost side of the equation since information generation “must be a risky process, in that the output (information obtained) can never be predicted perfectly from the inputs.”¹⁸⁹ Should these types of uncertainties matter? Does

¹⁸⁵ See 35 U.S.C. § 101 (2006) (listing “process[es]” as one of the enumerated classes of patentable subject matter).

¹⁸⁶ *Id.*

¹⁸⁷ ECONOMIC REVIEW OF THE PATENT SYSTEM, *supra* note 82, at 61; *see also* 3 PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION 293 (3d ed. 2008) (“[V]alue is almost impossible to determine, apart from such an obvious case as an improved process that reduces everyone’s production costs by, say, 10 percent.”).

¹⁸⁸ See Arrow, *supra* note 26, at 616.

¹⁸⁹ *Id.*

that extra uncertainty in the demand curve make inventions ill-suited for a market exchange?

I argue that it should not. In fact, those inventors who are willing to take on this risk are exactly those that the patent bargain addresses. In other words, the target demographic of the system is those with technical ability combined with the ability to discern what solutions are needed (i.e., demanded by the public). That type of uncertainty is very similar to uncertainties that make life challenging for any firm selling tangible goods and services. With its purpose of undergirding a market for inventions, the patent system should be seen as embracing not just inventors per se, but inventors as entrepreneurs.¹⁹⁰ In other words, though some uncertainty remains—and surely valuation outside the cost-saving process context will be more difficult—as a class, inventions have properties that enable valuation such that rational economic decisions can be made about both their creation and sale.

3. The Difficulty of Tracing Unauthorized Uses

In addition to uncertainty, Arrow also pointed out that tracing difficulties made information largely inappropriable. He argued that a patent system that could track and enforce the unauthorized usage of most pieces of information would be “unimaginably complex and subtle.”¹⁹¹ But for the cost-saving process, these tracing concerns have far less force. The cost-saving process is a specific set of physical steps that produces the output product. Though such industrial techniques are often practiced behind closed doors, there is no theoretical problem with enforcing exclusive rights over that particular process. Even if the issue merits further exploration, the invention appears to be close to the right legal construct that identifies the class of technological “things” able to be valued and commodified.

¹⁹⁰ See generally FRANK H. KNIGHT, RISK, UNCERTAINTY AND PROFIT (Augustus M. Kelly reprt. 1964) (1921), available at <http://library.mises.org/books/Frank%20H%20Knight/Risk,%20Uncertainty,%20and%20Profit.pdf> (discussing entrepreneurial aspects of business innovators).

¹⁹¹ Arrow, *supra* note 26, at 617.

4. The Invention & Property Modularity

An application of the economist Herbert Simon's concept of modularity,¹⁹² which is further applied to the design of property rights in the work of scholars like Henry Smith and Carliss Baldwin, can assist this discussion.¹⁹³ Simon's work "explain[ed] that the decomposition of a complex problem into separate, more elementary subproblems, is an organizational design issue."¹⁹⁴ As stressed by Henry Smith, such parsing of problems into manageable parts reduces information costs, which are critical aspects of property rights systems.¹⁹⁵

Simon's contribution to property theory provides important support for the arguments made here. In particular, the focus on the market for inventions (as opposed to technology) can be seen as a direct application of those ideas. Objections to markets in technology by Arrow and Samuelson can be seen as information cost arguments—that such arbitrary bundles of technological information do not easily fit as modules within the existing price system.¹⁹⁶ In contrast, inventions are special modules that can fit. In particular, this modular fit can be seen as designing the patent system (and its market) to conform to and to leverage the institutional competence of neoclassical firms. The patent system constrains the patent-backed market to bundles of technological information that the neoclassical firm can both value and consume (i.e., utilize).

A quick outline of the capabilities of the neoclassical firms makes this point explicit. Firms make business decisions based on production possibilities consisting of production plans. The firm's engineers tell the business department of their technological capabilities—their technical ability "to transform arrays of commodities into different arrays."¹⁹⁷ This set of all feasible production plans is called a production possibility set.¹⁹⁸

¹⁹² See Smith, *supra* note 112, at 1761; Merges, *supra* note 96, at 1480, 1514.

¹⁹³ See Smith, *supra* note 112, at 1761-66; Carliss Y. Baldwin & Joachim Henkel, *The Impact of Modularity on Intellectual Property and Value Appropriation* 3-5, 9 (Harvard Bus. Sch., Working Paper No. 12-040, 2012), available at <http://hbswk.hbs.edu/item/6894.html>.

¹⁹⁴ ARORA ET AL., *supra* note 95, at 99.

¹⁹⁵ Henry E. Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691, 1702-08 (2012).

¹⁹⁶ See *id.* at 1708-09 (describing the Lego-like fit of a well-designed module).

¹⁹⁷ KREPS, *supra* note 166, at 234.

¹⁹⁸ *Id.* at 234-39.

Armed with that information, the neoclassical firm aims to make the best business decision as to what production plan to actually implement. To determine the best production plan, the business department must estimate the demand for all possible outputs and then calculate the profit available for implementing a particular production plan. The goal for a profit-maximizing firm is, as the name implies, to pick the production plan that maximizes its profit.¹⁹⁹

Aiming to leverage modular design, the market for inventions is specifically designed to interface with those firms and their capabilities. In particular, inventions are defined such that those firms can place a value on them. Inventions in this regard can be thought of as particular production plans.²⁰⁰ In essence, inventors approach these neoclassical firms and tell them about the utility of their invention; they tell the firms what their invention can do as a completed production plan. The firms then can redo their profit maximization calculation, now incorporating the one added production plan (i.e., the invention) into its production possibility set. The profit difference between these two calculations is the value of the invention to the firm.

