

Experimental Tests of Intellectual Property Laws' Creativity Thresholds

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Introduction

In the United States, intellectual property (IP) law is intended to encourage the production of new creative works and inventions.¹ Copyright and patent laws do this by providing qualifying authors and inventors with a bundle of exclusive rights relating to the use and development of their creations.² Importantly, however, these fields differ greatly in the ways that they determine whether some new creation is sufficiently innovative to merit legal protection. Copyright law sets the creativity bar especially low for new works of authorship, whereas patent law demands that a putative inventor prove that her creation is highly innovative. Although this difference has been noted repeatedly in the past and explained as a matter of various differences between copyrightable and patentable subject matter (including differing goals of the two regimes),³ relatively little research has focused on whether the different IP thresholds affect the incentives and behavior of creators.

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1. *See infra* subpart I(A).
 2. We use the generic term “creation” to cover both copyrightable works of authorship and patentable inventions.
 3. *See infra* subpart I(B).

Legal scholarship on the effects of differing IP thresholds on creators has generally relied on standard economic assumptions about the way that people respond to incentives. Creators are assumed to be rational and to respond to increased incentives by producing more and better creations.⁴ According to this reasoning, because patent law requires more creativity as a precondition to the conferral of IP rights compared to what copyright law requires, creators subject to the patent regime will be encouraged to be more creative than those subject to the copyright regime.

Recent research in the social sciences, however, suggests that the connection between incentives and behavior—particularly with regard to creativity—is not always so straightforward. Although some research indicates that providing incentives to act creatively has the expected effect of increasing creativity, other research suggests that offering certain types of incentives can undermine creative behavior. For example, monetary incentives to perform creative tasks may dampen creativity. In such cases, the monetary incentive may create an extrinsic motivation for the behavior that can “crowd out” the intrinsic motivation to be creative. Moreover, and importantly for our purposes, increasing the magnitude of an incentive to be creative may not always lead to more or better behavior. Once creativity incentives are sufficiently salient or intense, there is a risk that people will be overly focused on achieving the incentive and “choke.”

Of course, the kinds of creativity that IP law deals with are highly varied.⁵ The innovative leap associated with designing a graphical user interface or with developing a new drug may be quite different from creativity involved in painting or poetry. There may also be differences in creativity *within* the separate IP regimes: Although both painting and poetry are within the domain of copyright law, thinking creatively about line, shape, and color could be very different from thinking creatively about diction, meter, and rhyme. Because the cognition associated with these efforts may be very different, one might think that the effects of thresholds on creativity could be different as well.

In the series of experiments reported in this Article, we extend the research on the effects of incentives for creativity into the realm of intellectual property. Specifically, we test whether the existence of a creativity threshold that conditions entry into a prize lottery on meeting certain performance standards affects how creative people are. The experiments reported here involve various creativity tasks in which subjects are randomly assigned to conditions that are intended to model the different

4. See *infra* notes 91–94 and accompanying text.

5. See generally Jeanne C. Fromer, *A Psychology of Intellectual Property*, 104 NW. U. L. REV. 1441 (2010) (utilizing the psychology of creativity to analyze the differences in protectability standards between patent and copyright law).

creativity thresholds employed by copyright and patent law. Doing so allows us to test whether the existence and nature of a threshold increases, decreases, or does not affect subjects' creativity.

This research contributes to the growing debates about whether copyright law's creativity threshold is set too low and should be increased and whether patent law's creativity threshold is appropriately set. In recent years, some scholars have questioned whether copyright law's creativity threshold ought to be raised to stimulate the production of works that are more creative. Other scholars suggest that copyright and patent laws' respective protection thresholds are more or less properly calibrated in light of their differing goals. Although our research cannot answer comprehensively the question of where to set these laws' thresholds given the many other significant issues at stake, it is valuable to know whether "hoisting" copyright's creativity threshold⁶ or whether downgrading patent's creativity threshold would be likely to improve certain kinds of creativity. More broadly, this research adds to the growing literature in law, psychology, economics, and management on the effects of incentives on behavior.⁷

In Part I, we explain the distinction between the creativity thresholds employed by copyright and patent laws and the justifications given for the distinction. We also survey recent suggestions that copyright's low threshold be raised to promote greater creativity. Part II reviews research on the study of creativity, including a discussion of preferred creativity metrics and studies of incentives to act creatively. In Part III, we report four original experiments designed to measure the effects of different thresholds on creativity. Three experiments employ different creativity tasks, and an additional non-creative task serves as a control. Part IV discusses the implications of our findings for IP law and for creativity and innovation more generally.

I. Thresholds in Patent and Copyright Laws

A. *Utilitarianism in Intellectual Property*

The Supreme Court, Congress, and many legal scholars consider utilitarianism the dominant justification for American copyright⁸ and patent

6. Joseph Scott Miller, *Hoisting Originality*, 31 CARDOZO L. REV. 451, 464, 488–89 (2009).

7. For a general background of the issues related to experimental law and economics, see Jennifer Arlen & Eric L. Talley, *Introduction*, in EXPERIMENTAL LAW AND ECONOMICS, at xv (Jennifer Arlen & Eric L. Talley eds., 2008).

8. *See, e.g.*, Act of May 31, 1790, ch. 15, 1 Stat. 124, 124 (repealed 1831) (declaring the purpose of the first U.S. copyright law to be "An Act for the encouragement of learning"); *Harper & Row, Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 558 (1985) (discussing congressional intent that copyright be a vehicle of free expression and the dissemination of ideas); 122 CONG.

laws.⁹ According to utilitarian IP theory, copyright law provides the incentive of exclusive rights for a limited duration to authors to motivate them to create culturally valuable works.¹⁰ Without this incentive, the theory suggests, authors might not invest the time, energy, and money necessary to create these works because their creations might be copied cheaply and easily by free riders, eliminating authors' ability to profit from their works.¹¹

Parallel reasoning supports a limited period of exclusive rights that patent law affords inventors for their technologically or scientifically valuable inventions. Public benefits accrue by rewarding inventors for taking two steps they likely would not otherwise have taken: first, to invent,

REC. 2834 (1976) (statement of Sen. John McClellan) (“The Constitution makes clear that the purpose of protecting the rights of an author is to promote the public interest.”); Shyamkrishna Balganesh, *Foreseeability and Copyright Incentives*, 122 HARV. L. REV. 1569, 1576–77 (2009) (“[C]opyright law in the United States has undeniably come to be understood almost entirely in utilitarian, incentive-driven terms.”); William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 326 (1989) (describing the attempt to strike a balance between the “public good aspect” and private incentives as the central problem of copyright law).

9. *See, e.g.*, *Diamond v. Chakrabarty*, 447 U.S. 303, 307 (1980) (indicating that the goal of patent law is to provide private incentives to ultimately benefit the public through the introduction of new products to the economy, the creation of jobs, and betterment of citizens' lives); *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 330–31 (1945) (“The primary purpose of our patent system is not reward of the individual but the advancement of the arts and sciences. . . . [I]t is not a certificate of merit, but an incentive to disclosure.”); Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1597–99 (2003) (pointing to “[t]he short term of patent protection, the broad right to prevent independent development of an idea, and the control patent law can give over products never built or contemplated by the patent owner” as confirmation that the philosophy behind patent protection is utilitarian); F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 697–98 (2001) (“[T]he consensus among those studying the American patent system is to focus on utilitarian approaches.”). Utilitarianism aligns fluently with (and is frequently justified by) the U.S. Constitution's grant of power to Congress “[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.” U.S. CONST. art. I, § 8, cl. 8. Other theories offered to justify copyright and patent laws include Lockean labor theory and Hegelian personality theory. *See generally* ROBERT P. MERGES, *JUSTIFYING INTELLECTUAL PROPERTY* (2011) (questioning the utilitarian justification for IP rights and offering a new theory, incorporating Kantian theory); Jeanne C. Fromer, *Expressive Incentives in Intellectual Property*, 98 VA. L. REV. 1745 (2012) (surveying alternatives to the utilitarian justification for intellectual property protection, including Hegelian personality theory).

10. Stewart E. Sterk, *Rhetoric and Reality in Copyright Law*, 94 MICH. L. REV. 1197, 1197 (1996).

11. *E.g.*, Alina Ng, *The Author's Rights in Literary and Artistic Works*, 9 J. MARSHALL REV. INTELL. PROP. L. 453, 454 (2009); Wendy J. Gordon, Professor of Law and Paul J. Liacos Scholar in Law, Boston University School of Law, Panel Discussion at the Cardozo Intellectual Property Law Program Symposium: The Constitutionality of Copyright Term Extension: How Long Is Too Long? (Aug. 30, 1999), in 18 CARDOZO ARTS & ENT. L.J. 651, 676–77 (2000) (accepting the theory of economic incentives for authors under an instrumentalist policy, but arguing its effectiveness wanes after a certain duration).

and possibly commercialize, and second, to reveal information to the public about these inventions that stimulates further innovation.¹²

Fundamentally, utilitarian theories of intellectual property rest on the premise that the benefit to society of creators crafting valuable works offsets the costs to society of the incentives the law offers to creators.¹³ Because this utilitarian approach establishes a cost–benefit analysis, the leading scholarly analyses of intellectual property have used an economic lens.¹⁴

Although IP law is generally understood as a mechanism for providing appropriate incentives to creators, it does not do so directly. Unlike the provision of prizes or grants,¹⁵ IP law does not directly provide creators with rewards for producing new works and inventions. Instead, it provides sets of exclusive rights that potentially provide creators greater returns on their investments.¹⁶ For example, there are many copyrighted works and patented inventions that are essentially valueless despite the IP rights that attach to them.¹⁷ In order to be valuable, the works and inventions still

12. Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 547–49 (2009). Utilitarian thinking comes in different flavors. One is prospect theory, which suggests that inventors are rewarded with a patent right to centralize investment in the patented invention’s commercialization and improvement, which in turn benefits society. *E.g.*, Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 266 (1977). A related theory advocates for encouraging commercialization because of its valuable role in diffusion of inventions. *E.g.*, Michael Abramowicz & John F. Duffy, *Intellectual Property for Market Experimentation*, 83 N.Y.U. L. REV. 337, 396–97 (2008). Another is the signaling theory, which proposes that patents are useful signals to financiers that the patenting firm is a worthy investment. Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 636–37, 648 (2002); Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1, 37 (2005).

13. Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEXAS L. REV. 989, 996–97 (1997).

14. *See, e.g.*, SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 60–61 (2004) (discussing incentive systems and their role in technological innovation from an economist’s perspective); John P. Conley & Christopher S. Yoo, *Nonrivalry and Price Discrimination in Copyright Economics*, 157 U. PA. L. REV. 1801, 1805 (2009) (applying an economics-based public good theory to copyright); F. Scott Kieff, *The Case for Registering Patents and the Law and Economics of Present Patent-Obtaining Rules*, 45 B.C. L. REV. 55, 59 (2003) (proposing a model system for patent rules that operates to minimize the social costs of patents); Lemley, *supra* note 13, at 994–97 (acknowledging the importance of economic theory in analyzing IP issues).

15. *See generally* WILLIAM W. FISHER III & TALHA SYED, INFECTION: THE HEALTH CRISIS IN THE DEVELOPING WORLD AND WHAT WE SHOULD DO ABOUT IT (forthcoming 2015), available at http://cyber.law.harvard.edu/people/ffisher/Drugs_Chapter7.pdf (discussing prize incentive systems, which reward creators for their creations, and their potential application to the patent system); Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When Is It the Best Incentive System?*, in 2 INNOVATION POLICY AND THE ECONOMY 51, 53–55 (Adam B. Jaffe et al., eds., 2002) (exploring prize systems and procurement or grant systems, which provide advances for a creator to finish a commissioned project, as alternatives to the IP system).

16. *See infra* text accompanying notes 29, 34–35.

17. *See* Herbert Hovenkamp, *Response: Markets in IP and Antitrust*, 100 GEO. L.J. 2133, 2139 (2012) (“Copyrights are only as valuable as the works to which they are attached, and these often become economically worthless long before the copyright expires.”); Mark A. Lemley &

must succeed in the market. Copyrights and patents themselves do not convey any specific value; they simply make it easier for the owners of commercially valuable works to thrive in the marketplace by limiting some forms of competition.¹⁸ Accordingly, one of the key features of how IP law provides incentives to be creative is the way it structures the mechanisms by which creations are deemed worthy of rights.¹⁹ Not every putative work or invention receives a copyright or patent.²⁰ As we describe in the following subpart, only those that clear some creativity threshold merit protection.

B. Protectability in Patent Law and Copyright Law

American patent and copyright laws implement utilitarianism in different ways,²¹ and their respective protectability standards are also strikingly distinct. As this subpart shows, patent law ensures that relatively few inventions will qualify for protection, as compared with creations that qualify for protection under copyright law's more permissive standard.

Patent law protects inventions so long as an applicant demonstrates that his or her invention is novel, useful, and nonobvious.²² Patents are granted after successfully undergoing examination by the Patent and Trademark Office to ascertain that an invention meets patentability conditions and the description in the patent application satisfies certain disclosure requirements.²³ The patent right permits the patentee to exclude others from practicing the invention claimed in the patent for a term of typically twenty years from the date the patent application was filed.²⁴

Patent law's first requirement for patentability—novelty—requires principally that the invention was not “patented, described in a printed publication, or in public use, on sale, or otherwise available to the public

Carl Shapiro, *Probabilistic Patents*, 19 J. ECON. PERSP. 75, 81 (2005) (“Many patents are virtually worthless . . . because they cover technology that is not commercially important . . .”).

18. See F.M. Scherer, *The Innovation Lottery*, in EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 3, 3–21 (Rochelle Cooper Dreyfuss et al. eds., 2001).

19. Fromer, *supra* note 5, at 1457–59.

20. See *infra* subpart I(B).

21. For analyses of some specific difference between the two bodies of law, see, for example, Fromer, *supra* note 5, at 1447–49, 1451–53; Jeanne C. Fromer, *Claiming Intellectual Property*, 76 U. CHI. L. REV. 719, 720–22 (2009) [hereinafter Fromer, *Claiming IP*]; Jeanne C. Fromer & Mark A. Lemley, *The Audience in Intellectual Property Infringement*, 112 MICH. L. REV. 1251, 1262–73 (2014); Lemley, *supra* note 13, at 1035–36; Clarisa Long, *Information Costs in Patent and Copyright*, 90 VA. L. REV. 465, 495 (2004).

