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The Psychology of Patent Protection

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This Article offers the first comprehensive assessment of the major justifications for our patent system using a behavioral psychology framework. Applying insights from the behavioral literature that I argue more accurately account for the realities of human action than previous analytical tools, I critically evaluate each of the major justifications for patents—incentive theory, disclosure theory, prospect theory, commercialization theory, patent racing theory, and non-utilitarian theories. I ask whether our current patent system is an effective regime for meeting the stated goals of these accounts. When the answer to this question is no, I again turn to the behavioral literature to provide suggestions for how we might better achieve these goals. The results of this analysis suggest that our current patent system is best justified under the commercialization account. Surprisingly, my analysis also suggests that many of the behaviors and outcomes we hope to encourage through patents might more effectively be accomplished using less socially costly non-financial incentives.

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The Psychology of Patent Protection

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I. INTRODUCTION

Intellectual property rights, including patent rights, play a significant role in the American innovation landscape. But why, exactly, do we grant patent monopolies?

To begin to answer this question, imagine that you are an inventor, working independently or as a founder of a small start-up company. What role, if any, does the patent system play in your decision-making as you proceed through the creative process?

Maybe the prospect of a patent provides the financial encouragement you need to invent something in the first place—a patent will allow you to protect your intellectual labor and hopefully make some money from your idea. Or maybe it encourages you to share the details of your invention with others—you would prefer to keep your idea secret, but choose to reveal it in exchange for the limited monopoly and corresponding financial returns a patent promises. Perhaps the prospect of monopoly profits will encourage you to make, or help you attract, the investments needed to turn your idea into a marketable product. Or maybe you would conceive, disclose, and commercialize your idea even without the patent incentive, but you nevertheless think that your idea deserves protection because you are personally attached to it, or because you believe it is a just reward for your contribution to society.

These are some of the reasons scholars have given to explain why we grant patent monopolies. But how can we know if our patent system actually works in the way these theories suggest? For instance, consider the predominant justification for the patent system: that a patent encourages people to invent things they would not invent without a patent. How can we know whether this actually happens in a typical case?

Patent scholars have traditionally answered this question using economic analyses, which assume that actors within the system behave

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rationally.¹ Indeed, many of the justifications for patents were developed based on this assumption.

But it is well known that people do not behave like rational actors.² In fact, a vast behavioral psychology literature reveals that people repeatedly depart from rational utility-maximizing behavior, and that they do so in predictable ways.³ Many of these well-studied behavioral trends take place in creative and innovative contexts. The behavioral literature, then, offers an alternative way to evaluate patent theories.

The time is ripe for reevaluating these justifications as the traditional view that patent rights optimally promote innovation is being challenged from a number of directions. Scholars, practitioners, and inventors in the software industry argue that strong patent rights may hinder rather than encourage innovation in their field.⁴ Commentators point to areas of endeavor where innovation flourishes without intellectual property protection.⁵ And patent trolls, who reap benefits from the patent regime without contributing the social value the system is meant to encourage, have caused many to question our current approach.⁶ Perhaps in response to these concerns, the Supreme Court has accepted an increased number of recent patent cases, and has decided these cases in ways that generally narrow the scope and availability of patent rights.⁷

¹ See William Fisher, *Theories of Intellectual Property*, in *NEW ESSAYS IN THE LEGAL AND POLITICAL THEORY OF PROPERTY* 168, 169 (Stephen R. Munzer ed., 2001) (explaining the economic basis of the predominant incentive theory of intellectual property).

² See Robert C. Ellickson, *Bringing Culture and Human Frailty to Rational Actors: A Critique of Classical Law and Economics*, 65 *CHI.-KENT L. REV.* 23, 23 (1989) (noting that an assumption of rationality exaggerates the actual cognitive capacities of humans).

³ See generally DAN ARIELY, *PREDICTABLY IRRATIONAL: THE HIDDEN FORCES THAT SHAPE OUR DECISIONS* xix–xx (2010) (arguing that humans act in predictably irrational ways in their economic reasoning and actions).

⁴ See, e.g., ADAM B. JAFFE & JOSH LERNER, *INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT* 198 (2011); *FED. TRADE COMM’N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY* 5–6 (2003), <https://www.ftc.gov/sites/default/files/documents/reports/promote-innovation-proper-balance-competition-and-patent-law-and-policy/innovati-onrpt.pdf> [<https://perma.cc/C6LH-TR5R>] (arguing that patents suppress productive competition among firms).

⁵ See, e.g., Aarthi S. Anand, “*Less is More*”: *New Property Paradigm in the Information Age?*, 11 *DUKE L. & TECH. REV.* 65, 69 (2012) (discussing software development as an area where innovation has flourished without strong intellectual property protection); Elizabeth L. Rosenblatt, *Intellectual Property’s Negative Space: Beyond the Utilitarian*, 40 *FLA. ST. U. L. REV.* 441, 447–48 (2013) (discussing intellectual property’s “negative-space”: areas of creation and innovation that thrive with little to no patent protection).

⁶ See Mark A. Lemley & A. Douglas Melamed, *Missing the Forest for the Trolls*, 113 *COLUM. L. REV.* 2117, 2172–80 (2013) (suggesting that trolls are a sign of a flawed patent system that warrants systemic reform).

⁷ See Jeremy Elman, *6 Key Decisions: Patent Year in Review*, *FLA. BUS. REV.* (Dec. 16, 2014), <http://www.dailybusinessreview.com/id=1202679187906/6-Key-Decisions-Patent-Year-in-Review>

Given the current distrust of patent rights, a renewed and comprehensive look at the various theoretical justifications for these rights is in order. Why *do* we grant patents? What do we hope to accomplish by doing so, and how?

After discussing the standard theoretical answers to these questions, this Article critically evaluates each of the theories—including incentive, disclosure, prospect, commercialization, patent racing, and non-utilitarian theories—using a behavioral approach that arguably more accurately accounts for the realities of human action than previous analytical tools. Applying this approach, this Article examines whether our current patent system is the most effective system for meeting the stated goals of these theories.

The behavioral framework used here offers insights into patent theories beyond what previously has been obtainable from traditional economic or rights-based analyses. For utilitarian theories, many of which invoke incentives to engage in innovation-optimizing behaviors (like invention, disclosure, and commercialization), the potential contribution of behavioral research is straightforward. Simply put, this work can help us understand whether individuals can be expected to respond to particular incentives in the way these theories propose. For non-utilitarian theories, many of which are focused on the rights of inventors, behavioral research can help us evaluate these theories in part by telling us whether our current system honors the interests implicated by the theories in a psychologically meaningful way.

This is not the first Article that has sought to examine one or more patent theories, or that has incorporated behavioral insights into its analysis. But it is the first to comprehensively evaluate the major theories of patent protection using a behavioral framework. This Article adds to the growing literature that incorporates findings from psychology and sociology into analyses of intellectual property policy⁸—a developing trend that is consistent with similar movements in other areas of the law, and is based on the recognition that classical law and economics theory

(noting that the six patent cases on the Supreme Court's 2014 docket represent the highest number of patent cases the Court has heard in one term).

⁸ See, e.g., Dennis D. Crouch, *The Patent Lottery: Exploiting Behavioral Economics for the Common Good*, 16 GEO. MASON L. REV. 141, 142 (2008); Jeanne C. Fromer, *A Psychology of Intellectual Property*, 104 NW. U. L. REV. 1441, 1443 (2010); William Hubbard, *Inventing Norms*, 44 CONN. L. REV. 369, 374 (2011); Eric E. Johnson, *Intellectual Property and the Incentive Fallacy*, 39 FLA. ST. U. L. REV. 623, 627 (2012); Gregory N. Mandel, *To Promote the Creative Process: Intellectual Property Law and the Psychology of Creativity*, 86 NOTRE DAME L. REV. 1999, 2002 (2011) [hereinafter Mandel, *To Promote the Creative Process*]; Gregory N. Mandel, *Left-Brain Versus Right-Brain: Competing Conceptions of Creativity in Intellectual Property Law*, 44 U.C. DAVIS L. REV. 283, 286 (2010); Laura G. Pedraza-Fariña, *Patent Law and the Sociology of Innovation*, 2013 WIS. L. REV. 813, 816.

does not capture the full complexity of human behavior.⁹

From the perspective of this Article, the end goal of the behavioral analysis is a utilitarian one. Ultimately, many would agree that we want a patent system that will maximize social value at minimal social cost. This Article demonstrates that a behavioral analysis can help us achieve this system in two ways. First, it can tell us whether we actually can expect our current patent system to achieve the goals proposed by each of the various theories. Second, if the answer to the first question is no for a given theory, the analysis can give us clues as to how we might better achieve that particular goal. Although behavioral research cannot tell us what the goal of the patent system *should* be (that is a normative question the theories themselves attempt to answer), it can, in the two ways mentioned, help guide us towards the patent system we claim to want.

This Article proceeds as follows. In Part II, I provide an overview of the various utilitarian and non-utilitarian accounts of the patent system. Part III forms the bulk of the Article; in it I examine each of the justifications for patents in light of relevant behavioral research, including work that has not previously been discussed in the intellectual property context. Based on this analysis, I conclude that the patent system in its current form is best structured to incentivize commercialization—the goal proposed by commercialization theory. In contrast, according to this inquiry, many of the ends proposed by the other theories do not justify our current system. The analysis reveals, however, that many of these goals—including promoting disclosure and productive competition—could be achieved by switching the focus of the patent system for early inventions from a primarily financial reward to a primarily attributional reward. In Part IV, I discuss the prescriptions that flow from my findings in the previous Parts.

II. ACCOUNTS OF THE PATENT SYSTEM

Scholars have offered various justifications for the intellectual property system generally and the patent system in particular. The majority of commentators focus on utilitarian accounts that employ primarily economic arguments to explain why patents encourage optimal levels of

⁹ See Ellickson, *supra* note 2, at 23 (arguing generally that insights from psychology and sociology can be used to enrich classical law and economics analyses); Russell B. Korobkin & Thomas S. Ulen, *Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics*, 88 CALIF. L. REV. 1051, 1057–58 (2000) (describing the development of “law and behavioral science” theory, which borrows from psychological and sociocultural theories, as a response to the shortcomings of rational choice theory); Donald C. Langevoort, *Behavioral Theories of Judgment and Decision Making in Legal Scholarship: A Literature Review*, 51 VAND. L. REV. 1499, 1502 (1998) (reviewing the substantive fields in which legal scholars have applied insights from behavioral decision-making research).

innovation. Additionally, non-utilitarian defenses that seek to justify the patent system as a means of promoting goals and values beyond innovation have been proposed. In this Part, I provide a brief overview of the principal accounts.

A. *Utilitarian Accounts*

1. *Incentive Theory*

The chief justification for the patent system is the so-called incentive theory. According to this theory, patents are necessary to efficiently incentivize the production of new ideas.¹⁰ This is so because ideas, unlike most physical property, are public goods: they are both non-rivalrous (meaning that they can be consumed simultaneously by more than one person) and non-excludable (meaning that one cannot effectively exclude others from their use).¹¹ Thus, once an individual produces an invention, incurring invention costs and production costs in the process, others can copy it while incurring only the production costs.¹² The result is that it is generally cheaper to copy someone else's idea than it is to create your own idea from scratch.¹³

Because the costs of copying are less than the costs of initial creation, copiers can sell their products at a lower cost than inventors, making it difficult for inventors to recoup the full costs of invention.¹⁴ Under this account, rational market players have every incentive to be copiers rather than inventors—to “free ride” on the larger expenditures and efforts of inventors.¹⁵

According to incentive theory, patents overcome these market problems by granting limited-term monopolies to inventors.¹⁶ This allows

¹⁰ See Mark A. Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129, 129–30 (2004) (explaining that without intellectual property protection, people would copy rather than create ideas).

¹¹ See ROBERT P. MERGES ET AL., *INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE* 11 (3d ed. 2003) (“Information has the characteristics of what economists call a ‘public good’—it may be ‘consumed’ by many people without depletion, and it is difficult to identify those who will not pay and prevent them from using the information.”); Fisher, *supra* note 1, at 169 (“The distinctive characteristic of most intellectual products . . . [is] that they are easily replicated and that enjoyment of them by one person does not prevent enjoyment of them by other persons.”); Johnson, *supra* note 8, at 631–32 (explaining that ideas are “copyable goods” that are nonrivalrous and nonexcludable).

¹² See Fisher, *supra* note 1, at 169 (explaining that copyists incur only low costs of production when distributing products based on an inventor's original idea).

¹³ See Rosenblatt, *supra* note 5, at 453 (“An underlying premise of the utilitarian approach is that copying costs less than initial creation.”).

¹⁴ See Fisher, *supra* note 1, at 169 (explaining that since copyists bear only the costs of production, they can offer products identical to the invention at very low prices).

¹⁵ See Johnson, *supra* note 8, at 629 (explaining that the public can take a “free ride” on the labor of persons who create nonrivalrous and nonexcludable goods).

¹⁶ See Fisher, *supra* note 1, at 169 (explaining that the patent system increases economic

inventors to recoup the full costs of invention by charging higher prices for their creations.¹⁷ It also provides market players with the necessary incentives to become inventors: because they can charge a premium for their goods, the payoff for inventors is potentially greater than that for copiers.¹⁸

As Eric Johnson notes, the incentive theory may owe its popularity to the fact that it is logically appealing.¹⁹ It is also the account of intellectual property given in the Constitution. Article I, Section 8 gives Congress the power to “secur[e] for limited times to authors and inventors the exclusive right to their respective writings and discoveries” for the purpose of “promot[ing] the progress of science and useful arts.”²⁰

2. Disclosure Theory

In contrast to incentive theory, disclosure theory does not presume that patents are necessary to incentivize invention.²¹ Instead, this theory posits that inventors will solve the problems that arise from the non-rivalrous, non-excludable nature of ideas by maintaining secrecy over their inventions.²²

But secrecy brings its own potential economic problems. In particular, it might inhibit downstream innovation by those who would otherwise be expected to build on the discoveries of the secret-keeping inventor.²³ Secrecy could also, due to increased transaction costs, deter the economically beneficial practice of licensing.²⁴

According to disclosure theory, then, a patent provides an inventor not

efficiency by granting creators the exclusive right to copy).

¹⁷ *Id.*

¹⁸ See Diane Leenheer Zimmerman, *Copyrights as Incentives: Did We Just Imagine That?*, 12 THEORETICAL INQUIRIES L. 29, 31 (2011) (“[W]ithout an intellectual property regime that reserves for copyright owners any profits that can be gleaned from their work over an extensive time span, potential authors would lack adequate motivation to create in the first place . . .”).

¹⁹ See Johnson, *supra* note 8, at 634 (positing that the “irresistible logic” of incentive theory has caused it to be enshrined in the U.S. Constitution).

²⁰ U.S. CONST. art. I, § 8, cl. 8.

²¹ Roberto Mazzoleni & Richard R. Nelson, *Economic Theories About the Benefits and Costs of Patents*, 32 J. ECON. ISSUES 1031, 1038 (1998).

²² *Id.* at 1039. An alternate conception of the theory envisions disclosure as a complement to incentive theory. Under this conception, the patent provides the primary incentive to innovate, but disclosure is an added benefit reaped by the public. See Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 548 (2009) (arguing that patents benefit society economically because they reward inventors for both inventing and disclosing information to the public); Mark A. Lemley, *The Myth of the Sole Inventor*, 110 MICH. L. REV. 709, 745 (2012) (“The benefit the public gets from the bargain, on [disclosure] theory, is not (or not just) a new invention but the publication of new learning that might otherwise have been kept secret.”).

²³ See Mazzoleni & Nelson, *supra* note 21, at 1039 (elaborating on the notion that the inventor who keeps all relevant information secret cannot exploit all possible uses of the invention).

²⁴ See *id.* at 1039 (explaining that “secrecy in general is less effective as a means of appropriating returns from product invention.”).

with an incentive to invent, but with an incentive to disclose the invention once she has created it. This theory is sometimes framed as a contract the inventor enters into with society.²⁵ In consideration for a patent, the inventor discloses her invention to the public.²⁶

Society reaps the benefits of this bargain with inventors in several ways. First, the public is free to use the information disclosed in the patent after the patent has expired, whereas if the patent had not issued, the information might have remained secret indefinitely.²⁷ Second, the patent disclosure might spur innovation even during the life of the patent, as others attempt to design around the patent, improve on the disclosed invention, or are inspired by the disclosed information to create something new.²⁸ Third, transaction costs of licensing are lowered because potential licensees are made aware of the existence of the invention, the parties in possession of the invention, and important details about precisely what the invention entails.²⁹

Disclosure theory is often endorsed by the courts as a justification for the patent system. Justice Ginsburg, writing for the majority in *Eldred v. Ashcroft*, reviewed a series of Supreme Court cases that characterized a patent as a “*quid pro quo*” given to the patentee in exchange for disclosure.³⁰ She explained that “immediate disclosure . . . from[] the patentee . . . is the price paid for the exclusivity secured.”³¹ The Federal Circuit endorsed this theory in *Enzo BioChem v. Gen-Probe* when it explained that a patent’s written description requirement fulfills “the *quid pro quo* of the patent system; the public must receive meaningful disclosure in exchange for being excluded from practicing the invention for a limited period of time.”³²

3. Prospect Theory

Incentive and disclosure theories focus on influencing behavior that occurs prior to invention. Prospect theory, in contrast, concerns itself with behavior that takes place after the initial inventive steps have been taken.³³

Edmund Kitch, the first proponent of the theory, compared a field of invention to a mining prospect.³⁴ He argued that just as a mining claim is

²⁵ *E.g.*, Lemley, *supra* note 22, at 745.

²⁶ *Id.*

²⁷ Fromer, *supra* note 22, at 548.

²⁸ *Id.* at 548–49.

²⁹ See Mazzoleni & Nelson, *supra* note 21, at 1034 (arguing that patents reduce the transaction costs involved in licensing an invention).

³⁰ 537 U.S. 186, 216 (2003).

³¹ *Id.*

³² 323 F.3d 956, 970 (Fed. Cir. 2002).

³³ Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 269 (1977).

