

The (Relatively) Easy Case for Patents on Inventions

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Abstract

This article outlines a new theory of patents that differs in kind from existing theories. Existing theories all employ a simple narrative: by setting both the scope and duration of patent law's powerful and lucrative exclusive rights, the system aims to induce the optimum levels of "progress in the useful arts." Though simple to state, that narrative is incredibly complex to employ and is fatally flawed requiring unknowable policy inputs and resulting in intractable policy stalemate. We just don't have (and probably will never have) the information needed to justify that narrative. The system is based on "guesswork" and supported by "faith" alone. And as the dubious activities of patent trolls and the patent arms race loom larger every day, our "faith" in the system is being deeply undermined if not lost all together.

This article argues that the problem is the narrative not the system. The article provides an alternative narrative that can justify at least part of the current system. The article develops a narrative that does not require unknowable *policy inputs* and intractable policy balancing. Instead the narrative designs a system that, as a natural result of the system's architecture, outputs those optimal levels of innovation. In that narrative, the patent system aims to provide the background support for the market exchange of inventions. Many assume such a narrative is doomed to fail. This article shows that, as to a market for *technological ideas or information generally*, those suspicions are likely correct, yet, the narrative introduced here focuses on something narrower: the voluntary market exchange of *inventions*. Inventions are special packages of information coupling technological and economic parameters into a modular thing that interfaces with the overall price system. This article shows that a patent system that supports such a market in inventions can be economically justified relatively unambiguously. Furthermore it offers the hope of a miraculous type of patent system: a system of socially beneficial, voluntary exchange with defensible exclusive rights that ultimately do not exclude anyone.

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I. Introduction

From economists, to legal scholar, and now judges, the patent system is now thought to be “in crisis,”¹ “broken,”² “[a] failure,”³ “an unnecessary evil”⁴ and “dysfunctional.”⁵ Many have pointed to “bad patents” as the rotten apple spoiling the patent barrel.⁶ These are patents that should never have been issued. They are either too broad or too obvious and are now being aggressively asserted by abusive patent holders. If only these “bad patents” were removed and proper quality control restored then, it is hoped, “good patents” could again prevail and the patent system could once again return to favor.

Undoubtedly doctrinal abuses are leading to problematic patents and sensible reforms have been proposed yet this article argues that the problem is unfortunately deeper than just quality control. Though these reforms can lead to “better” patents, we cannot conclude that they will ever lead to “good” patents.⁷ In fact, we don’t really know if there are any “good” patents. We don’t have proof that the social costs of a patent’s exclusion is outweighed by the socially beneficial activities the patent aims to incentivize.

This article argues that the problem isn’t so much the patent system as it is patent theory. Though the current patent narrative is nearly two hundred years old, the dominant patent narrative has never, and I think never will, develop a convincing case in favor of the patent system. The ensuing uncertainty has, for that same two hundred

¹ DAN L. BURK & MARK A. LEMLEY, THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT 8 (2009).

² ADAM B. JAFFE, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT (2006).

³ MICHAEL BESSEN & MICHAEL MEURER, PATENT FAILURE (2008).

⁴ BOLDRIN & LEVINE, AGAINST INTELLECTUAL PROPERTY (2008).

⁵ Richard Posner, *Capitalism*, June, 3, 2012 (available at <http://www.becker-posner-blog.com/2012/06/capitalismposner.html>) (stating that “The institutional structure of the United States is under stress... We have a ... a dysfunctional patent system Our capitalist system needs a lot of work to achieve proper capitalist goals.”)

⁶ See SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 75 (2004); HERBERT HOVENKAMP & CHRISTINA BOHANNON CREATION WITHOUT RESTRAINT 98 (2011) (discussing “the problematic topic of patent quality and its relation to the incentive to innovate.”).

⁷ In a recent article Michael Risch found little empirical difference between what most would call “good” and “bad” patents suggesting that even with “good” patents we may well see significant, aggressive, troll-like enforcement of those “good” patents. See Michael Risch, *Patent Troll Myths*, 42 SETON HALL L. REV. 457 (2012).

years, been fueled never ending patent controversy and patent instability.⁸ With the important role played by innovation⁹, we need confidence in our patent system.

This article aims to provide a patent theory that can provide that confidence, *for at least some portion of patent related activities*. The article provides a patent narrative that describes specific patent-related activities whose social benefits can be established with confidence and then it describes the patent system, and patent exclusion, needed to support those activities. And though this narrative is different in kind from existing patent theories, the article shows that surprisingly the new narrative does not require statutory reform. In other words, the bulk of patent ‘reform’ will consist in changing what we think the system is intended to accomplish rather than changing the statute.

Current patent theory is built around the sensible enough intuition that, without some kind of government intervention, the business of technological development will, because of slavish copying by competitors, be unprofitable and will remain at suboptimal levels. The free market and its emphasis on competition cannot itself support the needed levels of investment in technological development. The patent laws address this “public goods” problem by granting patentees valuable exclusive rights that give them “above market”¹⁰ returns thereby hopefully inducing the socially optimal production of technology. Patent policy focuses on the careful calibration of the patent reward so as to balance the social benefits of increased incentives and its concomitant inventive activity against the social costs incurred by a patent’s exclusionary, above market rewards.

That framing though has a host of problems. Importantly, the costs and benefits that are at the heart of this normative account are impossibly complex to compute and are likely unquantifiable.¹¹ As a result, the current normative account cannot conclusively justify the patent system.¹² The patent system has just “muddled through”¹³ in a persistent state limbo and low level controversy. At best it persists on “faith” alone.¹⁴

⁸ Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. ECON. HIST. 1-2 (1950).

⁹ See Solow report.

¹⁰ See ROBERT MERGES, *JUSTIFYING INTELLECTUAL PROPERTY* (2011).

¹¹ *Id.*

¹² See FRITZ MACHLUP, *AN ECONOMIC REVIEW OF THE PATENT SYSTEM*, SUBCOMM. ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE SENATE COMM. ON THE JUDICIARY, Study No 15, 85th Cong, 2d Sess. at 79 (1958). Yet also note that despite the serious lack of economic support, the sky has never really fallen on the system because that indeterminacy also saves the existing system from clear damnation; we cannot firmly establish that the system doesn’t work either.

¹³ *Id.*

¹⁴ See JAMES BOYLE, *SHAMANS, SOFTWARE, AND SPLEENS* 253 (1996) (describing support for the “current system” as “an article of religious faith”); see also BESSEN & MEURER, *supra* note 3 at 74 (quoting James Boyle as discussing IP policy not on empirical evidence but instead on “faith-based” reasoning).

The uncertainty stems from the basic architecture of the theory. In aiming to induce the optimum level of innovation by its statutorily derived incentive, the current patent narrative requires this optimum level as a policy input. The fact is we just don't know what that number should be. Likewise, in order to balance the costs against benefits, we need to quantify those costs. As before, the number is impossibly complex to calculate. In short, the current narrative has made the system intractably uncertain.

We need to do better; we need a different approach. If the cost-benefit balance of the standard narrative is intractable, then maybe we should just stop trying to solve it directly. We should try to design our patent system around a narrative where this illusive balance is reached as an outcome of the system rather than as a necessary but unknowable policy input. Despite its own imperfections, our private property market system from tangible goods performs exactly this feat. Though traditional property is certainly not perfect¹⁵, especially considering distributional issues, it does enjoy something that has eluded patent law: strong economic justification, stability and widespread acceptance.¹⁶

In particular, this article focuses on one set of activities: creation of and selling of an invention to those that can utilize it. The article argues that this narrative should form (perhaps not exclusively) the normative heart of the patent system. Patent exclusion (and remedies for infringement) should be keyed to prevent harm to that normative core.

That goal should immediately raise a question. Considering the acceptance and familiarity with the market exchange for tangible goods, if indeed such a narrative could be employed for patents, why hasn't it be done before? Patent theory is still dominated by the incentive story because we think the market exchange story just will not work for technological information. Highly influential economic thinking has regarded such a market for technology to be ill advised and likely to fail. In fact the work of two of the 20th centuries greatest economists appear to argue against exactly such a notion. In an extremely influential paper, Nobel prize-winning economist Kenneth Arrow argued that a competitive system would be unable to achieve an optimal allocation of resources for inventions.¹⁷ Since its publication in 1962 that paper has been one of the foundational theoretical pillars of the incentive-based theory of patents as Arrow's work is thought to rule out a strictly market-based solution.¹⁸

¹⁵ In addition to distributional issues there are also problems associated with the theory of the second best. See Glynn S. Lunney, Jr., *Copyright's Price Discrimination Panacea*, 21 HARV. J. L. & TECH. 387, 390 (2007).

¹⁶ See *infra* notes XX and accompanying text.

¹⁷ See Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in THE RATE AND DIRECTION OF INVENTIVE ACTIVITY 609 (Nat'l Bureau of Econ. Research ed. 1962).