22. 35 U.S.C. §§ 101–103 (2012).

23. *Id.* § 131. The Patent Act requires disclosure of certain content within the patent by calling for a written description and enablement. *Id.* § 112. See generally Fromer, *supra* note 12 (emphasizing the importance of disclosure for patent law's goals).

24. 35 U.S.C. § 154(a).

before the effective filing date of the claimed invention.”²⁵ The second patentability requirement is nonobviousness:

[A Patent] may not be obtained . . . if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.²⁶

The third requirement is utility, and is most frequently associated with the idea that an invention must have a practical utility, meaning a specific and substantial utility.²⁷

Contrast this situation with the relative ease of qualifying for copyright protection. Copyright law safeguards “original works of authorship fixed in any tangible medium of expression, now known or later developed,” including literary works, sound recordings, movies, and computer software code.²⁸ A copyright holder receives the exclusive right to reproduce the work, sell copies of it, and prepare derivative works, among other things,²⁹ typically until seventy years after the author’s death.³⁰

The Supreme Court’s most recent formulation of the originality requirement occurred in *Feist Publications, Inc. v. Rural Telephone Service Co.*,³¹ a case involving the copyrightability of a local telephone directory that listed individuals’ names in alphabetical order along with their towns and telephone numbers.³² The *Feist* Court held that work is original so long as it “was independently created by the author (as opposed to copied from other works), and that it possesses at least some minimal degree of creativity.”³³ The requisite level of creativity, according to the Supreme Court, “is extremely low; even a slight amount will suffice.”³⁴ A work

25. *Id.* § 102 (detailing exceptions for certain allowable disclosures, but also disallowing patents when “the claimed invention was described in a patent . . . , or in an application for patent published . . . , in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention”).

26. *Id.* § 103.

27. *E.g., In re Fisher*, 421 F.3d 1365, 1371 (Fed. Cir. 2005).

28. 17 U.S.C. §§ 101, 102(a), 117 (2012). To obtain copyright protection, copyright holders need not do more than create an original work. There is no requirement that a work be published to be protected. *Id.* § 102 (requiring only that a work be fixed in “any tangible medium of expression” to be copyrightable).

29. *Id.* § 106 (reserving to the copyright owner the exclusive right to reproduce works; prepare derivative works; distribute works by sale, rental, lease, or lending; perform works publicly; display works publicly; digitally transmit certain works; and authorize others to exercise these rights).

30. *Id.* § 302(a).

31. 499 U.S. 340 (1991).

32. *Id.* at 342.

33. *Id.* at 345.

34. *Id.* Some older decisions reasoned otherwise, finding that copyright ought to be bestowed

must merely evidence “intellectual production, . . . thought, and conception.”³⁵ Originality does not rise nearly to patent’s requirement of true novelty; a minimally creative work is protectable even if there is a nearly identical work, so long as the other work was not copied.³⁶ As Judge Learned Hand observed, “[I]f by some magic a man who had never known it were to compose anew Keats’s Ode on a Grecian Urn, he would be an ‘author,’ and, if he copyrighted it, others might not copy that poem, though they might of course copy Keats’s.”³⁷ It is thus the rare work that will not meet the low threshold of originality. For example, the Court held that the white pages telephone directory at issue in *Feist* was insufficiently original because its factual raw data did not owe its existence to the directory creator and the selection and alphabetical arrangement of the directory entries was not creative enough.³⁸ The threshold for copyright protection is thus minimal but not absent.

It is readily apparent that patent law sets a relatively high barrier to patentability, whereas copyright law sets a relatively low barrier to copyrightability.³⁹ This distinction means that a much higher percentage of works in copyright’s realm can qualify for protection than in patent’s realm.⁴⁰

There are various explanations for this stark difference between patent and copyright laws. One commonly invoked justification is that the differing protectability standards are justified by the narrower scope of copyright law and the broader scope of patent law.⁴¹ Copyright’s scope is narrower than patent’s in a few regards, including that copyright law does not bar independent creation of a protected work while patent law does. Copyright law also embraces broader defenses to infringement, notably fair use, that patent law lacks.⁴² This narrower scope has resulted in the

only on very creative works, of the type that “require[] genius for . . . [their] construction.” *Jollie v. Jacque*, 13 F. Cas. 910, 913 (C.C.S.D.N.Y. 1850) (No. 7437).

35. *Feist*, 499 U.S. at 362 (internal quotation marks omitted).

36. *Id.* at 345.

37. *Sheldon v. Metro-Goldwyn Pictures Corp.*, 81 F.2d 49, 54 (2d Cir. 1936). Others might copy Keats’s poem because any copyright on it has long expired, leaving the work in the public domain. John C. O’Quinn, *Protecting Private Intellectual Property from Government Intrusion: Revisiting SmithKline and the Case for Just Compensation*, 29 PEPP. L. REV. 435, 504 n.455 (2002).

38. *Feist*, 499 U.S. at 361–64. As another illustration, the Ninth Circuit held that a lamp design made up of preexisting parts was not sufficiently original to qualify for copyright protection. *Lamps Plus, Inc. v. Seattle Lighting Fixture Co.*, 345 F.3d 1140, 1146–47 (9th Cir. 2003).

39. Fromer, *supra* note 5, at 1453.

40. *See id.*

41. *E.g.*, Dale P. Olson, *Copyright Originality*, 48 MO. L. REV. 29, 34 (1983).

42. Shira Perlmutter, *Freeing Copyright from Formalities*, 13 CARDOZO ARTS & ENT. L.J. 565, 587 (1995).

argument that we ought to feel comfortable with copyright's more readily available protection, as culture has continued to develop apace.⁴³ On the other hand, patent law needs a stricter threshold, the argument goes, because scientific progress would stall if too many inventions were granted patent law's broad rights.⁴⁴

Alternatively, Paul Goldstein suggests that it is the different goals underlying copyright and patent laws that lead to the distinct protectability thresholds. He proposes that "[t]he aim of copyright law is to direct investment toward the production of abundant information, while the aim of patent law is to direct investment toward the production of efficient information."⁴⁵ Goldstein reasons that the easily satisfied standard of originality in copyright law leads to the creation of plenty of artistic works.⁴⁶ He contrasts that with patent law's stricter requirements of novelty, nonobviousness, utility, and disclosure, which channel innovators' energies to create the most effective scientific and engineering inventions.⁴⁷

43. Olson, *supra* note 41, at 34.

44. *Id.*; see also Fromer, *supra* note 5, at 1453–54 (criticizing this theory's explanatory power).

45. 1 PAUL GOLDSTEIN, GOLDSTEIN ON COPYRIGHT § 2.2.1 (3d ed. 2013).

46. *Id.*

47. *Id.* Goldstein suggests another reason for the different standards: an indexing theory. He claims that "unlike technological advances, which can be classified and indexed to facilitate efficient searches of the prior art, literary, musical and artistic expression cannot be effectively classified to enable authors, composers and artists to examine all pertinent prior works to determine whether their contributions substantially differ from these prior works." *Id.* at n.10. On this reasoning, then, copyright law must have a minimal standard of originality because creators under copyright's rubric cannot easily ensure that their works are distinct from preceding ones, as patent law can, thereby allowing stricter standards of novelty and nonobviousness to govern. *Cf.* Fromer, *Claiming IP*, *supra* note 21, at 781–94 (exploring whether copyrighted works might be claimed more like patented works, alleviating this difficulty).

In a different explanation, Clarisa Long suggests a judgment theory, which bases the differences in patent and copyright standards on the fact that an invention's characteristics are ascertainable objectively, while artistic works' characteristics lie in the eye of the beholder. Long, *supra* note 21, at 469–70, 487–89. Because artistic works cannot be judged in any objective fashion, copyright law imposes a subjective standard of originality. *Id.* at 488. By contrast, scientific works can be assessed on objective criteria, meriting patent law's objective standards of novelty, nonobviousness, and utility. *Id.* at 503; Note, *Protecting the Artistic Aspects of Articles of Utility: Copyright or Design Patent?*, 66 HARV. L. REV. 877, 885 (1953). *But cf.* Fromer, *supra* note 5, at 1454–55 (criticizing the assumptions on which this theory rests).

John Wiley offers another explanation: a learning theory. He hypothesizes that patent law requires novelty and nonobviousness because of the imperative for scientists and engineers to learn what has come before them. John Shepard Wiley, Jr., *Copyright at the School of Patent*, 58 U. CHI. L. REV. 119, 146 (1991). Patent law requires inventors to review what others in the domain have already accomplished, thereby producing the opportunity for the inventor to learn from and build upon the prior art and create something sufficiently different. *Id.* According to Wiley, this encouraged process of innovation accords with the notion that scientific and technological innovation is cumulative. *Id.* Wiley thinks copyright is different. He indicates that "[i]t is conventionally desirable for composers to know the literature, but a judge would seem brazen to assert that excavating musical artifacts was the most efficient way to compose new

In prior work one of us provides another explanation: “[T]he distinctions in the protectability standards governing patent and copyright law primarily accord with current psychological findings on creativity, even though it is unlikely that these findings actually motivated the enactment of these different legal standards.”⁴⁸ When evaluating inventive creativity, people tend to value large degrees of newness, whereas when evaluating artistic creativity, people instead prefer some but not too much newness.⁴⁹ The different thresholds of protectability in patent and copyright law seem to accord with these differences in the creative emphases.⁵⁰

Despite these arguments in favor of distinct threshold regimes for copyright and patent laws, some scholars have suggested that copyright law’s protectability threshold ought to be raised, putting it in greater sync with patent law. Gideon Parchomovsky and Alex Stein propose that the scope of copyright protection ought to be calibrated to the degree of originality in the work: the more originality, the more protection.⁵¹ According to Parchomovsky and Stein, copyright law’s low threshold sets a

music.” *Id.* at 147. Therefore, there is no requirement in copyright law that an artist ensure that his creation is novel before qualifying for copyright protection. *But cf.* Fromer, *supra* note 5, at 1456 (criticizing assumptions on which this theory rests).

48. Fromer, *supra* note 5, at 1443.

49. *Id.* at 1471–74, 1479–83.

50. *Id.* at 1483–1508. David Fagundes and Jonathan Masur explore a related issue, as to the fact that copyrights vest in authors automatically upon fixation, whereas patents must be granted by the government after a relatively costly screening process. *See* David Fagundes & Jonathan S. Masur, *Costly Intellectual Property*, 65 VAND. L. REV. 677, 679 (2012). They suggest that patent law wisely implements this screen to:

[D]eter[] applicants from seeking patents when the value of the exclusive right is less than the price of overcoming the screen. Moreover, because of a distinctive asymmetry in patent law’s generation of social and private value, the effect of this screen is to deter the production only of those low private value patents that also have low (or negative) social value. Examined in this light, the costly examination process is not a deadweight loss at all, but an efficient way to exclude the very kind of patents most likely to generate anticommons concerns.

Id. at 680. By contrast, because copyright protection is much narrower, the presence of copyright screens as in patent law would be harmful in that they would “deter the creation of works that have low value for their author but high value for the public—thus precluding production of one of the paradigmatic kinds of work that copyright was designed to create.” *Id.*

51. Gideon Parchomovsky & Alex Stein, *Originality*, 95 VA. L. REV. 1505, 1507 (2009) (“[A]uthors of highly original works will not only receive greater protection, but will also be sheltered from liability if sued for infringement by owners of preexisting works. Conversely, creators of minimally original works will receive little protection and incur greater exposure to liability if sued by others.”). Parchomovsky and Stein propose three mechanisms to accomplish this calibration: a “doctrine of inequivalents” to shelter highly original works from infringing the works of others, an “added value doctrine” to make infringement remedies dependent on whether the infringing or initial work has more originality, and a “sameness rule” creating a presumption of copying when minimally original works accused of infringement are substantively similar to the initial work. *Id.* at 1523–49.

target for creativity that results in creators barely clearing the bar.⁵² If the target were set higher, they argue, creators would be incentivized to produce more creative works.⁵³ Similarly, Joseph Scott Miller argues that copyright law ought to be structured to “encourag[e] those who experiment with expression to push against, and even break past, the norms and conventions of routine expression that dominate a given genre at a given time.”⁵⁴ Miller would inject a nonobviousness-like standard into copyright law.⁵⁵

These proposals share the view that the way to encourage more creativity is to set the protectability threshold higher. Others, like Erlend Lavik and Stef van Gompel, have pushed back and argued that it would be problematic to raise copyright’s protectability threshold because of the difficulty of assessing merit in the cultural domain, and because a raised standard would in any event be unlikely to perform its filtering function of protecting only aesthetically or culturally valuable works.⁵⁶

Conversely, it is rare to find proposals that patent law’s protectability standard ought to be diminished, making it more like copyright law’s.⁵⁷ Most scholars suggesting changes in patent law’s protectability standards suggest ratcheting them up, rather than down.⁵⁸

Key to the arguments by Parchomovsky and Stein and by Miller is the assumption that increasing the protectability threshold in copyright law will encourage people to be more creative. If the law sets a higher threshold for the vesting of rights, people who want those rights will have to be more creative. Although this assumption seems obviously correct from the perspective of classical law and economics, recent research in the social sciences suggests that the reality may be otherwise. We turn now to an overview of research on incentives and creativity.

52. *Id.* at 1506.

53. *Id.* at 1517. They write, “The problem with the existing design is that by rewarding minimally original works and highly original works alike, the law incentivizes authors to produce works containing just enough originality to receive protection—but not more.” *Id.* at 1506.

54. Miller, *supra* note 6, at 463–64.

55. *Id.* at 464.

56. Erlend Lavik & Stef van Gompel, *On the Prospects of Raising the Originality Requirement in Copyright Law: Perspectives from the Humanities*, 60 J. COPYRIGHT SOC’Y USA 387, 423–24 (2013).

57. For one example arguing for diminishing how novelty is assessed in certain complex fields like biotechnology, see Sean B. Seymore, *Rethinking Novelty in Patent Law*, 60 DUKE L.J. 919, 928–29 (2011).

