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Independent Invention as a Defense to Patent Infringement

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Independent Invention as a Defense to Patent Infringement

by Samson Vermont[1]

ABSTRACT

Independent invention is no defense to patent infringement under current law. This paper argues independent invention should be a defense provided the independent inventor creates the invention before receiving actual or constructive notice that someone else already created it. The defense reduces wasteful duplication of effort and enhances dissemination of inventions without lowering the incentive to invent below the necessary minimum. To be sure, the defense lowers the incentive for inventions that face significant odds of being invented by more than one inventor. By enabling a second inventor to compete with a first inventor (the patentee), the defense essentially breaks up the first inventor's monopoly into a duopoly. Monopoly profits exceed the collective profits of duopoly. Thus, from the perspective of inventors ex ante the defense reduces the expected profit for inventions that face significant odds of being invented by more than one inventor. Yet, as long as the reduction is moderate, the expected profit will usually remain sufficient. Per Bayes theorem, the fact that an invention faces significant odds of being invented by more than one inventor is itself evidence that a moderately reduced expected profit will motivate at least one inventor to create the invention.

I. INTRODUCTION

Many scholars who study intellectual property ("IP") argue we should tailor rights in IP so that they provide protection only when output of IP would clearly be too low without protection.[2] This argument rests on a variant of one of the following three claims.

First, the last bit of supra-competitive pricing by a monopolist provides disproportionately small profit to the monopolist in comparison to its social cost.[3] For example, lowering by 10% the price of an invention charged under a patent monopoly[4] might reduce the patentee's profit by only 1% while reducing the social costs of the patent monopoly by 19%.[5] This suggests the optimal patent monopoly falls short of providing complete exclusivity over the invention.[6]

Second, property rights serve two related functions: they provide (i) a way of deciding who gets what when and (ii) an incentive to create or improve the what.[7] In the case of rights in IP, function (i) is perverse – because IP is largely non-rivalrous. We cannot both drive the same car to different places, but we can both use the same invention

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[2] *See, e.g.,* William M. Landes & Richard A. Posner, *The Economic Structure of Intellectual Property Law* 9-10, 21-24 (2003).

[3] Ian Ayres & Paul Klemperer, *Limiting Patentees' Market Power Without Reducing Innovation Incentives: The Perverse Benefits of Uncertainty and Non-Injunctive Remedies*, 97 Mich. L. Rev. 985 (1999). *See also* Daniel J. Gifford, *How Do the Social Benefits and Costs of the Patent System Stack Up in Pharmaceuticals?* 12 J. Intell. Prop. L. 75 (2004). This logic applies equally to tangible property.

[4] 'Patent monopoly' is convenient shorthand for a *degree* of market monopoly. A patent seldom confers a complete market monopoly over a good or service. *See* Kenneth W. Dam, *The Economic Underpinnings of Patent Law*, 23 J. Legal Stud. 247 (1994). *See also* Landes & Posner, *supra* note x, at 22; John F. Duffy, *The Marginal Cost Controversy in Intellectual Property*, 71 U. Chi. L. Rev. 37, 54-55 (2004).

[5] These figures are based on a simple linear model. Ayres & Klemperer, *supra* note x, at 990 Table 1. Gifford presents a model that suggests the last bit of supra-competitive pricing is even more disproportionately costly in the normal case in which demand is concave. *See* Gifford, *supra* note x.

[6] Ayres & Klemperer, *supra note x, at* 989.

[7] *See* David D. Friedman, *Law's Order* 138-39 (2000).

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to build different machines and we can both simultaneously read different copies of the same book. This suggests that the case for rights in IP is weaker than the case for rights in tangible property.[8]

Third, IP generates higher rent dissipation and transaction costs than tangible property.[9] This too suggests that the case for rights in IP is weaker than the case for rights in tangible property.

These three claims are more or less sound. By themselves, they counsel in favor of erring on the side of under-rewarding invention. But they do not tell the whole story. The other part of the story is that once in a while an invention provides net benefits to society that astronomically exceed the net benefits to the inventor. The net social benefits of any type of property (intellectual or tangible) always exceed the net private benefits – because the social benefits include the private benefits. Yet, for inventions the difference between net social benefits and net private benefits can be staggering. Consider the polio vaccine. The private benefits to the inventor, Jonas Salk, consisted of fame, gratification and relatively modest financial gain. The social benefits consisted of millions of saved lives. No particular piece of tangible property can compete with the polio vaccine in terms of the great gap between net social benefits and net private benefits. Indeed, it is tempting to conclude that the social benefits of the polio vaccine exceed the combined social costs of every invention and IP right that has ever existed. This may also be true for inventions such as the smallpox vaccine, penicillin, and the

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[8] *See also* Michele Boldrin & David Levine, *The Case Against Intellectual Property*, 92 Am. Econ. Rev. 209-212 (2002); Michele Boldrin & David Levine, *Case Against Intellectual Monopoly*, *Chapter 2*, (Working Paper, 2003), available at http://levine.sscnet.ucla.edu/papers.htm [hereinafter Boldrin & Levine, *Monopoly*]; Danny Quah, *24/7 Competitive Innovation* (London Sch. of Econ, Working Paper, 2002), available at http://econ.lse.ac.uk/staff/dquah/currmnu1.html#working%20paper.

[9] *See* Landes & Posner, *supra* note x, at 12-17. "The principal difference between the law of intellectual property and the law of physical property is that the transaction costs tend to be much higher in the former case. The difference argues for less extensive propertization of intellectual than of physical property." *Id.* at 8. *See also* Robert P. Merges, *Rent Control in the Patent District: Observations on the Grady-Alexander Thesis*, 78 Va. L. Rev. 359, 374-75 (1992) ("A substantial literature documents the steep transaction costs of technology licensing…."); Edmund W. Kitch, *Patents, Prospects, and Economic Surplus: A Reply*, 23 J.L. & Econ. 205 (1980); Paul Heald, *A Transaction Costs Theory of Patent Law*, 66 Ohio St. L.J. 473 (2005). *Cf* Yoram Barzel, *Some Fallacies in the Interpretation of Information Costs*, 20 J.L. & Econ. 291, 292 (1977) (high transaction costs are what cause high rent dissipation).

pesticide DDT. By preventing malaria, DDT allegedly saved 500 million lives[10], which is more than twice the combined fatalities from all wars and atrocities in the 20th century.[11] Nor is the great gap between social and private benefits limited to health-related inventions. Consider the light bulb, telephone, combustion engine, airplane, television, transistor, and integrated circuit.

Would these super valuable inventions have ever been created and put to use had they been entitled to weaker patent protection? With the remotely possible exception of DDT[12], the answer is almost certainly yes. Super valuable inventions are precisely the inventions that are very likely to be produced even in the total absence of patent protection. Weaker patent protection, however, might have delayed a few of them a little bit.[13]

Many IP scholars seem to believe we can often get something for next to nothing, *i.e.*, that by scaling back patent protection we can often markedly decrease its social costs without markedly increasing the risk of missing out on or delaying invention. Actually, we *can* get something for next to nothing. But the opportunities to do so are exceptional. The key to exploiting these opportunities is to isolate the inventions for which scaling back patent protection would avoid disproportionately high social costs and/or would pose disproportionately low risks of under-rewarding inventors. This paper identifies a

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[10] *See* Nat'l Acad. of Sci., *The Life Sciences: Recent Progress and Application to Human Affairs, The World of Biological Research, Requirements for the Future* 432 (1970).

[11] *See* Zbigniew Brzezinski, *Out of Control: Global Turmoil on the Eve of the Twenty-First Century* (1993); Matthew White, *Deaths by Mass Unpleasantness: Estimated Totals for the Entire 20th Century*, http://users.erols.com/mwhite28/warstat8.htm (last visited Mar. 6, 2006) (estimating 188 million deaths from war and atrocities in the 20th century).

[12] In 1939, Paul Müller synthesized DDT and found that it quickly killed flies, aphids, mosquitoes, walking sticks and potato beetles. Müller patented it in Switzerland (1940), England (1942) and U.S. (1943). J. Gordon Edwards and Steven J. Milloy, *100 things you should know about DDT*, http://www.junkscience.com/ddtfaq.htm (last visited Feb. 2006). Had DDT been entitled to less patent protection, it is possible Müller never would have synthesized it or discovered its use.

[13] Weaker patent protection implies lower expected revenue for the inventor. An inventor will not pursue an invention unless his expected revenue exceeds his costs of invention. The costs of invention fall with time. (Inventing the polio vaccine today, for example, would not require the Herculean effort it required in the 1940s.) Thus, lowering expected revenue will delay an inventor's pursuit of invention until his costs of invention fall below his expected revenue.

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class of inventions for which this requirement can be satisfied: inventions that face significant odds of being invented by more than one inventor at roughly the same time.

Under current U.S. law, the second to invent generally comes up empty handed. Suppose inventor Smith and inventor Jones toil away for years in separate efforts to build a better mousetrap. They conceive essentially the same design but Smith does so a few months after Jones. Smith and Jones separately perfect the design, file for patents, and then start commercializing the mousetrap. Under U.S. law, only inventor Jones will receive a valid patent. As soon as Jones' patent issues (usually 2-3 years after its filing date), Smith can no longer make, use or sell the mousetrap unless Smith acquires a license from Jones.