¹⁸ Michael Burstein, *Exchanging Information Without Intellectual Property*, *forthcoming* TEX. L. REV.

Yet Arrow is not the only obstacle to a market-based vision for patents. In his seminal work on public goods Paul Samuelson described what has come to be known as the “Samuelson condition” which provides a top level condition for the optimal allocation of resources toward the creation of public goods like technology.¹⁹ After deriving that top-down condition Samuelson addressed whether private decision-making could ever lead to that optimal resource allocation. Samuelson argued that it could not.²⁰ He argued that 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.²¹

These arguments stand as formidable obstacles to a market based theory of patents. But note that there are two parts to the argument. First, the economists have shown that a market in technological information is likely to fail. And second, most patents commentators view the patent system as aiming to protect technological information.

This article argues that the second part of the argument is wrong. The patent system normatively should not and descriptively is not about technological information generation. In recent years my own research has focused on the invention in patent law. Despite the conventional view that incentivizing and protecting technological information is the goal, it is clear that the patent statute focuses and provides exclusion over the invention. And this article argues that this statutory feature is critically important.

In an important sense, we have been asking the patent system to do too much. If we force the patent system to be some universal information incentive machine then a justifiable market driven narrative may be out of reach and we are forced to stay with our current indeterminate narrative. Instead if we take the statute seriously and we see that the system focuses only on inventions, then we now have an opportunity. As shown below, though technological information more generally may be ill suited for market commodification, this article will show that within the class of technological information, there exists a subset whose technological and economic properties enable it to be commodified. Importantly, this article will show that these special bundles of technological information are already the focus of the existing patent statute. These special packets of information are inventions. In other words, as long as we limit the system to protecting inventions, something that the statute already does, then market commodification can be viable.

As will be argued in more detail below, inventions are completed solutions to relevant technological problems wherein that solution is refined enough that is ready to

¹⁹ See Paul A. Samuelson, *The Pure Theory of Public Expenditure*, REV. ECON. STAT. 387, 388 (1954).

²⁰ *Id.*

²¹ *Id.*

be practiced by "any" person of skill in the art.²² In economic terms, an invention is a production plan.²³ Accordingly it is a package of technological information that can effectively interface with neoclassical firms via the existing price system. Furthermore, property rights in invention can be effectively protected as the specificity of the invention makes protection a tractable proposition.²⁴ This article will show that limiting patent protection to inventions is a critical aspect of the patent systems design architecture where inventions are modules of information that can efficiently interface with the existing firms and indeed the broader price system.

The following sections of this article further detail these issues. The article first describes current patent theory and its emphasis on balancing access against exclusion. It then details the unresolved indeterminacy of that narrative and other problematic features of that view. Section III explores an enticing alternative where private decision making alone guides allocation of resources to production and dissemination of technology. That section then 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 that caution against commodifying technology for a market. Despite those widely held reservations, the section ends by describing a specific package of technology that can overcome both Samuelson's and Arrow's objections. Section IV takes that example builds a patent system to support the voluntary exchange of inventions. In that way it describes a patent system that can be justified. Surprisingly though this new normative theory is different in kind 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 normative goal, the section will highlight how our *interpretation* of those statutory features will change. Section V describes the benefits of employing this new normative view, its implications and describes future research questions.

II. Patent Incentive Theory & Its Failure

This section describes the current normative framework for patent law. Currently patent law is seen as a necessary intervention in the existing free-market economy that aims 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 to justify the patent system. In addition to that primary failure, the section also lists a number of related deficiencies of the current narrative.

²² 35 U.S.C. 112 (2006).

²³ See WILLIAM J. BAUMOL & ALAN S. BINDER, *ECONOMICS PRINCIPLES AND POLICY* (4th 1988).

²⁴ See *infra* notes XX and accompanying text.

a. Patent Incentive Theory

As to intellectual property and innovation policy there is one point of agreement: technological advancement matters.²⁵ And in a free market with its emphasis on competition (*i.e.* copying the success of others), there is agreement that, as to production of technological advances, we need to “do something.”²⁶ “[A] competitive market may not give enough incentive to invest in knowledge.”²⁷ With aggressive copying by savvy competitors, the market price for technological information will plummet to its near-zero marginal cost and the resulting market revenue for the original creator “will not cover the cost of developing the [information], and therefore the market will not work.”²⁸ Without “doing something ... everyone will want to be an imitator, not an inventor.”²⁹

Yet beyond agreeing that we should do something, *what* we should do is much more controversial.³⁰ Broadly speaking a number of different solutions have been offered to this problem of underproduction including prizes, contracts, patent regimes, and more recently commons-based production. Though not precluding the other methods, the U.S. Constitution explicitly authorizes Congress to provide for a patent system that “promote[s] progress in the useful arts” by granting “exclusive rights” to “inventors” for their “discoveries.”³¹ As a result much of the legal commentary has focused only on such exclusive rights regimes.³² This article is no exception.

²⁵ See Peter Menell, *Intellectual Property: General Theories*, in II ENCYCLOPEDIA OF LAW & ECONOMICS 134 (Boudewijn Bouckaert & Gerrit de Geest eds., 2000) (“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 Suzanne Scotchmer & Peter Menell, *Intellectual Property*, in HANDBOOK OF LAW AND ECONOMICS (A. Mitchell Polinsky & Steven Shavell eds., 2007) and F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 699 n. 4 (2001).

²⁶ DAN L. BURK & MARK A. LEMLEY, *THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT* 8 (2009).

²⁷ SUZANNE SCOTCHMER, *INNOVATION AND INCENTIVES* 58 (2004).

²⁸ *Id.* at 35.

²⁹ BURK & LEMLEY, *supra* note 2 at 8.

³⁰ Broadly speaking a number of different solutions have been investigated including prizes, contracts, exclusive rights regimes, and more recently commons-based production. For a more recent work considering those options see Amy Kapczynski, *The Cost of Price: Why and How to Get Beyond Intellectual Property Internalism*, 59 U.C.L.A. L. REV. 970, 986 (2012).

³¹ U.S. CONST. art I, § 8, cl. 8.

³² Though further below it has some thoughts on the suitability of these alternatives. Scotchmer 58 (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 law³³, they are all variations on one basic story.³⁴ In their recent book Burk and Lemley describe “[t]he classic utilitarian theory of patent law”³⁵ as aiming to “encourage [inventors] to invest in research and development by the prospect that their invention will be patented.”³⁶ It is a narrative that we have used “for 200 years”:³⁷

“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; that fact in turn gives you an incentive to create.”³⁸

That story is quite “simple”³⁹ and yet it is quite coarse. In short, we aim to get the optimal amount innovation by artificially making it more profitable. “[W]e grant patents in order to encourage invention.”⁴⁰ Our normative aim is “inducement”⁴¹ by way of exclusive rights that give “limited market power.”⁴²

In 1934 economist Arnold Plant described this narrative and the patent system generally as “a subsidy for invention.”⁴³ And now eight years later we still think about the patent system that way. It has been recently described alternatively as “a

PATENT AND ANTITRUST 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.”)

³³ See KIEFF *et. al.*, PRINCIPLES OF PATENT LAW 66 (4th ed. 2008).

³⁴ BURK & LEMLEY, *supra* note 2 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 how to balance the costs and benefits in the light of economic evidence about how innovation and patent incentives work.”)

³⁵ Lemley & Burk 68

³⁶ Lemley & Burk 68

³⁷ Mark Lemley, *Reconceiving Patents in the Age of Venture Capital*, 5 J. SMALL & EMERGING BUS. L. 137, 139 (2000); *see also* Machlup.

³⁸ Mark Lemley, *Reconceiving Patents in the Age of Venture Capital*, 5 J. SMALL & EMERGING BUS. L. 137, 139 (2000).

³⁹ Mark Lemley, *Reconceiving Patents in the Age of Venture Capital*, 5 J. SMALL & EMERGING BUS. L. 137, 139 (2000).

⁴⁰ Lemley & Burk 66; *see also* Ward S. Bowman Jr., PATENT AND ANTITRUST x (1973)(“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 under rewarded.”)

⁴¹ Amy Kapczynski, *The Cost of Price: Why and How to Get Beyond Intellectual Property Internalism*, 59 U.C.L.A. L. REV. 970, 986 (2012)(referring to the patent system as inducing works).

⁴² Scotchmer Book 58.

⁴³ Ward S. Bowman Jr., PATENT AND ANTITRUST 19 (1973)(describing Arnold Plant’s view of patent law).

mechanism the state uses to induce innovation”, “property like rights used by inventors to collect payment from society as inducement for their innovative efforts” or as “a mode of cataloging which third-parties should provide recompense to the inventor so as to guarantee the appropriate level of R&D and commercialization incentives.”⁴⁴ In short, to make up for the shortfall of incentives from the free market, patent law purposefully grants patent holders the ability to set up a toll whose revenue is designed to make up for that shortfall such that society gets an optimal amount of inventive activity.