58. See, e.g., ADAM B. JAFFE & JOSH LERNER, *INNOVATION AND ITS DISCONTENTS* 175–76 (2004) (decrying the ease with which the PTO has issued patents over the last two decades).

II. Creativity Incentives

IP law's utilitarian theory requires that the law provide people with the incentive to act creatively, thereby producing something of value to society. Accordingly, determining the optimal form and level of incentives to spur creativity is a central issue in IP.⁵⁹ Although legal scholars are just now turning increasing attention to this question,⁶⁰ psychologists, sociologists, and management scientists have long been studying both creativity and the effects of incentives on creativity. This Part reviews that work. We begin by canvassing the social-science literature on creativity and incentives. Next, we discuss work by IP scholars that has addressed some of these issues, and finally, we describe the motivations for the research in this Article.

A. Evidence from the Social Sciences

The social-science research on creativity and incentives has expanded dramatically over the past few decades. We describe some of that research in this subpart. We first focus on how researchers define and measure creativity. We then discuss some of their chief findings.

1. Defining and Measuring Creativity.—Although there are varying colloquial understandings of creativity,⁶¹ the field of psychology consistently defines creativity as a process that generates a product or idea and possesses two qualities: newness and appropriateness. Newness refers to novelty or originality,⁶² and appropriateness indicates that some community recognizes the contribution as socially valuable.⁶³ While the creative

59. For more on this connection between creativity and intellectual property, see Fromer, *supra* note 5, at 1457–59.

60. See *infra* subpart II(B).

61. The term “creativity” came into common usage only after World War II. ROBERT PAUL WEINER, *CREATIVITY & BEYOND: CULTURES, VALUES, AND CHANGE* 5 (2000). Although its etymological root, “create” (derived from the Latin *creatio* or *creatus*), was in long use, the noun “creativity” was first used in the late nineteenth century as people sought a term to represent a common quality that transcends the specific artistic and scientific domains. *Id.* at 8, 89 (reciting the first usage by Adolphus William Ward in his *History of Dramatic English Literature* to describe Shakespeare’s “poetic creativity”).

62. We use the terms “novelty” and “originality” here in their lay sense rather than their legal sense, see *supra* subpart I(B).

63. E.g., MIHALY CSIKSZENTMIHALYI, *CREATIVITY: FLOW AND THE PSYCHOLOGY OF DISCOVERY AND INVENTION* 25, 28–29 (1996) (defining creativity as a novel product that is accepted into a domain); R. KEITH SAWYER, *EXPLAINING CREATIVITY: THE SCIENCE OF HUMAN INNOVATION* 27 (2d. 2012) (understanding creativity to involve both novelty and social value to some community); Howard E. Gruber & Doris B. Wallace, *The Case Study Method and Evolving Systems Approach for Understanding Unique Creative People at Work*, in *HANDBOOK OF CREATIVITY* 93, 94 (Robert J. Sternberg ed., 1999) (“Like most definitions of creativity, ours includes novelty and value: The creative product must be new and must be given value according to some external criteria.”); Robert J. Sternberg & Todd I. Lubart, *The Concept of Creativity:*

process is essentially psychological, the element of appropriateness can be evaluated only in a sociocultural context.⁶⁴ As Keith Sawyer explains: “Individual-level explanations are the most important component of the explanation of creativity But individuals always create in contexts, and a better understanding of those contexts is essential to a complete explanation of creativity.”⁶⁵ Assessing creativity is not complete without reference to a work’s effect on the relevant culture and its social judgments.⁶⁶ According to Mihaly Csikszentmihalyi’s influential framework, creativity can be appraised only at the intersection of individuals, the domain in which they are working, and the field (the domain’s gatekeepers).⁶⁷ In a sense, the socio-psychological definition of creativity looks similar to IP law’s aim of giving protection for products that are requisitely new, while leaving to society the question of how valuable the product ought to be considered.

It is one thing to explain what creativity is, but it is another thing to be able to measure it validly and reliably. Psychologists have made enormous strides over the past few decades in crafting scientific techniques to do so. A 1989 review of creativity studies found 255 different tests in use,⁶⁸ but subsequent research has considerably narrowed the scope of appropriate procedures.⁶⁹ Depending on what one is trying to measure—whether a product is creative, whether a person is creative, or whether a thought process is creative—different kinds of tests may be more appropriate than others.⁷⁰ When measuring the creativity of a product—something quite relevant to IP law—one favored approach involves consensual agreement among judges that the product has certain features, such as originality, usefulness, or value.⁷¹ In some instances, expert judges will be appropriate,

Prospects and Paradigms, in HANDBOOK OF CREATIVITY *supra* at 3, 3 (defining creativity as “the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints)”).

64. SAWYER, *supra* note 63, at 209.

65. *Id.*

66. See CSIKSZENTMIHALYI, *supra* note 63, at 6 (noting that an essential prerequisite for creativity is “a culture that contains symbolic rules”); Joseph Kasof, *Explaining Creativity: The Attributional Perspective*, 8 CREATIVITY RES. J. 311, 313 (1995) (noting the importance of situational factors such as culture in assessing creativity).

67. CSIKSZENTMIHALYI, *supra* note 63, at 6, 27–30.

68. E. Paul Torrance & Kathy Goff, *A Quiet Revolution*, 23 J. CREATIVE BEHAV. 136, 143 tbl.1 (1989).

69. For a review of major areas of creativity research, see Arthur J. Cropley, *Defining and Measuring Creativity: Are Creativity Tests Worth Using?*, 23 ROEPER REV. 72 (2000).

70. *See id.*

71. See Beth A. Hennessey, *The Consensual Assessment Technique: An Examination of the Relationship Between Ratings of Process and Product Creativity*, 7 CREATIVITY RES. J. 193, 201 (1994) (finding interrater reliability levels of 0.93 among untrained undergraduate raters); *see also* Teresa M. Amabile, *Social Psychology of Creativity: A Consensual Assessment Technique*, 43 J. PERSONALITY & SOC. PSYCHOL. 997, 1011–12 (1984) (proposing a subjective-assessment

while in others lay judges provide equally valid results.⁷² The virtue of the consensual agreement technique is that it does not rely on any specific theory of creativity, and it tends to model the way that creativity is assessed in the real world (that is, people simply judge products or ideas to be creative or not unguided by sophisticated academic theories of what makes them so).⁷³

Perhaps the most widely used creativity tests are those that measure “divergent thinking.”⁷⁴ Divergent thinking refers to a person’s ability to generate a multitude of ideas to an open-ended question.⁷⁵ For example, subjects might be asked to think of unusual uses of a tin can. Answers to these tests, which E.P. Torrance pioneered, are frequently scored according to fluency (number of answers provided), originality (novelty or rarity of answers), and flexibility (a measure of the different fields or categories from which the answers come).⁷⁶ Divergent thinking matches well with the ideas of “problem finding” and “problem solving” in creativity.⁷⁷ Divergent-thinking tasks have been used in a wide variety of experimental settings, and they have been studied as predictive measures of entrepreneurship.⁷⁸

In addition, “convergent thinking” can also exhibit creativity.⁷⁹ Unlike divergent thinking, which involves generating multiple answers to an open-ended task, convergent thinking leads toward just one or a few correct answers.⁸⁰ But the narrow range of possible answers does not eliminate the role of creativity.⁸¹ Even when there is a single optimal answer to a problem, the method of determining the solution may not be apparent and may rely on more than simple algorithmic cognition or memory retrieval.⁸²

methodology to “produce clear and reliable subjective judgments of creativity”).

72. Amabile, *supra* note 71, at 1006; Hennessey, *supra* note 71, at 194.

73. John Baer & Sharon S. McKool, *Assessing Creativity Using the Consensual Assessment Technique*, in RESEARCH ON ASSESSMENT TECHNOLOGIES, METHODS, AND APPLICATIONS IN HIGHER EDUCATION 65, 67 (Christopher Schreiner ed., 2009).

74. *See generally* DIVERGENT THINKING AND CREATIVE POTENTIAL (Mark A. Runco ed., 2013) (describing divergent-thinking theories and tests for creative-thinking potential).

75. *See generally id.*

76. *See* Mark A. Runco et al., *Information, Experience, and Divergent Thinking: An Empirical Test*, 18 CREATIVITY RES. J. 269, 269 (2006).

77. *Id.*; *see also* Mark A. Runco & Shawn M. Okuda, *Problem Discovery, Divergent Thinking, and the Creative Process*, 17 J. YOUTH & ADOLESCENCE 211, 217 (1988) (finding divergent thinking to be consistent with developmental views of problem finding).

78. Michael Ames & Mark A. Runco, *Predicting Entrepreneurship from Ideation and Divergent Thinking*, 14 CREATIVITY & INNOVATION MGMT. 311, 312 (2005).

79. Cropley, *supra* note 69, at 73 (recognizing that creativity rests on both divergent and convergent thinking).

80. Arthur Cropley, *In Praise of Divergent Thinking*, 18 CREATIVITY RES. J. 391, 391 (2006).

81. *Id.* at 395–99.

82. *See id.* at 399 tbl.3 (listing numerous types of convergent-thinking processes that enable

Convergent creative thinking is often tested with so-called “insight problems,” that measure how quickly and accurately subjects can deduce the correct answer.⁸³ Accordingly, non-algorithmic convergent thinking aligns well with the notion of creativity as “problem solving” discussed above.

The kinds of creativity and innovation that are covered by IP law span the various processes and modes of cognition discussed above, although almost all of them will incorporate aspects of both divergent and convergent thinking.⁸⁴ Abstract painting likely involves mostly divergent thinking and computer programming can be a matter of non-algorithmic convergent thinking, but almost all creative fields require both the generation of novel or unusual responses as well as judgments about whether they are appropriate.⁸⁵ Accordingly, in the experiments reported below, we test the effects of creativity thresholds on both divergent and non-algorithmic convergent thinking.

2. Motivation, Incentives, and Creativity.—IP law exists to motivate creativity,⁸⁶ so understanding the relationship between motivation and creativity is essential. People can be motivated to create for a variety of reasons, but psychologists generally distinguish two classes of motivation: extrinsic and intrinsic.⁸⁷ Extrinsic motivation is motivation to engage in an activity that comes from a source that is external to the individual, such as payment of money, evaluation from a third party, or surveillance.⁸⁸ Intrinsic motivation, by contrast, is motivation that comes purely from a person’s intrinsic enjoyment of or interest in the activity at hand.⁸⁹

As IP scholars, we are interested in the interactions between intrinsic and extrinsic motivation. To varying degrees, the kinds of creativity that IP law deals with involve both kinds of motivation. Creators and inventors have manifold intrinsic and extrinsic reasons for engaging in their work.⁹⁰

the thinker to determine a singular solution by both generating and exploring variability).

83. See, e.g., Robert W. Weisberg, *Problem Solving and Creativity*, in *THE NATURE OF CREATIVITY: CONTEMPORARY PSYCHOLOGICAL PERSPECTIVES* 148, 151–53 (Robert J. Sternberg ed., 1988) (discussing perhaps the most famous such creativity task involving convergent thinking, the task of attaching a candle to the wall using only a book of matches and a box of tacks).

84. See Fromer, *supra* note 5, at 1477 (considering the view that convergent thinking is important to innovation in the sciences and divergent thinking important in the arts).

85. See *supra* note 63 and accompanying text.

86. See *supra* notes 8–10 and accompanying text.

87. Edward L. Deci, *Intrinsic Motivation, Extrinsic Reinforcement, and Inequity*, 22 *J. PERSONALITY & SOC. PSYCHOL.* 113, 113 (1972).

88. Teresa M. Amabile et al., *Social Influences on Creativity: The Effects of Contracted-for Reward*, 50 *J. PERSONALITY & SOC. PSYCHOL.* 14, 15 (1986); Deci, *supra* note 87, at 113.

89. Deci, *supra* note 87.

90. See, e.g., Rebecca Tushnet, *Economies of Desire: Fair Use and Marketplace*

To these existing reasons, IP law adds an additional extrinsic motivator: the opportunity to receive formal rights that potentially increase economic returns on creativity. We are interested in how the addition of differently structured external incentives affect creators' underlying effort and motivation.

From a classical economic perspective, the answer is simple: Motivation is motivation, and more of it is better. In order for a person to do something, she needs to have incentives that exceed the costs of engaging in the behavior.⁹¹ Perhaps she experiences some sense of internal pleasure or a warm glow when performing the task. Or perhaps she is paid a certain amount of money to perform the task. As long as the benefit she receives exceeds the cost of performing the task, she can be expected to engage in it. Moreover, the more incentives she receives, the better her performance. To an economist, the nature of the motivation does not matter, only its level does.⁹² On this view, extrinsic and intrinsic motivations are substitutable for one another, and the addition of extrinsic motivation to an already intrinsically motivated person should increase motivation and performance.⁹³ As Dan Ariely and others explain, “[t]he expectation that increasing performance-contingent incentives will improve performance rests on two subsidiary assumptions: (1) that increasing performance-contingent incentives will lead to greater motivation and effort and (2) that this increase in motivation and effort will result in improved performance.”⁹⁴

Over the past several decades, however, experimental social-science research has significantly complicated this otherwise simple story. Despite general findings that extrinsic incentives tend to enhance performance on tasks that are algorithmic (simple or straightforward),⁹⁵ many studies suggest otherwise with regard to the effect of incentives to complete creative tasks. Some studies suggest that intrinsic and extrinsic incentives

Assumptions, 51 WM. & MARY L. REV. 513, 522–36 (2009) (discussing various intrinsic and extrinsic motivations of creation).

91. See WILLIAM M. LANDES & RICHARD A. POSNER, *THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW* 20 (2003) (discussing investments that yield social benefits in excess of costs as desirable).

92. See Roland Bénabou & Jean Tirole, *Intrinsic and Extrinsic Motivation*, 70 REV. ECON. STUD. 489, 489 (2003) (implying that economists have neglected psychological research showing that incentives can undermine performance).

93. See Deci, *supra* note 87, at 113–14 (assessing impact of different extrinsic motivations upon intrinsically motivated people).