³⁴ *Id.* at 266.

given to a single firm for reasons of efficiency, so too should a broad patent be granted to an inventor to manage his invention and control further innovation within the field.³⁵

Prospect theory does not speak to the incentives that might be required to stimulate invention in the first place. It does, however, seek to provide the initial inventor with the incentive to efficiently use his invention and pursue additional innovation in the same field.³⁶ The incentive is commensurate with the scope of the patent, which Kitch asserted should be broad.³⁷

Under prospect theory, exclusive rights to a broad field are given to the initial inventor for two reasons. First, the theory assumes that free development and exploitation of an invention once it has been created and disclosed, such as might take place if patent rights are defined narrowly, would lead to duplication and waste.³⁸ This waste might show itself in the form of patent races where multiple parties compete to obtain a patent on an improvement of the original invention.³⁹ Second, prospect theory assumes the initial inventor is in the best position to improve on the original invention.⁴⁰

Although prospect theory has been widely debated in the academic literature, it is not often cited by the courts or by Congress as a goal of the patent system. Elements of prospect theory have arisen in the copyright context, however, via the congressional call for longer copyright terms in the Copyright Term Extension Act.⁴¹ As argued by proponents, that legislation, enacted in 1998,⁴² provides incentives to copyright owners to continue preserving, producing, and distributing their previous creations.⁴³

4. Commercialization Theory

Like prospect theory, commercialization theory also addresses behavior that occurs after an invention has been conceived.⁴⁴ But unlike

³⁵ *Id.* at 271–75.

³⁶ Lemley, *supra* note 22, at 738–39.

³⁷ Kitch, *supra* note 33, at 267.

³⁸ Mazzoleni & Nelson, *supra* note 21, at 1042.

³⁹ Mark F. Grady & Jay I. Alexander, *Patent Law and Rent Dissipation*, 78 VA. L. REV. 305, 307–08 (1992) (discussing the patent system's compromise of granting protection broad enough to serve the system's purposes, but not so broad as to encourage wasteful patent races); *see also* Kitch, *supra* note 33, at 269–71.

⁴⁰ *See* Mazzoleni & Nelson, *supra* note 21, at 1042 (describing prospect theory's assumption that a broad patent promotes development in a structured manner). *But see* Lemley, *supra* note 22, at 740–41 (questioning this assumption).

⁴¹ *Eldred v. Ashcroft*, 537 U.S. 186, 208, 222 (2003) (upholding the Copyright Term Extension Act); Lemley, *supra* note 10, at 134–35.

⁴² *See* Lemley, *supra* note 10, at 134–35; Sonny Bono Copyright Term Extension Act, Pub. L. No. 105-298, 112 Stat. 2827 (1998) (codified as amended in scattered sections of 17 U.S.C.).

⁴³ *See* Lemley, *supra* note 10, at 134–35.

⁴⁴ Lemley, *supra* note 22, at 738–39.

prospect theory, which focuses on eliminating socially wasteful patent races, commercialization theory focuses on the patent as an incentive for inventors to develop their ideas and, ultimately, bring them to market.⁴⁵

As Ted Sichelman explains, commercialization theory recognizes that “conception is more of a process than an event,” and a number of steps beyond the initial idea are generally required before a creation is ready for public consumption.⁴⁶ Because the economic benefits flowing from innovation largely depend on inventions reaching the public in usable form,⁴⁷ the theory focuses on the patent system as a means of providing adequate incentives for each of these essential steps.⁴⁸

According to this theory’s proponents, the patent system has the potential to facilitate commercialization in several ways. First, adequate patent incentives can encourage the original inventor to do what is necessary to bring the creation to market and reap the rewards of the patent monopoly.⁴⁹ If the original inventor does not have the resources to perform the post-inventive development activities required to bring a product to market, a patent may also facilitate transferring the invention to a larger or more specialized firm for commercialization.⁵⁰ If the inventor does decide to single-handedly undertake commercialization, a patent may facilitate the patentee’s search for development and commercialization funding.⁵¹ While some commercialization proponents focus on justifying the current patent system via a commercialization account, others have suggested reforms that would more effectively advance commercialization’s goals, including a new, commercialization-focused patent.⁵²

Commercialization has recently been cited by the Federal Circuit as a

⁴⁵ Michael Abramowicz, *The Dangers of Underdeveloped Patent Prospects*, 92 CORNELL L. REV. 1065, 1073–76 (2007); Ted Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341, 347–53 (2010).

⁴⁶ Sichelman, *supra* note 45, at 349–52 (noting that these steps might include making a prototype, market testing, marketing, and distribution).

⁴⁷ *Id.* at 377–78.

⁴⁸ *See id.* at 350–54 (describing the phases of work typically required to make commercial use of a patent).

⁴⁹ *See* F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 707–08 (2001).

⁵⁰ Mazzoleni & Nelson, *supra* note 21, at 1040.

⁵¹ *See* Michael J. Burstein, *Exchanging Information Without Intellectual Property*, 91 TEX. L. REV. 227, 241–43 (2012) (noting how two goals of the patent system articulated in commercialization theory—(1) facilitating transfer of an invention and (2) fundraising for commercialization purposes—are a solution to the “disclosure paradox”—the reticence of inventors to reveal important information to parties capable of helping to commercialize it for fear of having their ideas stolen); *see also* Arti Kaur Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 NW. U. L. REV. 77, 121–22 (1999). This Article focuses exclusively on the financial incentive strain, rather than the disclosure paradox strains, of commercialization theory.

⁵² *Compare* Kieff, *supra* note 49, at 707–08 (justifying the current system in terms of commercialization), *with* Sichelman, *supra* note 45, at 400–09 (proposing a separate commercialization patent for those who commit to developing and selling a product).

goal of the patent system. In *Fresenius USA v. Baxter International*, the court stated that “[t]he system of patents is founded on providing an incentive for the creation, *development, and commercialization* of new technology.”⁵³

The Bayh-Dole Act of 1980, which allows universities to obtain patents on the fruits of publicly funded research, also reflects commercialization concerns.⁵⁴ Section 200 of the Act states that “[i]t is the policy and objective of the Congress to use the patent system to promote the utilization of inventions arising from federally supported research or development . . . [and] the commercialization and public availability of inventions made in the United States by United States industry and labor.”⁵⁵

5. Patent Racing Theory

Under prospect theory, patent races are viewed as an inefficient outcome remedied by granting an initial inventor control over improvements and subsequent innovations in the field.⁵⁶ In contrast, Mark Lemley argues that patent races may perform an important function, and that a patent’s role in encouraging these races provides an independent theoretical justification for the patent system.⁵⁷

According to this theory, inventors do not necessarily need the incentive of the patent to invent in the first instance.⁵⁸ The fact that a patent is available, however, will tend to speed the pace of innovation as individuals and groups literally race for the patent prize.⁵⁹ Inventors may engage in these races because they want the monopoly reward a patent brings or because they fear being excluded from or taxed for the use of their own inventions if someone else patents them.⁶⁰

Although the traditional interpretation is that patent racing is economically wasteful, Lemley argues that this view may be overstated.⁶¹ A race to obtain a patent for a given invention will necessarily involve some duplication of effort, but because innovation is a trial-and-error process, independent groups working towards the same goal will likely adopt different approaches.⁶² These differences in approach may lead to

⁵³ *Fresenius USA v. Baxter Int’l*, 733 F.3d 1369, 1382 (Fed. Cir. 2013).

⁵⁴ Pub. L. No. 96-517, 94 Stat. 3015 (codified as amended in scattered sections of 35 U.S.C.); *see also* Mazzoleni & Nelson, *supra* note 21, at 1041.

⁵⁵ Bayh-Dole Act of 1980 § 200 (codified as amended at 35 U.S.C. § 200 (2012)).

⁵⁶ Grady & Alexander, *supra* note 39, at 307; *see also* Kitch, *supra* note 33, at 269–70.

⁵⁷ Lemley, *supra* note 22, at 750–51, 757.

⁵⁸ *Id.* at 736–37.

⁵⁹ *Id.* at 752–53.

⁶⁰ *Id.* at 755–56.

⁶¹ *Id.* at 752–53.

⁶² *Id.* at 753–54.

additional insights and contributions, useful in particular circumstances or for solving different iterations of the same problem.⁶³ Any waste from duplicative efforts is therefore, under this theory, more than made up for by gains in the pace of innovation and the added contributions by multiple parties working on a given problem.⁶⁴

B. *Non-Utilitarian Accounts*

1. *Labor-Desert Theory*

The labor-desert theory of intellectual property is the prominent non-utilitarian justification for patents. It stems from Locke's writings on common property.⁶⁵ Locke proposed that an individual who works to improve common property is entitled, via notions of natural law, to rights in this property.⁶⁶

In the intellectual property context, labor-desert proponents argue that the same holds true for the "common property" of ideas.⁶⁷ When someone takes an idea and improves upon it to create an invention, natural rights notions dictate a grant of rights in recognition of these efforts.⁶⁸

Locke moderated his theory of earned property rights by two "provisos." First, he argued that property rights should be granted only if there remains "enough and as good" in the commons for others to use.⁶⁹ Second, he argued that "property should not be wasted."⁷⁰ A common interpretation of Locke's provisos in the intellectual property context holds that granting intellectual property rights to one person should not cause a net harm to others.⁷¹

A system that grants exclusive, albeit temporally limited, rights has the potential to cause harm by removing ideas and inventions from the commons.⁷² Labor-desert theory in the intellectual property context thus seeks to achieve a balance between granting individual rights and

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ Fisher, *supra* note 1, at 170; Rosenblatt, *supra* note 5, at 444–46.

⁶⁶ JOHN LOCKE, TWO TREATISES OF GOVERNMENT 285–86 (Peter Laslett ed., Cambridge Univ. Press 1988) (1690).

⁶⁷ See ROBERT P. MERGES, JUSTIFYING INTELLECTUAL PROPERTY 32–33 (2011).

⁶⁸ *Id.*

⁶⁹ Fisher, *supra* note 1, at 170; Rosenblatt, *supra* note 5, at 455; Seana Valentine Shiffrin, *Lockean Arguments for Private Intellectual Property*, in NEW ESSAYS IN THE LEGAL AND POLITICAL THEORY OF PROPERTY 138, 146–47 (Stephen R. Munzer ed., 2001).

⁷⁰ See Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO. L.J. 287, 297–98 (1988); Rosenblatt, *supra* note 5, at 455.

⁷¹ Adam D. Moore, *A Lockean Theory of Intellectual Property*, 21 HAMLINE L. REV. 65, 78–79 (1997); see also Fisher, *supra* note 1, at 170; Rosenblatt, *supra* note 5, at 455.

⁷² See Rosenblatt, *supra* note 5, at 456.

preventing harm to the larger society.⁷³

The labor-desert rationale of intellectual property is rarely cited explicitly by the Supreme Court or the Federal Circuit in patent cases. But a number of scholars have argued that natural rights concerns nevertheless strongly inform judicial and congressional attitudes towards intellectual property.⁷⁴

2. *Personality Theory*

Personality theory shares many similarities with the labor-desert account; the two accounts are often referred to together as “moral rights” justifications.⁷⁵ Derived from the writings of Hegel, personality theory holds that a creator is entitled to rights in his invention, not only because justice dictates a reward for his labor, but because he has a personality interest in his discovery.⁷⁶ The theory conceives of creations as extensions of their creators; a creator thus has an ongoing interest in the fate of his creation just as a parent has an ongoing interest in the fate of his child.⁷⁷

Monetary reward plays a less central role in personality theory than in other theories.⁷⁸ Because the theory is primarily concerned with validating the personhood of creators through their works, its aims may be achieved in a variety of ways that do not necessarily involve payment; for example, by ensuring that a creator receives credit for her work or by giving her ongoing control over how her work is used.⁷⁹

Under the logic of personality theory, works that implicate a greater personhood interest should be entitled to greater protections, and vice versa.⁸⁰ Employing this logic, Justin Hughes has argued that artistic works,

⁷³ *Id.*

⁷⁴ See, e.g., Wendy J. Gordon, *On Owning Information: Intellectual Property and the Restitutionary Impulse*, 78 VA. L. REV. 149, 151–56 (1992) (arguing that Lockean fairness concerns have motivated the grant of ownership rights to an expanding range of “beneficial products of human effort”); Adam Mossoff, *Exclusion and Exclusive Use in Patent Law*, 22 HARV. J.L. & TECH. 321, 351 (2009) (arguing that natural rights notions were used to justify the creation of new areas of intellectual property law, including trade secrets and trademarks); Mathias Strasser, *A New Paradigm in Intellectual Property Law? The Case Against Open Sources*, 2001 STAN. TECH. L. REV. 4, 65 (“While sweat-of-the-brow considerations have almost disappeared from the courts’ jurisprudence, the labor-desert theory as such continues to influence attitudes toward intellectual property law.”); Deborah Tussey, *Owning the Law: Intellectual Property Rights in Primary Law*, 9 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 173, 226 (1998) (arguing that the recent expansion of property rights in intangibles has been fueled by natural rights notions).

⁷⁵ Jeanne C. Fromer, *Expressive Incentives in Intellectual Property*, 98 VA. L. REV. 1745, 1753 (2012).

⁷⁶ *Id.*; Hughes, *supra* note 70, at 330, 333; see also Margaret J. Radin, *Property and Personhood*, 34 STAN. L. REV. 957, 971–78 (1982) (arguing that the development of personality through the embodiment of one’s will should form the basis of abstract and formal rights).

⁷⁷ See Radin, *supra* note 76, at 965–68.

⁷⁸ Rosenblatt, *supra* note 5, at 457.

⁷⁹ *Id.*; Fromer, *supra* note 75, at 1790; see also Radin, *supra* note 76, at 968.

⁸⁰ See Hughes, *supra* note 70, at 339–40.

including “[p]oems, stories, novels, . . . musical works[,] . . . sculpture, paintings, and prints” are more likely candidates for legal protection than the works of the “genetic researcher or the aerospace engineer.”⁸¹

Unlike utilitarian (and to a lesser extent, labor-desert) theories, personality theory does not figure prominently in U.S. patent law.⁸² Hughes contrasts this with Europe, where in France and Germany, patent owners are given the explicit moral right to receive attribution for their works.⁸³

Perhaps unsurprisingly, and in line with Hughes’s arguments, to the extent that personality theory has proven influential in the United States, it has been in the context of expressive works of the kind commonly protected by copyright law.⁸⁴ For example, commentators have pointed to the Visual Artists Rights Act of 1990, which grants certain personality rights to the creators of small distributions of visual art, including the right to attribution.⁸⁵

3. *Social Planning Theory*

The final theory discussed here shares with utilitarian approaches an instrumentalist emphasis.⁸⁶ Unlike utilitarian accounts of patents, however, which focus narrowly on maximizing economic welfare by promoting innovation, social planning theory aims more broadly to promote a “just and attractive culture” through the intellectual property system.⁸⁷

Because the goals of social planning theory are broader and less well-defined than those of utilitarian approaches, scholarship in this area has been devoted to the threshold task of articulating what, exactly, constitutes a “just and attractive culture.” Madhavi Sunder, who has advocated an approach to intellectual property that would “emphasiz[e] multiple values beyond just efficiency,” has listed as desirable values autonomy, culture, democracy, equality, and development.⁸⁸ William Fisher has argued that the intellectual property system should promote a number of precise goals, including creativity, community, happiness, respect, and opportunities for meaningful work and self-determination.⁸⁹

⁸¹ *Id.* at 340, 342–43.

⁸² *But see* Fromer, *supra* note 75, at 1792 (arguing that the attribution requirement in U.S. patent law “ever so faintly” protects creators’ property interests).

⁸³ Hughes, *supra* note 70, at 350.

⁸⁴ Fisher, *supra* note 1, at 174.

⁸⁵ Pub. L. No. 101-650, sec. 603, § 106A (codified at 17 U.S.C. § 106A (1994)); Fisher, *supra* note 1, at 174; Fromer, *supra* note 75, at 1796.

⁸⁶ Rosenblatt, *supra* note 5, at 457–58.

⁸⁷ William W. Fisher, *Reconstructing the Fair Use Doctrine*, 101 HARV. L. REV. 1661, 1747–49 (1988); *see also* Fisher, *supra* note 1, at 171 (stating that one justification for intellectual property rights may be the creation of social and economic conditions conducive to human flourishing).

⁸⁸ Madhavi Sunder, *IP³*, 59 STAN. L. REV. 257, 324–25 (2006).

⁸⁹ Fisher, *supra* note 87, at 1747–48; *see also* Fisher, *supra* note 1, at 171. Many of the values

Social planning theorists have also discussed how current intellectual property doctrines fit with their identified goals and how the system could be tailored to better promote these goals. As with other non-utilitarian approaches, much of this work focuses on copyright and other non-patent intellectual property rights, like publicity.⁹⁰ To the extent that courts and legislators explicitly or implicitly rely on the social planning theory of intellectual property, it also tends to be outside the patent context.⁹¹

III. USING A BEHAVIORAL FRAMEWORK TO EVALUATE PATENT THEORIES

Of the various accounts that have been given to justify intellectual property, far and away the most influential of these is the utilitarian incentive story.⁹² The predominance of the incentive story may explain in part why many recent efforts to integrate insights from psychology and sociology into intellectual property scholarship have focused almost exclusively on this theory.⁹³

But a behavioral framework can play a much larger role in patent scholarship and policy analysis. Specifically, this framework can enable us to determine whether *any* of the theoretical accounts of the patent system align with real-world behaviors. If it appears from this analysis that theory and reality are not aligned, the behavioral literature can further contribute by giving us insights into the types of programs and incentives that have the best chance of achieving the goals we want our patent system to accomplish.

In this Part, I initiate that analysis by evaluating the implications of relevant behavioral research for each of the above-described accounts of the patent system. But first, I begin with a brief introduction to the use of

articulated by commentators working in the social planning theory vein share similarities with, or explicitly draw from, the capability approach to welfare economics, first articulated by Amartya Sen and most notably elaborated upon in the development context by Martha Nussbaum. *See, e.g.*, Sunder, *supra* note 88, at 313–14.