Yet though facially simply, that narrative creates serious costs as patent law aims to cure this “supply side problem.”⁴⁵ Because of the non-rival nature of information “there is no efficiency reasons to suppress anyone of use.... [and if the price for the information were zero] everyone would be served, and access would be efficient.”⁴⁶ And if the price for a piece of information is non-zero (as it must be if patent law hopes to provide any incentive) then there is assumed to be an inefficient use of the information. Nobel Prize winning economist Kenneth Arrow described such exclusive rights schemes:

Information [], say a new 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 information.*⁴⁷

This Gordian knot is the incentive versus access paradox.⁴⁸ Patent policy is a balancing of the benefits of the incentive scheme against the costs of exclusion inherent in that scheme. A great deal of hand wringing has focused on whether patent law has made this compromise wisely.⁴⁹ It is, as put by economist Suzanne Scotchmer, “a tortured

⁴⁴ Ted Sichelman, *Purging Patent Law of Private Law Remedies* (2011) (unpublished working paper), available at http://www.law.stanford.edu/display/images/dynamic/events_media/Ted%20Sichelman%20%20Purging%20Patent%20Law%20of%20Private%20Law%20Remedies.pdf

⁴⁵ Scotchmer Book 35.

⁴⁶ Scotchmer Book 35.

⁴⁷ Arrow, *supra* note 6 at 616–617.

⁴⁸ Glynn S. Lunney, Jr., *Reexamining Copyright’s Incentives-Access Paradigm*, 49 VAND. L. REV. 483, 489 (1996).

⁴⁹ See Ward S. Bowman Jr., PATENT AND ANTITRUST 50-51 (1973); Ward S. Bowman Jr., PATENT AND ANTITRUST xi (1973)(focusing on “the patent reward system in terms of whether it is likely to under rewarded over reward invention.”).

solution to the problem of providing a public good.”⁵⁰ The system is a “deliberate government interventions in the market – a sort of mercantilist economic policy for artificially stimulating innovation.”⁵¹

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, is a failure on many different levels. As detailed below, its primary failure is its inability to provide justification for the patent system. Related to that failure, this section further describes other curious features of that system that will be relevant for contrast against the market for inventions narrative developed in later sections. In particular, the incentive narrative is devoid of a concept of harm to provide a nuanced guide to infringement. In addition, the incentive narrative develops a very curious concept of patent transactions where naked exclusion, as opposed to some useful thing, is the heart of the exchange.

i. 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 the benefits and the costs of the exclusion has turned out to be near impossible. It is a problem that “is peculiarly unsusceptible to empirical proof”⁵² where the “the trade-offs ... are much more extreme and difficult to measure. No one knows what the optimal duration of patent proper 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.”⁵³ The system has remained “extraordinarily indeterminate.”⁵⁴ 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.”⁵⁵

⁵⁰ Scotchmer Book 34.

⁵¹ Lemley & Burk 8

⁵² Ward S. Bowman Jr., PATENT AND ANTITRUST 50 (1973).

⁵³ Hovenkamp & Bohannon 46.

⁵⁴ JAMES BOYLE, SHAMANS, SOFTWARE, AND SPLEENS 41 (1996).

⁵⁵ Hovenkamp & Bohannon 7

The basic incentive narrative “has some serious problems”⁵⁶ and it is time “to question the classic incentive theory.”⁵⁷ One solution would be to just try harder⁵⁸ to work out the cost benefit balance. But as recently put by Herb Hovenkamp and Christina Bohannon, “[f]inding the right balance between [incentives versus access] has proven to be one of the most difficult questions that government policy has ever had to face.”⁵⁹ In fact, I along with others fear it may be impossible.⁶⁰ As a result “we don't, in fact, know for sure what impact patents have on innovation.”⁶¹ Without proof many question intellectual property and stress alternatives.⁶² Others have even called for outright abandonment of the system.⁶³

ii. Behavioral Coarseness without A Concept of Harm

In addition to its intractable indeterminacy, the current narrative is conspicuously coarse. Though certainly the narrative involves complex balancing of interests *in designing the system*, the narrative provides little nuanced behavioral direction to patent holders. In fact, once a valid patent is granted, the current narrative gives the patent holder rather blunt and direct instruction: use the exclusion in the patent to make money. Justice Douglas, who was generally no great supporter of the patent system, noted that a “patent empowers the owner to exact royalties as high as he can negotiate with the leverage of that monopoly.”⁶⁴ In other words, “once a patent has been issued the patentee can be expected to utilize exclusive rights he has been granted to maximize his reward.”⁶⁵

As a result 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. In short, aggressive assertion of “good” patents is

⁵⁶ Mark Lemley, *Reconceiving Patents in the Age of Venture Capital*, 5 J. SMALL & EMERGING BUS. L. 137, 148 (2000).

⁵⁷ Mark Lemley, *Reconceiving Patents in the Age of Venture Capital*, 5 J. SMALL & EMERGING BUS. L. 137, 142 (2000).

⁵⁸ See Lemley telling us not to stop looking.

⁵⁹ Hovenkamp & Bohannon 404.

⁶⁰ See Oskar Liivak, *Maturing Patent Theory from Industrial Policy to Intellectual Property*, 86 TULANE L. REV. 1163, 1173-76 (2012); ROBERT MERGES, JUSTIFYING INTELLECTUAL PROPERTY 2-3 (2012).

⁶¹ Mark Lemley, *Reconceiving Patents in the Age of Venture Capital*, 5 J. SMALL & EMERGING BUS. L. 137, 139 (2000).

⁶² Amy Kapczynski, *The Cost of Price: Why and How to Get Beyond Intellectual Property Internalism*, 59 U.C.L.A. L. REV. 970 (2012)

⁶³ See BOLDRIN & LEVINE, AGAINST INTELLECTUAL PROPERTY (2008).

⁶⁴ *Brulotte v. Thys Co.*, 379 U.S. 29, 33 (1965); see also John Golden, *Principles of Patent Remedies*, 88 TEX. L. REV. 505, 508 (2010).

⁶⁵ Ward S. Bowman Jr., PATENT AND ANTITRUST 22 (1973).

what the current narrative expects. In their recent book on intellectual property, Bohannon and Hovenkamp highlight this coarse nature of the current narrative focusing on the lack of harm in patent infringement actions. They suggest that “[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.”⁶⁶ I agree with this suggestion though, as explained below, I think that their suggestion also entails rejection of the current patent narrative.

In recent work, Ted Sichelman has similarly noted the inconsistency between patent law’s public law narrative and many of its private law features like remedies. In order to achieve consistency Sichelman keeps the current patent narrative and then aims to remove any vestiges of private law from the patent system. This article agrees with the inconsistency yet advocates for the opposite resolution.⁶⁷ This article argues for rejecting the incentive narrative in favor of a more private/commercial law market narrative while putting more emphasis on the private law aspects of the patent statute.

iii. Markets for Exclusion Rather than for Technology

Another oddity of the current narrative is the nature of its transactions. As a general matter “[m]arket transactions are arms-length, anonymous, and typically involve the exchange of goods for money.”⁶⁸ Now 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.⁶⁹ Transactions in the incentive narrative are money in exchange, not for a useful thing, but instead for a promise not to sue.⁷⁰ This outcome is a direct result of viewing the patent system as setting up tolls to provide incentives. And those transactions are becoming a highly visible part of the modern patent system. “We’ve also seen the development of what I call licensing shops, that is, significant corporate entities with little or no business purpose other than to cumulate and license patents ... what they mostly seem to produce are patents and patent licenses.”⁷¹

⁶⁶ Hovenkamp & Bohannon 51

⁶⁷ Ted Sichelman (noting “ “ though his conclusion differ. Sichelman argues that if we take seriously the current narrative then private law should be removed. I agree with the mismatch, but I argue for the opposite course of action. We need to adjust patent theory to adapt a more private law perspective.)

⁶⁸ Asish Arora et. al., *Markets for Technology* 4 (2001).

⁶⁹ See Robert Merges, *A Transactional View of Property Rights*, 20 BERK. TECH L. J. 1477, 1499 (2005)(quoting Merrill & Smith, *What Happ Y LJ* 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).

⁷⁰ Lemley?

⁷¹ Mark Lemley, *Reconceiving Patents in the Age of Venture Capital*, 5 J. SMALL & EMERGING BUS. L. 137, 141 (2000).