94. Dan Ariely et al., *Large Stakes and Big Mistakes*, 76 REV. ECON. STUD. 451, 451 (2009).

95. See Kenneth O. McGraw, *The Detrimental Effects of Reward on Performance: A Literature Review and a Prediction Model*, in *THE HIDDEN COSTS OF REWARD: NEW PERSPECTIVES ON THE PSYCHOLOGY OF HUMAN MOTIVATION* 33, 55–57 (Mark R. Lepper & David Greene eds., 1978) (summarizing study results and finding that rewards are least disruptive when the task is aversive to the subject and algorithmic).

for creativity aren't always substitutable and that the provision of greater creativity incentives does not always result in more or better performance.⁹⁶

To understand the interrelationship between motivation, creativity, and incentives, psychologists examine the effects of intrinsic motivation and extrinsic motivation on creativity. Some psychologists' studies find that intrinsic motivation is more conducive to creativity than extrinsic motivation.⁹⁷ These studies typically investigate overjustification: having subjects engage in a task that they already might like to do with the promise of extrinsic reward.⁹⁸ Subjects engage in a creative task,⁹⁹ such as drawing or collage making or puzzle solving. Some are told that they will receive a reward for performance, while others are not.¹⁰⁰ In these situations, those subjects acting with reward expectation are judged to produce significantly less creative work than those acting without reward expectation.¹⁰¹

96. See generally Robert Gibbons & John Roberts, *Economic Theories of Incentives in Organizations*, in THE HANDBOOK OF ORGANIZATIONAL ECONOMICS 56, 90–91 (Robert Gibbons & John Roberts eds., 2013) (discussing the interplay between intrinsic and extrinsic incentives as posited by Bénabou & Tirole). Roland Bénabou & Jean Tirole respond to the psychological results showing that incentives can harm creativity by building an economic model that incorporates these psychological insights and shows why they can be rational. Bénabou & Tirole, *supra* note 92.

97. Teresa M. Amabile, *How To Kill Creativity*, HARV. BUS. REV., Sept.–Oct. 1988, at 77, 79.

98. Teresa M. Amabile, *Effects of External Evaluation on Artistic Creativity*, 37 J. PERSONALITY & SOC. PSYCHOL. 221, 222 (1979).

99. *Id.*

100. *Id.*

101. E.g., *id.* at 222 (discussing experimental results showing that rewarded subjects produced less creative responses than those not rewarded for participation); Regina Conti et al., *The Positive Impact of Creative Activity: Effects of Creative Task Engagement and Motivational Focus on College Students' Learning*, 21 PERSONALITY & SOC. PSYCHOL. BULL. 1107, 1109 (1995) (noting that “salient extrinsic motives, such as focusing on external evaluation, have been found to undermine . . . creativity”); Beth A. Hennessey, *The Effect of Extrinsic Constraints on Children's Creativity While Using a Computer*, 2 CREATIVITY RES. J. 151, 165 (1989) (describing experimental results showing that rewards given by a computer negatively affected the creativity of children participating in the study); cf. Ariely et al., *supra* note 94, at 454–67 (showing that “relatively high monetary incentives can have perverse effects on performance” for cognitively intense tasks, like creative ones). Relatedly, psychological studies systematically demonstrate that extrinsic motivation decreases subjects' intrinsic interest in a creative task. Amabile, *supra* note 98, at 229; Hennessey, *supra*. Edward Deci has refined this work by showing that some extrinsic motivators, like money, decrease intrinsic motivation, while others, such as verbal reinforcement and positive feedback, actually enhance intrinsic motivation. Edward L. Deci, *Effects of Externally Mediated Rewards on Intrinsic Motivation*, 18 J. PERSONALITY & SOC. PSYCHOL. 105, 114 (1971); Deci, *supra* note 87, at 113–18. They attribute their engagement in the task to the extrinsic motivation rather than any intrinsic motivation they might otherwise have had. Amabile et al., *supra* note 88, at 14. This effect might be due to the external motivation drawing the subjects' attention away from vaguer—but present—intrinsic motivations. See *id.* at 17–19 (verifying this explanation experimentally). Or the external motivation might lead subjects to view the task as a means to an end rather than an end in and of itself. *Id.* at 15. In fact, a number of management studies, including some focused on particular industries like open-source software, find that intrinsic motivation is the principal motivation articulated by industry participants for their work. E.g., Jürgen Bitzer et al., *Intrinsic Motivation in Open Source Software Development*,

Psychologists posit that those who are extrinsically motivated will be less creative because they will act more conventionally—to avoid taking risk—and will be more focused on the extrinsic motivation rather than the creative process itself.¹⁰²

Despite this line of findings, there are other studies that suggest that extrinsic rewards do not always undermine creativity and can, in fact, enhance it. For one thing, studies by behavioral psychologists tend to find that providing reward—external motivation—increases subjects' creative performance with regard to whatever aspect the subject is being told will be judged (such as originality or fluency).¹⁰³

Meta-analysis of these two strands of studies reconcile them by proposing that the latter set of studies instructs subjects specifically how (or with regard to which aspect) to perform creatively and the extrinsic reward then helps enhance creativity, whereas the former set of studies does not give specific instructions, resulting in the extrinsic reward decreasing creativity.¹⁰⁴ Moreover, when studies control for both whether specific instructions to perform creatively are provided and whether reward is provided, guidance as to performance metrics seems to explain the difference in the effect of reward.¹⁰⁵ The theory is that when subjects are

35 J. COMP. ECON. 160, 167 (2007) (finding that “the fun of programming is a major motivational driver” for open source software programmers); Karim R. Lakhani & Robert G. Wolf, *Why Hackers Do What They Do: Understanding Motivation and Effort in Free/Open Source Software Projects*, in PERSPECTIVES ON FREE AND OPEN SOURCE SOFTWARE 3 (J. Feller et al. eds., 2005) (“We find . . . that enjoyment-based intrinsic motivation—namely, how creative a person feels when working on the project—is the strongest and most persuasive driver.”); cf. Henry Sauermann & Wesley M. Cohen, *What Makes Them Tick?: Employee Motives and Firm Innovation*, 56 MGMT. SCI. 2134, 2134 (2010) (“We find [m]otives regarding intellectual challenge, independence, and money have a strong positive relationship with innovative output, whereas motives regarding job security and responsibility tend to have a negative relationship.”).

102. Amabile, *supra* note 98, at 222. For similar reasons, extrinsically motivated individuals tend to perform better on conventional, algorithmic tasks precisely because there is a straightforward path to completing the task. *Id.* (citing McGraw, *supra* note 95).

103. *E.g.*, John Glover & A.L. Gary, *Procedures to Increase Some Aspects of Creativity*, 9 J. APPLIED BEHAV. ANALYSIS 79 (1976) (finding this to be the case for a verbal creativity task in which points were awarded for fluency (number of different responses), flexibility (number of verb forms), elaboration (number of words per response), and originality (statistical infrequency of verb forms)).

104. Robert Eisenberger & Linda Shanock, *Rewards, Intrinsic Motivation, and Creativity: A Case Study of Conceptual and Methodological Isolation*, 15 CREATIVITY RES. J. 121, 121–25 (2003); see also Amabile, *supra* note 98, at 223 (citing McGraw, *supra* note 95).

105. Amabile, *supra* note 98, at 223–32 (studying this question with regard to collage making, but finding that those who received both extrinsic motivation and a general instruction to focus specifically on creativity—without more guidance—performed less creatively than those who got the same instruction but no extrinsic motivation). How specific this instruction to be creative need be is a matter of debate among psychologists. *Compare id.* (finding that those who received both extrinsic motivation and a general instruction to focus specifically on creativity—without more guidance—performed less creatively than those who got the same instruction but no extrinsic motivation), with Robert Eisenberger et al., *Can the Promise of Reward Increase Creativity?*, 74 J.

not instructed on how to perform specifically on a creative task, they are risk averse and choose conventional solutions to the task at hand, which is detrimental to creativity.¹⁰⁶ But when subjects are told the metric by which they will be judged on their creativity, they strive to do well on that metric—going beyond obvious approaches to the task—when there is a reward.¹⁰⁷ These results suggest that when it is possible to specify how to perform creatively, it is worth doing so along with providing a reward.¹⁰⁸ Indeed, some studies show an increase in intrinsic motivation—rather than a decrease—when subjects are offered a reward and are instructed to perform creatively.¹⁰⁹ Ultimately, however, one cannot simply assume that the addition of an incentive to an already motivated person will always yield more or better creative production.

Other studies suggest that the specific structure of the reward affects whether it may decrease creativity, increase it, or have no effect.¹¹⁰ Related studies show that rewards that are contingent on a subject's task performance do not undermine intrinsic task interest as much as rewards that are contingent only on a subject's completion of a task.¹¹¹

PERSONALITY & SOC. PSYCHOL. 704, 709–12 (1998) (showing through experiments that simply instructing subjects that they will be rewarded for unusual drawings along with a basic clarification about the task—rather than being given no such instruction—enhances creativity).

106. Amabile, *supra* note 98, 228.

107. *Id.* at 230–31.

108. *Id.* *But see id.* at 231–32 (noting, however, that such instruction is not always possible).

109. Eisenberger et al., *supra* note 105. Another aspect for which the studies showing reward's detrimental effect on creativity might be inapplicable is with regard to professionals. The studies discussed above focus on nonprofessionals. Psychologists speculate that the results might look different for professionals: According to Amabile, "While we might expect that some professional scientists or artists could succumb to the overjustification effect, it seems eminently clear that many highly creative people go on being creative in the face of numerous extrinsic constraints." Amabile, *supra* note 98, at 232. She theorizes that professional scientists and artists internalize how their work will be judged, and as a result, external motivators have less of an effect on them (at least detrimentally). *Id.* In addition, their intrinsic motivation is strong—likely much stronger than nonprofessional subjects—and overjustification is less likely to affect them than those whose "internal states are ambiguous or nonsalient." *Id.* In fact, empirical work bears this out. In an archival study, Dean Simonton finds no significant relationship between the creative productivity of ten classical composers at various points in their lives and the external motivation—such as honorary degrees—they received during those points. Dean Keith Simonton, *Creative Productivity, Age, and Stress: A Biographical Time-Series Analysis of 10 Classical Composers*, 35 J. PERSONALITY & SOC. PSYCHOL. 791, 801–03 (1977).

110. *See generally* Emir Kamenica, *Behavioral Economics and Psychology of Incentives*, 4 ANN. REV. ECON. 427 (2012) (reviewing "empirical findings on anomalous impacts of incentives" and suggesting that "a coherent set of principles can improve the design of incentive structures in a variety of settings").

111. Judy Cameron & W. David Pierce, *The Debate About Rewards and Intrinsic Motivation: Protests and Accusations Do Not Alter the Results*, 66 REV. EDUC. RES. 39, 39–40 (1996); Robert Eisenberger & Judy Cameron, *Detrimental Effects of Reward: Reality or Myth?*, 51 AM. PSYCHOL. 1153, 1155 (1996); David Rosenfield et al., *When Rewards Reflect Competence: A Qualification of the Overjustification Effect*, 39 J. PERSONALITY & SOC. PSYCHOL. 368, 374

Separate from the question of intrinsic and extrinsic motivation are issues about the magnitude and structure of creativity incentives. Just as classical economic theory predicts that adding external motivation to internal motivation increases total motivation, so too does it predict that higher magnitude incentives produce greater motivation and performance than lower magnitude incentives. Recently, Dan Ariely and others have studied the effects of particular magnitudes of performance-contingent rewards on task performance.¹¹² Ariely and his co-investigators studied subjects in both the United States and rural India performing a variety of tasks—based on creativity, cognition, memory, or motor skills—for which the magnitude of reward varied from low to moderate to very high.¹¹³ Payment in each condition depended on performance of the task.¹¹⁴ For example, in one reported experiment, subjects would receive full payment if performance was very good, half payment if performance was merely good, and no payment if performance did not qualify as good.¹¹⁵ Across the various experiments, Ariely and the others found that subjects offered low to moderate levels of reward outperformed those offered the very high level of reward.¹¹⁶ They also found that the propensity to choke on a task due to increasing reward was frequently task specific and not just based on individual characteristics.¹¹⁷ The authors suggest that these results are consistent with the idea that “beyond an optimal level of arousal for executing tasks, further increases in arousal can lead to a decrement in performance.”¹¹⁸ Importantly and surprisingly, however, the authors did not find variation between tasks involving creativity and those that did not in the study in rural India. The highest incentive level undermined performance in each case.

Relatedly, Katharina Eckartz and others recently investigated the effect of incentives on creativity using three different incentive schemes: a flat fee, a linear payment, and a tournament.¹¹⁹ They presented subjects with a

(1980).

112. Ariely et al., *supra* note 94.

113. *Id.* at 454–67. For example, the levels of payment in rural India were 4, 40, and 400 Indian Rupees, respectively, in the low, high, and very high conditions. *Id.* at 454. The payment in the high-incentive treatment is close to the monthly per capita consumer expenditure in the region. *Id.*

114. *Id.*

115. *Id.*

116. *Id.* at 454–67. One important exception was the only motor-skills task given to subjects in the United States, wherein performance increased the higher the offered reward was. *Id.* at 462.

117. *Id.* at 463.

118. *Id.* at 467.

119. Katharina Eckartz et al., *How Do Incentives Affect Creativity?* 6 (Ifb Inst. Center for Econ. Studies, Working Paper No. 4049, 2012), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2198760.

set of letters and asked them to construct as many words as they could within five minutes.¹²⁰ For each word, participants received a score that was more than proportionally increasing given the number of letters in the word.¹²¹ They also used an IQ task and a number-adding task as control tasks.¹²² Contrary to nearly all of the other studies described above, they found that the choice of incentive had no significant effect on performance for any of the three tasks; rather, they found that “performance depends almost entirely on individual characteristics of participants and can, on the aggregate level, hardly be influenced through incentives.”¹²³ More specifically, they found “[i]ndividual characteristics explain for all tasks more than 60% of the observed variance in the performance. The presence or absence of different incentive schemes explain for all tasks in this experiment less than 1% of the variance.”¹²⁴

Perhaps most relevant to our questions is research on the effects of goals and thresholds on performance. In many areas of life and law, performance is not measured precisely but rather by whether or not it meets certain thresholds. For example, payment bonuses may be given out when employees meet certain thresholds in terms of hours worked or dollars billed.¹²⁵ Additional bonuses kick in at each new threshold level rather than being smoothly distributed throughout the spectrum of performance. In the legal setting, three-strikes laws, zero-tolerance policies, and drunk-driving laws based on blood-alcohol limits structure negative incentives (punish-

120. *Id.* at 4.