This type of neck-and-neck finish is common. Researchers frequently converge on the same idea at roughly the same time.[14] Famous examples include the light bulb (Edison and Swann), telephone (Bell and Gray), integrated circuit (Kilby and Noyce), calculus (Newton and Leibniz), periodic table (Mendeleyev and Meyer), telegraph (Morse, Henry, Cooke and Wheatstone), telescope (Hans Lippershey, Drebbel, Fontana, Jansen, Metius and Galileo – each claiming they invented it in 1608 or 1609)[15], and certain facets of the theory of relativity (Einstein and Poincaré)[16]. Some historians and philosophers of science believe convergence is the rule rather than the exception.[17]

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[14] *See* David Lamb and Susan M. Easton, *Multiple Discovery: The Pattern of Scientific Progress* (1984); Robert K. Merton, *Singletons and Multiples in Scientific Discovery: A Chapter in the Sociology of Science*, 105 Proc. Am. Phil. Soc'y 470 (1961); Eugene Garfield, *Multiple Independent Discovery & Creativity in Science*, 44 Current Contents 5 (1980), *reprinted in* 4 *Essays of an Information Scientist* 660 (Eugene Garfield ed., 1981); William F. Ogburn and Dorothy S. Thomas, *Are inventions inevitable?* 37 Pol. Sci. Q. 37 83 (March 1922); William F. Ogburn, *Social Change* 90-122 (1922); Jerry Gaston, *Secretiveness and Competition for Priority and Discovery in Physics*, 9 Minerva 472 (1971). One study showed that 46% of researchers believed they had been anticipated at least once in their career, and an additional 16% believed they had been anticipated three or four times. *See* Warren O. Hagstrom, *The Scientific Community* 304 (1965). These figures agree with theoretical models of multiple discovery. Garfield, *supra*.

[15] *See* Lamb & Easton, *supra* note x.

[16] Poincaré formulated (but did not interpret) the exact equivalent of $E = mc^2$ slightly before Einstein did. *See* Tony Rothman, *Lost in Einstein's Shadow*, 94 American Scientist 112 (March-April 2006).

[17] *See, e.g.*, Lamb & Easton, *supra* note x; Merton, *supra* note x.

A crucial claim of this paper is that convergence is evidence that a smaller reward would have been sufficient to incentivize the invention. This claim flows straightforwardly from Bayes theorem, which tells us how to revise an estimated probability in light of new information. For our purposes, the estimated probability in question is the probability that standard patent protection ("complete protection") provides an excessive reward for a given invention. A reward is excessive when it exceeds the minimum necessary to incentivize timely creation of the invention. The new information in question – the information we use to revise the estimated probability – is the number of inventors who achieve the invention. If no inventor ever achieves the invention, the probability is very low that complete protection provides an excessive reward for the invention. If exactly one inventor achieves the invention, the probability is higher but still not high overall. If two or more inventors independently achieve the invention at about the same time (convergence), the probability is high overall.

Therefore, I argue, in a case in which two or more independent inventors converge on an invention, the patent protection available for that invention should be ratcheted down moderately. The best way to ratchet down protection moderately is to automatically bestow a defense to patent infringement to the independent inventor(s) not entitled to the patent.

Hereafter, this proposed defense is referred to as the "reinvention defense" or simply the "defense." The independent inventor(s) not entitled to the patent is referred to as the "reinventor." Although the second inventor is occasionally entitled to the patent under U.S. law[18], and although more than two independent inventors may be entitled to

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[18] The second inventor may be entitled to the patent if the first inventor "abandoned, suppressed, or concealed" the invention under 35 U.S.C. 102(g). In other words, the second inventor may be entitled to the patent if the first inventor does not publish, commercialize or file for a patent on the invention at some point before the second inventor files for a patent on it. However, the courts will seldom presume abandonment, suppression or concealment unless it appears the first inventor abandoned, suppressed or concealed for several uninterrupted years. Also, the first inventor can overcome the presumption by showing that he was working to perfect the invention. *See generally Lutzker v. Plet*, 843 F.2d 1364 (Fed. Cir. 1988). There have been very few reported cases where a first inventor has been enjoined from practicing his invention by a second inventor/patentee. *See* Kyla Harriel, *Prior User Rights in A First-To-Invent System: Why Not?* 3 IDEA 543, 550 (1996); Karl Jorda, *The Rights of the First Inventor-Trade Secret User as Against*

assert the reinvention defense, "reinventor" is used interchangeably with "second inventor" and "patentee" is used interchangeably with "first inventor," unless stated otherwise. To avoid vague pronoun references, the reinventor/second inventor is referred to as a "she" and the patentee/first inventor is referred to as a "he". Also referred to as a "he" is an inventor at the ex ante stage (who is neither yet a reinventor/second inventor nor a patentee/first inventor). Inventions for which the probability of reinvention is significant – or for which the probability of reinvention would be significant were it not for the law's adoption of the reinvention defense – are referred to as "reinventables."

Part II briefly discusses the literature most relevant to the reinvention defense.

Part III characterizes a version of the reinvention defense that would work best in the real world. The most important feature of the defense is that it be available only if the reinventor reinvents before she receives actual or constructive notice that someone else previously invented it. A reinventor receives constructive notice of previous invention on the date that someone else (usually the first inventor) discloses the details of the invention to the relevant public via, for example, an issued patent, published patent application, scientific journal, conference presentation, or press release.

Part IV establishes a test to evaluate the overall desirability of the reinvention defense. The test is: does the defense reduce the costs of providing patent protection ("system costs") more than it increases the expected cost of under-incentivizing invention?

Part V, the heart of the paper, aims to show that the defense passes this test. Part V first argues the defense reduces system costs. System costs include monopoly loss, rent dissipation, and miscellaneous costs.

Monopoly loss refers to the deadweight loss proximately caused by supra-competitive pricing of inventions. The main such loss is the access to (use of) inventions that consumers forego because of high prices. The defense reduces this loss by enabling

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Those of the Second Inventor-Patentee (Part II), 61 J. Pat. & Trademark Off. Soc'y 593, 600 (1979).

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reinventors to compete with patentees in the consumer market for inventions. Competition decreases prices, thereby enhancing consumer access.

Rent dissipation refers to the deadweight loss incurred in efforts among rival inventors to capture rents. That is, patent races incite speedy and duplicative R&D. Speedy and duplicative R&D can result in earlier invention, but the marginal social costs of earlier invention often exceed its marginal social benefits. Speed that generates costs in excess of benefits is referred to herein as "haste." Duplication that generates costs in excess of benefits is referred to herein as "redundancy."

The defense reduces haste and redundancy. As mentioned above, a reinventor qualifies for the defense only if she reinvents before receiving notice that someone else already invented it. If the defense is adopted into law, a first inventor will have an incentive to immediately notify potential reinventors of his invention, which will preempt or shorten their hasty and duplicative efforts to reinvent.

The defense further reduces haste and redundancy by reducing the incentive to pursue reinventables in the first place. When a reinventor is entitled to the defense, the patentee's monopoly is essentially split up into a duopoly shared with the reinventor. *Monopoly profits exceed the collective profits of duopoly.* Ex ante, an inventor does not know whether he will end up as the patentee or as the reinventor. Thus, from the perspective of an inventor ex ante, the defense reduces the expected reward for reinventables. Reducing the expected reward for reinventables attracts fewer and less zealous rival inventors, which results in fewer and less costly patent races and fewer occurrences of reinvention.

Miscellaneous costs is a catch-all category for various deadweight losses that do not qualify as prototypical monopoly loss or prototypical rent dissipation. Among other things, miscellaneous costs include: the costs of administering the Patent Office, the costs of transacting over patent rights, and the costs attributable to the biasing of R&D toward projects that are too similar to each other from the standpoint of social welfare.[19] The

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[19] Theory suggests firms tend to pursue projects that are "overly correlated," which roughly means overly similar. *See generally* Partha Dasgupta & Eric Maskin, *The Simple Economics of Research Portfolios*, 97 Econ. J. 581 (1987); Partha Dasgupta, *The Welfare Economics of Knowledge Production*, 4 Oxford Rev. Econ. Pol'y 8 (1988); Luis Cabral, *Bias in Market R&D*

defense reduces some of these miscellaneous costs. For example, by reducing the expected return when two or more inventors could achieve the same invention, the defense encourages inventors to pursue projects that are less similar to each other, which helps diversify R&D.

Part V next argues that, although the defense reduces the expected return on reinventables, the defense does not reduce it so much that it drops below every timely inventor's break-even point. The reduction is moderate. The reduction is moderate because, *inter alia*, when the defense splits the patent monopoly into a duopoly, the duopoly will usually be a Cournot duopoly that maintains prices above the competitive level. Furthermore, reinvention tends to occur precisely when the expected return is too high, *i.e.*, when the expected return on invention exceeds the average expected return on invention. This implies that moderately reducing the expected return on a reinventable will not destroy every inventor's incentive to pursue the reinventable in a timely manner.

Part VI discusses four objections to the defense. They are: (A) first inventors can learn to issue notice before reinventors are able to complete reinvention; (B) the defense may exacerbate patent races in some cases; (C) reinvention can be faked; and (D) patentees and reinventors can reinstate patent monopolies through bargaining. None of these objections turns out to be especially troubling.

II. PREVIOUS COMMENTARY

A. *Long's Theory of Information Costs*

Unlike a patent, a copyright provides no protection against independent creation of a copyrighted work, and a trade secret provides no protection against independent discovery of a trade secret. Clarisa Long attempts to explain the patent law difference in

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Portfolios, 12 Int'l J. Indus. Org. 533 (1994); Joseph Zeira, *Innovation, Patent Races, and Endogenous Growth*, (Kennedy Sch. Gov't, Faculty Research Working Paper No. RWP02-047, 2002). The reason is the same reason there is excessive entry of firms into patent races. Society cares only about getting the most useful inventions at the least cost, whereas firms care only about maximizing their individual gains. Thus, individual firms do not care if the number of firms pursuing an invention that is a relatively "sure thing" from a technological standpoint is non-optimally high.

terms of the different "information cost profile" of patents.[20] IP rights protect information. It is costly to produce information worthy of such protection. The costs of producing protected information are not the costs Long has in mind. She has in mind the costs of information *about* protected information. Costs of information about protected information include the costs of identifying the boundaries of protected information and the nature of its protection. These costs are incurred by potential infringers, by actual and potential owners and licensees, and by the courts and administrative agencies.

In copyright, Long argues, the defense of independent creation economizes on these information costs by rendering it unnecessary for an author to determine if the expressive work he plans to create is covered by another author's copyright. This cost savings outweighs the social costs arising from the defense's negligible reduction in the incentive to create expressive works.