Such a market in “naked exclusion”⁷² should strike us as quite odd. No technology or other goods ever have to be exchanged. Nonetheless some have aimed to improve the patent system by reducing the frictions in that market.⁷³ In fact, one of the primary defenses of patent trolls has been their injection of liquidity into this ‘market.’⁷⁴

Meanwhile markets in technology and inventions are different. In these later two markets, patent exclusion surely plays a critical, hopefully background role, as the central focus is on transactions where payment is exchanged for technological information or inventions respectively. The later two markets surely involve exchange of legal relations as well but these are a consequence of (and background features of) the exchange of the useful thing. Such markets look much more like traditional property rather than some industrial policy that induces wealth transfers.⁷⁵ These markets involve an asset, the technology or the invention, and they involve property rights that surround that asset and provide a “field of legal protection” around that asset.⁷⁶

In an important sense technological exchange is just not a central part of the transactions envisioned by the current narrative. That strikes me as odd and inherently wrong unless a persuasive case can be made that this system works, and as shown above, it can’t.⁷⁷

III. A Market for Inventions, not for Technology & not for Naked Exclusion

But those conclusions of intractability, though disheartening, do not doom the *patent system* (though they might well 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). We should try to design our patent system around a narrative where this illusive balance is reached as an outcome of the system rather than as a necessary but unknowable policy input. And while we are writing out a wish list, why not also ask for a system that results in an optimal allocation of resources to technology but one that doesn’t have any real costs. In other words, let’s create a patent system with exclusive rights that doesn’t actually exclude anyone.

⁷² Who came up with this term?

⁷³ See Mark A. Lemley & Nathan Myhrvold, HOW TO MAKE A PATENT MARKET, 36 HOFSTRA L. REV. 257 (2007).

⁷⁴ See Colleen Chien, Arms Race (noting that “growth in the patent marketplace, accompanied by an increase in liquidity, transactions, and business models for buyers, sellers, and intermediaries.”)Duffy quote.

⁷⁵ See Oskar Liivak, Maturing

⁷⁶ See Robert Merges, *A Transactional View of Property Rights*, 20 BERK. TECH L. J. 1477, 1499 (2005)(quoting Merrill & Smith, What Happ Y LJ 357, 359 (2001).

⁷⁷ See above for the lack of proof.

Certainly such a wish list seems like a fanciful pipe dream 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 as a policy input the right amount of shoe stores or Thai restaurants to build. Those levels are an output, a result of the system not a necessary informational input for it. Furthermore, though every item of tangible property comes with its powerful shield of near-Blackstonian exclusion, that exclusion ultimately should not exclude the highest valued user from utilizing the tangible resource. There are strong exclusive rights but we don't suffer the same costs of exclusion that we wrestle with in intellectual property. And furthermore, though traditional property is certainly not perfect⁷⁸, especially considering those "pesky" distributional issues⁷⁹, it does enjoy something that has eluded patent law: strong economic justification, stability and widespread acceptance.

This section explores the possibility of building a patent narrative along similar lines to that employed for the private property market: socially beneficial behavior driven not by government created incentives but rather driven by private decision making.⁸⁰ The section shows that, despite its allure and simplicity, there are thought to be long standing obstacles that prevent support for such a simple institution for information exchange. Though agreeing generally with those objections, this section concludes by presenting an example where in fact those objections do not hold and private decision making and voluntary exchange can result in a system of socially beneficial resource allocation. As will be explored in greater detail in the next section, that example is one member of a general set of actions 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 important foundational work pointing out the important benefits provided by the patent system in enabling markets in technological exchange. Robert Merges, Asish Arora, Paul Heald, and Henry Smith have all put emphasis on the role the patent system plays in supporting a market for technology.⁸¹

⁷⁸ in addition to distributional issues there is also problems associated with the theory of the second best. See Lunney discussing second best.

⁷⁹ Merges somewhere?;

⁸⁰ In earlier work I began sketching a research plan that aimed to find such a system. See Oskar Liivak, *Maturing Patent Theory from Industrial Policy to Intellectual Property*, Tul L Rev (2012). This current article is a result of that research plan.

⁸¹ See generally Merges, *Justifying* 154; Asish Arora et. al., *Markets for Technology* 261 (2001)("Intellectual property rights encouraged the rise of a market for technology."); Teece responding

In summarizing much of this work, Bob Merges lauds IP rights as “serv[ing] as the starting points for negotiations and exchange, setting in motion the great resource-allocating machinery so heartily lauded by such theorists as McCloskey and Sen.”⁸²

And though I heartily agree with that earlier work, 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”⁸³ and that just doesn’t seem to be good enough anymore. The simple fact is that, despite identifying “good” aspects of the patent system, we still cannot make a strong argument that supports any one part of the system.⁸⁴ As lamented by Merges, “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.”⁸⁵

The patent system just does not have the theoretical framework and *acceptance of that framework* as 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 optimal innovation.”⁸⁶ And they further note that “[IP] [l]ack[s] any consensus resembling the economic vision of price competition....”⁸⁷ And in particular they identify that the relative incoherence of IP in relation to antitrust and price competition stem from the well accepted “basic model of competition ... borrowed from neoclassical economics”⁸⁸ and the lack of such a model for IP.

to Merges 1239 (“For far too long, the debate about the patent system has neglected consideration of how patents enable enterprises and individual inventors to specialize in capture the economies of specialization.”); Nancy T. Gallini & Ralph A. Winter, Licensing in the theory of innovation, 16 RAND J. Econ. 237, 238 (1985)(“the 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.”); Paul Heald, Transaction Cost Theory of Patent Law, 66 Ohio State L. J. 473, 489 (2005)(Heald argues from a transaction cost perspective that “the patent form enables the potential transferor to share information asset without fear of misappropriation while assembling the complex team necessary to commercialize a new product.”); Asish Arora et. al., Markets for Technology 279 (2001)(“[p]oint to the role of patents and facilitating transactions in technology. This role of patents has largely been ignored informal economic analysis, but the focus has been on the trade-off between ex-ante incentives to innovate the ex post advantages of innovation diffusion.”).

⁸² Merges, Justifying 155.

⁸³ See note XX.

⁸⁴ Arora “Intellectual property rights are a sin qua non-for the development of such markets. But given the nature of knowledge, property rights (such as patents) in knowledge can create problems.”

⁸⁵ Merges Justifying 6.

⁸⁶ Hovenkamp & Bohannon 6

⁸⁷ Hovenkamp & Bohannon 47

⁸⁸ Hovenkamp & Bohannon 47

The purpose of the following sections and indeed the purpose of this article is to develop that economic framework for a market of inventions and then to identify the patent system needed to support such a market. 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 integrate the patent system as a natural extension of the price system and the traditional market. It aims to end patent system exceptionalism.⁸⁹

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 behavior as a relationship between ends and scarce means which have alternate uses.”⁹⁰ And is has been long recognized that in this context 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.”⁹¹

For justifying the allocating scarce resources toward creating tangible goods through the voluntary market, economists have used a two stage argument.⁹² First, economists developed the notion of efficiency. This is an overall “top-down” condition that describes the optimal allocation and distribution of those tangible scarce resources. Next, economists have shown that this optimal allocation can be reached through voluntary, private exchange guided by the price system.⁹³ Based on this narrative of socially beneficial voluntary exchange, property rights aim to prevent any harmful acts that would interfere with those acts. This article argues that, though most think it cannot be done, this 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 to 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 Bowen and Lindahl had 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 to the creation of a public good with the condition the now bears his name. The Samuelson

⁸⁹ See Liivak, *Maturing*

⁹⁰ LIONEL ROBBINS, *AN ESSAY ON THE NATURE AND SIGNIFICANCE OF ECONOMIC SCIENCE* 16 (1935).

⁹¹ Ward S. Bowman Jr., *PATENT AND ANTITRUST* 13 (1973).

⁹² See Baumol & Blinder *supra* note at 576.

⁹³ *Id.*

condition states that resources should be directed toward production and dissemination of a public good until

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

where MRT_{zy} is the alternative uses for the scarce resources that will be consumed in creating the invention z .⁹⁴ MRS_{zy}^i is the i th person's preference for the good z relative to those alternative uses (i.e. relative to private good y). Essentially the Samuelson condition just says that resources should continue to be directed toward creating more of some public good until the collective preference for that last increment of public good just equals the preference for the private good that could have been made from the scarce resources consumed in creating that increment of the public good. Just as the efficiency condition for tangible goods could guide the theoretical "omniscient" planner so could the Samuelson condition. In Samuelson's words, "[t]he solution 'exists'; the problem is how to 'find' it."⁹⁵

For the tangible market, economic theory has shown that voluntary exchange would guide transactions so that this optimality condition would be the equilibrium result. The obvious question is whether a similar narrative could be developed for the creation and distribution of technology? And 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 used to satisfy the Samuelson condition. Assume some private actor that has the capability to create a public good and they have the ability to estimate the scarce resources that will be consumed in creating the public good. And if the private actor could collect from each user of the public good the benefit provided by that good, then a profit motivated private decision maker would undertake projects to create 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.⁹⁶ But as will be detailed below, most have concluded that this possibility is a mirage and that such private decision making for creation and selling of information will be fatally defective. So what is the problem?

c. Objections to Private Decision Making & Markets for Information

⁹⁴ Samuelson, *supra* note XX at 388; *see also* CORNES & SANDLER, at 23 (using the notation that is adopted here).

⁹⁵ *Id.* at 389.