⁹⁰ Fisher, for example, has argued that the fair use copyright doctrine could be reworked such that uses promoting his vision of an attractive culture would be deemed “fair,” while those that detracted from this vision would not. Fisher, *supra* note 87, at 1766–67, 1780. Neil Netanel has argued that a shorter copyright term would help promote creativity by placing more materials in the public domain for others to build on. Neil W. Netanel, *Copyright and a Democratic Civil Society*, 106 *YALE L.J.* 283, 3668–71 (1996). One exception to this trend is Sunder’s work, which has evaluated developments in international patent law through the lens of distributive justice. Sunder, *supra* note 88, at 290–91.

⁹¹ *See* Fisher, *supra* note 1, at 175 (describing courts’ unwillingness to uphold assertions of copyright against criticism and commentary as an example of social planning theory in action).

⁹² Fisher, *supra* note 1, at 173–74; Johnson, *supra* note 8, at 626–27; Lemley, *supra* note 10, at 129–30; *see also supra* Part II.A.1.

⁹³ *See infra* Part III.B.1. As I also discuss in this Part, another obvious reason for this focus on the incentive theory is the fact that a key finding from the psychology research calls into question the premise of the incentive theory: that external incentives are required to encourage creativity.

behavioral research generally to inform utilitarian and other modes of legal inquiry.

A. *Using Behavioral Research to Inform Legal Analyses*

Beginning in the 1960s and through the 1970s, the law and economics approach grew to become one of the dominant strains of legal analysis.⁹⁴ The approach focuses on the efficiency of legal rules and incentives.⁹⁵ It assumes that an actor being governed by the legal system is rational and will respond in ways that maximize his own personal utility.⁹⁶

The premise of the rational actor, however, has long been suspect.⁹⁷ In particular, commentators have questioned whether cognitive biases could influence behavior and cause an individual to act less than rationally even when he has access to perfect information.⁹⁸ During the initial growth of the law and economics movement, however, there were few attempts by either legal theorists or psychologists to elucidate legal issues with psychological findings.⁹⁹

This slowly began to change during the late 1980s and through the 1990s and 2000s as an increasing number of legal scholars started to draw important connections between the work of experimental psychologists and the basic assumptions made in law and economics models.¹⁰⁰ As this “law and behavioral science” approach gained momentum, scholars began applying insights from the psychology literature to a range of substantive fields of law. In 1998, a review of the literature showed that behavioral decision-making research had been applied by commentators to questions of contract, tort, criminal, tax, corporate, property, and family law, among other areas.¹⁰¹

Today, it is an increasingly well-accepted premise that findings from

⁹⁴ See Paul H. Rubin, *Law and Economics*, in THE CONCISE ENCYCLOPEDIA OF ECONOMICS 322–23 (David R. Henderson ed., 2d ed. 2008).

⁹⁵ *Id.*

⁹⁶ *Id.*; Ellickson, *supra* note 2, at 23.

⁹⁷ Ellickson, *supra* note 2, at 23.

⁹⁸ *Id.*

⁹⁹ *Id.* at 24.

¹⁰⁰ See, e.g., *id.* at 35, 40–43 (discussing several experimental findings that call into question the rational-actor model, including the concept of framing, wherein an actor’s weighing of risk and reward depends on his reference frame; limitations on cognitive capacity that affect an actor’s ability to process information; the decreased ability of an actor to process dissonant information; and limitations on self-control that affect an actor’s ability to act rationally even when he knows this is the “right” choice); Korobkin & Ulen, *supra* note 9, at 1075–76, 1113–17, 1127–30, 1135–36 (discussing additional experimental findings that call into question the rational-actor model, including the use of heuristics or shortcuts in decision-making; the role of habits, addictions, and cravings in decision-making; and the finding that actors for various reasons, including compliance with social norms and conceptions of fairness, do not always act in their own self-interest).

¹⁰¹ Langevoort, *supra* note 9, at 1502, 1511–12, 1514–15, 1517.

the behavioral science literature can contribute important insights to a range of substantive fields and analytic paradigms.¹⁰² For whatever reason, however, behavioral research has been relatively slow to find its way into analyses of intellectual property entitlements, which have been, and continue to be, in a predominantly classical economic strain.¹⁰³

This is beginning to change, however, as a growing number of intellectual property scholars publish scholarship examining the implications of behavioral science for intellectual property.¹⁰⁴ Many of these works explore the implications of the behavioral science research for the dominant utilitarian incentive account of intellectual property.¹⁰⁵ The rest of this Part briefly reviews what has been done in this respect and goes on to generalize a behavioral framework for evaluating the other major accounts of the patent system.

B. *Psychology and Utilitarian Accounts of the Patent System*

In general, utilitarian justifications for patents posit that economic incentives will encourage actors to behave in various innovation-optimizing ways. Behavioral findings can help us understand whether individuals will respond to these incentives as predicted.

1. *Incentive Theory*

The incentive justification for patents holds that a patent is needed to overcome the free-rider problem and encourage potential inventors to engage in innovative activities they would not undertake without the incentive. A number of intellectual property scholars have pointed to a key finding from the psychology literature that calls the basic premise of the incentive account into question.¹⁰⁶

a. *Motivation Research*

The key finding is this: individuals, in general, undertake creative

¹⁰² This increased acceptance is exemplified by the recent growth of behavioral economics, where findings from behavioral decision-making research are explicitly integrated into economic legal analyses. See RICHARD H. THALER & CASS R. SUNSTEIN, *NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS* 6–8, 97–99 (2008).

¹⁰³ See Fisher, *supra* note 1, at 169.

¹⁰⁴ See, e.g., Fromer, *supra* note 75, at 1753; sources cited *supra* note 8.

¹⁰⁵ See, e.g., Hubbard, *supra* note 8, at 373 (arguing that the incentive theory of intellectual property law should be modified in light of social norms); Johnson, *supra* note 8, at 678–79 (concluding that patent entitlements should be sunsetted in light of behavioral research that calls the incentive theory into question); Mandel, *To Promote the Creative Process*, *supra* note 8, at 1999–2000 (arguing that psychological research offers insight into the incentive theory of intellectual property); Pedraza-Fariña, *supra* note 8, at 816–17 (arguing that a “socio-historical approach” can contribute important insights to the “primary goal of patent law . . . to incentivize innovation”).

¹⁰⁶ See Johnson, *supra* note 8, at 640–41; Mandel, *To Promote the Creative Process*, *supra* note 8, at 2007–12; Zimmerman, *supra* note 18, at 47–49.

activities not for a monetary reward, but because they are intrinsically motivated to do so—because they wish to “engag[e] in [the] activity for its own sake, out of interest, or for the pleasure and satisfaction derived from the experience.”¹⁰⁷ In contrast, extrinsic motivators like money, which align more closely with the utilitarian rational-actor model of decision-making,¹⁰⁸ actually may detract from creative behavior.¹⁰⁹ Since a patent may function as an extrinsic motivator, commentators have noted that this finding has implications for the incentive theory of patents.¹¹⁰

The commentators differ somewhat in their determinations of what these implications are. Eric Johnson argues that the current system of patent entitlements could be “phased out entirely.”¹¹¹ He points to restrictions on competition and other losses that accrue from the patent system.¹¹² Since it appears from the motivation research that patents may not be required to incentivize creativity, Johnson proposes that patent rights be granted only in limited situations and only on a showing that they are needed to incentivize creation or for some other reason.¹¹³

On the other hand, Gregory Mandel asserts that our current patent system is not necessarily inconsistent with the motivation research.¹¹⁴ The research suggests, for example, that framing a given activity as achieving either intrinsic or extrinsic goals can influence the motivation of the individual engaging in the activity.¹¹⁵ If the activity is framed as achieving intrinsic goals, intrinsic motivation and attendant creativity are enhanced,

¹⁰⁷ Hsiu-Fen Lin, *Effects of Extrinsic and Intrinsic Motivation on Employee Knowledge Sharing Intentions*, 33 J. INFO. SCI. 135, 137 (2007).

¹⁰⁸ *Id.*

¹⁰⁹ TERESA M. AMABILE, CREATIVITY IN CONTEXT 92–93 (1996); see also Mandel, *To Promote the Creative Process*, *supra* note 8, at 2007–08. But see Christopher Buccafusco et al., *Experimental Tests of Intellectual Property Laws’ Creativity Thresholds*, 92 TEX. L. REV. 1921, 1938–39 (2014) (discussing behavioral findings suggesting that extrinsic motivators may not undermine creativity in all contexts; for example, when individuals are given instructions about how to perform creatively to achieve a reward, or when the reward is performance-contingent rather than completion-contingent).

¹¹⁰ E.g., Johnson, *supra* note 8, at 624–26; Mandel, *To Promote the Creative Process*, *supra* note 8, at 2010–11. Cohen and Zimmerman have made the same observation in the context of the copyright system. See Julie E. Cohen, *Copyright as Property in the Post-Industrial Economy: A Research Agenda*, 2011 WIS. L. REV. 141, 143; Zimmerman, *supra* note 18, at 47–48.

¹¹¹ Johnson, *supra* note 8, at 675–76.

¹¹² *Id.* at 671, 677.

¹¹³ *Id.* at 675–76. In the copyright context, Diane Leenheer Zimmerman suggests a number of implications for the copyright system arising from the intrinsic motivation research. See Zimmerman, *supra* note 18, at 30. Although she does not suggest that copyright entitlements should be eliminated altogether, she does argue for an end to copyright term extensions, the creation of additional statutory exemptions to copyright, and a more liberal construal by courts of noninfringing uses. *Id.* at 54–57.

¹¹⁴ See Mandel, *To Promote the Creative Process*, *supra* note 8, at 2012 (arguing that patent law’s nonobviousness requirement may enhance intrinsic motivation and promote creative achievement).

¹¹⁵ Maarten Vansteenkiste et al., *Intrinsic Versus Extrinsic Goal Contents in Self-Determination Theory: Another Look at the Quality of Academic Motivation*, 41 EDUC. PSYCHOLOGIST 19, 24–25 (2006).

and vice versa.¹¹⁶ According to Mandel, to the extent the nonobviousness requirement for patents frames the inventive process as achieving the intrinsic goal of creativity, this doctrine may enhance rather than detract from creative behavior.¹¹⁷

Further, recent empirical work by Christopher Buccafusco and colleagues suggests that when extrinsic incentives are probabilistic and threshold-based—as patent rights are—rather than directly based on performance—as are many of the incentives examined in the social science literature—these incentives may not undermine, and may in fact encourage, creativity.¹¹⁸ Based on this finding, and similarly to Mandel, the authors of this empirical study suggest that the high nonobvious threshold for patent protection might be beneficial for motivation and creativity.¹¹⁹

Despite the disagreement over the best response to findings from the motivation research, it is clear that these findings present a more complicated picture than the economic incentive theory acknowledges. Further attention to this issue is thus justified. Incentive theory could be refined in order to fully account for the behavioral research.¹²⁰ Alternatively, the theory might lose its position as the dominant account of the patent system as commentators turn to other justifications for patent entitlements that are more in keeping with behavioral research.¹²¹

b. Other Findings

Intellectual property scholars working in a behavioral science vein have pointed to a number of other insights from the empirical literature and analyzed these within the framework of incentive theory. These insights include the discovery that collaborative, cross-disciplinary work can enhance creativity;¹²² the finding that creative output generally requires both problem-finding and problem-solving skills and a mix of convergent

¹¹⁶ *Id.*

¹¹⁷ Mandel, *To Promote the Creative Process*, *supra* note 8, at 2012.

¹¹⁸ Buccafusco et al., *supra* note 109, at 1977.

¹¹⁹ *Id.* at 1978.

¹²⁰ An example of such a refinement is Mandel's suggestion that the nonobviousness requirement be maintained or strengthened to assure that the patent "frames" invention as an intrinsic goal for inventors. Mandel, *To Promote the Creative Process*, *supra* note 8, at 2012; Gregory Mandel, *The Non-Obvious Problem: How the Indeterminate Nonobviousness Standard Produces Excessive Patent Grants*, 42 U.C. DAVIS L. REV. 57, 90 (2008).

¹²¹ As stated in Part I, one of the goals of this Article is to initiate an inquiry into the consistency of the various patent justifications with behavioral research. One of the main concerns of scholars who have pointed to the connection between the motivation research and the incentive theory of intellectual property is that the continued dominance of incentive theory may perpetuate rent-seeking behavior by actors who do not require a patent as an incentive, but who nevertheless want to reap the rewards a patent offers. See Johnson, *supra* note 8, at 665; Zimmerman, *supra* note 18, at 55.

¹²² Mandel, *To Promote the Creative Process*, *supra* note 8, at 2013–16; see also Pedraza-Fariña, *supra* note 8, at 838–40.

(analytic) and divergent (intuitive) thinking,¹²³ the understanding that the creative process progresses in stages,¹²⁴ and the idea that vested interests or prevailing social norms can either hinder or encourage innovation.¹²⁵

As these scholars have pointed out, these additional findings have implications for and within the incentive account of the patent system.¹²⁶ But unlike the discovery that individuals may not need external incentives to achieve optimal levels of creativity, these insights do not necessarily speak to the fundamental correctness or viability of incentive theory.¹²⁷ To the extent that these findings have more fundamental implications for alternate accounts of the patent system, I will discuss them below.

2. Disclosure Theory

Disclosure theory, a second utilitarian justification for patents that has seen some popularity with courts, holds that a patent incentive is necessary to prevent an inventor from keeping her invention secret.¹²⁸ But behavioral research suggests that this theory may not be grounded in the reality of human behavior.

a. Motivation Research

i. Disclosure and Reward

Just as incentive theory has been called into question by the suggestion that individuals may not need external motivators to encourage creative activity, it is also possible that individuals need no external motivators to encourage them to share their creative fruits with others. Indeed, following the logic of the creativity motivation research, which has shown that individuals are intrinsically motivated to create in part out of a desire to contribute and “give back” to society,¹²⁹ one might expect this to be the case.¹³⁰

This intuition is borne out by empirical studies. Researchers have

¹²³ Fromer, *supra* note 8, at 1468–72; Mandel, *To Promote the Creative Process*, *supra* note 8, at 2002, 2004–05, 2007.

¹²⁴ Fromer, *supra* note 8, at 1462.

¹²⁵ *Id.* at 1474; Hubbard, *supra* note 8, at 376–78; Pedraza-Fariña, *supra* note 8, at 844–45.

¹²⁶ *See, e.g.*, Fromer, *supra* note 8, at 1443–44 (“If the goal of patent and copyright law is to provide an incentive to produce creative works, it is worth looking to the psychological literature that illuminates the process by which scientists and artists actually create and by which individuals appreciate creative works.”).

¹²⁷ In contrast, and as explained in Part III.B.1, *supra*, the motivation research potentially presents a fatal challenge to incentive theory.

¹²⁸ *See supra* Part II.A.2.

¹²⁹ *See* Zimmerman, *supra* note 18, at 44.

¹³⁰ The idea that individuals may be willing to share their creative outputs for something other than a monetary reward has also been suggested by others. *See, e.g.*, Fromer, *supra* note 75, at 1790, 1797 (arguing that attribution can serve as a more powerful incentive than money in many cases); Rosenblatt, *supra* note 5, at 465 (same).

found that intrinsic motivation plays a significant role in a person's desire to share knowledge and discoveries with others.¹³¹ In particular, intrinsic factors like knowledge self-efficacy (a person's sense that he has valuable information to share) and enjoyment in helping others predict a person's willingness to share knowledge.¹³² In contrast, external rewards seem to have little effect on a person's willingness to share knowledge.¹³³

The behavioral research, then, suggests that disclosure theory's premise—that an external reward is required to encourage inventors to disclose information that they would otherwise keep secret—may not be correct.

A potential caveat of this conclusion is one that has also been identified for motivation research's challenge to incentive theory: although individuals may indeed be internally motivated to create (or, in this case, disclose their creations), the majority of patentable innovation (and subsequent disclosure) is accomplished by individuals who are working not independently, but within organizations.¹³⁴ Unlike individuals, organizations may be more likely to behave like rational actors, undertaking cost-benefit analyses and subject to utilitarian incentives.¹³⁵ So where an individual might disclose an invention for purely intrinsic reasons, a firm might keep the same invention secret absent an extrinsic award that tips the cost-benefit scale in favor of disclosure.¹³⁶

¹³¹ See, e.g., Lin, *supra* note 107, at 135, 137.

¹³² E.g., Lin, *supra* note 107, at 137; Wole Olatokun & Chinazom Irene Nwafor, *The Effect of Extrinsic and Intrinsic Motivation on Knowledge Sharing Intentions of Civil Servants in Ebonyi State, Nigeria*, 28 INFO. DEV. 216 (2012); Gee-Woo Bock & Young-Gul Kim, *Breaking the Myths of Rewards: An Exploratory Study of Attitudes About Knowledge Sharing* (PACIS 2001 Proceedings, Paper No. 78, 2001).

¹³³ Bock & Kim, *supra* note 132; Lin, *supra* note 107, at 143, 145; Olatokun & Nwafor, *supra* note 132. One exception to this conclusion, as I will discuss later in this Article, is the finding that the extrinsic reward of enhanced personal reputation can motivate knowledge sharing. See, e.g., Molly McLure Wasko & Samer Faraj, *Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice*, 29 MIS Q. 35, 53 (2005).

¹³⁴ According to the U.S. Patent and Trademark Office, only approximately fourteen percent of all patented inventions originate from independent inventors. *Compare Patent Counts by Class by Year—Independent Inventors, January 1977–December 2014*, U.S. PAT. & TRADEMARK OFF., http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cbcbby_in.htm [<http://perma.cc/E6VJ-GU4K>] (last visited Nov. 21, 2015) (listing 1,225,614 utility patents that were unassigned or assigned to an individual rather than an organization), with *Patent Counts by Class by Year, January 1977–December 2014*, U.S. PAT. & TRADEMARK OFF., <http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cbcbby.htm> [<http://perma.cc/WZ74-FEQE>] (last visited Nov. 21, 2015) (listing a total of 9,020,440 utility patents in the same time period).

¹³⁵ See Johnson, *supra* note 8, at 661 (stating that corporations, generally speaking, may proceed in a more calculated, practical manner than most individuals with respect to the production of intellectual property).