Importantly, the patent system is not then an isolated market separate from the regular price system. Rather, the patent system is designed to interface with the existing price system. It takes the neoclassical firms and then builds a market with inventions for those firms. Buying and selling inventions becomes an endogenous extension of the existing neoclassical model. Neoclassical firms can, for a licensing fee, receive the invention from the inventor and thereby expand their production possibilities. In a sense, technological growth (and the direction of technological growth) becomes an endogenous result of these specialized invention-producing firms interacting with the invention-consuming firms via the invention market.²⁰¹

¹⁹⁹ See *id.* at 239-53.

²⁰⁰ More precisely, each particular embodiment that makes up an invention is a particular production plan.

²⁰¹ See Paul M. Romer, *Endogenous Technological Change*, 98 J. POL. ECON. S71, S71 (1990).

5. Research Plans & Abstract Ideas Are Not Yet Inventions

Along with defining the types of technological advances the system aims to make into marketable commodities, this market narrative also suggests the types of advances that cannot be easily commodified. As to his criticisms, Arrow noted that among all the types of information, “basic research, the output of which is only used as an informational input into other inventive activities, is especially unlikely to be rewarded [in a market].”²⁰² Indeed, the Supreme Court has made clear that basic scientific discoveries are not patentable subject matter.²⁰³ This boundary of patentability coincides with the market narrative, and such basic discoveries are too hard to value and pose serious tractability problems for enforceable property rights.

Furthermore, patentable subject matter does not extend to “abstract ideas,” though the patent bar has been at a loss to articulate the exact contours of abstract ideas.²⁰⁴ The market-based narrative gives some hints as to the proper definition of abstract ideas. Often, en route toward creating an invention, inventors do develop technological advances and information that are useful for ultimately creating a workable production plan (i.e., an invention). This intermediate information is surely, in a sense, useful, yet these intermediate results should not be patentable—they are not yet inventions. Though important, these intermediate steps are too hard to price because it is too difficult to later separate out the relative contributions that produced the actual invention. Without knowing the ultimate inventions that will flow from the intermediate result, the valuation of those intermediate results remains highly uncertain. For example, bridges are certainly useful human creations, and by comparing the bridge crossing to alternative routes, we could hopefully judge the utility and value of the bridge. Now imagine an unfinished bridge spanning three quarters of your favorite body of water like the San Francisco Bay or the Hudson River.²⁰⁵ How much will you pay for the right to use that bridge? Certainly it is useful—it

²⁰² Arrow, *supra* note 26, at 618.

²⁰³ See *Mayo Collaborative Servs. v. Prometheus Labs.*, 132 S. Ct. 1289, 1294 (2012).

²⁰⁴ *Bilski v. Kappos*, 130 S. Ct. 3218, 3231 (2010).

²⁰⁵ See Lee Anne Fennel, *Lumpy Property*, 160 U. PA. L. REV. 1955, 1956 (2012) (opening her discussion with the image of a partially completed bridge).

gets you most of the way across—yet valuation has become much harder. For this reason, advances that are not completed inventions, but are still just “research plans” or “abstract ideas,” do not receive patent protection.²⁰⁶ They are not appropriate for this market and its special needs.

Scientific discoveries and incomplete technological advances (abstract ideas) also suffer from traceability problems. It is difficult to detect and police unauthorized use of these types of information. In this regard, the existing patent statute, which explicitly grants protection to inventions only, takes advantage of modularity. Only specific packages of information couple and properly fit with the existing price system, and only those packages are recognized by the patent system.

6. Connections to Existing Scholarship

This new patent narrative emphasizes a number of features of the patent system, many of which have been the subject of independent calls for reform. Inventions are the specific solution to some technical problem that has been conceived by its creator—the inventor. To qualify as an invention, the solution must be refined enough that it works for its intended purpose—i.e., it actually solves the problem it aims to solve—and that it can be described in enough detail so that without additional information, “any” person of skill in that technological area can practice it.²⁰⁷ It requires that little tacit

²⁰⁶ See *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1356-57 (Fed. Cir. 2010). Though *Ariad* is most often seen as a disclosure case, there is an alternate interpretation. The patentee in *Ariad* had indeed created a technological advance noting that disruption of the NF-κB pathway would likely reduce the harmful side effects of the inflammation caused by the pathway. That information may be useful but it had not yet matured to become an invention. Their advance had not matured to the level of completion and specificity to become a market commodity. Note there has always been a curious, relatively unexplored kinship between many § 101 and § 112 cases. For that reason, I have grouped § 101 and § 112 together as the requirements based on the existence of an invention. See Liivak, *Rescuing the Invention*, *supra* note 32, at 23 (arguing for considering both § 101 and § 112 in concert where § 101 asks whether the patentee invented anything at all and § 112 ensures that the claims do not exceed the invention disclosed in the specification).