In patent law, a reinvention defense would confer only modest savings in information costs, savings that would, Long argues, likely be outweighed by the costs of the defense's reduction in the incentive to invent. When a firm invents something on its own, the firm cannot assume it is free to embark on commercial development. Before embarking, the firm will typically ask patent counsel to prepare a "freedom to operate" or "clearance" opinion, which consists of a comprehensive search for and detailed analysis of patents that may cover the invention. A reinvention defense would mitigate the need for and the complexity of these costly opinions, but the savings would be modest for four reasons.

First, compared to copyrights the number of patents through which a potential infringer must search is small.

Second, the class of parties who must search patents is relatively small. That class is limited to the types of firms likely to be sued for patent infringement, *i.e.*, sophisticated firms that specialize in the technology in question. The average Joe could not infringe the typical patent if his life depended on it, whereas anybody can copy a copyrighted work.

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[20] Clarisa Long, *Information Costs in Patent and Copyright*, 90 Va. L. Rev. 465 (2004).

Third, patents are easier to search than copyrighted works because patents must be applied for, the applications and resulting patents have a uniform format, they are organized into predetermined classes, and they are published in keyword-searchable databases. The fact that it is even possible to search patents by keyword goes to the heart of the difference in the information cost profiles of patent and copyright. Inventions can be described in words because they are functional in nature, whereas the ineffable nature of expressive works often makes them harder to describe than to create in the first place.

Fourth, patent rights are easier to cognize than copyrights because patent rights cannot be parsed. Unlike a copyright, a patent does not cover subparts of the whole. If a patent claims an invention with elements A, B, C and D, a firm that practices only one, two or three of the elements does not infringe the patent. A firm must practice all four to infringe.

Long's argument – that the reinvention defense would at best confer only modest savings in information costs – is essentially sound. Yet, her argument neither explains nor justifies the absence of the defense from patent law. For one thing, her argument ignores savings in costs other than information costs. Her argument also presumes, contrary to the argument of this paper, that the defense would often lower the incentive to invent below the minimum necessary to stimulate the creation of socially valuable inventions.

B. *Reinvention Defense for Concealable Inventions*

Economists Stephen Maurer, Suzanne Scotchmer, Elisabetta Ottoz and Franco Cugno conclude that a reinvention defense would discourage wasteful patent races while lowering inventors' profits to levels commensurate with their costs of invention.[21] I agree with their conclusion but the models on which they base it do not for the most part speak to patentable inventions. The models purport to ask and answer the question: when will a potential reinventor choose to incur the costs of reinventing a patented invention

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[21] *See* Stephen M. Maurer & Suzanne Scotchmer, *The Independent Invention Defence in Intellectual Property*, 69 Economica 535 (2002); Elisabetta Ottoz & Franco Cugno, *The Independent Invention Defence in a Cournot Duopoly Model*, 12 Econ. Bull. 1 (2004). *See also* J.J. Anton & D.D. Yao, *Expropriation and Inventions: Appropriable Rents in the Absence of Property Rights*, 84 Am. Econ. Rev. 190 (1994).

rather than license it from the patentee?[22] The answers generated by the models suggest that giving the potential reinventor the ability to make this choice – by shielding her from liability if she does so – would enhance social welfare. The problem with the models is that they assume a potential reinventor can evaluate a patented invention and still invent *independently*. Seldom can a potential reinventor evaluate a patented invention and still invent it independently.[23] In practice, learning that a patented invention exists usually coincides with learning how to replicate it. For one thing, the patent explains how to make and use it. Also, in most cases the key elements of the patented invention can be readily ascertained by examining the commercial product that embodies it.

As such, the models are really models of trade secrecy rather than patent protection. The models speak only to inventions for which trade secrecy is suitable, *i.e.*, inventions that can be commercially exploited and kept secret at the same time, such as a manufacturing process that cannot be reverse-engineered through examination of the manufactured product.[24] With respect to such inventions, the models demonstrate that reinventors should be exempt from liability. Thus the models confirm the wisdom of the long-standing rule that trade secrets do not protect against reinvention. With respect to inventions that must rely on patent (*i.e.*, inventions that cannot be commercially exploited and kept secret at the same time), the models are largely irrelevant.

C. *User Rights*

Economist Carl Shapiro explores the welfare effects of prior user rights.[25] In

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[22] *See* Maurer & Scotchmer, *supra* note x; Ottoz & Cugno, *supra* note x.

[23] *See also* Roger D. Blair & Thomas F. Cotter, *Strict Liability and its Alternatives in Patent Law, Symposium: Patent System Reform*, 17 *Berkeley Tech. L. J.* 799, 813-20 (2002) (listing additional problems with the Maurer-Scotchmer model).

[24] *See generally* Landes & Posner, *supra* note x, at 6-7; Heald, *supra* note x.

[25] *See* Carl Shapiro, *Prior User Rights*, 96 Am. Econ. Rev. (forthcoming 2006); Shapiro, *Prior User Rights*, (Competition Policy Center, Working Paper No. CPC05-055, Dec. 2005). The U.S. recognized prior user rights for part of the 19th century. *See* Patent Act of 1839, Ch.88, §7, 5 Stat. 353 (establishing prior user rights later revoked in Patent Act of 1870). *See also* Kyla Harriel, *Prior User Rights in A First-To-Invent System: Why Not?* 3 IDEA 543, 550 (1996). Currently, the U.S. recognizes only a very limited form of prior user rights for inventions covered by business methods. *See* 35 U.S.C. § 273 (2000). Not only must the prior user have used the business method commercially in the U.S. before the application was filed, he must have done so at least one year before the application was filed. In most cases where these criteria are satisfied,

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countries that recognize prior user rights, the patent goes to the first to file the application as opposed to the first to invent. Typically, a prior user is defined as an inventor who commercialized the invention, or made substantial preparations to do so, before the patentee filed the application.[26] Prior user rights enable the prior user to continue commercializing the invention in the same manner and to the same extent he had commercialized it, or had prepared to, before the patentee filed the application.

However, Shapiro abstracts away from the details of which party filed the application first and which achieved the invention slightly before or after the other. Thus, Shapiro effectively removes the "prior" from "prior user rights," leaving "user rights" that differ in no fundamental way from a reinvention defense. Furthermore, his analysis agrees with mine. He states, for instance, that these rights will

> *automatically* reduce the rewards precisely for those inventions with a high profit to cost ratio, since these are the inventions most likely to be discovered simultaneously. They also are the inventions that the patent system is most likely to over-reward. From a Bayesian perspective, the fact that an invention was discovered independently by two or more parties is evidence that the profit to cost for that invention was relatively high, so reducing the reward based on market power is attractive.[27]

For simplicity, Shapiro's model assumes two firms pursue an invention. If the law does not recognize user rights, one of the firms always obtains a monopoly on the invention. If law recognizes user rights, a duopoly results in cases in which both firms achieve the invention. Under his model, which assumes social welfare under duopoly exceeds social welfare under monopoly, the ex post benefits of user rights are straightforward. The model also shows that user rights confer ex ante benefits. User rights lower the expected return on invention precisely when firms would otherwise be most likely to spend too much on R&D. In addition, user rights mitigate the bias in R&D toward overly similar research projects. That is, by reducing the expected return for achieving the same invention that someone else achieves, user rights encourage firms to

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prior user rights are unnecessary because the patent in question is invalid for lack of novelty under 35 U.S.C. § 102 (2000).

[26] *See, e.g.*, Japan Patent Law No. 121, Para.79 (non-exclusive license by virtue of prior use).

[27] Shapiro, Working Paper, *supra* note x, at 8.

pursue more diverse research projects, which is good provided R&D is, as theory predicts, too similar in market equilibrium.[28]

The case for user rights is weaker, Shapiro points out, if they encourage first inventors to keep their inventions secret. Part V(A)(2) of this paper argues that the particular reinvention defense advocated herein would *discourage* first inventors overall from keeping their inventions secret. Indeed, the defense would create a strong incentive for first inventors to issue notice of their inventions as soon as possible.

The case for user rights is stronger, Shapiro argues, if the duopoly competition that results when both firms achieve the same invention is not too sharp, *e.g.*, when the duopoly is a Cournot duopoly. Part V(B)(1) of this paper argues that the duopoly will usually be a Cournot duopoly.

III. FEATURES OF THE REINVENTION DEFENSE

A. The Thoughts and Acts that Constitute Reinvention

What thoughts and acts should constitute reinvention? There appears to be no reason why the thoughts and acts that constitute reinvention should differ from the thoughts and acts long recognized as constituting a first invention: independent conception of the invention and independent reduction of it to practice.[29] In other words, a reinventor must come up with the idea for the invention on her own and get the invention into workable form on her own.

B. One Patent Per Invention

In copyright, independent creators can get their own copyrights for works previously copyrighted by others. Should reinventors be able to get their own patents for inventions previously patented by others? No. Allowing reinventors to get separate patents would require changes in the law that upset numerous settled patent doctrines.

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[28] *See infra*, note x [currently note 19].

[29] *See*, *e.g.*, *Agawam Co. v. Jordan*, 74 U.S. 583, 602-03 (1868); *Loom Co. v. Webster*, 105 U.S. 580, 592-93 (1881); *Pitts v. Hall*, 19 F. Cas. 754 (C.C.N.D.N.Y. 1851).

For example, it would require changes at odds with the novelty requirement of patentability, which is as fundamental to patent as consideration is to contract. It would also require changes that undermine the widely-accepted notion that a patent confers only the right to exclude others from practicing the invention, not the affirmative right to practice the invention.

In addition, allowing reinventors to get separate patents could unduly reduce incentives to pursue reinventables. If the reduction in incentives is to be moderate, inventors ex ante must believe there is a fair chance that reinvention will result in a Cournot duopoly that maintains prices above the competitive level. As discussed later, asymmetry between the rights of the reinventor and the patentee facilitates Cournot duopoly; symmetry between their rights (*e.g.*, identical patent rights) leads to sharper competition between them.