⁹⁶ *Id.*

Though such a private decision making solution to the public goods problem is alluring, there are a number of objections most notably towering, Nobel Prize-winning, objections. Indeed the conventional view is that such a market for technological information would not work. The general consensus is that the exotic world of non-rival ideas is just too different from tangible goods and the relatively simple and accepted narrative for the tangible market will just not apply. 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.”⁹⁷ This section first describes Paul Samuelson’s objections to a private market for public goods and then it considers Kenneth Arrow’s objections to a private market for the public good of information.

In his initial articulation of his condition, Samuelson noted that, for *private goods*, there is indeed a decentralized “analogue calculating machine” namely the private market with price competition that reaches the optimality condition for *private goods*.⁹⁸ Immediately thereafter though he forcefully argued that as to *public goods* “no decentralized pricing system can serve to determine optimally these levels of collective consumption.”⁹⁹ He argued that “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.”¹⁰⁰ Those false signals prevent the aggregate revenue for the public good from reflecting its true collective value and prevent an optimal private decision-making system. Because 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.”¹⁰¹ Though alternatives have been explored,¹⁰² the inability “to induce consumers to reveal their marginal valuations”¹⁰³ remains the primary obstacle and continues to “make[] it all but impossible to determine the optimal level of production for any public good.”¹⁰⁴

To make matters worse, Samuelson’s objections are not the only obstacle. Kenneth Arrow, in one of the most influential articles to examine the economics of

⁹⁷ Asish Arora et. al., *Markets for Technology* 1 (2001); David Teece, *Toward an Economic Theory of the Multiproduct Firm*, 3 *J. Econ Behavior & Org.* 39, 49 (1982) (“Markets do not work well as institutional mode for trading know-how.”); *see also* Teece responding to Merges and Arora, 1237 (Teece is concerned with the transfer of tacit knowledge); Merges and Arora discussing Von Hippel (Von Hippel concerned with sticky information that cannot be easily transferred from one user to another.).

⁹⁸ Paul Samuelson, *Theory of Public Goods*, 388 (1954)

⁹⁹ Paul Samuelson, *Theory of Public Goods*, 388 (1954)

¹⁰⁰ Paul Samuelson, *Theory of Public Goods*, 388 (1954)

¹⁰¹ Paul Samuelson, *Theory of Public Goods*, 388 (1954).

¹⁰² *See* Yoo, 639

¹⁰³ *See* Yoo, 639

¹⁰⁴ *See* Yoo, 639

information, 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.”¹⁰⁵ Though using the term “invention” his analysis was very broad examining “the production of knowledge” generally.¹⁰⁶ The focus of the analysis was “the special nature of information”¹⁰⁷ as compared to private goods and he concluded that “a free enterprise economy [would] underinvest in invention and research (as compared with an ideal)...”¹⁰⁸ He reached that conclusion by highlighting that information possesses, among other problems, characteristics that challenge the market model: “inappropriability, and uncertainty.”¹⁰⁹

As to inappropriability, Arrow concluded, as have most others, that “[i]n the absence of special legal protection, the owner cannot ... simply sell information on the open market.”¹¹⁰ On this point he made two observations. First, “[a]ny one purchaser can destroy the monopoly.”¹¹¹ This is the standard point about the threat posed from the ease with which others can pirate and spread the information themselves. Second, Arrow made another point that remains one of the most noted 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.”¹¹² This point is widely cited and is now known as Arrow’s Information Paradox.¹¹³

In light of these problems if we “do nothing,” Arrow, like many others, suggested that we do something and he suggested the need for “suitable legal measures” namely “property rights.”¹¹⁴ Yet despite those property rights he argued that the market would still be suboptimal because of remaining inappropriability, intractability and uncertainty problems. Arrow argued that “there are obviously enormous difficulties in defining in any sharp way an item of information and differentiating it from other similar sounding items.”¹¹⁵ He lamented that the “patent laws would have to be unimaginably complex and subtle to permit such appropriation on a large scale.”¹¹⁶

¹⁰⁵ Arrow 609.

¹⁰⁶ Arrow 609.

¹⁰⁷ Bowman at 23; see also Arrow at 609

¹⁰⁸ Arrow 619.

¹⁰⁹ Arrow 619.

¹¹⁰ *Id.*

¹¹¹ *Id.*

¹¹² Arrow 615.

¹¹³ See Burstein, *supra* note XX.

¹¹⁴ Arrow 615.

¹¹⁵ Arrow 615.

¹¹⁶ Arrow 617

Lastly, Arrow argued that uncertainty would plague an information market. He first notes that uncertainty is part of most enterprises and that various risk shifting mechanisms exist but argued that would be especially problematic for “highly risky business activities, including invention.”¹¹⁷ In addition he notes that “information is not only the product of inventive activity, it is also an input” and as a result “the value of information for use in developing further information is much more conjectural.”¹¹⁸ These factors together led Arrow to conclude that “a free enterprise economy [would] underinvest in invention”¹¹⁹ even if backed with property rights to prevent misappropriation and that “a strong case for centralized decision making” had been made.¹²⁰

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 creation of *technological information* generally, then indeed private decision-making may not work and patent theory probably is destined to remain shackled to slog on in its incentive vs access indeterminism. And indeed most do see the patent system as incentivizing technological information generation. Indeed, the general view is that patent law aims to protect the information generated by the patent document. Ward Bowman argued that “[t]he product of the patent is information.”¹²¹ Suzanne Scotchmer described the system as giving “patent holders ... an almost absolute right to control uses of the knowledge they have created.”¹²² Ed Kitch argued patents alleviate the “fear that the fruits of the investment will produce unpatentable *information* appropriable by competitors.”¹²³ As long as patent theory conceives the goal of the patent system so broadly, then in light of Arrow and Samuelson’s objections, a solely market based narrative is ill advised. When so broadly conceived, private decision will likely not be able to provide the decentralized “analogue calculating machine” needed to provide the optimal allocation of resources to innovation. We are stuck with the incentive access paradigm despite the 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 public goods problem generally when he “emphasized”¹²⁴ the

¹¹⁷ Arrow 613.

¹¹⁸ Arrow 618.

¹¹⁹ Arrow 619.

¹²⁰ Arrow 616.

¹²¹ Ward S. Bowman Jr., *PATENT AND ANTITRUST* 17 (1973).

¹²² Scotchmer 83

¹²³ Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 *J. L. & ECON.* 265, 276 (1977).

¹²⁴ Samuelson, 389.

problems with private provision. And Arrow, though using the term “invention,” focused on information generation. Perhaps some narrower view might still work. 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.”¹²⁵ And indeed Arrow pointed the way noting that “the underinvestment will be greater for basic research.”¹²⁶ Rather than focusing on information generally, we should instead focus on fairly late stage, well developed technology.

In particular, this section will conclude by presenting a constructive proof that some bundles of technological information can be commodified. It focuses on a cost saving process invention and it shows that it could be efficiently provided by private decision-making. Following that example, the next section proceeds to highlight how the invention and the other requirements of the patent statute structure the system as a simple market for inventions.

Both Arrow’s and Samuelson’s objections to 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 uncertainty by the user. But 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 indeed have shown that under such conditions, an optimal allocation of resources can result.¹²⁷ Furthermore, it should be emphasized that “no potential customers of the public good are denied access.”¹²⁸ Together these are two highly appealing characteristics yet “the informational requirements of [the] model are extremely demanding” and as a result “[a]ll are uncomfortable with the assumption of complete knowledge ... and tailor[ing] ... different price[s].”¹²⁹ Despite worries that such model assumptions are “extremely demanding,”¹³⁰ this section provides one highly relevant example where we can expect those stringent conditions to be present. In particular the section will focus on the cost saving process invention.

¹²⁵ Samuelson, 389.

¹²⁶ Arrow, 619.

¹²⁷ See CORNES & SANDLER, at 243-47 (following the analysis in Earl Thompson, *The Perfectly Competitive Production of Collective Goods*, 50 REV. ECON. STAT. 1 (1968); see also Oakland in Hnadbook shows that monopolist with perfect information will deliver Samuelson condition.

¹²⁸ CORNES & SANDLER, at 247.

¹²⁹ CORNES & SANDLER, at 248.

¹³⁰ CORNES & SANDLER, at 248.

i. A Cost Saving Process

Assume an industry that produces a single output product and that output results from the transformation of a single input by way of a single public domain process. Economists describe such a package of technological know-how as production plan and they represent them by way of netput vectors.¹³¹ Such a process can be described by the netput vector $(\alpha, 1)$ where $\alpha < 0$. In other words, α units of input are consumed to produce a single unit of output.

Now presume a person who is knowledgeable about these processes who thinks that, with some expenditure of scarce resources and work, that they can improve this industrial process. Assume this person, who we will call the inventor, confidently knows that she can consume various of her scarce resources (principally her own time) in order to create a more efficient process for producing the same output. Using the earlier notation that new process could be described by a new net put vector $(\beta, 1)$ for creating the same output where $\alpha < \beta < 0$. This is a better process as fewer resources are needed to create the same amount of output. The inequality simply states that with the new process fewer units of input are needed to create the same output; in essence it is a more efficient process.