²⁰⁷ 35 U.S.C. § 112 (2006). That definition takes advantage of modularity by ensuring the technological thing is developed to the point that it can be transported from one firm to the next. In fact, it must be ready to be deployed by “any” person of skill in the art. See *ARORA ET AL.*, *supra* note 95, at 101 (describing the benefits to requiring “a better understanding of each other’s problems and needs, to share common objectives and beliefs, and to adopt a common language” (internal citation omitted)).

knowledge²⁰⁸ is necessary to practice the invention. By doing so, the patent system ensures that patentable inventions are ready to be commodified and widely (and easily) disseminated.²⁰⁹

Recently, scholars have argued for such reforms. Both Christopher Cotropia and I have been advocating for a conceptual understanding of the invention as the actual technological “thing” the inventor creates.²¹⁰ The current vision of the invention is not mainly as the technological “thing,” but solely as shorthand for the claimed subject matter. In my view, that conceptual void of the invention is tied to the incentive view. We both argue that a focus returning to the technological creation would not only keep the system true to its statutory and constitutional underpinnings, but also solve many of the current controversies in patent law. In a market for inventions narrative, the central focus is the substantive invention—i.e., the solution created by the invention that consumers will buy and use.

In addition to patentable subject matter and the invention, the utility requirement plays an important gatekeeping role. For processes or tangible “things” like manufactures or machines, the utility derived from the invention determines the users’ valuation. Thus, the utility requirement demands a rather specific level of usefulness. Basic scientific discoveries certainly are highly useful (in fact they are often essential) for innovation, but, nonetheless, they should be excluded from patentability because their utility is neither specific nor can be agreed upon. For example, consider a chemical engineering firm that designs and builds petrochemical refineries. For them, Boyle’s law (defining an inverse relationship between pressure and volume of a gas) matters, but how much does it matter?²¹¹ How much should they pay for it? That is a hard question to answer and, again, that is why Arrow viewed the broad notion of a market for technology with skepticism. The utility requirement

²⁰⁸ See MICHAEL POLANYI, *THE TACIT DIMENSION* 9-10 (1966) (explaining “the basic structure of tacit knowing”).

²⁰⁹ Cf. Peter Lee, *Transcending the Tacit Dimension: Patents, Relationships, and Organizational Integration in Technology Transfer*, 100 CALIF. L. REV. 1503, 1523 (2012) (describing difficulties in technology transfer in cases of basic and early applied research where significant tacit knowledge is still present therefore urging caution for patent protection for early stage and basic research).

²¹⁰ See Cotropia, *supra* note 34, at 1855; Liivak, *supra* note 32, at 5.

²¹¹ See Glenn Research Ctr., *Boyle’s Law*, NASA, <http://www.grc.nasa.gov/WWW/k-12/airplane/boyle.html> (last updated Mar. 7, 2011).

ensures that patentable inventions are only those technological “things” that have specific utility.²¹²

The Supreme Court made this point clear in *Brenner v. Manson*, in which it upheld the Court of Customs and Patent Appeals’ denial of patentability to a chemical process where the utility of the resulting product was still highly uncertain.²¹³ The Court reasoned that patentability should not attach “[u]nless and until a process is refined and developed to th[e] point . . . where specific benefit exists in currently available form”²¹⁴ The Court famously concluded, “a patent is not a hunting license. It is not a reward for the search, but compensation for its successful conclusion.”²¹⁵ From the perspective of a market for inventions, the utility requirement instructs innovators to continue to work and refine their work until it is substantially ready for any person of skill to use and value it.

Others have already been calling for such reinvigoration of the utility requirement. In a pair of articles, Michael Risch has argued for a utility requirement that would extend to what he calls “commercial usefulness.”²¹⁶ He reasoned “that a core benefit of the [utility] requirement is to aid in the commercialization of inventions” in order to “ensure that inventions are worth more to the public than they cost.”²¹⁷ Such reforms, focusing on concepts like commercial utility, are in line with a patent system whose goal is to back a market in inventions.

Lastly, there has been a long-standing debate over the proper timing of patent protection. Should patent protection attach early or late in the development of some technological advance? Ed Kitch’s “prospect” theory of patents asserts that early-stage patenting allows the inventor to mine the patent prospect more efficiently since it gives the inventor both central and exclusive control to coordinate the development and the commercialization of the invention.²¹⁸ John Duffy recently added to these early-stage filing rationales by arguing that

²¹² Closely related to the above discussion of modularity, there is an emerging strand of property research exploring “lumpy” property. See Fennel, *supra* note 205, at 1964. The patent system when seen through this market narrative appears to be a good example of that lumpiness.

²¹³ *Brenner v. Manson*, 383 U.S. 519, 535-36 (1966).

²¹⁴ *Id.* at 534-35.

²¹⁵ *Id.* at 536.

²¹⁶ See Michael Risch, *Reinventing Usefulness*, 2010 BYU L. REV. 1195, 1204-06 (2010) [hereinafter Risch, *Reinventing Usefulness*]; Michael Risch, *A Surprisingly Useful Requirement*, 19 GEO. MASON L. REV. 57, 67 (2011).

²¹⁷ Risch, *Reinventing Usefulness*, *supra* note 216, at 1197, 1199.

²¹⁸ Kitch, *supra* note 77, at 265, 276-79.

early filing had an overlooked, yet important, benefit: an earlier patent expiration and thus, an earlier entry into the public domain.²¹⁹

Pushing in the other direction, scholars such as Christopher Cotropia and Ted Sichelman have argued that early filing alone is a mistake.²²⁰ According to Cotropia, “early filing forces inventors to make decisions and draft applications with little technical or market information about the invention.”²²¹ He noted that “all inventors would be required to reduce their invention to practice before [filing] . . .”²²² His arguments are consistent with the market narrative that this article develops. Certainly the inventor must reduce the invention to practice. To be marketed to others, the invention needs to work for its intended purpose. And to overcome the objections by Arrow and Samuelson, it needs to be developed so that in negotiating exchange, there is enough technical and market information for both inventors and users to reach agreement.