Also, allowing reinventors to get separate patents would increase uncertainty in the market for inventions. No one could be sure whether or when a reinventor's patent might suddenly issue from the Patent Office and thereby markedly alter the value and exclusivity conferred by the first inventor's patent and licenses thereto. The Patent Office keeps applications secret until it publishes them. It publishes most of them 18 months after they are filed. However, an applicant who is willing to forego patent protection in other countries can instruct the Patent Office to delay publication until the application issues as a patent. The mean delay between filing and issuance is 34-43 months.[30] However, an applicant who wants to can delay issuance indefinitely by, for instance, filing one continuation application after another.

C. When Reinvention Must Occur

As mentioned earlier, it is impossible for a potential reinventor to learn about the details of an invention and *then* reinvent it independently. Therefore, the defense cannot be available to a purported reinventor who received actual notice of the details before

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[30] *See* Mark A. Lemley and John R. Allison, *Who's Patenting What? An Empirical Exploration of Patent Prosecution*, 52 Vanderbilt L. Rev. 2099, 2101, 2118 (2000); John R. Allison and Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AIPLA Q. J. 185, 237 (no. 3) (Summer 1998).

purportedly reinventing.

What about constructive notice? The law tends to regard constructive notice as sufficient when the cost is high to observe and verify whether the intended recipient received actual notice. That cost may be high in the context of the reinvention defense. Suppose a first inventor's application publishes and a potential reinventor sees it (actual notice). The first inventor would often find it difficult to establish that the potential reinventor saw the application.

The law also tends to regard constructive notice as sufficient when requiring actual notice would encourage would-be recipients to cultivate ignorance. Requiring actual notice would discourage potential legitimate reinventors from reading patents, scientific journals, and other sources of information that might notify them of a prior invention and thereby shut their reinvention window. As well as retarding the flow of information, requiring actual notice would generate high costs in cases in which the first inventor is unsure who the potential reinventors are. To cover his bases, the first inventor would have to send registered letters to numerous irrelevant parties who would waste time and money ascertaining the significance of the letters.

Therefore, first inventors should have the option to provide constructive notice through publication instead of or in addition to providing actual notice. When a first inventor provides both, a reinventor should not qualify for the defense unless she reinvents before receiving the earlier of the two. Notice must, however, be sufficient. Actual notice is sufficient if it provides an enabling disclosure of the invention, *i.e.*, a description that tells a person of ordinary skill in the art how to make and use the invention. This is the standard under current law for what qualifies as prior art that invalidates a patent.

Constructive notice is sufficient when, in addition to providing an enabling disclosure, it is published in good faith rather than in a manner designed to avoid giving actual notice to potential reinventors.[31] This is not the standard for what qualifies as

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[31] Admittedly, it might be difficult for courts to distinguish between bad faith publication that does not shut the reinvention window from good faith publication that does. If so, a better rule might be: only published patent applications dispositively shut the reinvention window; other forms of publication merely create a rebuttable presumption that the window was shut. The

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publication for prior art purposes. The standard for what qualifies as publication for prior art purposes is very liberal. Specifically, to qualify as prior art the publication need not appear in a mainstream source or even in English. Rather, prior art is deemed published when it is made publicly accessible *in principle*. For example, one copy of a doctoral thesis in a library somewhere in the world qualifies as publication for prior art purposes as long as a member of the public could have obtained access to it without much trouble.[32] If that standard were the standard for what counts as publication sufficient to shut the reinvention window, first inventors could shut the reinvention window for all potential legitimate reinventors without really disclosing the invention to the relevant public. For example, within as little as a few days of first completing the invention, a first inventor could "publish" the invention where no one would see it by posting a description of it for one week on an obscure page of an obscure website. Such strategic behavior could more or less render the reinvention defense a nullity. Thus, the standard for what qualifies as publication for purposes of constructive notice should be stricter than the standard for what qualifies as publication for purposes of prior art. Note that, even with the stricter standard, an unavoidable evil of letting constructive notice shut the reinvention window is that legitimate reinventors who look for but never see the first inventor's good faith publication will nevertheless lose the defense if they fail to complete reinvention before the date of that publication.[33]

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presumption is rebutted if the reinventor shows that the first inventor could have published the invention at lower or equivalent cost in a manner that would have notified a substantially larger portion of the relevant public.

[32] *See In re Hall*, 781 F.2d 897, 900 (Fed. Cir. 1986).

[33] What if the reinventor conceives of the invention before the first inventor's publication, but reduces the invention to practice afterwards? The normal rule in patent law is that one's date of invention is one's date of conception provided one was continually diligent in one's efforts to reduce the invention to practice throughout the time between conception and reduction. For example, inventor A who conceives an invention in, say, 2005 and reduces it to practice in 2008 has an earlier date of invention than inventor B who conceives the same invention in 2006 and reduces it to practice in 2007 – provided inventor A was consistently diligent in his efforts to reduce the invention to practice between 2005 and 2008. Adoption of the reinvention defense will not change this rule, a rule that governs who qualifies as the first inventor. A different rule, however, may have to govern who qualifies as a reinventor. Conceiving of an invention is often easier and cheaper than reducing it to practice. Thus, it may be wise to insist that a reinventor qualifies for the defense only if she both conceives of the invention and reduces it to practice before receiving notice of the prior invention.

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D. First Inventor as Reinventor

Under 35 U.S.C. 102(g), the second inventor may be entitled to the patent on the invention if the first inventor forgoes patent protection in favor of trade secrecy.[34] Under current law, the second inventor's patent bars such a first inventor from continuing to practice the invention. The question arises: if the reinvention defense is adopted, should first inventors who maintain inventions as trade secrets be entitled to assert the defense against second inventors' patents? Probably not. If these first inventors were entitled to assert the defense, it would encourage them (relative to the status quo) to elect trade secrecy over patent – because it would assure them they can continue practicing their inventions even if second inventors later obtain patents. This would partially undermine the defense's overall tendency (discussed in Part V(A)(2)) to discourage secrecy among inventors.

To obviate this problem, the rule could be that only second inventors can assert the defense. Or, the rule could be that an inventor can assert the defense only if he did not maintain the invention as a trade secret. Either rule will work. However, the latter rule, which could be modeled on 35 U.S.C. 102(g), is probably superior. The former rule would cause some upheaval in the law if the U.S. later changed over to a first-to-file system.

E. Transferability

Transferability is usually a prerequisite of efficiency. Generally speaking, rights in inventions are no exception. Inventors commonly license or assign rights in their inventions to other parties who can better commercialize and enforce those rights. Indeed, small inventors and companies that specialize in inventing (so called "invention factories") would be ruined if they were unable to transfer their rights in inventions.

It is not clear, however, that *unlimited* transferability of the reinvention defense is optimal. Specifically, it is not clear whether the reinventor should be able to license out the defense ("unlimited transferability") or whether the reinventor should only be able to assign it in its entirety ("limited transferability"). The question of which transferability

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[34] *See infra* note x [currently footnote 18].

regime is best implicates numerous trade-offs among interrelated variables.[35] No definitive answer to this question is forthcoming. I can only offer an informed guess as to which regime is best. My guess, which more or less conforms to the precautionary principle, is that a limited transferability regime is best overall. With limited transferability, only one party can possess the defense at any given time.[36] Keeping the defense in the hands of a single party prevents the defense from increasing (or at least from markedly increasing) uncertainty, transaction costs and fragmentation of rights in the market for inventions.[37] As discussed later, prohibiting reinventors from licensing out the defense to multiple parties also helps secure the asymmetry between reinventor and patentee that is necessary to maintain Cournot duopoly.

Now that we have tentatively established the main contours of the defense, we must establish a framework in which to evaluate its overall desirability. Establishing this framework is the goal of Part IV below.

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[35] Three examples of the variables include: (1) the extent to which reinventors' ability to license out would reduce the expected reward for invention (relative to the expected reward if reinventors could not license out the defense); (2) the extent to which reinventors' ability to license out would increase the costs to all parties of determining who holds what rights to inventions and what those rights entail (information costs); and (3) the extent to which reinventors' inability to license out would bias R&D toward industries (such as software) that rely heavily on licensing to end users.

[36] An exception would be if there was more than one timely reinventor. For example, if each of two inventors reinvents the invention before the first inventor or the other reinventor issues notice, then both reinventors would possess the defense.

[37] It is easy to overuse the argument that a doctrine will increase uncertainty, transaction costs or fragmentation of rights. The argument can be (but seldom is) made against many longstanding patent doctrines. Undoubtedly, if one of these doctrines did not already exist and some commentator proposed that it be adopted into law, other commentators would raise the argument. Consider, for instance, the shop rights doctrine, which is similar to the reinvention defense in some ways. Under the shop rights doctrine, an employer is entitled to free use of an invention made by an employee on company time or with company resources. Shop rights do not prevent the employee from patenting the invention and licensing it to other firms. Shop rights merely allow the employer to avoid paying a royalty. *See generally United States v. Dubilier Condensor Corp.*, 289 U.S. 178 (1933). *See also* Robert P. Merges, *The Law and Economics of Employee Inventions*, 13 Harv. J.L. & Tech. 1 (1999). The shop rights doctrine is well-accepted and uncontroversial. Yet, if the shop rights doctrine did not exist and some commentator proposed that it be adopted into law, other commentators could easily argue that it would increase uncertainty, transaction costs or fragmentation of rights. The argument is virtually unfalsifiable unless and until the doctrine is adopted and its actual effects are assessed.

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IV. FRAMEWORK FOR EVALUATING THE REINVENTION DEFENSE

The patent system should stimulate creation of inventions for which the social benefits exceed the social costs. The social costs of an invention consist of: (1) the unavoidable R&D costs inherent in overcoming the technical challenge of achieving the invention; (2) any negative externalities resulting from use of the invention (*e.g.*, nuclear weapons); and (3) the costs of providing patent protection for the invention. This paper focuses on the costs of providing patent protection, which are referred to as "system costs."