121. *Id.*

122. *Id.* at 5–6.

123. *Id.* at 17.

124. *Id.* Competition is a factor whose presence might lead to different results. Some studies suggest that competition can undermine intrinsic motivation, which might diminish creative performance. See Edward L. Deci et al., *When Trying To Win: Competition and Intrinsic Motivation*, 7 PERSONALITY & SOC. PSYCHOL. BULL. 79, 79 (1981) (presenting experiment results that indicate competition reduces intrinsic motivation); cf. Oriana Bandiera et al., *Social Preferences and the Response to Incentives: Evidence from Personnel Data*, 120 Q.J. ECON. 917, 917 (2005) (finding that “the productivity of the average worker is at least 50 percent higher under piece rates than under relative incentives,” pursuant to which “individual effort imposes a negative externality on others”). Further experimental work shows, however, that competition’s deleterious effect on intrinsic motivation and furthermore on creative performance obtains only for those individuals low in achievement orientation. John M. Tauer & Judith M. Harackiewicz, *Winning Isn’t Everything: Competition, Achievement Orientation, and Intrinsic Motivation*, 35 J. EXPERIMENTAL SOC. PSYCHOL. 209, 236–37 (1999). Individuals high in achievement orientation retain high levels of intrinsic motivation and perform creatively even in the face of competition. *Id.*

125. See Paul Healy, *The Effect of Bonus Schemes on Accounting Decisions*, 7 J. ACCT. & ECON. 85, 85 (1985) (noting that “[e]arnings-based bonus schemes are a popular means of rewarding corporate executives”). See generally Darren Grant, *The Essential Economics of Threshold-Based Incentives: Theory and Estimation* (unpublished manuscript), available at <http://www.shsu.edu/~dpg006/ws100.pdf> (presenting an empirical study on the economics of threshold-based incentives).

ments) as binary thresholds.¹²⁶ Tiered incentive structures like these can produce various distortions in individuals' performance.

On the one hand, empirical research suggests that creation of performance goals generally leads to improved performance, because goals tend to increase people's effort, persistence, and attention.¹²⁷ Relative to people without explicit goals, those with goals tend to perform better on a variety of different tasks involving physical, cognitive, and creative performance.¹²⁸

On the other hand, the existence of certain kinds of achievement thresholds can negatively affect performance. For example, if a threshold creates a binary distinction between those who reach it and those who do not, and if all who reach the threshold receive the same reward, people are likely to behave differently than if performance is smoothly rewarded. Imagine three people, *A*, *B*, and *C*, who are trying to perform a task that is rewarded by achieving a binary threshold and for whom performance is costly. *A* has low talent and, thus, no chance of reaching the threshold. *B* has medium talent and may be able to reach the threshold. *C* has high talent and can reach the threshold easily. *A* will likely realize that he cannot reach the threshold and will simply not bother to perform since performance is costly. For *B*, the threshold may create a goal that incentivizes her to commit more effort to the task, resulting in higher performance than if the threshold was not provided. *C*, however, can easily reach the threshold and will thus not be motivated to invest more effort in performing the task to achieve beyond the threshold, resulting in lower performance than if the threshold was not provided. Accordingly, thresholds can produce performance distortions that result in clustering or "piling up" around the threshold.¹²⁹ People are motivated to barely achieve the threshold but no more.¹³⁰ Clustering may be reduced, however, when the threshold is uncertain. If people do not know precisely where the threshold is set, they may be risk averse and perform better in an attempt to ensure satisfaction of the threshold.

A variety of empirical studies support these inferences. For example, ultramarathoners tend to cluster around significant performance measures

126. Cf. David Friedman & William Sjoström, *Hanged for a Sheep: The Economics of Marginal Deterrence*, 22 J. LEGAL STUD. 345 (1993) (examining the risk that a high punishment for one crime may lead an offender to commit a worse crime instead).

127. EDWIN A. LOCKE & GARY P. LATHAM, A THEORY OF GOAL SETTING AND TASK PERFORMANCE 27–29 (1990).

128. George Wu et al., A Prospect Theory Model of Goal Behavior 1 (Apr. 22, 2008) (unpublished manuscript), available at [http://faculty.chicagobooth.edu/george.wu/research/papers/wu%20heath%20larrick%20\(prospect%20theory%20model%20of%20goal%20behavior\).pdf](http://faculty.chicagobooth.edu/george.wu/research/papers/wu%20heath%20larrick%20(prospect%20theory%20model%20of%20goal%20behavior).pdf).

129. *Id.* at 15–19.

130. *Id.*

like completing the race in under twenty-four or thirty hours.¹³¹ Especially at the higher achievement end, some runners will tend to underperform because they are satisfied with meeting the threshold rather than expending more energy to get a better (but not necessarily rewarded) time.¹³² This is also true for those who run the more reasonable distance of 26.2 miles, a cross section much closer demographically to the general population. In an analysis of almost 9.4 million marathon finishing times across nearly 7,000 marathons between the years 1970–2013, Eric Allen and colleagues find massive piling-up effects.¹³³ Times just missing half-hour marks (such as 4:01) are observed far less often, and times just making half-hour marks (such as 3:59) are observed far more often than should be if the times were more normally distributed.¹³⁴

All in all, we face a murky picture of the relationship between incentives and creativity. A series of studies suggests that rewards—particularly higher ones—can undermine creativity, but other studies indicate that carefully designed rewards and instructions can instead enhance creativity.

B. Incentives and Creativity in IP Research

In recent years, a handful of legal scholars have made reference to social-science studies finding that incentives can harm creativity. Some scholars have argued that, as a general matter, IP law's approach to incentives is incorrect. For example, Julie Cohen argues that copyright law plays little or no role in actually motivating creators. She writes:

Everything we know about creativity and creative processes suggests that copyright plays very little role in motivating creative work. Creative people are much more apt to describe what they do as the product of desire, compulsion, or addiction, and to understand particular results as heavily influenced by cultural, intellectual, and emotional serendipity.¹³⁵

131. Grant, *supra* note 125, at 11.

132. As Grant notes, “This is the ultimate irony of the Western States 100: in one of the toughest endurance races in the world, most finishers choose not to use up all the gas in the tank.” *Id.* at 21.

133. Eric J. Allen et al., Reference-Dependent Preferences: Evidence from Marathon Runners 3, 9 (Dec. 30, 2013) (unpublished manuscript), available at http://faculty.chicagobooth.edu/devin.pope/research/pdf/Website_Marathons.pdf.

134. *Id.* at 3. Furthermore, the “excess mass” cannot fully be explained by the “extrinsic benefit” of qualifying for the Boston Marathon. *Id.* at 8, 18.

135. Julie E. Cohen, *Copyright as Property in the Post-Industrial Economy: A Research Agenda*, 2011 WIS. L. REV. 141, 143. Cohen goes on to propose that copyright should instead be used to “enable the provision of capital and organization so that creative work may be exploited,” so that it “creates a foundation for predictability in the organization of cultural production, something particularly important in capital-intensive industries like film production.” *Id.*

To Cohen and others,¹³⁶ most copyright creators have sufficient intrinsic incentives to create, and additional copyright incentives are unnecessary and wasteful.

Other scholars go further and argue that, consistent with the research discussed above, IP law's incentives may actually undermine creativity. For example, Diane Zimmerman asks legal scholars to wrestle with the legal implications of findings that "the promise of monetary or other extrinsic rewards for creative activities can actually diminish rather than enhance the likelihood that individuals will be induced to produce high-quality new work."¹³⁷ Eric Johnson suggests that, although there might be some exceptions, "[i]n general, the kind of creativity and innovation that benefits society as a whole is not in need of externally supplied incentives."¹³⁸ In reliance on this body of literature, Johnson speculates that patent and copyright laws might be counterproductive—or at best unnecessary—for individuals.¹³⁹ Similarly, Gregory Mandel worries that "law's ability to promote creativity not only may be limited, but could even be detrimental, to the extent it turns an artist's or inventor's internally motivated activity into one conducted for the copyright or patent prize."¹⁴⁰ Nonetheless, Mandel leaves open the possibility that IP laws might enhance creativity:

To the extent intellectual property law is perceived as creating competition, constraint, or providing rewards for task (not creative) performance, the law may produce extrinsically motivated efforts that are less creative. To the extent, however, that intellectual property law is perceived as providing potential creators with a wide degree of autonomy and a reward for creative achievement, the law can produce intrinsic motivation that enhances creativity.¹⁴¹

136. Relatedly, some scholars suggest that people will readily create in reliance on their intrinsic motivation, without regard to extrinsic motivations, such as IP-related incentives. *E.g.*, Yochai Benkler, *Coase's Penguin, or Linux and The Nature of the Firm*, 112 YALE L.J. 369, 426–34 (2002); Tushnet, *supra* note 90, at 513 (exploring "the ways in which the desire to create can be excessive, beyond rationality, and free from the need for economic incentive," and suggesting as a result that copyright law should not "treat[] creative activity as a product of economic incentives"); *see also* YOCHAI BENKLER, *THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM* 92–99 (2006) (analyzing different models for motivation, including "intrinsic motivation").

137. Diane Leenheer Zimmerman, *Copyrights as Incentives: Did We Just Imagine That?*, 12 THEORETICAL INQUIRIES L. 29, 43 (2011).

138. Eric E. Johnson, *Intellectual Property and the Incentive Fallacy*, 39 FLA. ST. U. L. REV. 623, 625 (2012).

139. *Id.* at 675–78.

140. Gregory N. Mandel, *To Promote the Creative Process: Intellectual Property Law and the Psychology of Creativity*, 86 NOTRE DAME L. REV. 1999, 2008 (2011).

141. *Id.* at 2012.

To Zimmerman, Johnson, and Mandel, IP laws may be not only socially wasteful expenditures on creativity that would have been produced anyway; IP laws may actually be inhibiting the very creativity that they exist to promote.

Aside from Mandel's work and Johnson's intimation, there has been very little discussion in the legal literature of the possibility of carefully structuring creativity incentives to avoid these detrimental effects. Moreover, until now, no one has tested the implications of the way that IP law specifically structures incentives for creative production. This Article takes a first step in that direction, with regard to the protectability thresholds in intellectual property and the effect on creativity of varying them.

C. *Motivation for This Research*

Although the different creativity thresholds established by copyright and patent laws have received considerable attention, there has been relatively little discussion of whether the difference affects creators' behavior.¹⁴² The creativity research described above provides some reasons for thinking that it does. One possibility, consistent with the claims of Parchomovsky and Stein and Miller, is that the higher creativity threshold in patent law provides a target that encourages creators to strive for creative solutions in order to meet the goal. Creators will have explicit knowledge of what is expected of them, and they will work to achieve it, whereas

142. For one such discussion, see Parchomovsky & Stein, *supra* note 51, at 1510–12, 1528. Another exception is some interesting speculation in Gregory Mandel's work:

Intriguingly, these results indicate that patent law's nonobviousness requirement may enhance creative efforts, while copyright's originality requirement could detract from them. In order to acquire a patent, an invention must not merely be novel in relation to the prior technology, but must measure a nonobvious advance over existing technology. The nonobviousness requirement thus mandates a certain level of creative achievement in order to secure a patent, making a patent a reward for a particularly creative achievement. To the extent that a potential inventor understands this, the inventor is likely to perceive a patent as a reward only for a creative accomplishment, and thus the patent system may enhance intrinsic motivation in this regard.

The creativity requirement for a copyright, on the other hand, is famously low, requiring only that a work display a minimum amount of creativity. The Supreme Court has held that the requisite level of creativity "is extremely low; even a slight amount will suffice." To the extent that potential creators are aware of copyright's minimalist creativity standard, the copyright reward will be viewed more as simply providing a reward for task performance. The perception of a task performance reward produces only extrinsic motivation, rather than providing the desired internal desire to achieve a creative result, and may lead to a reduction in the creativity of copyright-related efforts.

Mandel, *supra* note 140, at 2012–13 (citations omitted) (quoting *Feist Publ'ns, Inc., v. Rural Tel. Serv. Co.*, 499 U.S. 340, 345 (1991)).

copyright law's low threshold may provide no strong motivation to be particularly creative.

Another possibility, in contrast, is suggested by Theresa Amabile's and Dan Ariely's work and the broader body of work on the negative effect of many—particularly high—extrinsic rewards on creativity.¹⁴³ Perhaps creators will be inordinately focused on the high target that patent law establishes, ultimately leading them to choke, while those subjected to copyright law's low threshold—or no incentive at all—will be able to relax and create without the additional anxiety of meeting some externally imposed benchmark.

Relatedly, the high threshold in patent law may distort performance relative to copyright law. Whereas creators subject to the copyright regime might adjust their effort smoothly and efficiently once they have exceeded its very low threshold—which might appear to creators as nary a threshold at all—creators subject to the patent regime may cluster around the threshold. If creators are intrinsically motivated they may actually perform better with copyright law's negligible target. However, this effect ought not occur if there is some additional incentive for ever-better performance once a threshold is crossed.

These questions have not been directly addressed in the existing empirical literature, but they are important for the emerging discussion about how IP law can best encourage creativity. In the experiments described below, we attempt to understand how different kinds of creativity thresholds affect creators' behavior. Our goal is to test these issues across a range of different creativity tasks.

III. Experimental Tests of Creativity Thresholds

The following experiments involve various tasks for subjects to complete in order to win a \$500 prize. The subjects' performance in the tasks was scored. For each of the experiments, the subjects were randomly assigned to one of five different threshold conditions that determined how the prize would be distributed. The experiments all used the same set of thresholds in order to test whether different kinds of creativity would be differentially affected by threshold structure. For brevity, we describe the five threshold conditions just once below.

Our goal in designing the different conditions is to model the creativity thresholds that are used in IP law. As discussed above,¹⁴⁴ copyright law applies a negligible threshold requiring that an author produce a minimally creative work to qualify for protection. Patent law has a much higher

143. *See supra* section II(A)(2).