As is clear, the market narrative requires relatively clear technological and market information. As a result, reforms for later filings, where the patentee needs to have an invention (not just some technological idea), generally support a market in inventions.

B. Exclusive Rights, Harm, and Remedies

The second critical role for the patent system is to support the socially beneficial behavior of creating and disseminating inventions via exclusive rights. The system needs to recognize the third party actions that would harm or disrupt that socially beneficial behavior, and then define the exclusive rights of a patent in order to prohibit those harms.

²¹⁹ John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439, 469 (2004).

²²⁰ Christopher A. Cotropia, *The Folly of Early Filing in Patent Law*, 61 HASTINGS L.J. 65, 74-75 (2010); Ted Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341, 355-57 (2010) (arguing for a new additional type of narrow patent protection specifically aimed efforts to commercialize inventions).

²²¹ Cotropia, *supra* note 220, at 69.

²²² *Id.* at 71. Cotropia ultimately argues for a requirement that the invention be actually reduced to practice rather than constructively through filing the patent application (as is currently permitted). I would not go so far as to require actual reduction to practice. There is nothing wrong with constructive reduction to practice as long as we take it seriously. It is not meant to be a shortcut for inventors. Constructive reduction to practice, as any legal use of the word constructive, is a legal fiction where the technological advance has been refined to such a point that it could just as easily have been actually reduced to practice but for the sake of efficiency it was not.

This section will find that the inventor needs to prevent the unauthorized making, using, selling, offering to sell, and even importing the patented invention, which the current system grants as exclusive rights. Yet a system based on an exchange of inventions will diverge quite dramatically from the current system in regards to remedies. Remedies will no longer be seen as aiming to ensure that the artificial incentive of the patent reaches the patent holder. Instead, the aim of patent remedies will be to repair the actual harm done to the inventor's dissemination plan; if a patent holder is not disseminating their invention, however, it is generally much harder to find any harm.

1. Exclusive Rights and Correlative Duties to Refrain from Harm

Having identified and selected the proper “thing”—the invention—for this market, the next question is what set of exclusive rights (if any) are needed. Rather than beginning that discussion with exclusive rights, it is better to first examine the Hohfeldian correlative duties—the duty of third parties to avoid causing harm to the market—that constitute the exclusive rights.²²³ In other words, the discussion above describes socially beneficial behavior and the actions that could interfere with that beneficial behavior.²²⁴ The discussion below reveals that those duties to prevent harm to the market may coincide nicely with the exclusive rights that the current patent statute grants.

For the market to work properly, each consumer must signal their valuation of the invention based on their use. The following discusses the various ways this signaling function can be disrupted in descending order of seriousness. First, outright piracy of the invention is the most harmful act for the market. Imagine that the inventor discloses the invention to another, who then turns around and sells the invention him or herself. Each sale made by the pirate would be a lost valuation and if piracy were widespread, then such a market would not function. In other words, the rest of us should abide by a duty to abstain from selling inventions that are not our own.²²⁵ Accordingly, the

²²³ See generally Wesley Newcomb Hohfeld, *Some Fundamental Legal Conceptions as Applied in Judicial Reasoning*, 23 YALE L.J. 16, 36-37 (1913).

²²⁴ See Larissa Katz, *Exclusion and Exclusivity in Property Law*, 58 U. TORONTO L.J. 275, 278 (2008).

²²⁵ Note, however, that the issue of independent invention complicates this straightforward rule. See Oskar Liivak, *Rethinking the Concept of Exclusion in Patent*

patent system should (and does) grant an exclusive right to the inventor to “sell” and “offer[] to sell” the invention.²²⁶

Consider now someone who obtains an unauthorized copy of the invention from the inventor, but has no intention of selling or disseminating it to others. Rather, they just want to utilize the invention themselves. This is not as bad as outright piracy, but the usage is a lost signal from that one particular user. Again, if widespread, the market would not work properly and so, the patent system should accordingly grant an exclusive right “to use” the invention.

Lastly, there may be instances where a third party intends to either sell or use the invention him or herself, and he or she makes the invention first. In order to stave off the harm from unauthorized sales or uses, it seems reasonable to pre-emptively grant an exclusive right “to make” the invention, but this case is less clear. For example, making the invention for purposes of testing it or understanding how it works (even by competitors) does not seem harmful immediately. This market narrative leaves significant room for a research-use exemption to the exclusive right to make and, to some degree, to use as well.²²⁷

In addition to considering the acts that would cause harm, it is important to consider *what* particular “thing” would cause harm through its “making, using, or selling.” The harm comes from using or selling the inventor’s invention—the solution the inventor intends is to sell to others him or herself. The exclusive rights need not extend beyond the inventor’s actual invention; though this area is controversial, there are ample statutory arguments already establishing that the current patent statute could not extend exclusive rights beyond the invention.²²⁸ That limitation coincides with the market narrative.

With the exception of suggesting a reinvigorated research-use exception, the market for inventions narrative supports an array of exclusive rights quite similar to those granted by the current patent statute. But the narrative places those exclusive rights in a very different context. In particular,

Law, 98 GEO. L.J. 1643, 1680-81 (2010). The implications of independent invention for this market-based model are left for future work.

²²⁶ See 35 U.S.C. § 271(a) (2006).

²²⁷ See generally Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017, 1074-78 (1989) (recommending the creation of an experimental use exemption in patent law).