Minimizing system costs is tricky because system costs are the flipside of incentive to invent. Lowering system costs tends to lower the incentive to invent, and raising the incentive to invent tends to raise system costs. In other words, system costs are the price we pay to provide the incentive to invent, and the more incentive to invent we provide the higher the price tends to be.

Yet, it *is* possible to optimize, for three reasons. First, different ways of providing the same amount of incentive can impose different amounts of system costs.[38] Second, small reductions in the amount of incentive sometimes result in large reductions in the amounts of system costs. Third, even when a reduction in incentive exceeds the concomitant reduction in system costs, the reduced incentive may suffice to stimulate invention. Note that the incentive need not be proportional to the social value of the invention.[39] All that is required to incentivize invention is that an inventor's expected revenue exceed his costs of invention (including his opportunity costs). Ideally, we would never provide more than this minimum incentive. The more the incentive exceeds this minimum, the more we incur system costs without commensurate gain.

A. *Our Test*

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[38] Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 Harv. L. Rev. 1813, [ ] (1984).

[39] The common intuition that a patent should reward an inventor in proportion to the social value of his invention incorrectly focuses on total social benefits rather than net social benefits. *Id.* at 1821, 1827-28. The common intuition arises in part from mistaking correlation for causation. The social value of an invention often correlates positively with R&D costs simply because highly valuable inventions often cost more to produce than less valuable inventions.

Our test for assessing the desirability of the reinvention defense boils down to asking: does the defense decrease system costs more than it increases the expected cost[40] of under-incentivizing invention? The defense passes the test if it markedly decreases system costs while only marginally increasing the risk that no timely inventor's expected profit remains a positive number.

This test differs from the test established by Louis Kaplow in his landmark article about the intersection of patent and antitrust.[41] Kaplow's test, in which "monopoly loss" apparently stands for all types of system costs, is framed in terms of a ratio:

$$\frac{\text{Patentee Reward}}{\text{Monopoly Loss}}$$

Kaplow's test treats the desired magnitude of the incentive (reward) as a given. A patent doctrine passes his test if the doctrine increases the ratio by reducing the denominator without changing the numerator. Increasing the ratio without changing the numerator is possible because, again, different ways of providing the same amount of incentive impose different amounts of system costs. In short, his test asks whether we can reduce system costs by altering the form but not the magnitude of the incentive.

Our test does not treat the magnitude of the incentive as a given.[42] The defense could pass our test not only by altering the form of the incentive but also by reducing the magnitude of the incentive. Our test cannot be framed in terms of Kaplow's ratio because we cannot say the defense should always increase his ratio or leave its numerator

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[40] Expected means the cost is discounted by the probability of the cost being incurred. Cost in this context refers to foregone benefit. Suppose an invention would confer $10 million in net social benefits, and the probability of failing to incentivize its creation is 10%. In this case, the expected cost of under-incentivizing the invention is $1 million.

[41] *See generally* Kaplow, *supra* note x.

[42] Note that, though our test does not take the desired magnitude of the reward as a given, it does take as a given that the social benefits exceed the social costs for the invention(s) in question. Thus, this test is inappropriate for inventions that society would be better off without. It is in this sense that this paper focuses on system costs rather than the other two costs of invention: the unavoidable R&D costs inherent in overcoming the technical challenge of the invention and any negative externalities resulting from use of the invention.

unchanged. The defense could pass our test even if it would reduce his ratio or its numerator.[43]

For example, the defense both passes our test and reduces the numerator of Kaplow's ratio when: standard, complete patent exclusivity would provide an *above-average* expected return on invention, and the defense scales back patent exclusivity until the expected return on invention drops from above-average to average. Expected return and system costs both fall with reductions in patent exclusivity. With respect to inventions for which complete patent exclusivity would provide an above-average expected return, the opportunity presents itself to scale back the available patent exclusivity and thereby reduce system costs without reducing the expected return below the average. The average expected return is sufficient to incentivize invention provided, as is popular and reasonable to believe, the average return on invention generally exceeds the necessary minimum.

B. System Costs

System costs can be divided into three categories: monopoly loss, rent dissipation, and miscellaneous costs.

1. Monopoly loss

Monopoly loss refers to deadweight losses proximately caused by supra-competitive pricing of the invention. Patents both supply and deny consumers with access to (use of) inventions. Patents supply access by giving inventors the incentive to invent in the first place.[44] Without such incentive, many inventions would never be

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[43] Our test further differs from Kaplow's in that his focuses on the patentee's reward rather than the inventors' incentive. Our test focuses on the inventors' incentive because not all relevant inventors are patentees and because expected profit is not solely a function of patent exclusivity. *See also* Vincenzo Denicolo, *Patent Races and Optimal Patent Breadth and Length*, 44 *J. Indus. Econ*. 250, 253 (1996) (stating that a more general framework considers firms' overall incentives to invent rather than patentee firms' patent rents). Inventors also have non-monetary incentives.

[44] Most purported alternatives to the incentive theory of patent law are merely alternatives to a narrowly conceived formulation of the incentive theory. Most purported alternatives do not stray from the basic point that patents enable inventors to profit from invention. One exception is the portion of Kitch's prospect theory that posits avoidance of redundant effort as a contributory rationale for the patent system. *See generally* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & Econ. 265 (1977). *See also* Mark F. Grady & Jay I. Alexander, *Patent*

created or would be long delayed. Once inventions have been invented, however, patents deny access by maintaining prices above the competitive level. If the price of the invention is $100 when protected by patent and $75 when not protected by patent, the patent denies access to all consumers who value the invention at more than $75 but at less than $100.[45] This does not represent a pure transfer from consumers to producers. It is well known that each dollar of monopoly profit reduces the consumer surplus more than it increases the producer surplus.

Monopoly also leads to productive inefficiency. To maintain supra-competitive prices, monopolists must produce at quantities short of those necessary to fully exploit the advantages of mass production. That is, by deliberately restricting output, monopolists fail to wring the most out of the resources used to commercially produce the invention. Also, monopolists are less pressured to adopt new ways of producing the invention more efficiently.

2.   Rent dissipation

Rent dissipation includes the increase in R&D costs attributable to patent races that is not offset by the benefits of getting inventions earlier. Under current law, patent races are winner-take-all contests. Winner-take-all contests can attract too much investment and too many contestants, for reasons similar to those underlying the tragedy of the commons. Landes and Posner analogize patent races to salvaging sunken treasure.[46] Suppose, they say, a sunken treasure has a salvage value of $1 million that could be realized at a cost of $100,000. The potential gain to a salvager – the economic

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Law and Rent Dissipation, 78 Va. L. Rev. 305 (1992) (revising Kitch's prospect theory of the patent system).

[45] Patents also deny consumers access to inventions in the future by denying potential inventors access to preexisting inventions. The vast majority of inventions are improvements on preexisting inventions. Potential inventors must access preexisting inventions in order to improve them. When access to preexisting inventions is very costly, potential inventors make fewer improvement inventions. *See generally* Robert Merges & Richard Nelson, *On the Complex Economics of Patent Scope*, 90 Columbia Law Review 839 (1990); Grady & Alexander, *supra* note x; Mark Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 Tex. L. Rev. 993 (1997); Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 Sci. 698 (1998).

[46] Landes & Posner, *supra* note x, at 16-17. *See also Id.* at 25-29 (analogizing patent race to a race to claim an uninhabited continent).

rent (pure profit) from being first to salvage the treasure – is thus $900,000. However,

competition among salvagers to be first can gobble up all or most of the $900,000,

transforming it into a deadweight social loss (unless the competition speeds up the

salvage process enough to produce an increase in present value of the treasure that offsets

the added cost).[47] Similarly, patent races increase R&D costs by encouraging speed and

duplication among rival inventors.[48] Speed and duplication result in earlier invention, but

the marginal social costs of earlier invention often exceed the marginal social benefits.

Speed responsible for costs in excess of benefits is referred to herein as "haste."

Duplication responsible for costs in excess of benefits is referred to herein as

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[47] *See also* George Stigler, *A Note on Patents*, *in The Organization of Industry* 123, 124 (1968) ("the prospects of monopoly pricing will lead to such a scale of investment in producing knowledge that it will return only the competitive rate of return on average"); Yoram Barzel, *Optimal Timing of Innovations*, 50 Rev. Econ & Stat. 348, 349 (1968) ("competition among potential innovators may deprive innovations of all their special economic value"); Giuseppe Dari-Mattiacci and Francesco Parisi, *Rents, Dissipation, and Lost Treasures: Rethinking Tullock's Paradox*, 124 Public Choice 411 (2005).

[48] *See generally* Barzel, *supra* note x; Jack Hirshleifer, *The Private and Social Value of Information and the Reward to Inventive Activity*, 61 Am. Econ. Rev. 561 (1971); Grady & Alexander, *supra* note x; Roger A. McCain, *Optimal Entry in Information Product Sectors* (Eastern Econ. Assoc. Conf., Boston, March 1996); Suzanne Scotchmer, *Innovations and Incentives* 100-03, 112-14, 120-23 (2004); Urs Fischbacher & Christian Thoni, *Excess Entry in an Experimental Winner-Take-All Market* (Inst. for Empirical Research in Econ., Working Paper No. 86, 2002); Partha Dasgupta, *Patents, Priority and Imitation or, The Economics of Races and Waiting Games*, 98 Econ. J. 66, 74-78 (1988); Partha Dasgupta & Joseph Stiglitz, Uncertainty, Industrial Structure and the Speed of R&D, 11 *Bell J. Econ.* 1, 11-12 (1980); Drew Fundenberg, Richard Gilbert, Joseph Stiglitz, & Jean Tirole, *Preemption, Leapfrogging, and Competition in Patent Races*, 77 Eur. Econ. Rev. 176 (1983); Michael L. Katz & Carl Shapiro, *R&D Rivalry with Licensing or Imitation*, 77 Am Econ. Rev. 402 (1987); Steven A. Lippman & Kevin F. McCardle, *Dropout Behavior in R&D Races with Learning*, 18 RAND J, Econ. 287 (1987); Glenn C. Loury, *Market Structure and Innovation*, 93 Q. J. Econ. 395 (1979); Frederic M. Scherer, *Research and Development Resource Allocation Under Rivalry*, 81 Q. J. Econ. 359, 364-66 (1967); Pankaj Tandon, *Rivalry and the Excessive Allocation of Resources to Research*, 14 Bell J. Econ. 152 (1983); Andrew Farlow, *The Cost of R&D: How Much Money is Needed to Address the Current Need?,* International Conference on Ensuring Innovation for Neglected Diseases, London, United Kingdom (June 8, 2005), available at http://www.economics.ox.ac.uk/members/andrew.farlow. *But cf* Mark R. Patterson, *Patent Races with No Entrants* (Fordham Law & Econ., Research Paper No. 22, 2002), available at http://papers.ssrn.com/sol3/papers.*cf*m?abstract_id=336220 [permission to cite granted May 4, 2006] (stating that *under*investment in R&D can occur when an inventor who would have won the race drops out after suffering early setbacks in his research, not knowing his competitors have suffered similar setbacks); Christopher Harris & John Vickers, *Patent Races and the Persistence of Monopoly*, 33 J. Indus. Econ. 461 (1985) (stating that in race in which incumbent firm would affirmatively lose something if challenger won, challenger may anticipate that incumbent will outrace challenger, in which case challenger will not bother to enter race).