¹³⁶ The difference between individuals and organizations in their willingness to disclose information is hinted at by the fact that many firms require their employees to sign non-disclosure agreements. See, e.g., Orly Lobel, *Intellectual Property and Restrictive Covenants*, in 2 ENCYCLOPEDIA

A response to this caveat is the same as that provided for incentive theory's parallel concern.¹³⁷ Empirical studies suggest that many firms, in their innovative decision-making, simply do not take the prospect of a patent reward into account.¹³⁸ In fact, a surprising number of firms view patents as an ineffective way to make profits and recoup research and development costs.¹³⁹ If an organization is not motivated by a patent to innovate in the first place because it does not consider the patent an effective way to achieve a return on investment, it is unlikely that the same firm will be motivated by the patent to disclose information that it otherwise sees fit to keep to itself.¹⁴⁰

This response is by no means complete. For one thing, the studies cited do not suggest that firms, like people, are intrinsically motivated to disclose their inventions; instead, they indicate only that a patent might not be the most effective way to encourage this disclosure. Further attention to how intrinsic motivation and other sociological and psychological factors influencing disclosure behavior play out in the various settings where patentable innovation actually takes place is thus warranted. But at the very least, the fact that a patent reward likely will do little to encourage disclosure at the individual level suggests that disclosure theory may not align with real-world behavior.

ii. Disclosure and Attribution

Behavioral research suggests that the classic extrinsic motivator—money—does not influence an individual's willingness to share knowledge.¹⁴¹ Interestingly, though, this same work suggests that a different kind of reward, though still technically extrinsic in the sense that it is externally administered, does have the power to motivate disclosure behavior. This reward is attribution, with its concomitant benefits of reputation enhancement and feedback.

OF LABOR AND EMPLOYMENT LAW AND ECONOMICS 517, 525–26 (Kenneth G. Dau-Schmidt et al. eds., 2009).

¹³⁷ See Johnson, *supra* note 8, at 661.

¹³⁸ *Id.* at 661–63 (citing MICHELE BOLDRIN & DAVID K. LEVINE, AGAINST INTELLECTUAL MONOPOLY 62 (2008)).

¹³⁹ *Id.* One major exception to this is the pharmaceutical industry, where industry players report that patents play a major role in innovative behavior. A report cited by Johnson concludes that sixty-five percent of pharmaceutical innovations would not have made it to market without a patent incentive. *Id.* at 663 (citing Edwin Mansfield, *Patents and Innovation: An Empirical Study*, 32 MGMT. SCI. 173, 175 (1986)).

¹⁴⁰ For example, Boldrin and Levine's report indicates that for new processes in particular, innovators prefer secrecy to a patent monopoly. BOLDRIN & LEVINE, *supra* note 138, at 62.

¹⁴¹ Lin, *supra* note 107, at 143, 145; Olatokun & Nwafor, *supra* note 132; Bock & Kim, *supra* note 132.

In the context of online communities,¹⁴² for example, individuals choose to share their knowledge with others instead of free riding in part because they believe it will enhance their personal and professional reputations.¹⁴³ Similarly, in a controlled knowledge-sharing laboratory experiment, a reputation feedback reward was the most significant predictor of an individual's willingness to disclose.¹⁴⁴ This was in contrast to other extrinsic motivators, including economic rewards and reciprocity, which the study concluded had little effect on a participant's willingness to share knowledge.¹⁴⁵

These findings are notable because the classic understanding in the motivation community is that intrinsic motivators of a given action tend to promote that action and enhance its outcome, while extrinsic motivators tend to be outcome-neutral or outcome-detrimental.¹⁴⁶ The findings are potentially consistent, however, with Edward Deci and Richard Ryan's explanation that "there are varied types of extrinsic motivation, some of which do, indeed, represent impoverished forms of motivation and some of which represent active, agentic states."¹⁴⁷ In particular, extrinsically motivated behaviors that increase an individual's feelings of competence and autonomy can, like intrinsically motivated behaviors, result in enhanced performance outcomes.¹⁴⁸ Positive performance feedback has also been shown directly to enhance intrinsic motivation.¹⁴⁹ Attribution, therefore, though an extrinsic reward, is perhaps a powerful motivator of knowledge sharing because of the promise of enhanced feelings of competency (through enhanced reputation and positive feedback) that it offers.

Consistent with these findings, several commentators have argued that attribution is a key component of a successful intellectual property system that, in at least some cases, might be more important than economic reward. Michael Burstein and others suggest that attribution encourages

¹⁴² Online communities are referred to as "electronic networks of practice" by the authors. Wasko & Faraj, *supra* note 133, at 35.

¹⁴³ *Id.* at 49–50.

¹⁴⁴ Shin-Yuan Hung et al., *The Influence of Intrinsic and Extrinsic Motivation on Individuals' Knowledge Sharing Behavior*, 69 INT'L J. HUM.-COMPUTER STUD. 415, 422–23 (2011).

¹⁴⁵ *Id.* at 422–24. Consistent with the research described earlier in this Article, Hung et al. found that the intrinsic motivator of altruism was positively related to willingness to disclose, though the relationship was not as strong as that between willingness to disclose and reputation feedback. *Id.* at 424–25.

¹⁴⁶ See, e.g., Richard M. Ryan & Jennifer G. LaGuardia, *Achievement Motivation Within a Pleasured Society: Intrinsic and Extrinsic Motivations to Learn and the Politics of School Reform*, in 11 ADVANCES IN MOTIVATION AND ACHIEVEMENT 45, 50, 54, 55 (Timothy C. Urdan ed., 1999).

¹⁴⁷ Richard M. Ryan & Edward L. Deci, *Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions*, 25 CONTEMP. EDUC. PSYCHOL. 54, 55 (2000).

¹⁴⁸ *Id.* at 58 (citing R. CHRISTOPHER DECHARMS, PERSONAL CAUSATION (1968)).

¹⁴⁹ *Id.* at 59 (citing Edward L. Deci, *Effects of Externally Mediated Rewards on Intrinsic Motivation*, 18 J. PERSONALITY & SOC. PSYCHOL. 105, 114 (1971)).

disclosure in the academic context.¹⁵⁰ Jeanne Fromer argues that in addition to the financial advantages that flow from attribution through reputational effects, attribution can also act as an “expressive incentive” that encourages creation.¹⁵¹ And based on an analysis of the factors that influence the success of intellectual property’s negative spaces, Elizabeth Rosenblatt proposes attribution as an alternative to exclusivity.¹⁵² The analysis of the psychology literature presented here provides additional support for these proposals.

b. Disclosure Social Norms

Actors the patent system seeks to govern are influenced not only by individual psychological factors, but also by social norms.¹⁵³ Just as psychological motivations might make the patent, and the incentive to disclose it provides, unnecessary in certain instances, social norms in certain contexts might encourage information sharing even in the absence of a patent.¹⁵⁴

One context where this appears to be true is the university research setting. Intellectual property scholars have noted the prevalence of knowledge-sharing norms in the academic science community.¹⁵⁵ Robert Merton, for example, describes the norm of “scientific communism” in academia, where scientific researchers share a “common heritage” of collaboration that arises from both the community’s goal of advancing knowledge and individual researchers’ desires for recognition and esteem.¹⁵⁶

Although disclosure theory suggests that patent rights might enhance these knowledge-sharing norms by providing increased incentives for disclosure, Eisenberg and others have voiced concern that the opposite in fact might be true.¹⁵⁷ In particular, the prospect of a patent might delay knowledge sharing by academics who are concerned about meeting the

¹⁵⁰ Burstein, *supra* note 51, at 269–70.

¹⁵¹ Fromer, *supra* note 75, at 1790–91. The distinction Fromer draws between the “pecuniary” and “expressive” incentives offered by an attribution right are very similar to the “extrinsic” and “intrinsic” motivational components of attribution revealed in the psychology literature.

¹⁵² Rosenblatt, *supra* note 5, at 478–79.

¹⁵³ Hubbard, *supra* note 8, at 373; Pedraza-Fariña, *supra* note 8, at 815–16.

¹⁵⁴ Although this might not always be the case, social norms in many situations might result directly or indirectly from psychological factors. *See, e.g., infra* note 156.

¹⁵⁵ *E.g.*, Rebecca S. Eisenberg, *Patents and the Progress of Science*, 56 U. CHI. L. REV. 1017, 1046–48 (1989); Arti K. Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 NW. U. L. REV. 77, 79–80 (1999); Arti K. Rai & Rebecca S. Eisenberg, *Bayh-Dole Reform and the Progress of Biomedicine*, 66 LAW & CONTEMP. PROBS. 289, 289 (2003).

¹⁵⁶ Eisenberg, *supra* note 155, at 1046–47 (quoting ROBERT K. MERTON, *THE SOCIOLOGY OF SCIENCE* 273 (Norman W. Storer ed., 1973)). Note that according to Merton and Eisenberg’s accounts, the norm of scientific communism appears to arise at least in part from scientists’ desires for reputation enhancement. Perhaps unsurprisingly, this suggests that psychological factors may drive social norms.

¹⁵⁷ *E.g.*, Rai, *supra* note 155, at 109–15; Rai & Eisenberg, *supra* note 155, at 291.

requirements imposed by the patent system;¹⁵⁸ additionally, confidentiality requirements imposed by firms in academic-industry collaborations might impede disclosure.¹⁵⁹

Empirical studies confirm that patents have indeed undermined the knowledge sharing that flows from social norms in the academic community.¹⁶⁰ In a study examining data-sharing behavior among university scientists, Jeremy Grushcow found that patent-seekers were less likely than non-patent-seekers to share early research results.¹⁶¹ Patent-seekers also delayed formal publication as compared to non-patent-seekers.¹⁶² In one study, academic scientists involved in an academic-industry collaboration were more likely than their non-collaborating colleagues to delay publication and less likely to share their results with other scientists.¹⁶³ Over a period of ten years, non-patent-seeking academic scientists also increasingly delayed their pre-publication disclosures, suggesting that the introduction of patents to the academic community in 1980 via the Bayh-Dole Act shifted sharing norms in that group.¹⁶⁴

This case study of the academic community suggests that, rather than providing the incentive to share that disclosure theory posits, a patent actually might undermine disclosure behaviors largely governed by social norms.

3. *Prospect Theory*

Prospect theory seeks to promote the efficient management of innovation by granting broad and early patent rights to a single actor, who may then—presumably with optimal efficiency—direct and coordinate future research and development efforts within the field of the original invention.¹⁶⁵ Findings from the behavioral literature call these assumptions about the benefits of single-entity domination into question.¹⁶⁶

¹⁵⁸ For example, 35 U.S.C. § 102(b) bars an invention from being patented if it has been “described in a printed publication” or “in public use” for over a year before filing. The Federal Circuit held that a poster presentation, of the kind routinely given at academic conferences to report preliminary research results, counted as a “printed publication” that barred patentability under § 102(b). *In re Klopfenstein and Brent*, 380 F.3d 1345, 1352 (Fed. Cir. 2004).

¹⁵⁹ Rai, *supra* note 155, at 110–12.

¹⁶⁰ See, e.g., Jeremy M. Grushcow, *Measuring Secrecy: A Cost of the Patent System Revealed*, 33 J. LEGAL STUD. 59, 60 (2004) (measuring the secrecy of inventors who are preparing to file a patent application).

¹⁶¹ *Id.* at 74.

¹⁶² *Id.*

¹⁶³ David Blumenthal et al., *Withholding Research Results in Academic Life Sciences: Evidence from a National Survey of Faculty*, 277 JAMA 1224, 1224 (1997).

¹⁶⁴ *Id.* at 78; see also Rai, *supra* note 155, at 109–15.

¹⁶⁵ See *supra* Part II.A.3.

¹⁶⁶ Prospect theory has also been heavily criticized on economic grounds. See, e.g., Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 1048–50

a. Satisficing

The concept of satisficing was first introduced by the economist and psychologist Herbert Simon in the 1950s.¹⁶⁷ He postulated that cognitive limitations might prevent otherwise rational actors from finding the optimal solution to a problem.¹⁶⁸ As a result, these individuals might accept a satisfactory, but sub-optimal, alternative solution.¹⁶⁹ This decision-making strategy has since been observed in empirical studies.¹⁷⁰

Merges and Nelson have argued that satisficing behaviors might be relevant to the prospect theory of patents.¹⁷¹ Under prospect theory, the theoretically optimal solution for a firm with a patent is to maximize its value by making improvements that take full advantage of the broad scope of exclusivity.¹⁷² But a firm with a lucrative original invention might choose to settle for the financial benefits that flow from this invention rather than taking the risks inherent in further research and development.¹⁷³ This satisficing solution is made even more desirable by the original inventor's broad patent rights, which guarantee that no other firm—without either arranging for a license or risking infringement—will step in to fill the innovative space the patentee has chosen to leave empty.¹⁷⁴

b. Creativity Collaboration Research

Even assuming that an original inventor will undertake further innovation and research within the broad scope of the patent contemplated

(1997) [hereinafter Lemley, *The Economics of Improvement*] (describing the problems arising from making inventors outline every possible future use of their inventions); Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 TEX. L. REV. 1031, 1031 (2005) (arguing that intellectual property law should give the smallest amount of protection possible while still encouraging innovation); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 871–73 (1990) (describing the problems with single-entity domination of a patent).

¹⁶⁷ See Herbert A. Simon, *Theories of Decision-Making in Economics and Behavioral Science*, 49 AM. ECON. REV. 253, 262–65 (1959) (discussing the differences between satisficing and maximizing in a firm's decision-making).

¹⁶⁸ *Id.* at 262–63.

¹⁶⁹ *Id.*

¹⁷⁰ See Itamar Simonson & Aner Sela, *On the Heritability of Consumer Decision Making: An Exploratory Approach for Studying Genetic Effects on Judgment and Choice*, 37 J. CONSUMER RES. 951, 956 (2011) (analyzing different factors that influence a consumer's choices and judgments, including satisficing and maximizing decision-making approaches); Barry Schwartz et al., *Maximizing Versus Satisficing: Happiness Is a Matter of Choice*, 83 J. PERSONALITY & SOC. PSYCHOL. 1178, 1178 (2002) (analyzing the happiness of maximizers and satisficers).

¹⁷¹ Merges & Nelson, *supra* note 166, at 872.

¹⁷² Lemley, *supra* note 22, at 738.

¹⁷³ Merges & Nelson, *supra* note 166, at 916.

¹⁷⁴ See *id.* at 842. This concern is supported by anecdotal reports. See *id.* at 872 n.141 (describing Thomas Edison's refusal to improve his light bulb technology and his opposition to the innovation of alternating current); Lemley, *supra* note 22, at 740–41 (describing Edison's story and also pointing to Watt's decision not to improve on his steam engine).

by prospect theory, additional behavioral insights suggest that he may not be in the best position to do so.

In particular, creativity research, as noted by intellectual property scholars in other contexts, suggests that collaboration can facilitate creativity.¹⁷⁵ The benefits of collaboration for innovation arise because creative thinking often requires potential innovators to draw associations and make connections among disparate sources and fields.¹⁷⁶ Collaboration, and in particular, cross-disciplinary collaboration, facilitates this type of thinking because each member of a collaborative team brings a unique background, perspective, and specialization to the innovative process.¹⁷⁷

This finding undermines prospect theory's premise that a single inventor or firm is in the best position to direct further innovation in the field of the patent. Even when satisficing behaviors are not present, a patentee seeking to improve on her original invention likely will be unable to achieve the same level of creative achievement alone as she would with input from other sources.

Of course, even if the original inventor is not granted the broad patent rights that prospect theory envisions, there is no guarantee that she will collaborate with other individuals or firms when working to improve her original invention. But it is not collaboration per se that generates benefits for the creative process, but the exposure to diverse ideas that collaboration facilitates.¹⁷⁸ And this exposure likely will still come about even if the original inventor is not collaborating formally with others. In the absence of a broad patent monopoly, we might expect that within a short period of time other firms will begin introducing products that build on the original inventor's idea.¹⁷⁹ The commercial availability of these products will

¹⁷⁵ Mandel, *To Promote the Creative Process*, *supra* note 8, at 2013–16; Pedraza-Fariña, *supra* note 8, at 840–43; *see also* Paul B. Paulus & Bernard A. Nijstad, *Group Creativity: An Introduction*, in *GROUP CREATIVITY: INNOVATION THROUGH COLLABORATION* (Paul B. Paulus & Bernard A. Nijstad eds., 2003).

¹⁷⁶ *See* Mandel, *To Promote the Creative Process*, *supra* note 8, at 2014 (discussing several relevant findings from the psychology and sociology literature, including the finding that individuals exposed to unrelated images produce more creative output than those not so exposed; that reliance on a more diverse set of sources is related to creativity in scientists; and that significant innovation often integrates principles from different fields).

¹⁷⁷ *See id.*; Pedraza-Fariña, *supra* note 8, at 840–43. Collaborative problem-solving is not without potential drawbacks, however. In particular, there is a danger that group problem-solvers will engage in “group-think,” a phenomenon in which individuals within a group display limited or defective thinking as a result of efforts to avoid conflicts within the group. Garold Stasser & Zachary Birchmeier, *Group Creativity and Collective Choice*, in *GROUP CREATIVITY*, *supra* note 175, at 105.

¹⁷⁸ *See* Mandel, *To Promote the Creative Process*, *supra* note 8, at 2014.

¹⁷⁹ *See* Lemley, *supra* note 22, at 740 (referring to first-mover and brand reputation benefits that encourage firms to enter an innovative space in the absence of patent protection). As discussed in Part III.B.1., *supra*, others might also be intrinsically motivated to create, in this case, by building on the original patentee's ideas.

expose the original inventor—and others—to a range of ideas and uses that the inventor may not have originally contemplated.¹⁸⁰ This exposure, in turn, should inspire further creativity on the part of the original inventor and others.

c. Parkinson's Law

Parkinson's law is really a maxim, first proposed by the historian Cyril Northcote Parkinson in the 1950s. Parkinson opined that "work expands so as to fill the time available for its completion."¹⁸¹

Since that time, Parkinson's law has been tested in a variety of experimental settings. It has been found accurately to describe, not, as framed by Parkinson, the physical characteristics of work, but the behavior of individuals engaged in this work.¹⁸² Though the work itself does not expand, people generally adjust their behavior so as to fill the time allotted to complete a project.