²²⁸ See Liivak, *Rescuing the Invention*, *supra* note 32, at 5; Liivak, *Finding Invention*, *supra* note 32, at 58-59.

the market narrative defines the rights under circumstances where market actors are directly harmed. The current incentive-based narrative, instead, views exclusion as the reward for having earned a patent: harm is not a central part of that story.²²⁹

By constructing the normative theory of patent law around socially beneficial behavior and then predicating exclusion around preventing the third-party actions that harm that beneficial behavior, patent law can finally begin to integrate itself with other bodies of private law.²³⁰ There have been recent calls to introduce a concept of harm into patent law. Hovenkamp and Bohannon argue that “[a]n essential part of an infringement lawsuit should be proof of actual injury.”²³¹ This market narrative provides a way for patent law to develop this necessary notion of harm.

2. Remedies

So far in discussing patentability and exclusive rights, though there are have been differences in emphasis, the current patent system looks quite similar to the patent system necessary to support a market in inventions. The critical conceptual difference between this market narrative and the incentive narrative is the purpose of the patent system. In the incentive narrative, patents create incentives that would otherwise not exist; in the market narrative, the system aims to support and enable already existing incentives for transmission from invention consumers to the invention producers. As described above, that new purpose adds context to the discussion of exclusive rights. In the market narrative, exclusion is not granted just to transfer wealth; rather, it enables a beneficial exchange of inventions. That *purpose* is the ends for which the exclusion is (part of) the *means*. As a result, the means are tempered to serve (and not interfere with) those ends. That difference in purpose makes its most visible appearance in the discussion of remedies.

The patent statute provides for two types of remedies: damages and injunctive relief. For damages, the court shall

²²⁹ HOVENKAMP & BOHANNON, *supra* note 79, at 61 (“[T]he patent system lacks a serious harm requirement . . .”).

²³⁰ See ERNEST J. WEINRIB, *THE IDEA OF PRIVATE LAW* 56 (1995). *But see* Sichelman, *supra* note 66, at 2-4 (noting the disconnect between current patent theory and private law).

²³¹ HOVENKAMP & BOHANNON, *supra* note 79, at 15.

“award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer”²³² Viewed from the incentive narrative, “damages adequate to compensate for the infringement” has a relatively straightforward interpretation.²³³ Congress designed the system to provide a certain incentive to the patent holder and, through unauthorized infringement, the defendant has failed to contribute to that incentive. From this view, damages should aim to give the patent holder the incentive that Congress intended. Yet, owing directly to the intractable nature of the incentive narrative, nobody really knows what (from a policy perspective) that incentive should be. As a result, patent damages have been mired in real controversy.

When viewed from the market narrative, a different interpretation emerges. As the purpose of the system is to provide for an institution where inventions can be exchanged, exclusion is aimed to prevent harm to that institution. Therefore, “damages adequate to compensate for the infringement” should also look to the harm as a result of the defendant’s infringing actions.²³⁴ That view provides context for determinations of remedies that is far richer than the more absolutist incentive narrative. For example, a difference appears in the understanding of reasonable royalties provided by the statutory language—that damages are “in no event less than a reasonable royalty for the use made of the invention by the infringer”²³⁵

Currently, interpretation of that provision requires consideration of multiple factors—the *Georgia-Pacific* factors—identified by the case that first listed them.²³⁶ Among other factors, a reasonable royalty should consider

the amount that a licensor . . . and a licensee . . . would have agreed upon . . . if both had been reasonably and voluntarily trying to reach an agreement; that is, the amount which a prudent licensee . . . would have been willing to pay as a royalty and yet be able to make a reasonable profit and which amount would have been acceptable by a prudent patentee who was willing to grant a license.²³⁷

²³² 35 U.S.C. § 284 (2006).

²³³ *Id.*

²³⁴ *Id.*

²³⁵ *Id.*

²³⁶ See *Georgia-Pacific Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970).

²³⁷ *Id.*

From the perspective of the incentive narrative, the *Georgia-Pacific* factors analyze what the hypothetical license is *for the exclusive rights* controlled by the patent holder: how much would a patentee demand, knowing that the patent grants relatively absolute rights of exclusion? As with patent law's more general damages calculation, the reasonable royalty calculation has been very imprecise, uncertain, and vaguely circular. In this formulation, a reasonable royalty is a license to make or use the "things" circumscribed by the exclusive rights, not a license for "the use made of the invention" as instructed by the statute.

A different, more consistent view emerges when considered from the perspective of the market narrative. There, the minimum value of a "use made of the invention" makes much more sense since it can be literally interpreted. In the market narrative, some infringers can cause quite a bit of harm. Outright pirates can, for example, reduce revenue for the inventor to near zero. For such harmful acts, the patent statute rightfully should aim to determine how much the patentee would have made without the defendant's piracy. The well-known alternate remedy of lost profits would be appropriate in those circumstances.

Yet, others are not as harmful as pirates. Some are simply using the invention (and gaining its useful benefits) without paying for it. They are not further disseminating the invention. In that case, the patentee is just missing out on the licensing fee the user would have agreed to in order to use the invention. That missing revenue, which fits cleanly into the market narrative, is then seen as the purpose of the minimum damages provision and provides the proper remedy in the fact pattern described. There is no further consideration of an extra (monopoly derived) fee that the patentee could leverage based on her patent position because, in the market narrative, the patent system does not aim to necessarily grant such profits. The system only aims to enable inventors to reap revenues equal to the sum of the licensing fees from those that use the invention. Where a user slips through that licensing system, the patent system aims for the patentee to be able to capture that lost revenue.²³⁸

²³⁸ Treble damages do exist as a stick to force potential users of the invention into ex ante licensing with the patent holder. *See* 35 U.S.C. § 284.