"redundancy."

Rent dissipation also includes costly efforts by competitors to invent around the patent. The more the patented invention is priced above the competitive level, the more profitable are non-infringing substitutes for the patented invention and the more incentive competitors have to design products that fall just outside the patent's scope. This is inefficient to the extent these products are inferior substitutes for the patented invention.[49]

3. Miscellaneous costs

Miscellaneous costs is a catch-all category for the various social costs that do not clearly or traditionally fall into the category of monopoly loss or rent dissipation. Examples of miscellaneous costs include: the information costs of ascertaining the boundaries of patent rights[50]; the costs of transacting over patent rights; the costs attributable to the biasing of R&D toward patentable technology and away from unpatentable technology that is nevertheless socially valuable; the costs attributable to the biasing of R&D toward projects too similar to each other from the standpoint of social welfare; the costs of administering the Patent Office; the costs of pressing, defending and administering patent suits; and the costs of prosecuting and administering patent applications through the Patent Office.

V. THE REINVENTION DEFENSE LOWERS SYSTEM COSTS WITHOUT DESTROYING NECESSARY INCENTIVE

This Part argues the reinvention defense characterized in Part III passes the test established in Part IV. Section (A) below argues the defense markedly lowers system costs. Section (B) below argues the defense seldom lowers expected revenue below every timely inventor's costs. To be sure, the defense does lower the expected revenue for reinventables. Ex ante, an inventor does not know whether he will end up as the patentee or as the reinventor. If the defense is adopted into law, a reinventor could

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[49] Races to invent superior substitutes can also be inefficient if rent dissipation is severe. *See generally* Grady & Alexander, *supra* note x.

[50] *See generally* Long, *supra* note x.

compete with whoever ends up as the patentee, thereby breaking up the patent monopoly into a duopoly. *Monopoly profits exceed the collective profits of duopoly.* Thus, from the ex ante perspective of inventors who are considering reinventables, the defense tends to shrink the pot at the end of the rainbow. Section (B)(1) argues, however, that the shrinkage is moderate. Section (B)(2) argues that, without the shrinkage, the pot is too big.

A. Reinvention Defense Lowers System Costs

    1.   Reinvention defense reduces monopoly loss

The defense reduces monopoly loss in a straightforward manner. In cases in which reinvention occurs, the reinventor would typically sell the patented invention in competition with the patentee, thereby increasing commercial output of the invention and decreasing its price. Increased output and decreased price mean increased consumer access.

    2.   Reinvention defense reduces rent dissipation

The defense reduces rent dissipation though not always in a straightforward manner. Haste and redundancy can occur at three stages: (1) before anyone has achieved the invention ("pre-invention stage"); (2) after the first inventor has achieved the invention but before he has notified a potential reinventor of it ("submarine stage"); and (3) after a reinventor has reinvented in a timely manner ("commercialization stage").

By reducing the expected reward for reinventables, the defense reduces haste and redundancy at the pre-invention and submarine stages in a straightforward manner. Specifically, by reducing the expected reward for reinventables, the defense causes fewer and less zealous inventors to pursue reinventables, thereby reducing the number and intensity of patent races.

The defense further reduces haste and redundancy at the submarine stage in a less straightforward manner – by shortening the submarine stage. Recall that reinvention qualifies as a defense only if the reinventor completes the invention before receiving notice that someone else already completed it. If the defense is adopted into law, first inventors will try to safeguard their patent monopolies by issuing notice of their

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inventions before would-be reinventors can complete the invention. The notice will apprise would-be reinventors that they have already lost the patent race and are too late to qualify for the defense.[51] These would-be reinventors will terminate their hasty and redundant work on the inventions and will turn their attention to other projects. Under current law, first inventors have little incentive to issue notice of their inventions promptly. Most first inventors issue notice perhaps 6-36 months after they complete the invention.[52] Adoption of the defense should cut the typical delay to perhaps 2-18 months.

Harder to assess are the effects of the defense at the commercialization stage. Under current law, patents deter reinventors from commercializing the patented inventions If the defense is adopted into law, reinvention will occur less often overall, but in cases in which it does occur reinventors and patentees will both be able to exploit the patented inventions. Their competitive efforts to do so may qualify as hasty and redundant. To reiterate, the defense makes reinvention less common in the first place, which reduces the absolute number (relative to the status quo) of cases in which reinventors stand ready to commercialize the patented inventions. But the defense could increase the *proportion* (relative to the status quo) of such cases in which reinventors move forward with commercializing the patented inventions.

This leads to the question: is haste or redundancy at the commercialization stage as significant as haste or redundancy at the pre-invention and submarine stages? Probably not. Haste can arise at the commercialization stage because the patentee and reinventor both have an incentive to capture the reputational and branding advantages of

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[51] *See also* Patterson, *supra* note x, at 12-19. In Patterson's model, an inventor who otherwise would have won the race may drop out after suffering early setbacks, not knowing his competitors have suffered similar setbacks. This is another way of saying that patent races occasionally generate too little redundancy rather than too much. However, the reinvention defense comports closely with Patterson's remedies for this exceptional problem. He identifies three types of changes in the law one might consider. First, changes that provide race participants with information about the progress of their competitors. Second, changes that encourage competitors to provide information to each other about whether they are still in the race. Third, changes that mitigate the winner-take-all nature of patent races by providing some reward to those who do not finish first. The reinvention defense would bring about all three of these changes.

[52] This estimated range is based on what I experienced in my patent law practice.

being first to market.[53] In many cases, however, the patentee enjoys too big a head start for the reinventor to have any hope of being first to market. Not only will the patentee often enjoy a big head start, the patentee can also scale up faster because he can, unlike the reinventor, coordinate multi-party production by licensing out the invention.[54]

Redundancy can arise at the commercialization stage when the patentee and reinventor duplicate their efforts to commercialize. Note, however, the indivisibility of duplication (which typically has a bad connotation) and competition (which typically has a good connotation). Competition simultaneously entails inherent costs in the form of duplication and generates social benefits in the form of increased productive and allocative efficiency. Duplication is properly regarded as redundant only when (and only to the extent that) the costs of duplication inherent in competition exceed the benefits of competition.[55]

For IP, the inherent costs of duplication at the pre-invention and submarine stages tend to exceed the inherent costs of duplication at the commercialization stage. A defining characteristic of IP is that, compared to tangible property, it has a high ratio of fixed costs to marginal costs.[56] The fixed costs of invention consist more or less of the costs of R&D, which are incurred during the pre-invention and submarine stages. The marginal costs of invention consist of the costs of commercializing the invention, *i.e.*, the costs of producing, marketing and selling the product or service embodying the invention. The marginal costs of invention are incurred during the commercialization stage.

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[53] The first mover advantage is more important than the patent right in some industries. *See generally* R.C. Levin, A.K. Klevorick, Richard R. Nelson, & S.G. Winter, *Appropriating the Returns from Industrial Research and Development*, 3 Brookings Papers on Econ. Activity 783 (1987); Edwin Mansfield, *Patents and Innovation: An Empirical Study*, 32 Mgmt Sci. 173 (1986); Boldrin & Levine, *Monopoly*, *supra* note x, at 24-27; Andrew Farlow, *Costs of Monopoly Pricing Under Patent Protection*, (Access to Medicines and the Financing of Innovations in Health Care Conference, The Program on Science, Technology, and Global Development at The Earth Institute at Columbia University, New York, 2003), available at http://www.earthinstitute.columbia.edu/cgsd/accesstomedicines_papers.html.

[54] *See infra* discussion Part III(E).

[55] *But cf* Barzel, *supra* note x, at 352. Under the assumptions of Barzel's model, including continuously rising demand for the invention over time, "the basic wasteful effect of competition lies not in duplicating the use of resources but in using these resources prematurely, when they would have earned a higher return elsewhere in the economy." *Id*.

[56] *See* Landes & Posner, *supra* note x, at 23 (IP has a high ratio of fixed to marginal costs).

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Because the fixed costs of invention tend to be high and the marginal costs low, the inherent costs of duplicating the fixed costs of invention tend to exceed the inherent costs of duplicating the marginal costs of invention. This is especially true for information goods with very low marginal costs, such as songs, movies, books and software.

In sum, the defense clearly decreases haste and redundancy in the first and second of the three stages in which haste and redundancy can occur. Unclear is whether the defense decreases or increases haste and redundancy at the third stage. However, even if the defense increases haste and redundancy at the third stage, that increase appears to be dwarfed by the decrease at the first and second stages.[57]

3. Reinvention defense reduces miscellaneous costs

The defense probably reduces miscellaneous costs overall. Examples of how it does so include the following. The defense reduces litigation costs by lowering the number of patent suits against reinventors. The defense sometimes allows reinventors to commercialize their inventions without first obtaining elaborate clearance opinions from patent counsel, opinions that under current law range in price from about $10,000 to $150,000 each.[58] By reducing the expected return on reinventables, the defense alleviates some of the bias in R&D toward patentable technology. As mentioned earlier, the defense also alleviates the bias in R&D toward overly similar projects. That is, the defense helps diversify society's portfolio of inventions, which improves welfare assuming, as theory predicts, the portfolio is under-diversified in market equilibrium.