Edwin Locke, a pioneer in the field of goal-setting, has shown that Parkinson's law is mediated by individuals' goal-setting behavior.¹⁸³ When time limits are decreased, individuals set more difficult goals for themselves, and the more difficult goals in turn reduce time-to-completion and enhance performance.¹⁸⁴ In the creative arena, empirical research confirms that goal-setting also leads to higher levels of creativity.¹⁸⁵

Parkinson's law has potential implications for the pace of innovation under prospect theory. If an original inventor is granted a broad patent that encompasses both the original invention and future improvements, the inventor has a predetermined amount of time—the duration of the patent, presently twenty years from filing¹⁸⁶—to enjoy that monopoly. The inventor thus knows in advance that he has this period, which in some

¹⁸⁰ See Lemley, *supra* note 22, at 743 (arguing that an original inventor might be "psychologically tied" to a particular use of his idea and may not grasp the uses or improvements that outsiders might see).

¹⁸¹ CYRIL NORTHCOTE PARKINSON, *PARKINSON'S LAW AND OTHER STUDIES IN ADMINISTRATION* 2 (1957).

¹⁸² E.g., Gary P. Latham & Edwin A. Locke, *Increasing Productivity with Decreasing Time Limits: A Field Replication of Parkinson's Law*, 60 J. APPLIED PSYCHOL. 524, 524 (1975); Edwin A. Locke & Gary P. Latham, *Building a Practically Useful Theory of Goal Setting and Task Motivation: A 35-Year Odyssey*, 57 AM. PSYCHOLOGIST 705, 705 (2002); Lawrence H. Peters et al., *The Relationship Between Time Pressure and Performance: A Field Test of Parkinson's Law*, 5 J. OCCUPATIONAL BEHAV. 293, 293–94 (1984).

¹⁸³ E.g., Edwin A. Locke & Judith Bryan, *The Directing Function of Goals in Task Performance*, 4 ORG. BEHAV. & HUM. PERFORMANCE 35 (1969).

¹⁸⁴ *Id.*

¹⁸⁵ E.g., Christina E. Shalley, *Effects of Coaction, Expected Evaluation, and Goal Setting on Creativity and Productivity*, 38 ACAD. MGMT. J. 483, 499 (1995).

¹⁸⁶ 35 U.S.C. § 154(a)(2) (2012).

fields is quite long compared to the average pace of innovation,¹⁸⁷ to maximize patent value. According to Parkinson's law, the inventor thus might set less difficult creative goals for himself, resulting in a relatively slow pace of innovation and less creative output. In contrast, if the inventor enjoys no such monopoly, he is aware that a competitor might release potentially lucrative downstream innovation at any time. He thus might set more difficult goals for himself, resulting in more creative, faster-paced innovation.

It is true that even under the broad grant of rights prospect theory envisions, a patentee will still have an economic incentive to develop follow-on innovation sooner rather than later. If a patentee develops a commercially successful improvement covered by his patent in the first year of an eighteen-year patent term, for example, he can enjoy monopoly profits on that improvement for the remaining seventeen years of the patent. If, on the other hand, he waits until fifteen years of the patent term have passed before introducing the improvement, the total monopoly profit he can hope to gain from this improvement clearly will be much lower.

This financial incentive might still not be as effective as the free-market scenario, however, due to satisficing. Satisficing might affect not only, as discussed above, whether follow-on innovation occurs at all, but also the pace of this innovation. For instance, an original inventor with a broad patent might rest on the laurels of his original invention for part of the patent term before eventually deciding to develop follow-on innovation. Just as a tendency towards satisficing might overcome the economic incentive to maximize the patent space,¹⁸⁸ so too might it overcome the incentive to engage in maximization sooner rather than later.

4. *Commercialization*

Commercialization theory justifies the patent system as a means of encouraging, not (as incentive theory posits) the original creative step, nor (as envisioned by prospect theory) follow-on creative steps, but post-inventive commercialization activities.¹⁸⁹ Unlike these other utilitarian accounts of the patent system, the empirical psychology literature does not call the basic assumptions of the commercialization account into question. Instead, the literature generally supports the main premise of commercialization theory—that economic incentives might encourage inventors to bring their ideas to market.

¹⁸⁷ The software field in particular has been noted as having a particularly fast rate of innovation. *See, e.g.*, Benjamin N. Roin, *The Case for Tailoring Patent Awards Based on Time-to-Market*, 61 *UCLA L. REV.* 672, 679–81, 719 (2014) (noting that the average time-to-market for innovations in the information-technology industries is relatively short compared to other industries).

¹⁸⁸ *See supra* text accompanying notes 171–74.

¹⁸⁹ *See supra* Part II.A.4.

a. Motivation Research

i. Motivation to Engage in Different Types of Tasks

As discussed in my treatment of incentive theory above, individuals are intrinsically motivated to engage in creative behaviors.¹⁹⁰ Richard Ryan and Edward Deci have described intrinsic motivation as “the inherent tendency to seek out novelty and challenges, to extend and exercise one’s capacities, to explore, and to learn.”¹⁹¹

Given this description, one might expect certain types of activities to be more susceptible to intrinsic motivation than others. In particular, individuals might experience relatively lower intrinsic motivation for activities that do not involve novelty, challenge, or the opportunity to exercise one’s skills, explore, or learn, as compared to those that do.

This intuition is borne out by the psychology literature. In a review of the intrinsic motivation literature, Ryan and Deci explain:

[P]eople will be intrinsically motivated only for activities that hold intrinsic interest for them, activities that have the appeal of novelty, challenge, or aesthetic value. For activities that do not hold such appeal, the principles of [our theoretical framework for intrinsic motivation] do not apply, because the activities will not be experienced as intrinsically motivated to begin with.¹⁹²

The finding that only certain types of activities inspire intrinsic motivation¹⁹³ has implications for various accounts of the patent system. In the context of incentive theory, the finding that individuals are intrinsically motivated to create—and the subsequent conclusion by some commentators that a patent might not be necessary to encourage individuals to do so—squares well with an intuitive understanding of what creation is. Almost by definition, creativity involves the “novelty and challenge[], . . . explor[ation], . . . [and] learn[ing]” that Ryan and Deci speak of.¹⁹⁴ Indeed, dictionary definitions of creativity describe it as the ability to “make new things or think of new ideas,”¹⁹⁵ “transcend

¹⁹⁰ AMABILE, *supra* note 109, at 107.

¹⁹¹ Richard M. Ryan & Edward L. Deci, *Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being*, 55 AM. PSYCHOLOGIST 68, 70 (2000).

¹⁹² *Id.* at 71.

¹⁹³ Even for categories of activities that one might expect to be intrinsically motivated, the context in which these activities are carried out has important implications for the degree of motivation felt. For example, empirical studies have shown that feelings of autonomy, competence, and relatedness each play an important role in determining the ultimate level of intrinsic motivation for a particular task. For a review of the literature, see *id.* at 70–71.

¹⁹⁴ *Id.* at 70.

¹⁹⁵ Definition of “Creative”, MERRIAM-WEBSTER, <http://www.merriam-webster.com/dictionary/creative> [<http://perma.cc/69XF-2D9S>] (last visited Dec. 31, 2014).

traditional ideas, rules, patterns, relationships, or the like, and to create meaningful new ideas, forms, methods, [and] interpretations.”¹⁹⁶

In contrast, we may not think of the tasks that must be accomplished to bring a creation to market—tasks that occur after the initial inventive steps have been taken—as embodying the same qualities that inspire intrinsic motivation.

Take, for example, the case of the pharmaceutical industry—a field for which it is almost universally accepted that some type of economic incentive is required to encourage optimal levels of innovation.¹⁹⁷ Because of the intensive regulatory requirements placed on pharmaceutical products,¹⁹⁸ there are many relatively routine and structured steps that need to be taken after the initial creative research has been completed, but before a potential product can be brought to market.¹⁹⁹ These include initial laboratory and preclinical testing, several phases of clinical trials, and formulation and bioavailability studies, among other things.²⁰⁰ Although these tasks might require some creative thinking on the part of the employees who undertake them, it can be argued that these steps present fewer opportunities for “novelty and challenge[], . . . explor[ation], . . . [and] learn[ing]”²⁰¹ than the drug discovery process that precedes them.²⁰²

¹⁹⁶ Definition of “Creativity”, DICTIONARY.COM, <http://dictionary.reference.com/browse/creativity> [<http://perma.cc/KUX3-E72M>] (last visited Dec. 31, 2014).

¹⁹⁷ See, e.g., BOLDRIN & LEVINE, *supra* note 138, at 62–63 (noting that while patents are typically regarded as the least effective means of economic incentive, the pharmaceutical industry provides an example of why patents are essential); Johnson, *supra* note 8, at 663 (“[M]ultiple empirical studies confirm that patents are highly effective for appropriating gains only in certain industries. One of those is pharmaceuticals.”); Benjamin N. Roin, *Unpatentable Drugs and the Standards of Patentability*, 87 TEX. L. REV. 503, 507–08 (2009) (explaining that because pharmaceutical firms must invest large amounts of money into clinic trials before drugs can be sold to the public, strong patent protection is necessary as an incentive for product development); Roin, *supra* note 187, at 680–81 (noting that firms in the pharmaceutical industry did not support policy proposals that would weaken patent protection because strong patent protection is thought to be critical in protecting their research and development investments).

¹⁹⁸ See *Wyeth v. Levine*, 555 U.S. 555, 567 (2009) (discussing the FDA’s premarket approval requirements for new drugs); PETER BARTON HUTT ET AL., *FOOD AND DRUG LAW: CASES AND MATERIALS* 643 (4th ed. 2014) (“In short, the FDA licensure process is extremely lengthy and expensive.”).

¹⁹⁹ See generally HUTT ET AL., *supra* note 198, at 669–751 (discussing development and licensure of new drugs).

²⁰⁰ *Id.*

²⁰¹ Ryan & Deci, *supra* note 191, at 70.

²⁰² Compare ALFONSO GAMBARDELLA, *SCIENCE AND INNOVATION: THE US PHARMACEUTICAL INDUSTRY DURING THE 1980s*, at 163 (1995) (finding that small pharmaceutical firms are more creative than large firms), and Rebecca Henderson & Kim B. Clark, *Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms*, 35 ADMIN. SCI. Q. 9, 28–29 (1990) (finding that less-established architectural firms may be more willing to innovate than well-entrenched, dominant firms), with SARAH RICKWOOD, *GLOBAL PHARMACEUTICALS: TRENDS AND PROSPECTS* 70–71 (1993) (finding that small pharmaceutical firms spend a higher proportion of their potential profits on research versus commercialization than large

The same can be said for other types of inventions as well. Tasks like market research, product management, and quality assurance, though perhaps more routine and thus not as intrinsically motivating as the earlier phases of the inventive process, are nevertheless necessary steps for bringing most inventions to market successfully.²⁰³ If individuals are not intrinsically motivated to undertake these activities, then it is possible that some type of external motivation, like a patent, is necessary to encourage this behavior.

Empirical studies confirm that individuals may respond to external motivations like financial rewards when engaged in tasks that are not intrinsically motivating. For example, Calder and Staw first demonstrated that monetary rewards could increase motivation for boring tasks.²⁰⁴ A further study concluded that individuals may be more willing to engage in a highly structured task (as opposed to a low-structure task where there is more room for independence and creativity) when they receive a financial reward for doing so.²⁰⁵ And a study of recently employed professional graduates concluded that while individuals who choose a job based on salary considerations do not exhibit significantly increased intrinsic motivation compared to those who do not choose the job for financial reasons, they do exhibit increased behavioral and attitudinal commitment to the job.²⁰⁶

ii. A Motivational Account of Commercialization Theory

In developing a motivational account of commercialization theory, the case of the pharmaceutical industry is instructive. Besides being an area where extensive non-intrinsically motivating work is needed to bring an invention to market, it is also a field where the patent system of financial incentives actually seems to work pretty well.²⁰⁷ In contrast, the software

firms).

²⁰³ See Sichelman, *supra* note 45, at 348–54.

²⁰⁴ Bobby J. Calder & Barry M. Staw, *Self-Perception of Intrinsic and Extrinsic Motivation*, 31 J. PERSONALITY & SOC. PSYCHOL. 599, 602 (1975). Consistent with earlier studies and the research reported in this Article, Calder and Staw found that monetary rewards decreased motivation for interesting tasks. *Id.* But see Thomas L. Daniel & James K. Esser, *Intrinsic Motivation as Influenced by Rewards, Task Interest, and Task Structure*, 65 J. APPLIED PSYCHOL. 566, 571 (1980) (finding that monetary rewards did not increase intrinsic motivation for low-interest tasks, but did increase individuals' willingness to repeat these tasks).

²⁰⁵ Daniel & Esser, *supra* note 204, at 571.

²⁰⁶ Charles A. O'Reilly III & David F. Caldwell, *Job Choice: The Impact of Intrinsic and Extrinsic Factors on Subsequent Satisfaction and Commitment*, 65 J. APPLIED PSYCHOL. 559, 561–63 (1980).

²⁰⁷ See, e.g., Johnson, *supra* note 8, at 663 (citing BOLDRIN & LEVINE, *supra* note 138, at 62) (discussing empirical findings suggesting that patents provide incentives only in certain industries, one of which is the pharmaceutical industry); Roin, *supra* note 197, at 507–08, 510–11 (describing pharmaceutical innovation as the “golden child of the patent system,” and discussing the essential role that patents play in promoting drug development); Roin, *supra* note 187, at 680 (noting that

industry requires a relatively slight amount of post-invention commercialization activity, and it is well-known that patents do little to encourage innovation in this field.²⁰⁸

Proponents of commercialization theory have noted the relationship between the extent of post-innovative activity generally required to bring a product to market and the need for financial incentives. Based on this correlation, Benjamin Roin has proposed that the length of patent protection be keyed to the time required to bring a product to market as measured from the time of first patent filing.²⁰⁹

Roin and others explain the correlation between time-to-market and the need for financial incentives in terms of economic factors such as higher research, development, and production costs, greater economic risk, and greater susceptibility to free-riding.²¹⁰ But the relationship could also be explained in part by the motivation research. According to motivation theory, while financial incentives do not help—and could hurt—progress in fields where the bulk of the work is of the kind typically considered to be intrinsically motivated, these incentives can be useful when bringing a product to market requires a substantial amount of routine and structured work. This is precisely what we see in the software and pharmaceutical industries.

As with every application of motivation research to the theories discussed in this Article, there is a major caveat to the argument that motivation research supports the premise of commercialization theory. This is the fact that most patentable innovation originates not from individuals but from firms, which may respond to various incentives differently from individuals.

Of course, firms are made up of individuals. So at the very least, we might expect employees' intrinsic motivation to lower costs for firms, and conversely, employees' lack of intrinsic motivation to raise costs for firms as more financial incentives are required to entice employees to undertake non-creative work.²¹¹

pharmaceutical firms perceive patents to be critical in protecting their research and development investments).

²⁰⁸ See, e.g., Roin, *supra* note 187, at 679–81; Robert E. Thomas, *Debugging Software Patents: Increasing Innovation and Reducing Uncertainty in the Judicial Reform of Software Patent Law*, 25 SANTA CLARA COMPUTER & HIGH TECH. L.J. 191, 193 (2008).

²⁰⁹ See Roin, *supra* note 187.

²¹⁰ *Id.* at 684–85; see also Johnson, *supra* note 8, at 672–74 (explaining the pharmaceutical industry's deviance from the “general rule of spontaneous creative labor” as the result of high “costs of production and distribution of creative and innovative labors”).

²¹¹ See Johnson, *supra* note 8, at 668 (“[T]here is a behavioral-economic subsidy for corporations undertaking endeavors that accord with human passions to invent, create, and contribute. The existence of the intrinsic-motivation subsidy means that intrinsic motivation can be expected to cheapen the cost of capital and labor for companies that are engaged in innovation and creative activity.”). This principle is illustrated by an empirical study conducted by Scott Stern. The study found that graduating doctoral

b. Beyond Financial Incentives

The research discussed above provides support for the commercialization account by suggesting that economic incentives might encourage individuals to undertake the more routine post-invention tasks necessary to bring a product to market. But even though patents arguably can be justified by the commercialization account, from a behavioral perspective, patents might not be the only, or even the best, option for encouraging commercialization activity.

i. Encouraging Commercialization Through Internalization and Integration

Additional motivation research suggests that while financial incentives can indeed encourage individuals to undertake non-intrinsically motivating tasks, the most effective means of incentivizing this work is through a process wherein workers “internalize” and “integrate” the task—or in other words, make it their own.²¹² Once a task—even one that is externally prescribed, and that outside observers might consider boring or routine—has been internalized and integrated, the quality of motivation the performer feels resembles the quality of motivation experienced for intrinsically motivating tasks. Extrinsic incentives are no longer necessarily required to motivate the task’s performance.²¹³

Psychologists have examined the means by which internalization and integration of routine, mandatory tasks can be facilitated, and have discovered three main determinants of this process. The first is relatedness, or the need to feel connected to others.²¹⁴ To the degree that this need can be satisfied by undertaking non-intrinsically motivated behaviors—because, for example, the behaviors are modeled by others to whom an individual wishes to feel related—these behaviors are more likely to be integrated and internalized.²¹⁵ The second is perceived competence, or the degree to which an individual feels that he can accomplish a given task effectively.²¹⁶ And the third and most important determinant of

students in biology were willing to accept a decrease in pay from industry employers if the employers gave them the opportunity to engage in independent research and publishing. Scott Stern, *Do Scientists Pay to Be Scientists?*, 50 MGMT. SCI. 835, 848–49 (2004).

²¹² Ryan & Deci, *supra* note 191, at 71.

²¹³ *See id.* at 71–73.

²¹⁴ *Id.* at 73.

²¹⁵ *Id.* at 73; *see also* Richard M. Ryan et al., *Representations of Relationships to Teachers, Parents, and Friends as Predictors of Academic Motivation and Self-Esteem*, 14 J. EARLY ADOLESCENCE 226 (1994) (finding that children who had better connections with their parents and teachers more fully internalized the regulated behaviors of school).