As discussed above, before getting to any questions of 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 does provide exactly that determination.¹³²

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

Valuation can be confidently for each industry participant. A firm that produces q_i units of the output using the new process will have a MRS_{zy}^i for the newer process of $q_i p_{input} (\beta - \alpha)$. This is their cost savings created by using the new process instead of the older, public domain process. Each firm knows that whenever they want to produce a unit of the output then they will benefit by using the newer process. There is no room for strategic reporting of the MRS_{zy}^i because both the inventor and the firms using the processes know how to value the process. And though I will discuss exclusive rights below, negotiations between inventor and users need not run into Arrow's Information

¹³¹ See DAVID M. KREPS, A COURSE IN MICROECONOMIC THEORY 233-64 (1990).

¹³² See *supra* .

Paradox.¹³³ As long as firms are assured that the process “works for its intended purpose” of producing one unit of output for every β unit of input, then firms can form a valuation of the process without even know exactly how the process works. If a firm wants to use the new process they must license from the inventor. The inventor knows that the new process is worth $q_i p_{input} (\beta - \alpha)$ to each firm and the inventor can expect the licensee to agree as long as the licensing fee on a price per unit of output is $\gamma p_{input} (\beta - \alpha)$ where $0 < \gamma < 1$.¹³⁴

On the supply side, an inventor will undertake creating the cost saving process whenever it is her best option. That is the inventor will undertake the project whenever

$$\gamma Q p_{input} (\beta - \alpha) \geq c$$

where the industry as a whole is producing Q units of output. Here c is the highest price the inventor can receive for the alternative uses of those scarce resources that are consumed in producing the new process. Assuming that the price system is working then $c = MRT_{zy}$ and therefore a privately motivated inventor will be make the decisions to allocate resources to inventing only when society would concur with that resource allocation. In other words, this section showed that there exists at least this one example of a special package of technological information that can be valued and that can be 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 unambiguously socially beneficial activity that is driven by private decision-making. And note that no one is denied use of the invention. The next section expands this one specific example to the entire class of inventions and it explores the patent system needed to back a market in inventions.

IV. A Patent System for Backing a Market for Inventions

The previous section showed that, contrary to widely held beliefs, there are packages of technological information whose creation and voluntarily exchange in a market can be shown to be socially beneficial. Like a private property market more

¹³³ See *supra* Arrow

¹³⁴ See Lemley discussing the theoretical default value for, γ , that divides the surplus,. The parameter γ ranges from 0 to 1 and it represents the fraction of the surplus that goes to the inventor versus the 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. $\gamma=1$). In ongoing research I am to consider conditions and implications of whether the inventor will look to industry demand curve for the output to decide if there is a benefit to dropping their demanded share that will then allow industrial output expansion. If $\gamma=1$ then output does not expand. But if license written in this way will firms expand output and if $\gamma < 1$ will firms automatically compete to expand output.

generally, it identified socially beneficial behavior where scarce resource utilization is guided by private decision making. Yet such behavior “do[es] not arise simply because the benefits of having them outweigh the costs. They require institutions to support them.”¹³⁵

This section explores the institution¹³⁶, *i.e.* the patent system, that is needed to support this socially beneficial activity. In particular the section examines two critical issues: gate-keeping and harm prevention. First, as to gate-keeping, Arrow and Samuelson emphasized that most packages of information cannot be easily commodified for market exchange. Yet as shown above the cost saving process is an exception to that general rule. The patent system that aims to support such a market must separate which packages can and cannot be exchanged in this market. Second, as its role is to support socially behavior, such a patent system defines its exclusive rights by prohibiting harmful acts by third parties. In short, it prevents the acts that would prevent people from otherwise utilizing this socially beneficial institution.

In addition, the section also considers whether that the patent system described coincides at all with our existing patent system? Interestingly, it does. Though this market narrative is different in kind from existing patent theories, this section shows that the patent statute needed to support this new market oriented narrative is not very different from the existing patent statute. As to gate-keeping, this section will show that the commodifiable technological thing is an invention – a concept already with fundamentally important characteristics in patent law. A quick look to the gate-keeping statutory provisions of section 101 and 112 shows that indeed the invention is the central character. And as to preventing harm, the narrative leads to the normative aim of preventing acts like unauthorized selling and using of the patented invention and indeed the current statute coincides with those requirements as well.

Though the statutory provisions needed to support and back this market for inventions already exists, the interpretation of those statutory provisions needs adjustment as they are currently colored by the incentive narrative. Interestingly, most of those new interpretations involve reforms that have been already individually suggested in the scholarly literature. This section shows that this new market oriented narrative provides an economically justified and unified basis for those (until now) separate reforms.

a. Patentable & Unpatentable Subject Matter: Inventions & Non-Inventions

¹³⁵ Asish Arora et. al., *Markets for Technology* 278 (2001)(“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.”).

¹³⁶ See Hanoch Dagan for extended discussion of property and institutions.

The first critical role for a patent system is gate-keeping. It needs to regulate the things that are being sold on the market that the patent system supports. And as shown above, only very specific packages of information can be commodified in an open market and therefore this gatekeeping function is quite important. In particular, Arrow pointed to both difficulties in valuation and tractability as the likely sources of market failure. As a result, the patent system needs to identify and select those packages of information that can avoid those problems. As noted by Ward Bowman,

“The production of knowledge in general (especially basic research) as Arrow stresses, tends to be substantially underrewarded in a market system unless special provisions are made for its production. Whether the specific form of knowledge qualifying for patentability would also be underreported without protection depends upon what it is that is patentable.”¹³⁷

In other words, patentable subject matter and the requirements of patentability should be tailored to ensure that patents cover technological things that can in fact be properly rewarded by voluntary exchange.

This section argues the current patent system already has the tools to undertake this critical gate keeping function. The cost-saving process discussed above is just one example of a broader class of technological packages that can be commodified. Marketable packages of technological information are better known as *inventions*. Inventions are special packages of technological things that can be both valued and around which exclusive rights can be tractably employed.

In an important sense, these limitations on patentable subject matter can be tied into the rich discussions of modularity in the management literature that has recently appeared in discussions of property and even intellectual property. This section shows that only specific technological things can interface with the existing price system. That is, the need to avoid the problems with valuation and tractability can be seen as the institutional design constraint that patentable subject matter limits the system to technological modules that fit and interface with the existing price system. In other words, as opposed to tangible goods, where the level of granularity of defining commodifiable things can be arbitrarily small,¹³⁸ the world of commodifiable technological information is much more limited and constrained to inventions.

To ensure the proper functioning of this gate keeping function, the patent system must limit patents to inventions and as discussed below this implicates a number of doctrinal areas in patent law including the topics of patentable subject matter, reduction to practice, utility, and the disclosure requirements. Emerging strands of scholarship and judicial opinions are putting greater emphasis on these issues. This section shows

¹³⁷ Ward S. Bowman Jr., *PATENT AND ANTITRUST* 32 (1973).

¹³⁸ See Coase, *Nature of the Firm*

that these seemingly disparate areas of reform are all nudging the patent system toward a substantive vision of the invention as the marketable technological thing¹³⁹ and toward a system where exchange of the invention is the normative heart of the system.

i. The Invention: The Modular Interface with the Price System

As discussed above Arrow argued that both the uncertainty and inappropriability of information made it ill-suited for markets. As to uncertainty, Arrow noted two sources. First, he argued that the value of the information was uncertain. Second, information generation was risky and unpredictable. In particular, information is often used “in developing further information”¹⁴⁰ and under such circumstances “the value of information ... is much more conjectural.”¹⁴¹ 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 the process itself can be valued by users. That process had reached a level of refinement where it worked and it was ready to be employed by others. That level of refinement allowed the creator to approach firms and to describe what, with particularity, the process would do for them. In an important sense that cost saving process, and indeed the whole class of inventions generally, require refinement so that both technical and economic details come into focus. On the technical side the inventor can promise that person of skill can utilize the invention to achieve its intended purpose. At the same time 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 establish the valuation of the process.

In so far as valuation, a cost-saving process example 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. And as it is presumed to be a new process for creating an old product, there is already a well-established substitute process in the public domain. Given all that economic information, the cost saving process can be priced by the inventor and firms. Indeed the ability to make quantitative estimates about cost saving process invention has been highlighted for some time.¹⁴²

Process inventions are certainly still an important part of patentable subject matter¹⁴³ and notably they were traditionally the focus of the earliest patent systems.¹⁴⁴ And

¹³⁹ On things in intellectual property see Michael Madison.

¹⁴⁰ Arrow 618.

¹⁴¹ Arrow 618.

¹⁴² See Fritz Machlup, Senate Report 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 economize in the production of the original output.”).