Similar differences can be described for patent law's injunctive relief that, by statute, are granted "in accordance with the principles of equity."²³⁹ In the absolutist incentive narrative, injunctive relief would be common and rather independent of both the patentee's efforts to commercialize and the defendant's actions.²⁴⁰ In contrast with the market narrative, injunctive relief would become far more contextual, depending on the harm that the defendant's infringement was causing. In addition to depending on the defendant's actions, the harm and injunctive relief would also depend on the patent holder's actions as well. Efforts to disseminate the invention to those that can use it (the central mission of the system) would figure prominently in the equitable decision to grant and tailor injunctive relief.²⁴¹

In various guises, reforms resembling those suggested above have emerged in the literature, yet most of them suffer from still being tied to the incentive narrative. For example, many have been calling for a notion of harm in patent law. Cotter and Blair suggested as much ten years ago.²⁴² Lee Anne Landers similarly looks for such notion, and Bohannon and Hovenkamp spend a great deal of their recent book arguing for a concept of harm.²⁴³

Though that direction is certainly in line with the argument here, the continued shadow of the incentive narrative has limited those suggestions. For example, Landers focuses on remedies and argues for "the fundamental premise that a patentee's harm cannot be greater than the patentee's contribution."²⁴⁴ Lemley and Shapiro further argue, "patent royalties [should] bear some reasonable relationship to what patentees actually contributed."²⁴⁵

Though I agree with much of that work, it does not go far enough to define its terms. The trouble is that "contribution" is far too vague a concept to really reform remedies. Does the contribution include market information developed by the patentee, other inventions that were inspired

²³⁹ *Id.* § 283.

²⁴⁰ *See* *Cont'l Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405, 423-27 (1908).

²⁴¹ *See* *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 395-97 (2006) (Kennedy, J., concurring) (stating that the rise of patent trolls should impact the equitable factors relevant for the grant of a permanent injunction).

²⁴² Blair & Cotter, *supra* note 52, at 48-49.

²⁴³ *See generally* HOVENKAMP & BOHANNON, *supra* note 79.

²⁴⁴ Amy L. Landers, *Patent Claim Apportionment, Patentee Injury, and Sequential Invention*, 19 GEO. MASON L. REV. 471, 471-72 (2012).

²⁴⁵ Lemley & Shapiro, *supra* note 41, at 2044.

by the patentee, or other assorted technological information that is developed as a consequence of developing the invention?

Because it does not answer these types of questions, contribution remains too ill defined. As made clear above, the invention is a more specific, manageable concept by which to judge remedies. Indeed, Lemley and Shapiro implicitly define their notion of contribution along lines that are similar to the notion of the invention developed here. Their discussion of remedies “develop[s] a benchmark level for the royalty rate, i.e., the royalty rate that would be reasonable and expected in the ideal patent system without any element of holdup.”²⁴⁶ After developing that notion of a baseline, Lemley and Shapiro then go on to show that patent licensing revenue can exceed that baseline since patentees leverage their “holdup power” (or as I describe, the naked exclusion of the patent).²⁴⁷

Perhaps not surprisingly, their proposal ran headlong into criticism, which came from a straightforward application of the incentive narrative.²⁴⁸ After all, as they describe, “[t]he Federal Circuit has concluded that this ‘additional leverage in licensing’ is ‘a natural consequence of the right to exclude and not an inappropriate reward’ to a patentee.”²⁴⁹ For instance, John Golden criticized Lemley and Shapiro’s “lack of a well-justified baseline for determining whether royalties are ‘excessive.’”²⁵⁰ According to Golden, they failed to show “that [their] specific royalty ‘benchmark,’ . . . represents the socially optimal level of patent-holder compensation.”²⁵¹ “[T]hey do remarkably little to justify this use. How could they?”²⁵²

Certainly within the framework of the incentive narrative, it is near impossible to prove that any level of protection provides the socially optimal level of protection, a difficulty Lemley and Shapiro admit.²⁵³ The point is that their baseline has come under fire largely because the idea of a baseline derived from the utility of the invention is just foreign. Yet exactly such a concept does emerge naturally from the market narrative.

²⁴⁶ *Id.* at 1999 (emphasis omitted).

²⁴⁷ *See id.* at 1999-2000.

²⁴⁸ Golden, *supra* note 41, at 2115.

²⁴⁹ Lemley & Shapiro, *supra* note 41, at 2010.

²⁵⁰ Golden, *supra* note 41, at 2115.

²⁵¹ *Id.* at 2115-16 (footnote omitted).

²⁵² *Id.* at 2137.

²⁵³ Lemley & Shapiro, *supra* note 41, at 2166.

Of the recent discussions of remedies, Paul Heald's work comes closest to the suggestions made in this article. Heald makes clear that his reforms are based, at least in part, on a transaction model of technological exchange. He highlights the problems with the incentive model, noting that they

provide no help in calculating an upper-bound for patent remedies. Given that most current debates in patent law involve claims of overcompensation to patentees, the lack of means to measure whether damages are excessive is glaring. It is no surprise that the conventional incentive theory of patent law has proven to be of little use in resolving present debates over the scope of patent remedies.²⁵⁴

As Heald lays out his arguments for reforming patent remedies, he focuses on the "gross value of the invention to the exploiting firm in terms of profits earned from additional sales or manufacturing costs saved . . ." ²⁵⁵ Much of his sophisticated analysis of remedies in the transactional context can be employed to structure remedies in the market narrative presented here.