144. *See supra* subpart I(B).

standard, limiting protection to inventions that are both novel and nonobvious to someone skilled in the relevant art. Our conditions reflect these differences in the magnitude of the threshold. In addition to testing the effects of different thresholds on subjects' creativity, we want to compare that performance to the performance of subjects who receive no incentive to be creative. This condition provides a baseline from which to assess the effects of different thresholds on creativity.

Our five conditions are as follows:

- *No Incentive* – Subjects were told that although their performance in the task would be scored, their score would not affect their chances to win the \$500 prize. Instead, each subject would be assigned a lottery ticket, and the winner would be drawn at random.
- *Copyright* – Subjects were told that their performance on the task would be scored, and that for each point they received they would earn one lottery ticket for a random prize drawing. Accordingly, each subject who submitted a valid answer had a chance of winning the prize, but subjects who provided better answers had better chances to win.
- *Patent High* – Subjects were told that their performance on the task would be scored. Next, they were told that the subjects whose performance was in the top 5% of total scores would receive one lottery ticket for each point that they scored and that the lottery tickets would be entered into a random drawing for the prize. Subjects whose scores were below the top 5% would not receive lottery tickets.
- *Patent Mid* – Subjects were given the same instructions as for Patent High except the threshold was set at the top 25%.
- *Patent Low* – Subjects were given the same instructions as for Patent High except the threshold was set at the top 50%.

For each of the conditions, the subjects were provided with a hypothetical example that demonstrated how the lottery tickets would be distributed.

The provision of prizes in our experiments differs from those of other creativity and threshold experiments. The prize winner for the four IP-related conditions is determined by a lottery that relates task performance above the threshold with probability of winning. This method better simulates IP law's indirect rewards for creativity via the provision of exclusive rights that are more likely to prove valuable as the quality of the underlying creative work increases.¹⁴⁵ Unlike other creativity experiments

145. See *supra* text accompanying notes 15–17.

in which a prize is awarded to the entry judged to be the best,¹⁴⁶ here we seek to model the probabilistic relationship between IP rights and monetary returns to the owner. To that end, our experiments employ a lottery or tournament style prize-distribution mechanism that is consistent with the way market value tends to be distributed in IP markets.¹⁴⁷ Our model assumes that IP rights play a gatekeeping function that tends to limit competition in a field only to those works that qualify for rights, and that within the category of those that qualify, the probability of marketplace success is directly—but not completely—related to the quality of the work.¹⁴⁸

Additionally, we maintain the same total prize value in each condition: the winner of the lottery for each of the five conditions receives \$500. Although this equivalence keeps the conditions symmetrical in terms of the value-per-subject payouts, it does create different marginal values for better scores in the Copyright and Patent conditions. In the Copyright condition, the value of additional creativity is linear and increasing—more and better answers yield higher chances to win. In the Patent conditions, however, the value of additional creativity is dichotomous: More and better answers are worth nothing until the subject reaches the threshold, and after that they are increasingly valuable. Thus, the marginal value of additional creativity in the Patent conditions relative to the Copyright condition has a very different valence depending on the location of a particular subject's solution on the creativity spectrum: Below the Patent threshold, additional creativity in a Patent condition is worth less than additional creativity in Copyright, but above the Patent threshold, additional creativity in a Patent condition is worth more than additional creativity in the Copyright condition because fewer subjects will be in the final lottery.

146. Christopher Buccafusco & Christopher Jon Sprigman, *The Creativity Effect*, 78 U. CHI. L. REV. 31, 37–39 (2011) [hereinafter Buccafusco & Sprigman, *Creativity Effect*]; Christopher Buccafusco & Christopher Jon Sprigman, *Valuing Intellectual Property: An Experiment*, 96 CORNELL L. REV. 1, 21–22 (2010); Christopher Jon Sprigman, Christopher Buccafusco & Zachary Burns, *What's a Name Worth?: Experimental Tests of the Value of Attribution in Intellectual Property*, 93 B.U. L. REV. 1389, 1405–09 (2013).

147. See, e.g., Gideon Parchomovsky, *Publish or Perish*, 98 MICH. L. REV. 926, 926–27 (2000) (contemplating the patent system as a race to invent between competitors); Jennifer F. Reinganum, *The Timing of Innovation: Research, Development, and Diffusion*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 849, 850–52 (Richard Schmalensee & Robert Willig eds., 1989) (same). We could run the experiments again using a different model of payouts, such as proportional payouts to each subject based on their performance. Cf. John P. Conley & Christopher S. Yoo, *Nonrivalry and Price Discrimination in Copyright Economics*, 157 U. PA. L. REV. 1801, 1804 (2009) (contemplating that many similar protected creations can coexist and be “imperfect substitutes” for one another).

148. These assumptions involve a number of simplifications of competition in the real world, but they are required in order to explain the experimental setup to subjects.

If subjects were able to calculate the expected value of their participation in such a way that it differed *ex ante* across conditions, it would have been necessary to adjust the prize value across the conditions to ensure that the expected value was the same across the conditions so as not to confound the threshold condition with the expected value of the prize. That said, subjects cannot calculate the expected value of their participation for at least two reasons: They do not know how many other subjects are participating, nor do they know the distribution of scores that subjects will have. Because subjects do not know other subjects' scores, there is no way for subjects to know both how high they will have to score to hit their condition's threshold and how many lottery tickets there will be in total (both of which affect their chances of winning the prize).¹⁴⁹ We think that this indeterminacy models the patent and copyright systems and the subsequent payoffs that rightholders might achieve in the marketplace.¹⁵⁰ In other words, the key difference between the Patent and Copyright conditions is not the total expected payoff, but the way in which the payoff is distributed. The Patent and Copyright conditions subject the same total expected payoff to different risk profiles. The risk profiles are created by the differing thresholds.

Finally, the structure of the thresholds in our studies differs from many of those in the prevailing literature because they are not purely binary. Although there is a discontinuity between those who reach the threshold and those who fail to reach the threshold, those who do reach it are not treated identically. Better performance above the threshold is rewarded more than weaker performance above the threshold. Accordingly, we expect not to see a significant diminution in effort by high talent individuals who can easily clear the threshold, because they stand to gain further advantage by increased performance.

A. *Experiment 1 – Computational Creativity*

In Experiment 1, we seek to measure the effects of different kinds of creativity thresholds on subjects' responses to a "computational" creativity task. The task involved mathematical reasoning, but it was difficult enough (and NP-complete)¹⁵¹ that participants would not be able to compute the

149. The best they might do is build a rudimentary qualitative model to approximate whether they might perform well and meet the threshold, whether due to optimism, confidence, or lack thereof, issues as to which we enquire in our experiments. See *infra* subparts III(A)–(D).

150. See *supra* text accompanying notes 145–148.

151. NP-complete problems are those for which there is no known efficient (polynomial time) way to find a solution (although the solution can be verified quickly once it is found). In fact, the time required to solve the problem increases substantially as the size of the problem grows. Because of the complexity of NP-complete problems, algorithms that tackle these problems typically use heuristics or approximation to "solve" them. See generally MICHAEL SIPSER,

solution in any straightforward or complete way in the time given. Instead, they would have to rely on some sort of heuristic to approximate the optimal answer. The task presented an opportunity for creativity in constructing a heuristic that would yield answers close to the optimum. Our goal in this task was to model aspects of information aggregation and convergent thinking that play significant roles in intellectual discovery and invention.¹⁵²

To test the effects of thresholds on this sort of creativity, we adapted a variant of the classic knapsack problem, a combinatorial optimization problem that derives its name from one of the ways in which it is typically structured—as a game featuring a player who must fill a knapsack of fixed weight capacity with items of the maximum value chosen from a menu of items, each having a specific value and weight.¹⁵³ Our version of the problem was based on the popular “Oregon Trail” video game of the 1980s,¹⁵⁴ and featured not a knapsack, but a covered wagon that players were asked to fill. The wagon had a weight limit, and players were presented with a menu of items, each having a specific value and weight. Because one cannot determine whether a given item is in the optimal solution until one knows the solution,¹⁵⁵ the game requires more than simple mathematics. Moreover, subjects were limited to 180 seconds to submit a solution, which meant that at the level of difficulty presented by the problem, players would almost certainly be unable to compute the optimal combination of items. They were forced, instead, to rely on some heuristic to approach the optimum solution within the time allotted. One such heuristic, for example, would be to estimate the approximate ratios between value and weight, and attempt to fill the wagon with the items presenting the highest ratio.¹⁵⁶ Players using this heuristic would approach, but would only very rarely achieve, the optimum solution.

INTRODUCTION TO THE THEORY OF COMPUTATION 299–310 (3d ed. 2012) (defining NP-completeness and explaining the complexities in solving such problems).

152. See Gallini & Scotchmer, *supra* note 15, at 56–58 (discussing information aggregation problems in the invention process).

153. See generally HANS KELLERER ET AL., KNAPSACK PROBLEMS 1–9 (2004) (describing the knapsack problem and its mathematical implications). Other scholars have used knapsack problems to study innovation and incentives. See Deborah Meloso et al., *Promoting Intellectual Discovery: Patents Versus Markets*, 323 SCIENCE 1335, 1336–37 (2009) (explaining a similar study that utilized a knapsack problem to test patent innovation).

154. See Jessica Lussenhop, *Oregon Trail: How Three Minnesotans Forged its Path*, CITY PAGES, Jan. 19, 2011, <http://www.citypages.com/2011-01-19/news/oregon-trail-how-three-minnesotans-forged-its-path/> (detailing the history of the Oregon Trail game and its widespread popularity).

155. Meloso et al., *supra* note 153, at 1337.

156. Another plausible heuristic would involve adding the most valuable item currently available until doing so would result in an overweight wagon and then adding the next most valuable item until doing so would result in an overweight wagon, and so forth.

Subjects were recruited online using Amazon's Mechanical Turk subject recruitment service.¹⁵⁷ Recruitment was restricted to those in the United States. Once subjects signed up to take the experiment, they were directed to the Qualtrics survey website. Subjects were apprised of the rules of the game and given an opportunity to practice on a simplified example. After receiving these instructions, subjects were randomly assigned to one of the five different conditions based on creativity thresholds described above.

We recruited 1,003 subjects to participate in the experiment. The sample had a mean age of 31.2 (SD = 10.11) and was 36% female. They were fairly well educated, 88.3% reporting having at least some college education. Self-reported math skills were above average; 88.7% of respondents said they were "Okay" at math (the midpoint of the scale) or better.

Subjects were paid \$1 to participate and were given a chance to win a \$500 prize. Subjects were excluded from the sample if their Mechanical Turk worker ID matched one that previously had been used in a pilot version of this study or if the subject believed that she had participated in the pilot study.¹⁵⁸ In addition, subjects were excluded from the analysis if their responses to follow-up questions indicated that they had not paid attention to the experiment.¹⁵⁹ The likelihood of being excluded due to inattention was not significantly correlated with the different conditions. This left us with 986 subjects in the sample.

We excluded almost 200 more subjects, as discussed below, for not complying with the rules governing the task. The remaining sample of 789 had a mean age of 30.9 (SD = 9.79) and was 38% female. They were fairly well educated, 89% reporting having at least some college education. Self-reported math skills were again above average; 87.8% of respondents said

157. See generally Winter Mason & Siddharth Suri, *Conducting Behavioral Research on Amazon's Mechanical Turk*, 44 BEHAV. RES. METHODS 1 (2012) (explaining the functionality of Amazon's Mechanical Turk research platform).

158. First, we used an identified method to exclude workers who had previously participated in earlier iterations by identifying their worker ID and disallowing access to those in a previous sample. See Eyal Peer et al., *Selectively Recruiting Participants from Amazon's Mechanical Turk Using Qualtrics* (Nov. 9, 2012) (unpublished manuscript), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2100631 (describing a method to use Qualtrics, rather than Mechanical Turk, to exclude workers who participated in a previous study). We further asked how many of the 1,003 total participants felt like they had taken the survey before; four responded in the positive and were excluded.

159. See Adam W. Meade & S. Bartholomew Craig, *Identifying Careless Responses in Survey Data*, 17 PSYCHOL. METHOD 437, 452 (2012) (finding that these self-reports correlate with other attention filters). Finally, we asked how much attention the participant paid to the survey and "In your honest opinion, should we use your data in our analyses in this study?" In our remaining sample, the two questions were correlated at $r = .068$. Of the remaining sample, 982 responded that we should use their data, of whom 98.7% reported they gave the study "most of" or "all of" their attention.

they were “Okay” at math (the midpoint of the scale) or better. The participants were distributed across conditions as follows:

Table 1

	<i>N</i> (before exclusions)	Excluded for Inattention/ Previous Participation	Excluded for Overweight	Analyzed <i>N</i>
No Incentive	201	6	88	107
Copyright	202	1	39	162
Patent High	204	5	21	177
Patent Mid	201	1	21	177
Patent Low	195	5	24	166
Total	1003	18	193	789

We analyzed two separate metrics of subjects’ performance on the wagon task. Our first measure of performance considers the number of subjects who exceeded the wagon’s weight limit. Subjects were told that they would receive zero points if they exceeded the weight limit, so doing so constitutes poorer task performance. Participants were significantly more likely to go overweight in the No Incentive condition (45.1%) than either the Copyright (19.4%) or the Patent (11.3%) conditions.¹⁶⁰ Furthermore, those in the Copyright condition were significantly more likely to go overweight than those in the Patent conditions.¹⁶¹ There were no significant differences between the various Patent thresholds. These results indicate that subjects in the Patent conditions performed better than did subjects in the Copyright condition, and that subjects in both the Patent and Copyright conditions outperformed subjects in the No Incentive condition. Relative to the Patent conditions, subjects in the No Incentive and Copyright conditions were likely trying less hard or paying less attention to the task.

Our second measure of performance compared mean wagon value across the conditions. Because subjects who went overweight received zero points, including them in this analysis would bias downward those conditions with a disproportionate number of overweight wagons. Accordingly, they were excluded from this analysis. The remaining 789

160. All Sidak adjusted $ps \leq .024$. An omnibus F -test revealed no differences between individual patent conditions, except where discussed.