²¹⁶ Ryan & Deci, *supra* note 191, at 73.

internalization and integration is autonomy.²¹⁷ As the autonomy an individual experiences in undertaking a task increases, the probability that she will internalize and integrate the task also increases, and the quality of motivation more closely resembles intrinsic motivation.²¹⁸

Empirical studies also suggest that encouraging internalization and integration of mandatory and routine tasks achieves more desirable outcomes than incentivizing these tasks via external regulation and reward. As these tasks become more internalized and integrated, a variety of desirable outcomes, including greater interest and effort in, and enjoyment and performance of, the tasks ensue.²¹⁹ Conversely, lower internalization and increased responsiveness to external regulation and reward results in less interest and effort, greater anxiety, and increased blaming behavior.²²⁰

ii. Promoting Internalization and Integration

If, as commercialization theory proposes, the goal of a patent is to motivate individuals to undertake commercialization activities, the financial reward a patent offers is likely effective. But it might not be the optimal way to achieve this goal. Instead, policymakers seeking to encourage commercialization might achieve better success by facilitating development and commercialization environments that are “autonomy supportive”—that is, where the individuals involved feel related, competent, and autonomous, and are therefore more likely to internalize and integrate routine tasks.

Consistent with this conclusion are the results of an empirical study that looked at motivation, effort, and performance of over 11,000 employees performing either research or development tasks in a range of manufacturing and service sectors. According to the results of the study, while intrinsic motivators played the most significant role in motivating basic and applied research activity (which, as described above, one might consider to be intrinsically motivating), employee independence was the

²¹⁷ *Id.* at 70–73; see also Eric E. Johnson, *The Economics and Sociality of Sharing Intellectual Property Rights*, 94 B.U. L. REV. 1935, 1959 (2014) (discussing Ryan and Deci’s findings about autonomy, competence, and relatedness).

²¹⁸ Ryan & Deci, *supra* note 191, at 73.

²¹⁹ See, e.g., *id.* at 73 (listing behavioral effectiveness, volitional persistence, enhanced well-being, and social assimilation as some of the advantages of greater internalization); James P. Connell & James G. Wellborn, *Competence, Autonomy, and Relatedness: A Motivational Analysis of Self-System Processes*, in MINNESOTA SYMPOSIUM ON CHILD PSYCHOLOGY 43, 51–52, 55 (M.R. Gunnar & L.A. Sroufe eds., 1991); Marianne Miserandino, *Children Who Do Well in School: Individual Differences in Perceived Competence and Autonomy in Above-Average Children*, 88 J. EDUC. PSYCHOL. 203, 208 (1996) (finding that children who feel more certain in their abilities and more autonomous perform better in school).

²²⁰ Richard M. Ryan & James P. Connell, *Perceived Locus of Causality and Internalization: Examining Reasons for Acting in Two Domains*, 57 J. PERSONALITY & SOC. PSYCHOL. 749, 755–56 (1989).

most significant motivator of development or commercialization activity (which one might consider to be less intrinsically motivating).²²¹ Financial reward, in the form of salary, had a lesser, positive effect on the productivity of those engaged in either research or development.²²²

Facilitating autonomy-supportive commercialization environments might seem like a vague and daunting task when compared to the comparative simplicity of offering a financial reward. But this goal can be achieved in surprisingly simple ways, such as providing individuals with a meaningful rationale for their work, giving timely and appropriate feedback, including variety in the tasks an individual is asked to perform, and giving individuals opportunities to participate in professional communities.²²³ Further, given the deadweight loss that inevitably results from patent monopolies,²²⁴ these types of interventions might prove to be less economically and socially costly than the current patent system.

Again, these findings from the motivation literature apply to individuals and not necessarily to organizations. And it is reasonable to assume that—perhaps to an even greater degree than for initial invention—commercialization, which may not be intrinsically motivating and which often requires specialized expertise, equipment, and other resources, is largely undertaken by or in conjunction with firms.²²⁵ But the empirical results discussed here do apply to individuals working for firms in the context of an employer-employee relationship.²²⁶ Thus, to the extent that firms—who are likely in the best position to do so—facilitate autonomy-supportive environments for their employees, they will reap the reward of lowered costs resulting from the employees' improved motivation and performance.

Whether this subsidy would be sufficient, in and of itself, to motivate rational-actor firms to undertake commercialization activities is unclear. The case of the pharmaceutical industry suggests perhaps not. But, at the very least, increased firm awareness of the financial benefits flowing from these interventions might allow us to decrease the economic reward needed to encourage commercialization—through shortened patent terms, for

²²¹ Henry Sauermann & Wesley M. Cohen, *What Makes Them Tick? Employee Motives and Firm Innovation*, 56 *MGMT. SCI.* 2134, 2149–50 (2010).

²²² *Id.* at 2149.

²²³ Edward L. Deci et al., *Facilitating Internalization: The Self-Determination Theory Perspective*, 62 *J. PERSONALITY* 119 (1994); J. Richard Hackman & Greg R. Oldman, *Motivation Through the Design of Work: Test of a Theory*, 16 *ORG. BEHAV. & HUM. PERFORMANCE* 250 (1976); Stern, *supra* note 211, at 848.

²²⁴ Johnson, *supra* note 8, at 677; see also Sean C. Phippen, *Dollars and Lives: Finding Balance in the Patent “Gene Utility” Doctrine*, 12 *B.U. J. SCI. & TECH. L.* 193, 208–09 (2006) (discussing how the high transaction costs associated with patent licensing can impede research in the biotech industry).

²²⁵ See Stephen K. Markham, *Moving Technologies from Lab to Market*, 45 *RES.-TECH. MGMT.* 31, 31 (2002).

²²⁶ See Sauerman & Cohen, *supra* note 221, at 2149.

example.²²⁷ Under commercialization theory, to the extent monopolies can be minimized while still maintaining optimal incentives to commercialize, society benefits.

5. Patent Racing Theory

According to the patent racing account, a patent is not required to incentivize invention in the first instance,²²⁸ but speeds the pace of innovation as inventors working on the same problem race either to reap the patent's financial reward²²⁹ or avoid being taxed for practicing their own invention.²³⁰ The psychology literature suggests that competition can indeed enhance innovation under certain conditions. These conditions, however, are not necessarily those our current patent system facilitates.

a. Motivation Research

The motivation research is relevant to patent racing theory. If, as this research suggests, individuals need no external incentives to be creative because they are intrinsically motivated to be so, we might assume that these same individuals will not respond to external incentives designed to speed the pace of their creative activity.²³¹ It is possible, however, that the competitive environment patent racing theory emphasizes changes the calculus of motivation. An in-depth look at the psychology of competition is thus in order.

b. Competition Research

The psychology literature examining the relationship between competition and performance is complex. Two strains of competition research informative for purposes of this Article are the literature examining the relationship between competition and individual motivation and the literature examining the relationship between competition and individual goal setting.

i. Competition and Motivation

A number of studies have explored the effects of competition on intrinsic motivation. An important conclusion is that competition, in

²²⁷ See Roin, *supra* note 187, at 750 (discussing the trade-offs between innovation and patent length in various industries).

²²⁸ *Supra* Part II.A.5; see also Lemley, *supra* note 22, at 711–12 (discussing patent racing theory and alternative patent theories).

²²⁹ Note that “wanting” a financial reward for an invention when the inventor would have undertaken the challenge regardless of reward is different from requiring the financial reward as an incentive to undertake the inventive process in the first place. While incentive theory posits the latter scenario, patent racing theory proposes the former.

²³⁰ Lemley, *supra* note 22, at 755–56.

²³¹ *Id.* at 758.

certain contexts, can enhance intrinsic motivation.²³² This is so because winning plays an important informational role that increases an individual's perceived competence at a task.²³³

This finding, consistent with patent racing theory, suggests that competition can indeed be beneficial for innovation. The right kind of competition can enhance intrinsic motivation, and, as discussed earlier, enhanced intrinsic motivation is associated with higher creativity and better performance on a variety of tasks.²³⁴

It is not known, however, whether the current patent system offers the "right" kind of competition for purposes of enhancing motivation and creativity. The benefits of competition for intrinsic motivation do not accrue when the context of the competition is construed by the competitor as controlling—when there is high external pressure to win.²³⁵ If the prospect of a financial reward causes firms and universities to impose significant pressure on the inventors they employ, the competition induced by a patent race might have detrimental effects on motivation and innovation generally.

ii. Competition and Goal Setting

As discussed in the earlier analysis of prospect theory, when individuals are time-constrained, they tend to set more difficult goals for themselves and accomplish tasks more quickly.²³⁶ This finding also has relevance for patent racing theory. If a competitive environment causes individuals to feel time-constrained and set more difficult inventive goals for themselves, a patent race might speed the pace of innovation as patent racing theory postulates.

Supporting this hypothesis, an empirical study examining the relationship between goal setting and competition concluded that participants who set more difficult goals for themselves showed enhanced

²³² Johnmarshall Reeve & Edward L. Deci, *Elements of the Competitive Situation that Affect Intrinsic Motivation*, 22 PERSONALITY & SOC. PSYCHOL. BULL. 24, 30 (1996); see also Jennifer A. Epstein & Judith M. Harackiewicz, *Winning Is Not Enough: The Effects of Competition and Achievement Orientation on Intrinsic Interest*, 18 PERSONALITY & SOC. PSYCHOL. BULL. 128 (1992) (finding that competition can increase intrinsic motivation for achievement-oriented individuals); Robert S. Weinberg & John Ragan, *Effects of Competition, Success/Failure, and Sex on Intrinsic Motivation*, 50 RES. Q. 503, 508 (1979) (finding that individuals demonstrated increased intrinsic motivation both at completion of the competition generally and when they succeeded at the competition).

²³³ Reeve & Deci, *supra* note 232, at 30–32. As discussed above, perceived competence can enhance feelings of intrinsic motivation. See Ryan & Deci, *supra* note 191, at 73; *supra* Part III.B.4.b.i.

²³⁴ See AMABILE, *supra* note 109, at 132–33. It should also be noted, however, that many studies show that competition had the opposite effect, and that the effect of competition on creativity is complex. *Id.* at 131–32, 150; see also Ryan & Deci, *supra* note 147, at 55.

²³⁵ Reeve & Deci, *supra* note 232, at 30–31.

²³⁶ Locke & Bryan, *supra* note 183; *supra* Part III.B.3.c.

performance on a set of routine tasks.²³⁷ But the study also surprisingly found that when individuals had already set goals, the additional presence of competition did not enhance task performance, and in fact detracted from it.²³⁸ The authors of the study hypothesized that the decreased performance resulted from lowered concentration or increased anxiety in the presence of competition.²³⁹

This study examined performance on routine arithmetic tasks rather than the more difficult tasks one would expect to be associated with the process of innovation.²⁴⁰ Nevertheless, its findings are consistent with the idea that competition may be beneficial to the individual creative process only under certain conditions—in particular, when the competition does not impose undue external pressure on an individual that might interfere with cognitive processes.

Also consistent with this conclusion is additional goal-setting research that reveals the importance of framing. When a goal is presented as a threat, with an emphasis on failing, performance is decreased compared to when the same goal is presented as a challenge, with an emphasis on success and the utility of the effort put in by the individual.²⁴¹

The framing results are particularly relevant to the iteration of patent racing theory in which the patent acts as a “stick” rather than a “carrot”—where inventors race for a patent not because they want the reward, but because they fear being excluded from practicing their own invention.²⁴² Because framing goals as efforts to avoid failure decreases individual performance, the “stick” model of patent racing might not be the optimal way to enhance creativity and innovation.²⁴³

iii. Competition Conclusions

Overall, the competition research suggests that competition has positive effects on innovation when it provides competence information and allows for high goal setting, but detracts from innovation when it poses a threat or results in a controlling situation.

One way to take advantage of the benefits of competition while

²³⁷ Donald J. Campbell & David M. Furrer, *Goal Setting and Competition as Determinants of Task Performance*, 16 J. ORG. BEHAV. 377, 386 (1995).

²³⁸ *Id.*

²³⁹ *Id.*

²⁴⁰ *Id.* at 381.

²⁴¹ Edwin A. Locke & Gary P. Latham, *New Directions in Goal-Setting Theory*, 15 CURRENT DIRECTIONS IN PSYCHOL. SCI. 265, 266 (2006).

²⁴² Lemley, *supra* note 22, at 755–56.

²⁴³ According to this view, the 2011 America Invents Act’s expansion of prior user rights under 35 U.S.C. § 273 was a positive development. *Cf.* Lemley, *supra* note 22, at 757 (arguing that the AIA’s prior rights amendments might reduce racing incentives). By allowing parties who lose the patent race to practice their inventions without penalty, this amendment reduces the threatening aspects of the race, and helps ensure that any competition taking place is of the beneficial kind.

avoiding its pitfalls would be to offer a primarily attributional reward, where “winning” inventors are publicly announced. This attributional system sets up positive competition for reputational gain and competence feedback, but does not pose a threat of significant financial loss or give employers reason to pressure inventors in ways that are detrimental to creativity.

C. Psychology and Non-Utilitarian Accounts of the Patent System

As discussed above, behavioral research can illuminate utilitarian accounts of the patent system by elucidating how people respond to incentives in real-world scenarios.

In contrast, non-utilitarian accounts of patents are based largely on deontological conceptions and generally do not depend on individuals responding to incentives in particular ways. But behavioral work can still serve as an important tool to evaluate these theories.

First, psychology research can elucidate the psychological salience of various rights. Labor-desert theory, for example, justifies patent rights as a just reward for an inventor’s hard work. Behavioral research can help us understand how much inventors, and society at large, are concerned about justice in this context. Research showing that these groups are anxious about fairness could bolster labor-desert theory. Conversely, if research suggests that a fair reward for innovative labor is not a consideration for inventors or the general populace, we might question whether labor-desert is a valid justification for strong intellectual property rights.

Second, and relatedly, behavioral findings can give us insights into the consequences, good or bad, that might result if we honor or fail to honor certain rights deemed important by deontologists. If negative consequences flow from a failure to honor these rights, the case for granting them may be strengthened; but if not granting the rights does not result in measurable psychological or behavioral harm, or if granting the rights actually causes harm, we may again question the utility of these rights.

Admittedly, this line of analysis puts a consequentialist spin on non-utilitarian theories because it seeks to justify or discredit these theories on the basis of their psychological and behavioral consequences. The approach is consistent with the practical focus of this Article, which, as mentioned above, seeks to harness the behavioral literature to develop an intellectual property regime that maximizes social value (broadly defined) while minimizing social costs. Not everyone will agree with this approach; a non-utilitarian theorist might argue, for example, that we should honor an inventor’s personality rights regardless of whether the inventor (or society as a whole) cares about them and even if doing so leads on balance to social harm, because it is the morally correct thing to do. Although this Article adopts a different view, it does not seek to challenge this argument.

Behavioral research can be used to evaluate non-utilitarian theories in a

third way, arguably useful even to those who reject any attempts to evaluate the theories on consequentialist grounds. This is to determine whether our current system honors the interests implicated by non-utilitarian theories in a psychologically salient way, and, if not, to give insights into how this might best be done. For example, behavioral research could help us determine whether inventors' personality interests are best honored through a monetary award, attribution, ongoing control over works, a combination of these, or something else. Though the existing behavioral literature does not definitively answer all of the types of questions discussed here that it *could* potentially answer, it does shed light on some of them, as I now discuss.

1. *Labor-Desert Theory*

The labor-desert account envisions a patent as a reward for the labor an inventor invests in her creation.²⁴⁴ A proviso to this theory is that a patent should not be granted when doing so harms others,²⁴⁵ generally understood in the patent context as inappropriately excluding others from the public domain.²⁴⁶

a. Fairness Research

The labor-desert theory implicates notions of fairness. We grant a patent to an inventor because she has earned natural rights in her invention, and it is thus the just thing to do.

Ample psychological evidence supports the idea that humans feel strongly about fairness.²⁴⁷ Babies as young as fifteen months old favor experimenters who distribute toys evenly over those who do not.²⁴⁸ Children as young as three take merit into consideration when asked to distribute stickers.²⁴⁹ And when placed in a game situation, adult subjects are much happier when they receive a financial reward they perceive as

²⁴⁴ MERGES, *supra* note 67, at 32–33; *see also supra* Part III.B.1.

²⁴⁵ Moore, *supra* note 71, at 78–79.

²⁴⁶ *E.g.*, Rosenblatt, *supra* note 5, at 456.

²⁴⁷ Many scientists in fact believe that our preference for fairness is an evolutionary trait that is hard-wired into our systems. *See, e.g.*, L. SUN, THE FAIRNESS INSTINCT: THE ROBIN HOOD MENTALITY AND OUR BIOLOGICAL NATURE 49 (2013) (“Driven by our fairness instinct, we keep watchful eyes on all sorts of violations of fairness rules in our daily lives. . . . Our subconscious emotional response in these common scenarios indicates that a preference for fairness may be deeply ingrained in our DNA. This hypothesis has gained much support from scientific studies in recent years.”).

²⁴⁸ Monica P. Burns & Jennifer A. Sommerville, “I Pick You”: *The Impact on Fairness and Race on Infants’ Selection of Social Partners*, 5 FRONTIERS IN PSYCHOL. 1, 6 (2014).

²⁴⁹ Patricia Kanngiesser & Felix Warneken, *Young Children Consider Merit when Distributing Resources with Others*, PLOS ONE (Aug. 29, 2012), <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0043979> [<http://perma.cc/83XF-JF8S>].

fair than when they receive the same reward but perceive it to be unfair.²⁵⁰ When these subjects' brains were scanned, the authors of this latter study found that accepting the "fair" reward activated centers of the brain normally associated with reward.²⁵¹ Conversely, accepting the "unfair" reward activated centers of the brain associated with self-control, suggesting that to accept the reward, an individual had to overcome the strong negative emotions associated with unfair treatment.²⁵²

b. Fairness and Innovation

More specifically for purposes of this Article, empirical results suggest that our basic drive towards fairness extends to rewards for innovative behavior. For example, a study by Onne Janssen concluded that employees engage in more innovative work behaviors in response to job demands when they perceive the rewards reaped from their efforts to be fair versus unfair.²⁵³ In a later study, Janssen found that employees find innovation stressful when fairness is low.²⁵⁴ The latter finding is significant because excess stress is known to have adverse effects on performance and motivation.²⁵⁵

c. Supporting Labor-Desert

These findings generally support, on consequentialist grounds, the labor-desert account of patent law.²⁵⁶ Ignoring the fairness considerations labor-desert theory implicates may result in both psychological and innovative harms, while honoring them may promote innovative

²⁵⁰ Golnaz Tabibnia et al., *The Sunny Side of Fairness: Preference for Fairness Activates Reward Circuitry (and Disregarding Unfairness Activates Self-Control Circuitry)*, 19 PSYCHOL. SCI. 339, 341 (2008).