3. Patent Duration

In the incentive narrative, patent duration has long been seen as one of the central policy levers that can modulate the patent incentive. For example, economists have employed sophisticated models to justify the patent term from within that incentive narrative.²⁵⁶ Though the exact length of the patent term is contested, there is consensus that the patent term should not be infinite (constitutionally, it cannot be²⁵⁷) and likely should be shorter than the copyright term. As with the rest of the patent incentive narrative, the patent term is seen as giving a rough estimate of the necessary incentive to optimize innovation.

Yet in the market-based narrative advocated for here, there is no attempt to dial-in the right amount of *artificial* incentives since the purpose of the system is the mutually beneficial exchange of inventions. With that narrative, how long should society protect that exchange? As it is more squarely designed as a natural extension of private property, does this narrative suggest an infinite patent term? After all, if revenue

²⁵⁴ Heald, *Optimal Remedies*, *supra* note 105, at 1173 (footnote omitted).

²⁵⁵ *Id.* at 1176-77 (emphasis omitted).

²⁵⁶ NORDHAUS, *supra* note 183, at 76-90.

²⁵⁷ See U.S. CONST. art. I, § 8 cl. 8.

(from sales of the invention derived a few years after filing the patent) should go to the inventor, why shouldn't revenue derived fifty years from filing go as well? What patent term is demanded by the market narrative? How long should patents last?

This section gives what appears as an initially smug answer: the patent term should last long enough, but need not be unnecessarily long. That statement can be given workable form by considering the idea of the "effective patent life."²⁵⁸ Independent of the actual patent term, effective patent life describes the time the invention is created until the underlying invention is no longer demanded by consumers—e.g., where the invention is overtaken by newer, better developments.²⁵⁹ As long as the actual patent term is longer than the effective patent life, all the relevant revenue is directed to the patent holder; it is presumed to go to zero afterwards for the rest of the patent term. This supports the policy rationale that the patent term needs to be long enough—i.e., it needs to be longer than the effective patent life in most industries—and there is *some* evidence that this is less than the twenty-year patent term in some cases.²⁶⁰

With the argument that the actual patent term should be greater than the effective invention life, why isn't the easiest resolution (aside from constitutional issues) to just set the patent term to infinity? We would then be assured that the actual patent term exceeds the effective patent life. The short answer is that such an infinite term is not necessary to substantially achieve the purpose of the system. The system is designed to allocate today's scarce resources toward the creation and dissemination of tomorrow's inventions. The success of that system relies upon the business judgment of entrepreneurial inventors. They are the ones making the judgment (and taking the associated risks) that balance today's opportunity costs of the scarce resources against the aggregate revenue they could receive during the patent term from licensing the invention. As the patent term is extended, more inventive projects are becoming feasible, but the marginal incentive of each additional year decreases exponentially.

²⁵⁸ Ted O'Donoghue et al., *Patent Breadth, Patent Life, and the Pace of Technological Progress*, 7 J. ECON. & MGMT. STRATEGY 1, 2-5 (1998).

²⁵⁹ *Id.*

²⁶⁰ *Id.* at 2.

Justice Breyer's dissent in *Eldred v. Ashcroft* cited economists making just this point in an amicus brief.²⁶¹

Though some might quibble with discount rates, a twenty-year patent term captures approximately seventy-five percent of the discounted present value of an infinite patent term *assuming* constant demand for the invention.²⁶² Note that this last assumption is highly contested and likely far too generous; as suggested above, inventions may well have effective patent terms where demand drops often quite dramatically during the patent term.²⁶³ With Moore's Law impacting many areas of computing, doubling many relevant performance metrics every eighteen months,²⁶⁴ demand for inventions surely drops radically during the twenty-year term.²⁶⁵ The result is that a twenty-year patent term likely is long enough for inventors to recoup the costs of their investments in many cases. That being said, this new narrative does open the door to a different exploration of the patent term, apart from (and no longer constrained by) the incentive narrative.

IV. IMPLICATIONS AND FURTHER RESEARCH

A. *Unified Patent Law and Industry-Specific Innovation*

As described above, one result of this new patent narrative is that the scope of patent exclusion should not extend beyond the invention created and disclosed by the inventor. As I have argued elsewhere, there are good doctrinal and policy reasons to adopt this unified limitation for all patentees.²⁶⁶ There is one facet of this unified argument, however, that appears troubling at first.

²⁶¹ *Eldred v. Ashcroft*, 537 U.S. 186, 254-55 (2003) (Breyer, J., dissenting).

²⁶² See Brief of George A. Akerlof et al. as Amici Curiae in Support of Petitioners at 5-7, *Eldred*, 537 U.S. at 186 (No. 01-618) (making their calculations with a seven percent discount rate).

²⁶³ *Eldred*, 537 U.S. at 267-68 (Breyer, J., dissenting) (“[U]ncontested data indicate that no author could rationally expect that a stream of copyright royalties will be constant forever.”).

²⁶⁴ See Nathan Myhrvold, *Moore's Law Corollary: Pixel Power*, N.Y. TIMES, June 7, 2006, at G3.

²⁶⁵ If Moore's law holds across a twenty year period and doubles every 18 months, the relevant performance metric has increased by a factor of about 10,000 during twenty years. How much would you pay for a computer that is 10,000 slower than your current computer?