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[57] *But cf* Kitch, Nature and Function, *supra* note x. Kitch believes that redundant efforts to commercially exploit an invention are very costly. According to his well-known "prospect theory," patent rights are doled out to the first "prospector" to identify the inventive prospect, much the way mineral rights are doled out to the first prospector to identify a mineral deposit. Patents do not, Kitch argues, merely encourage the initial creation of the invention. Another major function of patents is to encourage efficient investment in the perfection and commercialization of the invention. The exclusivity conferred by the patent enables the first prospector to efficiently coordinate perfection and commercialization, thereby encouraging the first prospector to invest in bringing the invention to market while simultaneously discouraging rivals from doing so. There is not enough space here to respond to Kitch's argument. Suffice to say few scholars accept it. *See, e.g.*, Grady & Alexander, *supra* note x, at 317 (Kitch's coordination rationale fails to explain the case law).

[58] This range of prices is based on my practice experience from 2001 to 2004 at a large firm in Washington DC.

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B. Reinvention Defense Seldom Lowers Reward Below Break-Even Point

Let "reward C" be the reward for an invention afforded by complete patent exclusivity, that is, the reward inventors expect under current law. Let "reward R" be the lower reward for an invention that inventors would expect were the reinvention defense adopted into law. If reward C causes an invention to be reinvented – *i.e.*, if reward C incentivizes multiple inventors to cross the same finish line neck and neck – it is tempting to conclude that reward R would have been sufficient (provided it were only moderately lower than reward C) to incentivize at least one of the inventors to cross the finish line without undue delay.[59] This is my conclusion, but I cannot jump to it. Reward C might be the break-even point below which no inventor would be incentivized to cross the finish line without undue delay. Or, reward C might exceed the inventors' break-even point by only a tiny margin, in which case reward R could lie beneath the break-even point. This Section argues that, with respect to reinventables, reward C exceeds the break-even point by a large margin and that reward R exceeds the break-even point by a small but still clear margin.

Subsection (1) below argues reward R is only moderately lower than reward C. Subsection (2) argues that, with respect to reinventables, reward C provides a considerably higher than average return on invention. Note that, because "moderately" is an inexact term, it does not strictly follow from the arguments of Subsections (1) and (2) that reward R exceeds an inventor's break-even point. I cannot *prove* reward R exceeds an inventor's break-even point. I can only show that the probability is high that reward R exceeds an inventor's break-even point in the vast majority of cases. Such indeterminacy is the norm in all areas of IP law. All IP doctrines are based on informed intuitions about

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[59] Can we analogize to foot races? Consider marathons. In 2005, rewards were: $100,000 for the men's winner of the New York Marathon, $25,000 for the men's winner of the Honolulu Marathon, $15,000 for the men's winner of the Baltimore Marathon, and $0 for the men's winner of the Marine Corps Marathon. The New York reward is immoderately higher than these other rewards. Yet, the New York winner was only 2.5 minutes faster than the Honolulu winner, 4 minutes faster than the Baltimore winner, and 10.5 minutes faster than the Marine Corps winner. A similar pattern holds for other marathons such as the Boston, Las Vegas, and Houston marathons. Of course, people typically run, but do not typically invent, for reasons that are largely non-pecuniary.

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the magnitudes of competing effects, not on close reasoning from hard data.[60]

1.   Reward R is only moderately lower than reward C

The defense drops the expected reward for reinventables from C to R. The drop from C to R is moderate, for the following three reasons.

First, even when a reinventor breaks up the patentee's monopoly, some degree of market exclusivity will usually remain. The duopoly shared by the patentee and the reinventor will usually be a Cournot duopoly that maintains prices above the competitive level. A Cournot duopoly forms when two firms that produce homogeneous goods compete against each other but at least one of the firms cannot increase output freely and other firms are barred from entry. A reinventor cannot increase output freely. If the reinventor increases output until it competes away all of the patentee's profits, the patentee will have no incentive to enforce the patent against third parties or to pay the periodic maintenance fees necessary to keep the patent in force. If the patentee stops enforcing the patent or stops paying maintenance fees, the invention will effectively fall into the public domain, rendering the reinventor's defense worthless. In any event, even if a reinventor wanted to compete away all profits, she may be unable to. A reinventor cannot increase output as easily as a patentee because she cannot coordinate multi-party production by licensing out the invention.

The second reason the drop from C to R is moderate is that the defense reduces the risk of inventive activity by reducing the variance in its payoffs.[61] Under current law,

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[60] *Cf* George L. Priest, *What Economists Can Tell Lawyers About Intellectual Property*, 8 *Res. L. Econ.* 19 (1986) (concluding not much); William Fisher, *Theories of Intellectual Property, in New Essays in the Legal and Political Theory of Property* 17 (Stephen R. Munzer ed., 2001).

[61] In his classic article on invention, Kenneth Arrow suggested risk aversion leads to under-investment in invention. Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention, in The Rate and Direction of Inventive Activity: Economic and Social Factors* 609, 610-14 (1962). Invention is indeed a risky activity. Not only is technological success far from assured, financial success is the exception. It is not clear, however, that risk aversion has actually lead to under-investment in invention in general. A stronger argument can be made that risk aversion has biased investment away from especially risky inventions toward less risky inventions. *See, e.g.*, Cabral, *supra* note x (arguing R&D is biased toward non-optimally low risk projects). *See also* Joseph A. DiMasi, Ronald W. Hansen, & Henry G. Grabowski, *The Price of Innovation: New Estimates of Drug Development Costs*, 22 J. Health Econ. 151 (2003) (*half* of the cost of developing a new drug is the increased cost of capital attributable to the high risk of failure in drug development).

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a reinventor gets no rights to the invention and may be sued by the patentee. Thus, inventors ex ante face the prospect of spending enormous sums on R&D only to end up scuttling the whole project. If the defense is adopted, inventors will take some comfort in the prospect of receiving the defense as a consolation prize. All other things equal, reducing the risk of an activity usually increases the incentive to engage in the activity. This effect partially[62] offsets the defense's overall tendency to decrease the incentive to pursue reinventables.

The third reason the drop from C to R is moderate is that the drop is somewhat self-moderating. As explained earlier, reducing the expected reward lowers the number of inventors who will pursue a reinventable in the first place. Lowering the number of inventors in the race increases the odds for an inventor who stays in the race that he will win the reward and not have to share it with a reinventor. Indeed, reducing the expected reward "on paper" can occasionally increase the expected reward for the inventor who stays in. Suppose, for example, that inventor A can develop a patentable invention at an R&D cost of $500,000 and that the invention would yield $4 million in revenue after discounting to present value. However, the initial expected profit of $3.5 million will attract rival inventor B, thereby starting a race. The race will result in invention one year earlier than otherwise but will drive up R&D to $1.5 million for each of the rival inventors. If A and B face an equal chance of winning the patent, the revised expected profit for each will be $500,000 (($4 million / 2) - $1.5 million) plus the reduction in the present value discount attributable to realizing profits one year earlier. The rent dissipation is $2.5 million[63] minus the social benefits of getting access to the invention one year earlier. Now suppose that a newly adopted patent doctrine would decrease the patent exclusivity available for the invention so that it would yield $2 million in revenue instead of $4 million. The initial expected profit is therefore only $1.5 million, which is less attractive to inventor B than the initial expected profit of $3.5 million in the previous

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[62] Occasionally, the defense's attenuation of risk may wholly offset or even outweigh its attenuation of the promise of exclusivity. That is, in exceptional cases the increase in incentives due to the reduction in risk could equal or exceed the decrease in incentives due to the reduction in patent protection.

[63] $2.5 million is the difference between what the total R&D costs ended up being ($3 million) and what they started out as ($500,000).

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scenario. If the initial expected profit of $1.5 million is insufficient to attract B, A's expected profit will remain $1.5 million, which well exceeds the revised expected profit of $500,000+ in the previous scenario. Also, rent dissipation will be far lower than in the previous scenario unless achieving the invention one year earlier provides freakishly high social benefits.[64]

2.   Reward C is too high for reinventables

The occurrence of reinvention implies a high probability that reward C is excessive. Recall the Bayesian point in the Introduction. If no inventor ever achieves a given invention, the probability is very low that reward C is excessive for that invention. If only one inventor achieves the invention, the probability is higher (but still not high overall) that reward C is excessive. If two or more inventors independently achieve the invention at about the same time, the probability is high that reward C is excessive.

Reward C is excessive when it exceeds the minimum necessary to stimulate creation of the invention. Reward C exceeds the minimum necessary when the minimum necessary for the invention in question is lower than the minimum necessary for the average invention. Alternatively, reward C exceeds the minimum necessary when reward C exceeds the average reward (assuming, as is popular and reasonable, that the average reward is not below the minimum necessary for most inventions).

In other words, reward C is excessive for inventions that promise inventors either unusually low costs or unusually high revenue. This situation can arise when, for example, an abrupt social or technological change suddenly lowers the cost of an input into an invention, thereby transforming it overnight from a high cost invention into a low cost invention. Or, an abrupt social or technological change can create demand for an invention that was low cost to begin with. Innumerable non-existent inventions have low costs but are never brought into existence because they are of no value to anyone. If demand for the invention suddenly appears, multiple inventors may invent it more or less

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[64] Revenue (as opposed to profit) is a proxy for the social benefits of an invention. Thus, if the total revenue the inventor could ever get from the invention were only $2-4 million, the social benefits of getting the invention one year earlier would almost never exceed $2.5 million.

simultaneously.[65] Consider Amazon.com's infamous one-click patent, which covers website transactions in which, after creating an account, the consumer buys the goods with one click rather than having to click through several pages to check out.[66] The one-click method posed only a trivial technical challenge (low cost of invention) but did not come into being until ecommerce abruptly emerged.