²⁵¹ *Id.* at 342. These same centers are activated when an individual partakes in good food, sex, or mood-enhancing drugs. E.g., Kenneth Blum et al., *Sex, Drugs, and Rock 'N' Roll: Hypothesizing Common Mesolimbic Activation as a Function of Reward Gene Polymorphisms*, 44 J. PSYCHOACTIVE DRUGS 38, 39 (2012).

²⁵² Tabibnia et al., *supra* note 250, at 343–44.

²⁵³ Onne Janssen, *Job Demands, Perceptions of Effort-Reward Fairness and Innovative Work Behaviour*, 73 J. OCCUPATIONAL & ORGANIZATIONAL PSYCHOL. 287, 297 (2000).

²⁵⁴ Onne Janssen, *How Fairness Perceptions Make Innovative Behavior More or Less Stressful*, 25 J. ORG. BEHAV. 201, 209 (2004).

²⁵⁵ See generally STRESS AND HUMAN PERFORMANCE (James E. Driskell & Eduardo Salas eds., 2013).

²⁵⁶ The notion that a preference for fairness may be "hard-wired" into our systems might also help explain why, though fairness is not an explicit aspect of patent law, congressional and judicial attitudes toward intellectual property rights often implicitly reflect fairness concerns. See *supra* Part II.B.1; sources cited *supra* note 74. Moreover, empirical work by Gregory Mandel suggests that a large segment of the population believes that intellectual property exists to protect inventors' natural rights in their creations. Gregory N. Mandel, *The Public Perception of Intellectual Property*, 66 FLA. L. REV. 261, 287 (2014).

behaviors.²⁵⁷

Designing a legal environment that creators and the public perceive as fair may not necessarily require granting *financial* rewards to inventors, however. In the study finding a positive relationship between innovative behavior and perceived fairness, the questionnaire meant to unearth notions of fairness did not explicitly reference financial compensation.²⁵⁸ Instead, it arguably focused more on attributional than financial concerns, asking subjects to agree or disagree with such statements as “I give a great deal of time and attention to the organization, but get very little appreciation”; “I put more energy into my job than it is worth”; and “I feel unfairly treated in my job.”²⁵⁹ Consistent with earlier conclusions of this Article, then, an attributional reward might help achieve many of the proposed goals of the patent system, including, in this case, the satisfaction of fairness considerations.²⁶⁰ Notably, a purely attributional reward would also satisfy the “no-harm” proviso that labor-desert theory mandates, because it would not remove inventions from the public domain.

2. *Personality Theory*

Personality theory holds that an inventor has a personality interest in his discovery that merits protection.²⁶¹ Although there is surprisingly little empirical research testing this claim, preliminary work does seem to support the idea of a personality interest in creation.²⁶²

a. Feelings of Ownership and Valuation

Many inventors engage in creative work primarily to satisfy a need for self-expression.²⁶³ More specifically, a qualitative study of employees working at a video game design studio concluded that these individuals do in fact experience a feeling of psychological ownership over their innovative work product.²⁶⁴ Empirical work by Christopher Buccafusco and Christopher Sprigman further suggests that creators of intrinsically motivated work may value their creations more highly than those of works

²⁵⁷ See generally Christopher Buccafusco & David Fagundes, *The Moral Psychology of Copyright Infringement*, 100 MINN. L. REV. (forthcoming).

²⁵⁸ Janssen, *supra* note 253, at 291–92.

²⁵⁹ *Id.*

²⁶⁰ Jeanne Fromer has also argued that an attributional award could help advance the fairness and personality interests implicated by the creative process. Fromer, *supra* note 75, at 1791–98.

²⁶¹ See *supra* Part II.B.2.

²⁶² Elizabeth Rouse, Kill Your Darlings? Experiencing, Maintaining, and Changing Psychological Ownership in Creative Work 4–5 (2013) (unpublished Ph.D. dissertation, Boston College), <http://dlib.bc.edu/islandora/object/bc-ir:101452> [https://perma.cc/9GZP-GR8W].

²⁶³ Fromer, *supra* note 75, at 1771–72 & n.152 (citing JOSEPH ROSSMAN, INDUSTRIAL CREATIVITY: THE PSYCHOLOGY OF THE INVENTOR 200 (1964)); Sauermaun & Cohen, *supra* note 221, at 2134.

²⁶⁴ Rouse, *supra* note 262, at 3.

that are not intrinsically motivated.²⁶⁵

b. Effects of Relinquishing Control

If a personality interest in invention is a real psychological phenomenon, it is useful from a consequentialist perspective to determine what negative effects, if any, flow from the failure to validate this interest.

A recent study by On Amir and Orly Lobel suggests that loss of control over intellectual work product might result in decreased motivation and performance.²⁶⁶ The study measured task performance in a group of subjects under restrictions that caused them to relinquish ownership of their work product and limited their future ability to perform the same task in other contexts. Compared to a control group under no such restrictions, these subjects spent less time and were less focused on the tasks, and committed twice as many performance errors.²⁶⁷

These negative effects were less pronounced when subjects were asked to perform what the authors classified as a “creative” task (a word-association activity) versus a task classified as purely effort-based (searching matrices for numbers adding up to ten).²⁶⁸ The study’s authors hypothesized that the intrinsic motivation presumably triggered by the creative task served to mitigate the negative effects flowing from loss of ownership.²⁶⁹

This latter finding raises an interesting question for personality theory. Legal scholars writing in a personality theory vein have suggested that personality rights are particularly important for creative works.²⁷⁰ Going further, Justin Hughes argues that more expressive creative works, i.e., artistic pursuits, are more deserving of personality rights than less expressive works, i.e., scientific inventions.²⁷¹

But though it might be true that an individual’s ownership interest is stronger for more creative versus less creative work,²⁷² Amir and Lobel’s

²⁶⁵ Christopher Buccafusco & Christopher Jon Sprigman, *The Creativity Effect*, 78 U. CHI. L. REV. 31, 46 (2011).

²⁶⁶ On Amir & Orly Lobel, *How Noncompetes Stifle Performance*, HARV. BUS. REV., Jan.–Feb. 2014, at 26.

²⁶⁷ *Id.*; see also Orly Lobel, Op-Ed., *My Ideas, My Boss’s Property*, N.Y. TIMES (Apr. 13, 2014), <http://www.nytimes.com/2014/04/14/opinion/my-ideas-my-bosss-property.html> (arguing that when corporations force their inventors to pre-assign their intellectual property, inventors lose their “creative fire” and produce fewer inventor-owned patents).

²⁶⁸ Amir & Lobel, *supra* note 266.

²⁶⁹ *Id.*

²⁷⁰ Fromer, *supra* note 75, at 1754; Hughes, *supra* note 70, at 340–43.

²⁷¹ Sources cited *supra* note 270.

²⁷² Although, as discussed in Part III.C.2.a, *supra*, preliminary evidence shows that creative works invoke feelings of psychological ownership, there is no empirical evidence to support or refute Hughes’s additional hypothesis: that artistic works invoke stronger feelings of psychological ownership and intrinsic motivation than scientific works. In the motivation literature, both scientific and artistic pursuits are considered to be creative and intrinsically motivating; and, as mentioned already, there is

study suggests that the negative effects on innovation flowing from loss of this ownership are *lower* for more creative versus less creative work, due to the mitigating effects of intrinsic motivation. If, as Jeanne Fromer has recommended, our aim is to administer personality rights within a utilitarian framework, such that personality rights are granted only if the benefits outweigh the costs,²⁷³ this finding suggests that personality rights may be less desirable for more creative and therefore more intrinsically motivating works.²⁷⁴

c. Implementing Personality Theory

If, for whatever reason, we decide that a patent system that respects personality rights is justified, then the question becomes how to accomplish this task. Fromer and Hughes have each suggested that the personality interests of inventors can be satisfied, at least in part, by granting attribution rights.²⁷⁵

The conceptual relationship between labor-desert theory and personality theory also suggests that attribution might go a long way towards satisfying personality interests. Psychologists have conceptualized the personality interest individuals feel in their creations as the result of the “efforts, time, and attention” invested in them.²⁷⁶ Thus, to the extent that empirical results support the use of attribution for satisfying labor-desert concerns,²⁷⁷ they might also support the same approach for satisfying personality concerns.

Because the personality interest conceives of an invention as the

little empirical research examining personality interests in creative works of any kind. One study from the motivation literature examining levels of motivation in a variety of high school courses found the highest levels of motivation in art and computer science classes—but this was likely related to the relatively high level of active participation in these classes compared to more passive lecture-based courses like Math and English. David J. Shernoff et al., *Student Engagement in High School Classrooms from the Perspective of Flow Theory*, 18 SCH. PSYCHOL. Q. 158, 170 (2003).

²⁷³ Fromer, *supra* note 75, at 1779.

²⁷⁴ This conclusion is consistent with my earlier conclusion that while incentives to innovate might not be required for the intrinsically motivating work of creation, they might be needed for the less intrinsically motivating work of implementation and commercialization. *See supra* Parts III.B.1, III.B.4. Of course, we might also decide that personality rights are important, not because an economic analysis concludes that they will have positive effects on innovation, but simply because we believe, from a deontological perspective, that an inventor has a right to such protection.

²⁷⁵ Fromer, *supra* note 75, at 1790–92; Hughes, *supra* note 70, at 349; *see also* Rosenblatt, *supra* note 5, at 457. Fromer, for example, cites empirical evidence suggesting that creators will accept lower license fees for their works in exchange for attribution. Fromer, *supra* note 75, at 1791 (citing Christopher Jon Sprigman et al., *What’s a Name Worth?: Experimental Tests of the Value of Attribution in Intellectual Property*, 93 B.U. L. REV. 1389, 1415–16 (2013)).

²⁷⁶ Russell W. Belk, *Possessions and the Extended Self*, 15 J. CONSUMER RES. 139, 144 (1988); *see also* MIHALY CSIKSZENTMIHALYI & EUGENE ROCHBERG-HALTON, *THE MEANING OF THINGS: DOMESTIC SYMBOLS AND THE SELF* 248–49 (1981). Legal theorists have also noted the similarities between the personality and fairness theories. *See* Fromer, *supra* note 75, at 1753.

²⁷⁷ *See supra* Part III.C.1.b.

extension of its creator, however, it implicates issues of control that the labor-desert account does not.²⁷⁸ Amir and Lobel's empirical study indirectly²⁷⁹ suggests that ongoing control may be an important motivator—although it seems to be less important when the work is intrinsically motivating, as most inventive work is.²⁸⁰

But granting inventors lasting control over their creations might have detrimental effects on innovation, for example by stifling user innovation or improvements. If we take a consequentialist approach to implementing personality theory, we might ask whether the benefits we hope to gain from granting inventors lasting control over their inventions (measured, for example, in increased motivations to invent or increased societal well-being) are worth the costs (measured, for example, in decreased follow-on innovation). Another possibility involves granting a limited control—like that codified in the Visual Artists Rights Act—that gives inventors, for example, the right to prevent the unauthorized use of their name in conjunction with modified works.²⁸¹

3. *Social Planning Theory*

Social planning theory posits that patent rules should be structured so as to promote a “just and attractive culture,”²⁸² as measured by a range of metrics beyond economic welfare. Scholars have proposed a number of values to be taken into consideration, and have hypothesized how intellectual property rights—particularly in the copyright and publicity contexts—might be structured to advance these values.²⁸³

Social planning theory is not so much a justification of the current patent system as it is an aspirational statement about how intellectual property rights ideally should be structured. Scholars working in this vein have proposed that the patent system should promote the values of autonomy, culture, democracy, equality, development, creativity, community, happiness, respect, and opportunities for meaningful work and self-determination.²⁸⁴

²⁷⁸ Fromer, *supra* note 75, at 1770; Hughes, *supra* note 70, at 344.

²⁷⁹ The study does not directly investigate the effects of lack of control. The restricted subjects transferred ownership of their work product and could not perform similar tasks for others in the future. Although the transfer of ownership necessarily entailed relinquishment of control, the loss of motivation associated with the transfer might have been due to the loss of attribution the transfer entailed or the inability to continue working on tasks the workers enjoyed.

²⁸⁰ Amir & Lobel, *supra* note 266.

²⁸¹ See *supra* Part II.B.2.

²⁸² Fisher, *supra* note 1, at 171–72.

²⁸³ See *supra* Part III.B.3.

²⁸⁴ See Fisher, *supra* note 87, at 1687; Sunder, *supra* note 88, at 324–25.

a. Social Planning Values and Well-Being

Social planning theorists' assertion that the above-listed values will contribute to the "just and attractive culture" that is the stated goal of the theory is largely supported by the empirical literature. In particular, there is a robust psychology literature demonstrating that the values of autonomy,²⁸⁵ competence,²⁸⁶ engagement in meaningful work,²⁸⁷ self-expression,²⁸⁸ and community²⁸⁹ are positively related to measures of well-

²⁸⁵ Marc R. Blais et al., *Toward a Motivational Model of Couple Happiness*, 59 J. PERSONALITY & SOC. PSYCHOL. 1021, 1021–22, 1027, 1030 (1990); Edward L. Deci & Richard M. Ryan, *The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior*, 11 PSYCHOL. INQUIRY 227, 231–34, 241–43, 253, 263 (2000); C. Raymond Knee et al., *Self-Determination and Conflict in Romantic Relationships*, 89 J. PERSONALITY & SOC. PSYCHOL. 997, 997–1000 (2005); Harry T. Reis et al., *Daily Well-Being: The Role of Autonomy, Competence, and Relatedness*, 26 SOC. PSYCHOL. BULL. 419, 424 (2000); Richard M. Ryan & Edward L. Deci, *On Happiness and Human Potentials: A Review of Research on Hedonic and Eudaimonic Well-Being*, 52 ANN. REV. PSYCHOL. 141, 156–57, 159–61 (2001); Richard M. Ryan et al., *On the Interpersonal Regulation of Emotions: Emotional Reliance Across Gender, Relationships, and Cultures*, 12 PERS. RELATIONSHIPS 145, 149 (2005); see also Reed W. Larson, *Toward a Psychology of Positive Youth Development*, 55 AM. PSYCHOL. 170, 170 (2000); Richard M. Ryan et al., *The Significance of Autonomy and Autonomy Support in Psychological Development and Psychopathology*, in DEVELOPMENTAL PSYCHOPATHOLOGY: THEORY AND METHOD 795, 802 (Dante Cicchetti & Donald J. Cohen eds., 2006) [hereinafter Ryan et al., *The Significance of Autonomy*].

²⁸⁶ Tim Kasser & Richard M. Ryan, *A Dark Side of the American Dream: Correlates of Financial Success as a Central Life Aspiration*, 65 J. PERSONALITY & SOC. PSYCHOL. 410, 420 (1993); Tim Kasser & Richard M. Ryan, *Further Examining the American Dream: Differential Correlates of Intrinsic and Extrinsic Goals*, 22 PERSONALITY & SOC. PSYCHOL. BULL. 280, 280 (1996); Reis et al., *supra* note 285, at 424; Kennon M. Sheldon & Tim Kasser, *Coherence and Congruence: Two Aspects of Personality Integration*, 68 J. PERSONALITY & SOC. PSYCHOL. 531, 531 (1995); see also Ryan et al., *The Significance of Autonomy*, *supra* note 285, at 832; Martin E.P. Seligman, *Positive Psychotherapy*, 61 AM. PSYCHOLOGIST 774, 776–77 (2006).

²⁸⁷ Amy Love Collins et al., *Flow and Happiness in Later Life: An Investigation into the Role of Daily and Weekly Flow Experiences*, 10 J. HAPPINESS STUD. 703, 704 (2009); Mihaly Csikszentmihalyi & Jeremy Hunter, *Happiness in Everyday Life: The Uses of Experience Sampling*, 4 J. HAPPINESS STUD. 185, 186, 194 (2003); Jeanne Nakamura & Mihaly Csikszentmihalyi, *The Concept of Flow*, in HANDBOOK OF POSITIVE PSYCHOLOGY 90 (C.R. Snyder & Shane Lopez eds., 2002); Seligman, *supra* note 286, at 777; Anne J. Wells, *Self-Esteem and Optimal Experience*, in OPTIMAL EXPERIENCE: PSYCHOLOGICAL STUDIES OF FLOW IN CONSCIOUSNESS 327 (Mihalyi Csikszentmihalyi & Isabella Csikszentmihalyi eds., 1988).

²⁸⁸ See Sherry L. Dupuis & Bryan J.A. Smale, *An Examination of Relationship Between Psychological Well-Being and Depression and Leisure Activity Participation Among Older Adults*, 18 LOISIR ET SOCIÉTÉ 67 (1995); Ana Puig et al., *The Efficacy of Creative Arts Therapies to Enhance Emotional Expression, Spirituality, and Psychological Well-Being of Newly Diagnosed Stage I and Stage II Breast Cancer Patients: A Preliminary Study*, 33 ARTS PSYCHOTHERAPY 218, 224 (2006) (finding that creative arts therapy intervention enhanced psychological well-being in subjects); Kennon M. Sheldon et al., *Trait Self and True Self: Cross-Role Variation in the Big-Five Personality Traits with Psychological Authenticity and Subjective Well-Being*, 73 J. PERSONALITY & SOC. PSYCHOL. 1380, 1380 (1997) (finding that increased opportunities for authenticity and self-expression led to more agreeableness, openness, and greater satisfaction in employment).