161. Omnibus $F(2,979) = 59.40$, $p < .0001$. All post-hoc test $ps \leq .025$ using Sidak corrections.

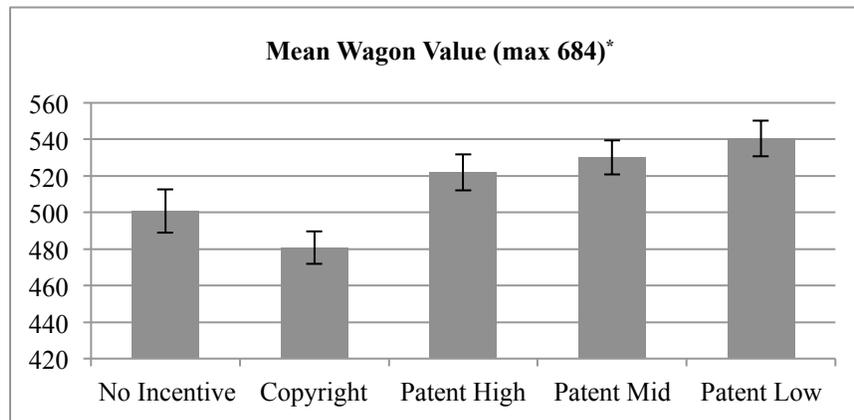
participants were analyzed for their performance on the task. The best possible solution for the task is 684 (possible with a few different combinations of items). The data on subjects' responses appears below.

Table 2

Max Possible Value: 684	Wagon Value (SD)	No Incentive/ Copyright Comparison	Copyright/Patent Comparisons	No Incentive/Pooled Patent Comparison
No Incentive	500.79 (123.08)	$p = .885, n.s.$	All $ps \leq .023$	$p = .069$
Copyright	480.78 (113.45)			
Patent High	521.88 (130.23)			
Patent Mid	530.06 (123.13)			
Patent Low	540.40 (125.22)			

All p values are SPSS-adjusted Sidak ps . Bonferroni corrections did not differ significantly.

Chart 1



*Error bars are standard errors.

As outlined in the above table, post-hoc analyses indicate that subjects in each of the Patent conditions performed significantly better than those in

the Copyright condition.¹⁶² Subjects in the Copyright condition did not perform significantly differently than those in the No Incentive condition. There were no statistically significant differences between the Patent conditions.

Because performance in each of the Patent conditions did not differ significantly, we also look at comparisons when the Patent conditions are pooled.¹⁶³ Those in the pooled Patent conditions performed the best ($M = 530.58$, $SD = 126.79$), with No Incentive performing second-best (500.80) and Copyright performing the worst (480.78).¹⁶⁴ Post-hoc tests with Sidak corrections reveal the Copyright vs. pooled Patent differ significantly ($p < .001$) and No Incentive vs. Patent differ marginally ($p = .069$).¹⁶⁵

Because the different Patent levels did not affect performance significantly in any of the studies reported in this Article, we can look at the difference between subjects' performance in the Copyright condition versus the Patent Mid condition as a representative comparison. Participants in the Patent Mid condition significantly outperformed those in the Copyright condition (Patent Mid $M = 530.06$, Copyright $M = 480.78$, $t = 3.821$, $p < .001$).

In sum, we find evidence that subjects in the Patent conditions outperform those in the Copyright condition. Those in the No Incentive condition perform similarly to those in the Copyright condition and worse than those in the Patent conditions. Interestingly, we find no significant differences between the various Patent thresholds. It seems that some non-negligible threshold will motivate increased performance on this non-algorithmic convergent-thinking task.

We should note that our experimental design tends to understate—perhaps significantly—the differences between the No Incentive, Copyright, and Patent conditions. This is because, as we noted above, subjects were significantly more likely to produce overweight wagons in the No Incentive condition (45.1%) versus Copyright (19.4%) and (even more markedly) Patent (11.3%). We did not assign a value to overweight wagons, instead, we excluded them from our second-stage data analysis entirely. If we had assigned some value to these overweight wagons (presumably zero), we would see larger differences between the conditions.

162. Omnibus $F(4,786) = 10.99$, $p < .0001$.

163. There was a slight but non-significant trend that higher thresholds induced worse performance (Patent High $M = 521.88$, Patent Mid $M = 530.06$, Patent Low $M = 540.40$).

164. Omnibus $F(2,786) = 10.99$, $p < .0001$.

165. The corrections used in the analysis are intended to control for the use of multiple conditions. Because it is more likely that a significant result will appear due to chance when more conditions are used, these corrections require a higher degree of significance to establish a meaningful result.

In order to better understand why the higher threshold was producing better results, we asked several questions when the task was over:

- *How likely do you think it is that you will be the winner of the \$500 prize?*
- *How likely do you think it is that your answer will be in the top X% and get you into the lottery? (Patent conditions only)*
- *How motivated were you to score well on the game?*
- *How much fun did you think the game was to play?*

Each of these was significantly correlated with performance.¹⁶⁶ We also asked participants how many other people they believed were in the competition. One possible response might be to perform better as a function of there being more people in the competition to overcome, and yet, on the other hand, subjects might perform worse out of a fear of futility.¹⁶⁷ Performance on the task was significantly correlated with beliefs about how many others were also in the task,¹⁶⁸ but these beliefs did not differ across conditions.¹⁶⁹ Accordingly, it does not appear as though the results are driven by differing assumptions about the size of the competitive pool.

We also measured competitiveness as a possible mediator for the differences in performance between conditions. We hypothesized that the Patent conditions might be promoting people to be more competitive because there were fewer slots available in the lottery, and thus more likelihood to win if a subject were to make it into the lottery pool. Competitiveness was assessed with four items, adapted from previous research on the issue.¹⁷⁰ Our competitiveness measure failed to pick up any

166. All $r_s \geq .09$, all $p_s \leq .012$.

167. See Stephen M. Garcia & Avshalom Tor, *The N-Effect: More Competitors, Less Competition*, 20 PSYCHOL. SCI. 871, 871 (2009) (finding that increasing the number of competitors can decrease competitors' motivation).

168. Spearman $r = .087$, $p = .015$.

169. Kruskal-Wallis $H = 5.213$, 4 d.f., $p = .266$.

170. See John Houston et al., *Revising the Competitiveness Index Using Factor Analysis*, 90 PSYCHOL. REPORTS 31, 33 tbl.1 (2002). The four items were selected from the "Enjoyment of Competition" subscale, as the other subscale, "Contentiousness" does not apply to competitiveness in the current context. The selected items were "I am a competitive individual," "I try to avoid competing with others," "I find competitive situations unpleasant," and "I enjoy competing against an opponent." All responses were on a five-point Likert scale, with points labeled "Strongly Disagree," "Disagree," "Neither Agree nor Disagree," "Agree," and "Strongly Agree." The middle two items were reverse coded.

Among all participants not excluded for being overweight or other reason discussed above, the four items were highly correlated (Chronbach's $\alpha = .919$; all bivariate $r_s > .676$, all $p_s < .0001$), and so the items were averaged into a composite competitiveness measure. The overall mean competitiveness in the sample was 3.57, or just above the midpoint of the scale, indicating a slight taste for competition.

significant differences between subjects in the different conditions.¹⁷¹ Though it is possible to have mediation without association between the variables,¹⁷² the difference in performance between the Patent Mid and Copyright conditions was not a result of differences in competitiveness.¹⁷³

The most obvious explanation for the increased performance in the Patent conditions is that subjects perceive improvement in an answer to have a higher value than they do in the other conditions. While this is true once subjects exceed the threshold, it is not necessarily true as a general matter. That is, if a subject exceeds the threshold in the Patent conditions, each increment of improvement in an answer is worth more than the same improvement would be worth in Copyright. But improvements in answers below the Patent threshold are worth less than those in Copyright. It is possible that the subjects in the Patent conditions assumed, optimistically,¹⁷⁴ that they would clear the threshold and were competing in the part of the distribution where improvements in answers were especially valuable.¹⁷⁵

Our results from Experiment 1 are illuminating and suggestive. In general, the existence of some threshold for entry into a prize lottery had a positive effect on subjects' performance. Subjects in the Copyright condition produced solutions that failed to satisfy the rules of the task significantly more often than did those in the Patent conditions. Moreover, when we compare only those solutions that met the rules of the task, Copyright subjects still performed significantly worse. These results suggest that the negligible threshold in the Copyright condition caused subjects to be less motivated or to pay less attention to the task than did the higher thresholds in the Patent conditions. Interestingly, however, we detected no significant difference in performance among the various Patent conditions.

171. An omnibus *F*-test indicated competitiveness did not differ by condition ($F(2,786) = 1.26$, n.s.). This is not to say that competitiveness was not a useful measure. The index was correlated with performance at $r = .108$ ($p = .002$). Furthermore, the index correlated positively with other measures, such as likelihood of winning, likelihood of getting into the lottery, self-reported motivation, and self-reported fun with the task (all r s $\leq .14$, all p s $< .001$). However, the different conditions do not induce the differences in performance via competitiveness.

172. Andrew F. Hayes, *Beyond Baron and Kenny: Statistical Mediation Analysis in the New Millennium*, 76 COMM. MONOGRAPHS 408, 413 (2009).

173. Using a bootstrap model to estimate the indirect effect, the 95% confidence interval included 0 ($\beta = .077$, 95% CI: [-3.471, 4.015]), indicating that competitiveness did not mediate the effect of condition on performance.

174. Optimism among creators is consistent with previous research. See Buccafusco & Sprigman, *Creativity Effect*, *supra* note 146, at 31 (explaining that "creators of works value their creations substantially more than do both potential purchasers of their works and mere owners of the works").

175. Even though we did not detect any differences in self-reported motivation between the conditions, subjects might nonetheless have experienced different levels of motivation that they did not or could not accurately report.

B. Experiment 2 – Verbal Creativity

In Experiment 1, we sought to measure the effects of different levels of creativity thresholds on subjects' responses to a computational convergent thinking creativity task. As addressed in Part II, however, notions of creativity vary widely in different situations. Accordingly, we wanted to test whether our results with a computational creativity task would hold for a task that involved a different kind of creative behavior. The following experiment tested the effects of different thresholds on a verbal divergent-thinking creativity task.

In order to test the effects of thresholds on verbal creativity, we adapted a creativity game that has long been used by the Odyssey of the Mind organization.¹⁷⁶ The task involved rapidly generating a list of words that bear an indirect relationship with some target word, usually in the form of a pun. In our task, subjects were asked to come up with a list of “keys,” and they were rewarded for answers that were judged to be creative. For example, “house key” would not be considered a creative answer, while “Keyshawn Johnson,” “monkey,” “keynote speech,” or “John Maynard Keynes” would be considered creative. The ability to generate unexpected or punning uses of a word is a significant feature of verbal or linguistic creativity.¹⁷⁷ Also, unlike the Wagon task in Experiment 1, this task involves divergent thinking. Rather than offering a single right answer, divergent thinking tasks are open-ended and enable subjects to generate a multitude of novel relationships.¹⁷⁸

Again using computers connected to the Qualtrics survey website, subjects were told that they would be playing a game that involved verbal creativity. As with Experiment 1, subjects were paid \$1 for participating in the task, and they were told that they would have a chance to win a \$500 prize. Subjects were told that they would be asked to list words or phrases that fit a given theme, that they would receive one point for creative answers, and that they would receive zero points for standard answers. Subjects were told that examples of creative and standard answers would be given to them.

After they acknowledged that they understood the directions, all of the subjects were directed to the creativity task. Subjects were given the following instructions:

176. See *Learn More!*, ODYSSEY MIND, <http://www.odysseyofthemind.com> (describing various problem designs used to teach “creative problem-solving methods”).

177. See, e.g., JAMES JOYCE, *ULYSSES* (First Vintage Int'l ed. 1990) (exemplifying significant literary usage of puns).

178. See *supra* text accompanying notes 74–78; see also Runco & Okuda, *supra* note 77, at 217 (finding that divergent thinking incorporates both problem solving and problem discovery).

In three minutes, provide as many examples of “keys” as you can.

Creative Answer: “monkey” = 1 point

Standard Answer: “house key” = 0 points

Subjects typed their answers into the survey program. Following the task, subjects were asked to complete a series of demographic and follow-up questions.

We recruited 1,005 participants through Amazon’s Mechanical Turk service. As before, recruitment was restricted to those in the United States. Subjects were told that they would receive \$1 for performing a creativity task and that they would be eligible to win a \$500 prize. As with Experiment 1, workers who had taken other studies in this Article were disallowed from participating. Of those remaining, 55 reported we should not use their data. Finally, we used JavaScript to limit some of the behaviors available to participants. For example, we did not want participants to open a new browser window and search terms that include “key,” so once the round began, the study automatically advanced if the participant clicked off of the task window. Subjects were told about this rule and instructed not to click off the task window. We excluded 155 participants for violating this rule. The number of excluded participants did not differ by condition.

The remaining participants were distributed as follows:

Table 3

	<i>N</i> (before exclusions)	Excluded for Inattention/ Previous Participation	Excluded for Clicking off Task	Analyzed <i>N</i>
No Incentive	198	11	27	160
Copyright	201	10	33	158
Patent High	203	14	26	163
Patent Mid	201	10	41	150
Patent Low	202	10	28	164
Total	1005	55	155	795

In order to assess the creativity of responses, the subjects' responses were standardized and then rated. First, every entry was standardized by two independent raters and ties were broken by a third, so that spelling, plurals, and word forms were consistent. This standardization produced 737 unique answers. Next, we created a task (excluding workers who generated the answers) on Amazon's Mechanical Turk service advertised as a "Rating Task."¹⁷⁹ Workers were first exposed to the prompt given to the participants who generated the answers, and then they were given two examples of both creative and standard answers. Each worker then evaluated 40 of the unique entries, using their own intuitions to produce the ratings,¹⁸⁰ responding "Creative," "Standard," or "I'm not familiar with this." Raters did not generally use "I'm not familiar with this," the largest percentage being 29.7% for "paracentric key." Any answer receiving more than 50% of total votes as "Creative" was tallied as creative. Each answer was rated between 24 and 56 times, with the average number of times being 48.2.¹⁸¹ The raters were reasonably consistent with each other. Of the answers, 79.5% had vote ratios of at least 2:1 in the direction of the final rating (for example, "whiskey" received 44 creative votes, 5 standard votes, and 0 "I'm not familiar with this" votes and was thus rated as creative). Of answers in the middle tercile of vote ratios (those with vote ratios of less than 2:1), 47.1% were voted creative, indicating no bias towards standard or

179. Workers were paid \$0.50 for the task.

180. The rating system used here is similar to those employed in the Consensual Assessment Technique. *See supra* text accompanying notes 72–73.