²⁶⁶ See Liivak, *Rescuing the Invention*, *supra* note 32, at 5; Liivak, *Finding Invention*, *supra* note 32, at 50-52.

During the course of the past decade,²⁶⁷ Dan Burk and Mark Lemley authored a series of articles arguing that innovation varies by industry and that, though it is a daunting task, patent law should take these industry differences into account.²⁶⁸ Their work culminated in a book, which principally argues that,

[A] purely unitary patent system no longer fits the extraordinarily diverse needs of innovators in today's technology industries . . . [and] that the solution is not to split the patent system into industry-specific protection statutes, but to tailor the unitary patent rules on a case-by-case basis to the needs of different industries²⁶⁹

There are two components of their arguments. First, as a positive matter, they observe that different technology industries have different risk, cost, and revenue profiles.²⁷⁰ Second, taking the incentive narrative for patents as a given, those differences should be accounted for by the incentives granted by an optimized patent system.²⁷¹ As a corollary, any strictly uniform patent system must under- and over-incentivize some industries.²⁷² To a large extent, their views have gained traction. There is agreement that the “factually right answer[s]’ to problematic questions about the duration and scope of IP rights . . . are very complex and may vary considerably from one industry to the next.”²⁷³

So how does the unified patent system (and, in particular, the unified patent exclusion) developed here deal with these industry-specific differences? At a high level of generality, the short answer is that it doesn't deal with the issue directly. More precisely, the patent system developed here doesn't *need* to deal with it directly—that is an important strength of a system not aiming to calibrate incentives itself; rather, it polices and channels behavior.

The patent institution developed here should be seen as a socially beneficial, fairly universal tool that can be utilized by innovative businesses. The purpose of the institution and its underlying rules should be well publicized, and if a firm can

²⁶⁷ See BURK & LEMLEY, *supra* note 12, at vii.

²⁶⁸ See *id.* at 38.

²⁶⁹ *Id.* at 5.

²⁷⁰ See *id.* at 38.

²⁷¹ See *id.* at 66.

²⁷² SCOTCHMER, *supra* note 47, at 117 (noting the “defect . . . aris[ing] from the ‘onesize fits all’ [IP system] . . . [i]t is almost inevitable that some classes of innovations are under rewarded and others are overrewarded relative to the costs of invention.”).

²⁷³ HOVENKAMP & BOHANNON, *supra* note 79, at 47.

beneficially utilize the institution, then they will use it—i.e., the firms themselves are in the best position to judge the needs and frailties of their business models. Patent law provides one of many tools they can turn to and layer in order to structure that business. In short, patent law writ large need not be industry specific, but as differing firms will differ in the way and amount that they rely on the system, the net effect will address those differing requirements. For example, despite the very divergent needs of an apartment-building developer in Manhattan and a rancher in Montana, both can utilize fairly uniform property laws even though they are using the tool of property to support very different businesses.

Furthermore, though the overall structure of property is the same in Montana and Manhattan, it is the institution that can quite effectively account for their contextual differences, primarily in regards to harms and remedies. Here, in the domain of remedies, courts can deploy contextual differences and their own experience of best business practices in other market arenas, in order to help tailor concepts (like patent harm and patent remedies) that reflect industrial and contextual differences in markets for inventions.

B. Further Research

Though the above section outlined both the economic justification for a market in inventions and the exclusive rights and remedies necessary for that system, there are many detailed economic and legal issues that still need to be explored. Real questions remain as to the impact of price discrimination on the analysis, the impact and role of independent inventors, the role of compulsory licensing, and the relationship between optimality and spillovers. Answers to these significant questions will surely help shed light on the strengths and weaknesses of this proposed view and purpose of the patent system.

CONCLUSION

This article has established that private decision-making alone (without the influence of artificial incentives) can align with society's interest in allocating resources toward creating inventions. In other words, a simple market exchange for disseminating inventions is socially justified. Importantly, the justification does not extend broadly to a market in

technology generally, but rather only to a market in inventions. Inventions are special technological “things” that, in contrast to other technological information, can be valued and negotiated by neoclassical firms. With that narrowed focus, the article established the social benefits created by the voluntary exchange of inventions. In this narrative, the patent system leverages a modular design, which enables it to interface with neoclassical firms through the price system and, thereby, also allows the system’s benefits to be quantified and ultimately justified.

Though not emphasized throughout, this narrative is not an exclusive one. It leaves room for others to either expand this narrative or to form some other alternative in order to justify another aspect of patent ecosystem. This market narrative supports parts of the existing patent system, while it does not explicitly remove support for other areas—the existing incentive narrative with all its faults and ambiguities still is there. But in effect, if it can develop a consensus behind it, this new market narrative will implicitly force out these intractable narratives. As for behavior, like patent trolling, that is outside the justification of the market narrative, proponents of trolling will need to develop their own convincing case for troll behavior—I doubt such a case can be made.

Furthermore, even as to the market narrative itself, this is not the end of the story; rather, it is just the beginning. This brief introduction to the market narrative leaves many important and interesting questions for future research. Though only scratching the surface, the hope is that this article establishes that certain specific acts—namely creating and disseminating an invention—can be economically justified. The patent system may be necessary to protect those activities. By developing a patent narrative with these more familiar market oriented economic arguments, it is hoped that new doors are opened for a more thorough economic exploration and refinement of the patent system. And if we’re lucky, that might lead to consensus and acceptance.