¹⁴³ See 35 U.S.C. 101.

because of their potential for valuation, the market narrative described in Section III, can provide justification for a patent system covering processes. Nonetheless the important question arises whether, beyond process inventions, can these same arguments extend to the other types of traditional patentable subject matter: “machine[s], manufacture[s], or composition[s] of matter.”¹⁴⁵ Beyond process inventions, many have argued that valuation becomes harder. Fritz Machlup among others argued that “there is little possibility, however of estimating the social benefit of quality improving invention, and almost no possibility in the case of inventions of new products.”¹⁴⁶

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 as the inventor of a new machine, manufacture or composition of matter must also disclose both how to make that thing as well as 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 using. The main difference between valuation of the cost saving process and the process of using some new, nonobvious thing is that there will generally be less information about the demand for new use of that thing. Surely in many cases the valuation of the invented thing will not assume a compact, closed analytical form as was the case above.

In addition to valuation uncertainty, Arrow also pointed out that the creation of information also has other aspects of uncertainty.¹⁴⁷ He noted that information production was uncertain on the cost side of the equation as information generation “must be a risky process, in that the output (information obtained) can never be predicted perfectly from the inputs.”¹⁴⁸ But should these types of uncertainties matter? Does that extra uncertainty in the demand curve make them ill-suited for a market exchange?

I would argue that they should not. That type of uncertainty is very similar to uncertainties that make life challenging for any firm selling tangible goods and services. As argued by Frank Knight in his classic work *Risk, Uncertainty, and Profit*, managing

¹⁴⁴ JUSTINE PILA, THE REQUIREMENT FOR AN INVENTION IN PATENT LAW 24 (2010) (“An 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.”)

¹⁴⁵ 35 U.S.C. 101 (2006).

¹⁴⁶ *Id.* (Machlup at 61); see also 3 Phillip E. Areeda Herbert Hovenkamp, *Antitrust Law: An Analysis of Antitrust Principles and their Application* Section 707i, at 293 (3rd 2008) (“value 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.”)

¹⁴⁷ Arrow 616 (note that this particular concern, namely the cost uncertainty applies both to process and tangible thing inventions).

¹⁴⁸ Arrow 616.

such business uncertainties is in fact the main ingredient of successful entrepreneurs.¹⁴⁹ As to the uncertainties of inventing in particular Knight added that “[inventions] are in large part the result of deliberate application of resources to bring them about, and in the large if not in a particular instance, the results of such activity can be so for foreseen that it is even possible the hired men and borrow capital at fixed remunerations for the purpose of carrying it on.”¹⁵⁰ In other words, though some uncertainty remains, and surely valuation outside the cost saving process context will be more difficult, inventions as a class have properties that enable valuation such that rational economic decisions can be made about both creation and selling of those inventions.

In addition to uncertainty, Arrow also pointed out that information was largely inappropriable due in large part to tracing difficulties. 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.”¹⁵¹ But for the cost saving process these tracing concerns have far less force. The cost saving process was described as a specific set of physical steps that would produce the output product. Though such industrial techniques may be often practiced behind closed doors, there is not a theoretical problem with enforcing exclusive rights over that particular process.

Much of this discussion can be aided and understood as an application of the concepts of modularity developed by the work of economist Herbert Simon.¹⁵² His work “explain[ed that] the decomposition of a complex problem into separate, more elementary some problems, is an organizational design issue.”¹⁵³ As stressed by Henry Smith such parsing of problems in manageable parts provides great benefits in reducing information costs and such costs a critical aspects of property rights systems.¹⁵⁴

Simon’s work and the previous scholarship that brought it to bear on property theory provide 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. Arrow’s and Samuelson’s objections to markets in technology can be seen as information cost arguments that such arbitrary bundles of technological information do not easily fit as modules with the existing price system.¹⁵⁵ 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. That is, the patent system

¹⁴⁹ See FRANK H. KNIGHT, RISK, UNCERTAINTY AND PROFIT (1957).

¹⁵⁰ Knight at 318; see also Bowman 29.

¹⁵¹ Arrow 617.

¹⁵² See Henry Smith, Arora & Merges,

¹⁵³ Asish Arora et. al., Markets for Technology 99 (2001).

¹⁵⁴ Henry Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691 (202)

¹⁵⁵ See *Id.* (describing the lego-like fit of well designed modules).

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 which are made up of production plans, sometimes referred to as netput vectors. Engineers at the firm tell the business side of the firm of their technological capabilities. In others they let the business side know about their technical ability “to transform arrays of commodities into different arrays.”¹⁵⁶ This set of all feasible production plans is called production possibility set.¹⁵⁷

Armed with that information, the neoclassical firm aims to make the best business decision as to what production plan to actually implement. To find that best production plan, the business side of the firm must estimate the demand for all possible outputs and then calculates 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 their profit.¹⁵⁸

Aiming to leverage modular design, the market for invention is specifically designed to interface with those firms and their capabilities. In particular inventions are defined such that those firms can provide a valuation of the invention. Inventions in this regard can be thought of as particular production plans.¹⁵⁹ In essence inventors approach these neoclassical firms and tell them about the utility of their invention. In other words, they tell the firms what the invention can do in terms of the production plan the invention enables. The firms then simply can redo their profit maximization calculation, now incorporating the one added production plan (ie the invention). The difference between the maximum profit 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; the patent system is designed to interface with the existing price system. It takes the neoclassical firms and it then builds a market for inventions where buying and selling inventions becomes an endogenous extension of the existing neoclassical model. In a sense, technological growth (and the direction of technological growth) becomes an endogenous result of these specialized invention producing firms and the broader invention consuming firms.¹⁶⁰

ii. Unpatentable Subject Matter: Non-Inventions

¹⁵⁶ DAVID M. KREPS, A COURSE IN MICROECONOMIC THEORY 234 (1990).

¹⁵⁷ *Id.* at 234-239.

¹⁵⁸ *Id.* at 239-53.

¹⁵⁹ More precisely I would say that each particular embodiment that makes up an invention is a particular production plan.

¹⁶⁰ See Paul M. Romer, *Endogenous Technological Change*, 98 J. POL. ECON. S71 (1990).

Along with defining what types of technological advances the system aims to make into marketable commodities, this market narrative also suggests the types of advances that cannot. 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].”¹⁶¹ Indeed as the Supreme Court has made clear that basic scientific discoveries are not patentable subject matter.¹⁶²

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.¹⁶³ 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 is 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 hard 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 result remains highly uncertain. For this reason, advances that are not completed invention but are still just “research plans” or “abstract ideas” do not receive patent protection.¹⁶⁴

Scientific discoveries as well as incomplete technological advances (abstract ideas) also suffer from traceability problems. As inputs to further concrete work, as argued by Arrow, unauthorized use of these types of information are hard to detect and police. In this regard the existing patent statute that explicitly grants protection only to inventions takes advantage of modularity. Only specific packages of information that couple and properly fit with the existing price system are recognized by this institution.

iii. Unifying Existing Scholarly Reforms

¹⁶¹ Arrow 62 at 618.

¹⁶² See *Prometheus v. Mayo*.

¹⁶³ See *Bilski v. Kappos*.

¹⁶⁴ See *Ariad v. Eli Lilly*. 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-kB pathway would enable reduction of the harmful side effects of the inflammation cause by the pathway. But the patentee had not yet invented anything. 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.

This new patent narrative puts emphasis on a number of features of the patent system. Interestingly many of those features 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, not surprisingly called 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 it can be described in enough detail so that following that description “without more” it can be practiced by “any” person of skill in that technological area.¹⁶⁵ In particular the invention market narrative puts emphasis on the substantive concept of the invention featured in both section 101 and 112 of the patent statute. Furthermore within the concept of the invention, this narrative puts heavy emphasis on concepts like disclosure, reduction to practice (whether actual or constructive), utility, and relatively late filing. This section describes some of those earlier proposals and ties them to the market narrative.

In recent years, a number of scholars have argued for reforms that push in this general direction. Both Chris Cotropia and I have been pushing for a conceptual understanding of the invention as the actual technological thing created by the inventor.¹⁶⁶ The current vision of the invention sees the invention not mainly as the technological thing but solely as a short-hand for the claimed subject matter. We both argue that this current view is a mistake and that a returned focus on the technological creation would, not only keep the system true to its statutory and constitutional underpinnings, but it would also solve many of the current controversies in patent law. In a market for inventions narrative, the substantive invention, the solution created by the invention that consumers will buy and use must be the central focus.

In addition this focus on the invention as the completed, ready to be practiced, technological solution, puts renewed emphasis on a strong utility requirement. There have already been suggestions that utility needs to be strengthened. Michael Risch, in a series of recent articles, argued for a reinvigorated utility requirement that would extend to what he called commercial utility.¹⁶⁷ He “reason[ed] that a core benefit of the [utility] requirement is to aid in the commercialization of inventions.”¹⁶⁸ This is to

¹⁶⁵ 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 Asish Arora et. al., *Markets for Technology* 101 (2001)(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.”)