Reward C also exceeds the average reward when demand for the invention is inelastic. Sometimes the invention is by far the best means of achieving a particular end, *i.e.*, the invention is the only feasible solution to a problem. When the invention is the only feasible solution to a problem, there are no close substitutes for the invention. No close substitutes means consumer demand for the invention is inelastic. The returns to monopoly hinge on the inelasticity of demand for the monopolized good. If demand is inelastic because no close substitutes exist, the patentee can price the invention farther above the competitive level than patentees normally can.[67] Furthermore, when the invention is the only feasible solution to a problem, the minimum necessary to stimulate the invention may be unusually low. When the invention is the only feasible solution, rival inventors are channeled down the same road despite their initial inclinations to go down different roads. In short, the invention may to some degree be inevitable.[68]

In summary, the sheer fact that an invention is (or is likely to be) reinvented implies reward C is too high for that invention. It does not strictly follow that reward R is high enough. The fact that reward C incentivizes multiple inventors to achieve the invention contemporaneously does not prove that reward R (even if it is only moderately below reward C) will suffice to incentivize at least one inventor to achieve the invention

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[65] *See Landes* & Posner, *supra* note x, at 21, 304.

[66] *See* U.S. Patent No. 5,960,411, issued Sept. 28, 1999.

[67] *See generally* William D. Nordhaus, *Invention, Growth, and Welfare: A Theoretical Treatment of Technological Chance* (1969) (examining inelasticity of demand and length of patent life); Gifford, *supra* note x (discussing shape of demand curve for invention).

[68] *See also* Ogburn and Thomas, *supra* at note x; Ogburn, *supra* at note x; Zeira, *supra* at note x. Zeira's model drops the standard assumption that the set of potential inventions in each period is unlimited. His model suggests that, when the assumption is dropped, the problem of rent dissipation and monopoly loss is even worse than standard models suggest. With regard to policy, Zeira tentatively suggests we should provide more support for inventors who pursue inventions with the lowest probabilities of success. *Id. at* 25-26.

in a timely manner. What does follow, however, is that *the odds are good* that reward R will suffice.

VI. OBJECTIONS TO THE REINVENTION DEFENSE

A. Inventors Will Learn to Issue Notice Immediately

Again, a reinventor cannot qualify for the defense if she reinvents after the first inventor issues sufficient notice of his invention. Accordingly, if the defense is adopted into law, first inventors will have an incentive to issue notice before would-be reinventors can reinvent. What if first inventors adapt to the defense by learning to issue notice within as little as a few weeks ("immediately") after completing invention? Rarely does a reinventor complete invention immediately after the first inventor completes it. Thus, if first inventors learn to issue notice immediately, reinventors will rarely qualify for the defense. As such, the defense will do little to reduce monopoly loss. The defense will also do little to reduce ex ante incentives to pursue reinventables. If inventors ex ante know they will issue notice immediately after they complete the invention, they know the odds are very low that anyone will complete reinvention in time to qualify for the defense.

This argument is correct. To the extent inventors learn to issue notice immediately, the defense will reduce neither monopoly loss nor the number and intensity of patent races. To the same extent, however, the defense will reduce the *duration* of patent races. The sooner first inventors issue notice, the sooner trailing inventors find out they have lost and terminate their hasty and redundant R&D. Thus, even if all inventors learn to issue notice immediately, the defense will still lead to a state of affairs superior to the status quo – provided, as will generally be true, the benefits of shortening patent races exceed the costs of issuing notice immediately.[69]

B. Reinvention Defense Could Exacerbate Some Patent Races

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[69] This proviso will generally be satisfied because the benefits of terminating hasty and redundant R&D that would otherwise endure generally exceed the costs of sending letters to potential reinventors (actual notice) or publishing the invention via, for example, a press release (constructive notice).

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One could argue that the defense will cause inventors to race faster in order to not only win the patent but to do so with greater lead time. That is, under current law inventors are satisfied to win by an inch; the defense may give them an incentive to win by a mile.

This argument is weaker than it seems. The strategy of winning by a mile is inferior to the strategy of issuing notice promptly after winning by an inch. The strategies are equally effective at shutting the window of reinvention for a trailing inventor, but the strategy of winning by a mile tends to be much more expensive than the strategy of issuing notice promptly after winning by an inch. Thus, rational inventors will choose the latter strategy.

Compare, for instance, the following two cases. In case 1, inventors A and B are in the middle of a patent race. In terms of progress on the invention, A is about three months ahead of B. To prevent B from qualifying for the reinvention defense, A steps up the pace of his R&D, increases his lead, and ends up crossing the invention finish line six months before B can cross it. Yet, A issues notice of his invention five months later in his customary unrushed fashion. In case 2, A does not step up the pace of R&D. Rather, A maintains his three month lead throughout the race, but issues notice two months after he crosses the finish line. In both case 1 and case 2, B's reinvention window is shut one month before she can complete reinvention. A's costs, however, are likely to be much higher in case 1 than in case 2.

C. Reinvention Can Be Faked

An early version of this paper purported to be descriptive rather than normative. It aimed to explain why the reinvention defense does not exist in patent law rather than to argue it should exist. The purported descriptive explanation is that the defense would open the door to fraudulent claims of reinvention, which would degrade incentives for all inventions, not just for inventions that face a significant chance of being legitimately reinvented.

On closer inspection, the fraud explanation is unconvincing. To perpetrate a fraudulent reinvention defense, the phony reinventor would have to commit perjury

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and/or forge records. Advocacy and self-serving belief are not especially rare among members of the inventive community but outright fraud is. That community consists of scientists and engineers who are if anything more earnest than the general population. Unsurprisingly, therefore, fraudulent attempts to win first inventor status are quite rare. It is true that reinvention is somewhat easier to fake than first invention is.[70] On the other hand, a phony first inventor stands to gain more today from successfully faking first invention than a phony reinventor will gain from successfully faking reinvention. To the extent the overall risk-reward calculus for phony first invention approximates or is better than the overall risk-reward calculus for phony reinvention, the fact that fraudulent first invention is rare today suggests that fraudulent reinvention will be rare if the defense is adopted into law. In any event, if fraudulent reinvention turns out to be a problem, we can respond by increasing the evidentiary requirements that reinventors must satisfy to qualify for the defense.

Nor will the danger of phony reinvention encourage secrecy among first inventors. The benefit to first inventors of issuing early notice – early shutting of the reinvention window for legitimate potential reinventors – outweighs the risk that issuing early notice will help phony reinventors to fake reinvention. Issuing early notice will seldom help phony reinventors anymore than issuing late notice will. A phony reinventor can backdate her lab records to a date before late notice just as easily (in fact more easily) than she can backdate them to a date before early notice.

D. Patent Monopolies Can Be Reinstated Through Bargaining

Timely reinvention breaks up the patent monopoly into a duopoly. However, nothing in the regime of limited transferability discussed in Part III(E) prevents the reinventor and patentee from cobbling the patent monopoly back together. Per Coasian

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[70] In most legal disputes over who was first to invent ("priority contests"), neither party initially knows the other's date of invention. Each party must disclose his date of invention to the court or Patent Office before he knows the other's date. This discourages fraud because, at the time when the fraud would need to occur – at the outset of the priority contest – the phony first inventor does not know the date to beat. In contrast, a phony reinventor would know the date to beat: the date she received actual or constructive notice of the first inventor's invention. The phony reinventor would merely have to persuade the court or Patent Office she completed reinvention at least one day before that date of notice.

bargaining, the reinventor and the patentee can transfer their rights to the party who can best exploit those rights. When the patentee can best exploit the patent monopoly, the reinventor can assign her defense to the patentee. When the reinventor can best exploit the patent monopoly, the patentee can assign or license his patent to the reinventor. When a third party can best exploit the patent monopoly, the patentee and the reinventor can transfer their respective rights to the third party. In short, absent bargaining breakdown and prohibitive transaction costs, the patentee's patent rights and the reinventor's defense rights should find their way to their most highly valued use (facilitating monopoly).

If reinstatement of monopolies became the norm, the defense would do little to reduce monopoly loss and ex ante incentives to pursue reinventables. Reinstatement of monopolies would also generate transaction costs not incurred under current law. Nevertheless, the prospect of reinstatement is not especially troublesome. If reinstatement threatens to become the norm, we can nip it in the bud by tweaking the regime of limited transferability to forbid reinventors and patentees from transferring their rights to each other or to the same third party. We could, for example, simply declare that reinstating a patent monopoly in this way violates the antitrust laws or renders the patent unenforceable under the doctrine of patent misuse.

VII. CONCLUSION

The incentives necessary to stimulate invention vary across inventions. In an ideal world, incentives would be calibrated individually for each invention and would never exceed the minimum necessary to bring each invention into being at an opportune time. Incentives above the minimum impose deadweight losses. One deadweight loss comes in the form of diminished consumer access due to prices of inventions being higher above the competitive level than they have to be to stimulate the initial creation of the inventions. Another deadweight loss comes in the form of increased R&D costs that do not translate into equal benefits for consumers. When multiple inventors enter a race, each incurs the costs of invention. And when only one inventor can win, each is encouraged to rush and to incur the costs of invention early in time rather than waiting for the costs to fall as they normally will.

Under current law, an inventor's incentive to invent is a function of his expected return under complete patent exclusivity weighted by the probability of obtaining that exclusivity. If the reinvention defense is adopted into law, an inventor's incentive will be a function of his expected return under varying degrees of exclusivity weighted by the probability of obtaining each degree of exclusivity. In general, his incentive will fall with a rise in the probability of timely reinvention. When that probability is high, he might drop out of the race. His dropping out is usually good for society provided at least one other inventor stays in. If one inventor stays in, the invention gets made and the costs of invention are incurred only once. The risk is that no inventor stays in or that the invention is delayed. This risk appears to be minimal and worth accepting.