²⁸⁹ See, e.g., Ellen Berscheid & Harry T. Reis, *Interpersonal Attraction and Close Relationships*, in HANDBOOK OF SOCIAL PSYCHOLOGY (Susan T. Fiske et al. eds., 1998); see also ANGUS CAMPBELL ET AL., *THE QUALITY OF AMERICAN LIFE: PERCEPTIONS, EVALUATIONS, AND SATISFACTIONS* (1976);

being and flourishing.

b. Social Planning Values and Innovation

Perhaps more salient to those with a welfarist bent, some of the values social planning theory seeks to promote are also related to positive innovation outcomes. For example, autonomy increases intrinsic motivation, which in turn enhances creative output.²⁹⁰ Feelings of competence are related to higher academic achievement.²⁹¹ And opportunities for self-expression and community may also lead to increased intrinsic motivation.²⁹² These values should thus be of interest to anyone concerned with promoting creativity and innovative behavior.

c. Social Planning—Prescriptions

As discussed throughout this Article, the financial reward a patent offers does not necessarily enhance creative output or motivations to innovate. But as my analysis in this Part suggests, promoting values consistent with a “just and attractive culture” may benefit society generally through enhanced well-being and specifically through incentives to innovate.

As far as the innovation-enhancing benefits of these principles are concerned, to the extent that innovation happens in private organizations, employers might be in the best position to promote them.²⁹³ Even if firms as a whole behave like rational actors, they have a financial incentive to endorse these values, since they can expect gains in productivity and creative output from their employees as a result.

For innovation that takes place in the academic setting, policy reforms that ensure research funding is administered in a way that promotes, rather

Reed W. Larson & Mihalyi Csikszentmihalyi, *The Experience Sampling Method*, 15 *NEW DIRECTIONS FOR METHODOLOGY OF SOC. & BEHAV. SCI.* 41 (1983); Reis et al., *supra* note 285, at 420; Wolfgang Stroebe & Margaret Stroebe, *The Social Psychology of Social Support*, in *SOCIAL PSYCHOLOGY: HANDBOOK OF BASIC PRINCIPLES* 597 (E. Tory Higgins & Arie W. Kruglanski eds., 1996).

²⁹⁰ See Teresa M. Amabile, *The Social Psychology of Creativity: A Componential Conceptualization*, 45 *J. PERSONALITY & SOC. PSYCHOL.* 357, 364 (1983) (finding that the positive effects of autonomy on motivation are strengthened when the task is a creative one); Marylène Gagné & Edward L. Deci, *Self-Determination Theory and Work Motivation*, 26 *J. ORGANIZATIONAL BEHAV.* 331, 342, 355 (2005) (finding that job motivation and performance are positively related to autonomy support by managers); *see also supra* Part III.B.4.b.

²⁹¹ Hyungshim Jang et al., *Can Self-Determination Theory Explain What Underlies the Productive, Satisfying Learning Experiences of Collectivistically Oriented Korean Students*, 101 *J. EDUC. PSYCHOL.* 644, 644 (2009) (finding that experiences of autonomy, competence, and relatedness led to better learning outcomes in Korean students).

²⁹² See Ryan & Connell, *supra* note 220, at 749; Sheldon & Kasser, *supra* note 286, at 534 (finding that increased opportunities for authenticity and self-expression led to enhanced intrinsic motivation in employment); *see also supra* Part III.B.4.b (analyzing the role of relatedness in improving intrinsic motivation).

²⁹³ *See supra* Part III.B.4.b.

than detracts from, the innovation-enhancing principles of autonomy, engagement, community, and so on, are in order. For example, the research funding structure could promote community by offering funds for collaborative research projects.²⁹⁴ And the funding scheme could be administered in such a way that academic researchers have more autonomy to choose the particular projects that interest them, even if these projects present a greater scientific or financial risk.²⁹⁵

IV. IMPLICATIONS

Though by no means comprehensive, the above analysis provides a starting point for evaluating the various accounts of the patent system from a behavioral perspective. This analysis can help us determine whether the patent system is justified under any account, and can give us ideas for building a patent system that accomplishes more of what we want it to accomplish. Here, I summarize the results and discuss some of their implications.

A. *Commercialization Theory*

1. *Support from Psychology*

From a purely behavioral perspective, my analysis suggests that commercialization theory provides the strongest justification for a system that, like ours, provides a primarily financial reward.²⁹⁶ While the early creative steps of the innovative process are intrinsically motivating and may be harmed rather than helped by an external financial reward,²⁹⁷ an economic reward is likely of some use for incentivizing the more routine and structured tasks associated with implementation and

²⁹⁴ Promoting collaborative and, in particular, interdisciplinary research projects would be expected to result in additional gains in innovation. *See supra* Part III.B.3.b.

²⁹⁵ A recent popular press article tells the story of two academic research scientists who left their careers because they felt constrained by the current funding scheme that allowed them to work only on conservative and incremental research. Richard Harris, *When Scientists Give Up*, NPR (Sept. 9, 2014, 4:27 PM), <http://www.npr.org/blogs/health/2014/09/09/345289127/when-scientists-give-up>. This is an extreme example of lost motivation that can occur when autonomy is curtailed. On the positive side, when researchers are given the autonomy to work on what interests them, we might expect enhanced creative output. In a story about a researcher who received “very special funding from the National Institutes of Health . . . that g[ave him] unbridled funds for [him] to do anything [he] s[aw] fit,” the researcher explained that this funding “really emboldened [his group] to explore very new directions.” Jon Hamilton, *A Scientist Deploys Light and Sound to Reveal the Brain*, NPR (July 27, 2015, 3:57 AM), <http://www.npr.org/sections/health-shots/2015/07/27/425068015/a-scientist-deploys-light-and-sound-to-reveal-the-brain>.

²⁹⁶ *See supra* Part III.B.4. It should be noted that this conclusion rests entirely on my analysis of the psychology literature and does not take into account the many economic arguments advanced for and against commercialization theory.

²⁹⁷ *Id.*

commercialization.²⁹⁸

Further, though this Article focuses primarily on individual-level psychological factors rather than firm-level dynamics, the commercialization phase of innovation may—due to financing and equipment requirements and economies of scale—be more likely to require participation from a large firm.²⁹⁹ To the extent that these firms behave more like rational actors and less like individuals subject to psychological forces, a financial reward might be required to incentivize commercialization decisions that take place primarily at the organizational level.

This latter dynamic might change over time as technological advances make it easier for individuals and small groups to undertake commercialization on their own.³⁰⁰ Johnson has made a similar point and provides the example of home recording systems that make it much easier for individuals to produce music without the involvement of expensive studios.³⁰¹ Another recent example is the 3-D printer, which allows individuals to self-produce a number of products of their own design.³⁰² As these technologies proliferate and become cheaper, reduced financial incentives, in conjunction with more effective kinds of individual-level behavioral incentives, may be in order.

2. Structuring Commercialization

Assuming for the present that some financial incentive is required to encourage commercialization, how should a patent system designed for this purpose be structured? Though our current system likely meets the goals of commercialization theory more effectively than those of any other theory, a system specifically designed to foster commercialization would diverge in important ways from our present regime. Sichelman, in his call for a new commercialization patent, discusses in some detail what a commercialization patent might look like in terms of scope and patentability requirements.³⁰³ And as Roin has suggested, a commercialization-focused scheme could be tailored so that products requiring more time (and, consequently, more time engaged in routine work) and resources to be brought to market are granted a proportionally

²⁹⁸ *Id.*

²⁹⁹ *Id.*

³⁰⁰ Johnson, *supra* note 8, at 672–75.

³⁰¹ *Id.*

³⁰² See generally Lucas Osborn, *Of PhDs, Pirates, and the Public: Three-Dimensional Printing Technology and the Arts*, 1 TEX. A&M L. REV. 811 (2014) (identifying and analyzing the implications of 3-D printing technology for copyright law).

³⁰³ Sichelman, *supra* note 45, at 400–11.

greater financial incentive.³⁰⁴

B. *Other Theories*

In contrast to commercialization theory, the behavioral literature suggests that a financial incentive may not be the most effective means of achieving the ends and means put forth by the other accounts of the patent system.

The intrinsic motivation literature, for example, suggests that external financial incentives may not be helpful for motivating individuals to either engage in creative behavior (as incentive theory posits)³⁰⁵ or share the results of their efforts (as disclosure theory posits).³⁰⁶ Although the literature suggests that competition can enhance creative performance under certain conditions (as patent racing theory proposes),³⁰⁷ the current patent system, which poses a threat of potentially significant financial harm to the loser of a patent race, likely does not satisfy these conditions.³⁰⁸

Though psychology research suggests that desert, personality, and social planning values are significant human concerns which, if respected, have the potential to promote innovative behavior,³⁰⁹ there is little evidence to suggest that a financial reward is the best, or even an effective, way to satisfy these concerns.

The account that garners the least support from the behavioral literature is prospect theory.³¹⁰ Research studying the effects of collaboration, goal-setting, and cognitive limitations on creative performance suggests that granting a broad patent to a single actor in order to allow the actor to exploit the field is likely counterproductive for innovation. This finding is consistent with economic criticisms of prospect theory,³¹¹ and suggests that prospect theory be abandoned as a viable approach to patent law.

³⁰⁴ Roin, *supra* note 187.

³⁰⁵ *See supra* Part III.B.1.

³⁰⁶ *See supra* Part III.B.2.

³⁰⁷ *See supra* Part III.B.5.

³⁰⁸ *See* Locke & Latham, *supra* note 241, at 266.

³⁰⁹ The behavioral literature itself supports this utilitarian spin on the non-utilitarian patent theories. Some proponents of these theories, taking a rights-based approach, would argue that these values should be promoted regardless of the utilitarian outcome. While this might be true, it is also true, according to the behavioral literature, that promoting these values in the innovation context likely will have positive effects on innovation. *See, e.g., supra* Part III.C.3.b.

³¹⁰ *See id.*

³¹¹ *See, e.g.,* Lemley, *The Economics of Improvement*, *supra* note 166, at 1048–58 (criticizing prospect theory on economic grounds).

C. *The Importance of Attribution*

The idea of attribution is not new: a number of intellectual property scholars have argued that attribution should play a more prominent role in the intellectual property system.³¹² But one of the more striking results to come from this analysis is the extent to which an attribution right has the potential to achieve many of the goals proposed by disparate accounts of the patent system.

Empirical research, for example, suggests that the reputational and feedback benefits flowing from attribution are significant motivators of disclosure—the means to promoting innovation set forth by disclosure theory.³¹³ A primarily attributional reward could also create the “right” kind of competitive scenario that has the potential to speed the pace of innovation, consistent with racing theory.³¹⁴ For non-utilitarian accounts of the patent system, empirical research suggests that an attributional reward could go a long way towards satisfying inventors’ natural rights and personality concerns.³¹⁵

Moreover, attributional rewards are not necessarily inconsistent with the commercialization-focused rewards described above. According to the behavioral research, the goals we can hope to achieve via attribution—namely, motivating disclosure and productive competition and satisfying desert and personality concerns—are generally associated with the early, creative phases of innovation rather than the later implementation phases.³¹⁶ A two-track patent system similar to that proposed by Sichelman, with separate rewards³¹⁷ offered for the creative and commercialization phases of innovation, could take advantage of this insight. Under my proposal, however, the first track would focus on attribution, rather than a financial reward, for early-stage creation. The second track would aim to promote commercialization through a commercialization patent.³¹⁸

³¹² E.g., Fromer, *supra* note 75, at 1790; Rosenblatt, *supra* note 5, at 478–79. *But cf.* Sprigman et al., *supra* note 275, at 1415–16 (proposing caution in strengthening attribution rights).

³¹³ See *supra* Part III.B.2.

³¹⁴ See *supra* Part III.B.5.

³¹⁵ See *supra* Part III.C.1–2.

³¹⁶ See *supra* Part II.

³¹⁷ See Fromer, *supra* note 75, at 1780 (discussing the possibility of splitting the bundle of rights to provide for financial and attributional components). In contrast to my suggestion of splitting the reward based on the phase of the innovation process, Fromer suggests granting attributional rights at the individual level and granting financial rewards at the firm level.

³¹⁸ As discussed above, financial rewards may be effective for motivating individuals to engage in the routine activities associated with commercialization, and are also likely effective for motivating large rational-actor firms who may play a more prominent role in the commercialization phase of innovation. To fully satisfy commercialization theory, then, the financial reward might itself be split such that key contributing employees at large firms receive a proportion of the monetary reward awarded to the commercializing firm.

To be optimally effective, an attributional reward granted at the early stages of innovation must achieve the motivating ends of reputational enhancement, positive competition, and competence feedback suggested by the behavioral literature. The current patent system, which provides for minimal attribution by listing inventors on patents that may or may not be read by a wide audience, is likely insufficient for these purposes.³¹⁹ Instead, a thoughtfully tailored attributional reward could involve periodic announcements or press releases providing inventor biographies and summarizing their inventions. A more sophisticated system might operate in a manner similar to the scientific publication process, with inventions evaluated for quality and scientific impact by a committee or an inventor's peers; inventions deemed more significant would receive some special treatment designed to enhance reputational effects—wider circulation, for example, or an interview with the popular press. This type of system would provide inventors with a positive competitive goal as well as reputation feedback,³²⁰ and would also help satisfy natural rights and personality concerns by giving inventors credit and acclaim for their work.³²¹

An attributional reward, though low-cost compared to our current patent system, might bear its own price. Empirical work by Christopher Sprigman and colleagues suggests that strengthening attribution in the intellectual property context might increase transaction costs because creators value attribution more highly where it is granted as a default right. This makes it more difficult to bargain with creators for the use of their creations without attribution.³²² But these costs need not be implicated if attribution is structured as described above, such that the inventor is credited once, in a very public way, rather than every time the product is used.

D. *Beyond Patents*

Besides attribution, behavioral research suggests that additional non-financial interventions may have positive effects on innovation. In particular, the research highlighted in my discussions of commercialization and social planning theory above underscores the importance of facilitating innovative environments that promote autonomy, competence, relatedness, and self-expression³²³—what psychologists refer to as “autonomy-supportive” environments.³²⁴ In the context of commercialization theory, this research suggests that facilitating these environments can be even

³¹⁹ See Fromer, *supra* note 75, at 1792.

³²⁰ See *supra* Parts II.B.5, III.B.2.

³²¹ See *supra* Parts II.C.2, III.C.1.

³²² Sprigman et al., *supra* note 275, at 1430–32.

³²³ See *supra* Parts III.B.4, III.C.3.

³²⁴ Ryan & Deci, *supra* note 191, at 73–74.

more effective than financial rewards for motivating individuals to engage in the routine work that often accompanies commercialization.³²⁵ In the context of social planning theory, this research suggests that facilitating these environments can have positive effects on creative output.³²⁶

It is thus worth thinking about what can be done at various levels to promote autonomy-supportive environments. In the case of the innovative behavior that takes place in private firms, the firms themselves may be in the best position to facilitate these environments.³²⁷ Because firms stand to gain financially through increased productivity and higher quality output from making these changes, educating them about the potential benefits might be sufficient to effect positive change.

For innovative behavior that takes place in publically funded institutions such as universities, drafting funding policies that give researchers autonomy in project choice and provide opportunities for collaborative work could prove beneficial.³²⁸ Universities themselves, as employers, could also undertake initiatives designed to enhance the autonomy, competence, and relatedness of their researchers.

For innovative behavior that takes place on an unstructured level, we are currently seeing the rise of autonomy-supportive innovation environments—featuring the key components of autonomy, relatedness, self-expression, and competence feedback—on the internet.³²⁹ Communities and governments can also do their part to facilitate these environments by providing informational (e.g., listings of groups with shared interests) or physical (e.g., meeting places) resources to innovation-minded individuals.

E. Caveats

Before concluding, two caveats of this work must be reiterated. First, the conclusions drawn here are based entirely on behavioral research and do not take into account the various economic or rights arguments that have been advanced for and against the various accounts of the patent system. Nevertheless, this analysis is not necessarily mutually exclusive of, or inconsistent with, these other types of arguments.³³⁰ Future efforts could integrate these arguments with other strains of analysis.

³²⁵ See *supra* Part III.B.4.

³²⁶ See *supra* Part III.C.3.

³²⁷ See *supra* Part III.B.4.b.ii.

³²⁸ See *supra* Part III.C.3.c.

³²⁹ See John Quiggin & Dan Hunter, *Money Ruins Everything*, 30 HASTINGS COMM. & ENT. L.J. 203, 204 (2008) (relating the rise of amateur production of information and innovation to the availability of free or quasi-free distributional channels, the most significant of which is the internet).

³³⁰ See Pedraza-Fariña, *supra* note 8, at 857 (arguing that a socio-historical approach to patent law can complement more traditional approaches).

Second, the analysis here focuses primarily on the level of individual incentives, while a significant amount of innovative behavior currently occurs in the context of organizations. The general response to this is two-fold. First, organizations are made up of individuals.³³¹ To the extent that individuals within organizations are motivated by non-financial considerations, firms benefit from lower costs and higher productivity, and the corresponding financial reward necessary to incentivize the (presumably) rational-actor employer should be lowered.³³² Second, as technology improves, more avenues for innovation and commercialization are opening to individuals.³³³ Thus, individual-level incentives may be poised to gain greater salience over time.

Of course, more work can be done to determine the answers to questions such as: How closely do firm-level behavioral incentives track individual incentives? Do firm incentives change as a function of firm size? How do individual-level and firm-level behavioral incentives interact? As the answers to these questions are clarified, we can tailor the patent system so as to bring it more fully in line with the behavior of actors within the system, thereby minimizing the system's social costs.

V. CONCLUSION

As shown here, research from the behavioral sciences provides a tool for measuring theoretical accounts of the patent system against the expected behaviors of actors responding to the system in real life. It thus helps us answer the pressing question of whether patent rights are justified, and if so, for what purpose. My analysis here suggests that, at least according to the behavioral literature, our current patent system is best justified as a means of promoting commercialization activities.

Beyond this, the Article also demonstrates that a behavioral framework can bring us closer to an ideal patent system—one that promotes innovation through mechanisms like disclosure and competition while at the same time satisfying moral concerns like justice and personality interests. My analysis suggests that this can be accomplished by developing a patent system that offers attributional and financial rewards at different times to different actors in a manner that takes advantage of the psychological factors that govern the innovation process.

Finally, the behavioral analysis undertaken here provides support for broad interventions outside the traditional patent system—including changes to our approach to research funding—to foster innovation-supportive environments. All of these insights, taken together, have the

³³¹ See *supra* Part III.B.4.a.

³³² *Id.*

³³³ See *supra* Part IV.A.1.

potential to direct innovation policy in ways that align more closely with the realities of human creativity and decision-making.