¹⁶⁶ See Oskar Liivak, *Rescuing the Invention from the Cult of the Claim*, 42 *Seton Hall L Rev.* 1 (2012); Chris Cotropia, *What is the Invention?* *Wm Mary L Rev* (2012).

¹⁶⁷ See Michael Risch, *Reinventing Usefulness*; Michael Risch, *Utility: A Surprisingly Useful Requirement*.

¹⁶⁸ Michael Risch, *Reinventing Usefulness* 2

“ensure that inventions are worth more to the public than they cost.”¹⁶⁹ Those reforms are in line with a patent system whose goal is to back a market in inventions.

Lastly, there has been a longstanding 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 is often cited as the basis for the push for early stage patenting.¹⁷⁰ Kitch argued that early patenting allowed the inventor to more efficiently mine the patent prospect by giving the inventor central, exclusive control coordinate the development and then commercialization of the invention.¹⁷¹ Recently John Duffy added to these early filing rationales by arguing the early filing had an overlooked, yet important, benefit: earlier patent expiration and thus earlier entry into the public domain.¹⁷²

Pushing in the other direction, Chris Cotropia has argued that early filing is a mistake.¹⁷³ He argued that “early filing forces inventors to make decisions to draft applications with little technical or market information about the invention.”¹⁷⁴ Arguing for later filing, he argues that “all inventors would be required to reduce their invention to practice before [filing].”¹⁷⁵ His arguments are consistent with the market narrative developed in this article. Certainly the inventor must reduce the invention to practice. For it to be marketed to others, it needs to work for its intended purpose. And certainly to overcome Arrow’s and Samuelson’s objections, it needs to be developed so that there is enough technical and market information so that both inventors and users can reach agreement in negotiating exchange.

As is clear, the market narrative requires relatively clear technological and market information. I think that is inherent in what it means to invent. As a result, reforms that push toward later filing where the patentee needs to have an invention (not just some technological idea) also support a market in inventions.

b. Exclusive Rights & Correlative Duties to Prevent Harm to the Market

¹⁶⁹ Michael Risch, *Reinventing Usefulness* 3

¹⁷⁰ Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977)

¹⁷¹ *Id.* at 276-79.

¹⁷² John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439 (2004).

¹⁷³ Christopher A. Cotropia, *The Folly of Early Filing*, 61 *Hastings L.J.* 65 (2010).

¹⁷⁴ Christopher A. Cotropia, *The Folly of Early Filing*, 61 *Hastings L.J.* 69 (2010).

¹⁷⁵ Christopher A. Cotropia, *The Folly of Early Filing*, 61 *Hastings L.J.* 71 (2010). 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 short cut for inventors. Constructive reduction to practice, as any legal use of the work constructive, is a legal fiction where the technological advance has been refined to such a point that it could just as easily been actually reduced to practice but for sake of efficiency it was not.

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 easier to define the rights by first examining the Hohfeldian correlative duties that will make up that right.¹⁷⁶ And as to duties, the question will be the duties of (generally) third parties from causing harm to the market. In other words, the above discussion describes socially beneficial behavior, and the question is what actions by others could possibly interfere with that beneficial behavior.¹⁷⁷ By determining the acts that should be prohibited, the patent system will bind the rest of use with exactly those duties to avoid those harms by granting the inventor the correlative rights of those duties. As discussed below, for the most part, those exclusive rights match surprisingly well with the rights granted by the current patent statute.

In order for the market to work properly, each consumer of the invention must signal their valuation of their use to the inventor. And there are a number of ways that signaling function can be disrupted. The following discusses these acts in descending order of seriousness. First, consider outright piracy of the invention. Imagine that the inventor discloses the invention to another and that person then turns around and starts to sell the invention themselves. This is likely the most harmful act for such a market. Each sale made by the pirate is a lost valuation and if piracy were widespread then surely 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. And accordingly the patent system should grant an exclusive right the inventor “to sell” and even to “offer to sell” the invention.

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

Lastly, there may be instances where a third party intends to either sell or themselves utilize the invention, and they first make the invention. In order to stave off the harm from unauthorized sales or uses, it seems reasonable to grant an exclusive right “to make” the invention. Yet 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 immediately seem harmful and indeed from the perspective of

¹⁷⁶ See Hohfeld.

¹⁷⁷ See Larissa Katz, *Exclusion and Exclusivity in Property Law*, 58 U. TOR. L. J. 273 (2008).

harm to the market, there are strong arguments for a research use exemption certainly for the exclusive right to make and to some degree to use as well.¹⁷⁸

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. Yet the narrative places those exclusive rights in a very different context. In particular, the market narrative defines the rights through a concept of a fairly direct harm to the market actors. In the current incentive based narrative, exclusion is seen as the reward for having earned a patent. Harm is not a central part of that story.¹⁷⁹

By constructing the normative theory of patent law on socially beneficial behavior and then predicating exclusion around preventing the third-party actions that can harm that behavior, patent law can finally begin to integrate itself with other bodies of private law.¹⁸⁰ And indeed there have been recent calls to introduce a concept of harm into patent law. Hovenkamp & Bohannon argue that “an essential part of an infringement lawsuit should be proof of actual injury.”¹⁸¹

V. Implications & Further Research

a. Unified Patent Law and Industry Specific Innovation

As described above one strong result of this new patent narrative is that the scope of patent exclusion should not extend by 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.¹⁸² Yet there is one facet of this unified argument that appears at first troubling.

During the course of the past decade, Mark Lemley and Dan Burk authored a series of articles that argue that patent law should be industry specific and that, though it is a daunting task, patent law should take these industry differences into account.¹⁸³ That work culminated in a book that 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

¹⁷⁸ Rebecca Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U Chi L Rev 1017, 1074-78 (1989).

¹⁷⁹ Hovenkamp & Bohannon 61 (“The patent system lacks a serious harm requirement.”)

¹⁸⁰ See Weinrib *The Idea of Private Law*; see Sichelman, *Purging* (noting the disconnect between current patent theory and private law).

¹⁸¹ Hovenkamp & Bohannon 15

¹⁸² See Liivak, *Rescuing; Liivak, Finding Invention*

¹⁸³ See Lemley Burk articles and books.

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 industries.¹⁸⁴

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.¹⁸⁵ Second, taking the incentive narrative for patents as a given, those differences should be accounted for by the rewards granted by an optimized patent system.¹⁸⁶ And as a corollary then any strictly uniform patent system has to be under and over incentivizing some industries.¹⁸⁷ To a large extent their views have been accepted is agreement that the “factually right answers to problematic questions about the duration and scope of IP rights ... are very complex and may vary considerably from one industry to the next.”¹⁸⁸

So how does the unified patent system (and in particular, 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 – and that is an important strength of a system that is not aiming itself to calibrate incentives.

Instead, 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 sees that this institution can be beneficially utilized by their firm then they will use it. In other words, 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 that they can turn to and layer to structure that business. In short, patent law need not be industry specific yet, as differing firms will differ in the way and amount that they rely of the system, the net effect will address those differing needs. Consider the very differing needs of an apartment building developer in Manhattan versus a rancher in Montana. Both can utilize the fairly uniform property laws yet they are utilizing the tool of property to support very different businesses.

b. Further Research

¹⁸⁴ Dan Burk & Mark Lemley, *The Patent Crisis and How Courts Can Solve It* 5 (2009).

¹⁸⁵ *Id.*

¹⁸⁶ *Id.*

¹⁸⁷ Scotchmer 117 (noting the “defect’ arising from the ‘one-size-fits-all’ IP system.... It is almost inevitable that some classes of innovations are under rewarded and others are over rewarded relative to the costs of invention.”)

¹⁸⁸ Hovenkamp & Bohannon 47

Though the above section detailed the contours of the exclusive rights that would be supported by this market narrative, many features are left to explore in future work. For example, two important features were not explicitly discussed: compulsory access and independent inventors.

As to access, note that one of the most appealing features of the cost saving example is that no user for the process would be excluded from access. As denied access due to exclusion is considered one of the major costs of the current system such universal access is surely intriguing. It certainly suggests that Arrow was wrong to think that incentives are inherently in conflict with access. Yet the question remains how can a patent system guarantee (or at least maximize access) without sacrificing some other goal?

VI. Conclusion

This article shows that at least part of the existing patent system can be justified along lines similar to the economic justification for private property exchange more generally. It did so by limiting the patent system, not to providing a market in technology, but rather to market in inventions. Inventions were shown to be special technological things that, in contrast to other technological information, should be capable of being valued and negotiated over by neo-classical firms. With that narrowed focus, relatively exacting claims can be made about the social benefits created by voluntary exchange of inventions with those that can use them. In this narrative the patent system leverages a modular design that enables it to adapt itself to interface with neoclassical firms through the price system and thereby also enable the system's benefits to be quantified and ultimately justified.

That is hopefully not the end of the story, rather is just the beginning. This brief introduction to the market narrative leaves a number of important and interesting questions for future research.