181. Standard deviation is 6.19.

creative on answers about which the raters were in relatively less agreement.

The mean results are displayed below.

Table 4

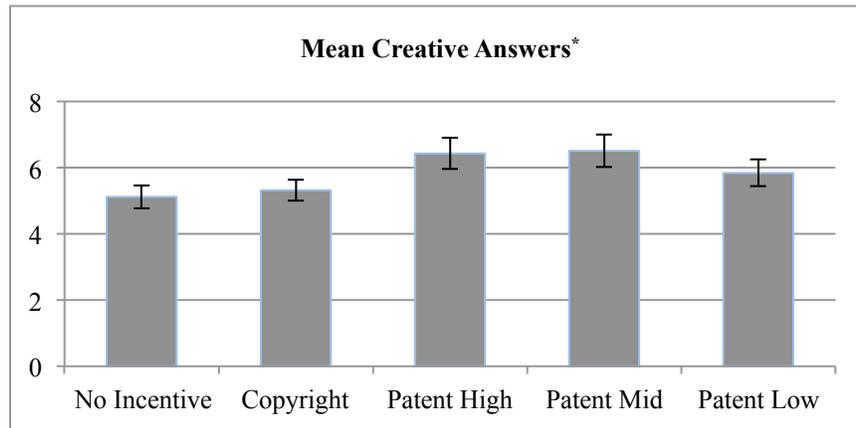
	Total Answers	Creative Answers	Standard Answers
No Incentive	9.36	5.12	4.24
Copyright	8.54	5.32	3.22
Patent High	9.14	6.43	2.71
Patent Mid	9.10	6.51	2.59
Patent Low	9.01	5.84	3.18
All Patents Pooled	9.08	6.25	2.83

In general, subjects in the various Patent conditions provided more creative answers than did subjects in the Copyright condition. The data are fairly consistent with the previous studies reported, as well as an unreported pilot study: Copyright and No Incentive are similar, and induce worse performance than the Patent conditions (which all perform similarly).

Table 5

	Creative Answers	No Incentive/ Copyright Comparison	Copyright/ Patent Comparisons	No Incentive/ Pooled Patent Comparison
No Incentive	5.12 (4.42)	$p = 1, n.s.$	All ps $n.s.$	$p = .051$
Copyright	5.32 (3.79)			
Patent High	6.43 (6.08)			
Patent Mid	6.51 (5.99)			
Patent Low	5.84 (5.19)			
All p values are SPSS-adjusted Sidak ps . Bonferroni corrections did not differ significantly.				

Chart 2



*Error bars are standard errors

When we compare all of the conditions using full corrections for significance, post-hoc analyses do not indicate differences in performance at standard statistical levels.¹⁸² Subjects in the Copyright condition did not perform significantly differently than those in the No Incentive condition. Because performance in each of the Patent conditions did not differ significantly, we also look at comparisons when the Patent conditions are pooled. Those in the pooled Patent conditions performed the best ($M = 6.25$, $SD = 5.76$), with Copyright performing second-best (5.32) and No Incentive performing the worst (5.12).¹⁸³ Post-hoc tests with Sidak corrections reveal the No Incentive vs. pooled Patent differed marginally ($p = .051$) and Copyright vs. pooled Patent differed somewhat ($p = .147$). Copyright and No Incentive did not differ.

If we look at the representative comparison between the Copyright and Patent Mid conditions, those in the Patent Mid condition produced no more *total* answers than those in the Copyright condition (difference = .56, $t = .993$, $p = .321$). They did, however, produce a significantly greater number of *creative* answers (difference = 1.19, $t = 2.04$, $p = .042$). These results suggest that the establishment of some creative threshold positively affects subjects' performance on a verbal creativity task. When creative answers are incentivized by a threshold that conditions a prize on achieving the threshold, subjects tend to provide more of them.

Responses to the demographic questions revealed no significant differences based on reported age or gender. Both education level and self-

182. Omnibus $F(4,795) = 2.32$, $p = .056$.

183. Omnibus $F(2,795) = 3.83$, $p = .022$.

reported verbal ability were significantly correlated with creative answer generation on the task but were equally represented across conditions.

We again assessed competitiveness using the same items as in Experiment 1 on computational creativity. Competitiveness was correlated with the production of creative answers ($r = .073, p = .039$). However, there were no differences in competitiveness across conditions.

We asked participants their perceived likelihood of winning on a six-point Likert scale.¹⁸⁴ Participants were generally pessimistic about their chances,¹⁸⁵ although perceived likelihood of winning was correlated with generation of creative answers ($r = .251, p < .0001$). We also asked those in the Patent conditions how likely they thought they would be to exceed the threshold and get into the lottery. Participants in the Patent conditions were slightly more optimistic about clearing the threshold than winning,¹⁸⁶ and this was again correlated with how many creative answers participants generated ($r = .364, p < .0001$).

These variables could help us assess the psychological mechanism that is responsible for the performance differences between conditions. For example, do any of the conditions induce differential beliefs about the likelihood of winning, which in turn produces better performance? In order to assess this, we constructed several mediation models.¹⁸⁷ We used the bootstrap model of Preacher and Hayes¹⁸⁸ to estimate (separately) the indirect effect of both likelihood of winning and probability of surpassing the threshold on production of creative answers based on 10,000 bootstrap samples. According to the simulations, the indirect effects of likelihood of winning and probability of surpassing the threshold between any of the conditions failed to reach significance. That is, according to the mediation models, the differences in production of creative answers described above do not operate through the mediating influence of either perceived likelihood of winning or perceived likelihood of surpassing the threshold.

184. The categories were Very Unlikely, Unlikely, Somewhat Unlikely, Somewhat Likely, Likely, and Very Likely.

185. The mean response was 2.10 (Unlikely); 86.2% responded Somewhat Unlikely or below.

186. The mean response was 2.61 (between Unlikely and Somewhat Unlikely).

187. Mediation is a statistical tool used to identify a third variable that explains the relationship between the independent and dependent variables. In our experiment, we tested to see whether differences in performance by condition could be explained by a more complex process: specifically, that the conditioning induced different expectations of winning, which in turn induced differential performance.

188. Kristopher J. Preacher & Andrew F. Hayes, *SPSS and SAS Procedures for Estimating Indirect Effects in Simple Mediation Models*, 36 *BEHAV. RES. METHODS INSTRUMENTS & COMPUTERS* 717, 721–22 (2004). This method is preferred to the traditional one proposed by Reuben M. Baron & David A. Kenny, *The Moderator–Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations*, 51 *J. PERSONALITY & SOC. PSYCHOL.* 1173, 1174–81 (1986), as it does not rely on the assumption that the sampling distribution of the mediation effect is normal.

If anything, the process is working in the other direction. For example, the differences in assessment of win likelihood between the Copyright and Patent Mid conditions are mediated by differences in performance on the task.¹⁸⁹ That is, the difference in performance drives expectations of winning, not vice versa.

In general, our test of the effects of thresholds on verbal divergent creativity aligns with the results of our test of computational convergent creativity in Experiment 1. In both experiments, the existence of some threshold for entry into a prize lottery produced more creative answers when compared to a condition where subjects would always be entered into the lottery. Our attempts to determine the psychological mechanism responsible for this improvement are, however, inconclusive at this stage. Our data suggests that a high threshold may have a stronger impact on verbal creativity than a lower threshold, but more work is needed to test whether and why this is the case. It seems that the existence of some threshold rather than no threshold generates more verbal creativity.

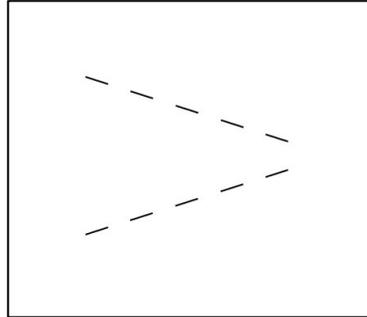
C. Experiment 3 – Figural Creativity

In Experiment 3, we continued to test the effects of creativity thresholds on divergent thinking, although this time the task involved visual or figural creativity rather than verbal creativity. Here, we adapted a series of stimuli that have been repeatedly used in creativity research.¹⁹⁰ Subjects were shown a simple black and white figure (see Figure 1), and they were given three minutes to name as many things as it could be. This task was then repeated with two additional stimuli. Subjects were told that they would play three separate creativity games in which they would be shown pictures and asked to describe as many things as the pictures could be. Subjects were told that the creativity of their answers would be judged and that they would receive a cumulative score between 0–100 based on their overall creativity.

189. $\beta = .10895\%$ CI: [.0099, .2328].

190. See, e.g., Mark A. Runco, *Flexibility and Originality in Children's Divergent Thinking*, 120 J. PSYCHOL. 345, 346–47, 351 (1986) (using “open-ended problems” involving “ambiguous figural stimuli” to test the creative flexibility of children).

Figure 1: Sample Stimulus from Experiment 3



Divergent-thinking tasks such as this one are intended to measure a variety of aspects of creative behavior, including subjects' ability to generate many original or creative solutions to an open-ended prompt. The skills associated with divergent thinking about images, however, might be different from those associated with thinking about words. Since IP law covers manifold kinds of creative output, we incorporated a task that matched other key areas of creativity. A figural task like this aligns with the kinds of tasks that are specifically important to many fields governed by IP regimes, including product design; mechanical engineering; and the creation of pictorial, graphic, and sculptural works.

As with the previous experiments, subjects were recruited via Amazon's Mechanical Turk and directed to Qualtrics to complete the study. Again, recruitment was restricted to those in the United States. In total, 1,007 subjects completed the study. Subjects were placed into the same five threshold conditions discussed above.

Participants were shown three different figures sequentially and asked to generate as many ideas in 180 seconds about what each figure could be. Creativity Testing Services (CTS) scored the task according to traditional indices of fluency (overall count of responses provided),¹⁹¹ originality (answers not commonly provided by other participants in the sample),¹⁹² and flexibility (number of different lexical categories that responses fit).¹⁹³

191. Fluency was measured as follows: Subjects' answers that were abbreviated or incoherent (after a spell-check procedure was done) were removed from their fluency count. After applying that filter, fluency was measured based on the sum of responses given.

192. Once responses were corrected for typos and spelling errors, each response was standardized to remove subtle redundancies. For example, "a coin" was standardized to "coin." The standardized answers, together with how frequently each was given, provided a count of the most commonly given responses, which in turn, determined originality scoring. The originality scoring procedure was that the top 10% of most commonly given responses were assigned to a

Forty-six participants were removed from analysis at their own suggestion. The mean results based on the ratings of the answers given by the remaining 961 participants are displayed below.¹⁹⁴

Table 6

	Figure 1	Figure 2	Figure 3
Analyzed <i>N</i>	960	944	944
Total Unique Standardized Responses	1553	1872	1387
Total Lexical Categories	10	8	7
Fluency Mean	7.459	6.831	7.041
Originality Mean	2.275	2.151	2.244
Flexibility Mean	4.303	3.756	3.581

By measuring the number of creative answers per second, we can normalize the creative output with respect to time spent on the task.¹⁹⁵ Time spent on the task highly correlated with the total creative answers produced in a given task (all $r_s \geq .439$), but time spent on the task did not differ across conditions.

category of “unoriginal,” and all responses not so deemed to be “unoriginal” were given a point for originality. Each subject then received an originality score, as per CTS procedure, by summing the originality points of that subject’s answers.

193. The standardized responses used for originality scoring, see *supra* note 192, were also used to assign them to lexical categories established by prior samples that used the same figural tasks. These lexical categories provide general themes of subject responses and were developed to capture all possible responses provided by participants. The variety of categories in which a subject’s answers fall provides insight on the subject’s cognitive shifts throughout her ideational process. Once responses have been assigned categorical attributes, the numbers of unique categories are then summed for each subject, resulting in a flexibility score for each subject.

194. Note that not all participants completed all three figure tasks.

195. It might be the case that two participants who have the same productivity might have different costs of time, meaning that some do not persist, even though they would do equally well. We test for this by standardizing over time.

Table 7

	Analyzed <i>N</i>	Average Fluency	Average Originality	Average Flexibility	Average Originality per Minute
No Incentive	193	7.10	2.14	3.97	1.06
Copyright	195	7.54	2.43	4.02	1.16
Patent High	191	7.55	2.32	4.07	1.07
Patent Mid	193	6.89	2.11	3.78	1.07
Patent Low	189	7.62	2.51	4.03	1.26
All Patents Pooled	573	7.34	2.30	3.97	1.13
Averages are across all 3 tasks.					

Planned contrasts revealed the following results:¹⁹⁶

Table 8

	Creative Answers	No Incentive/ Copyright Comparison	Copyright/ Patent Comparisons	No Incentive/ Pooled Patent Comparison
No Incentive	2.14 (1.97)	$t(956) = 1.29$ $p = .198, n.s.$		
Copyright	2.43 (2.18)		All t s ≤ 1.42 All p s $n.s.$	
Patent High	2.32 (2.30)			
Patent Mid	2.11 (2.22)			$t(956) = .951$ $p = .342, n.s.$
Patent Low	2.51 (2.30)			
All Rules Pooled	2.30 (2.20)	No Incentive vs. All Rules Pooled $t(956) = 1.14, p = .253 n.s.$		
Pooled Patent	2.32 (2.28)	Copyright vs. Pooled Patent $t(956) = .623, p = .533 n.s.$		
Patents vs. Each Other		All t s $\leq 1.77, All p$ s $n.s.$		

There were no differences at all across any of the conditions, on any of the measures.¹⁹⁷ Several factors did correlate with production of creative answers, including time spent on the task (as noted above), how much fun participants thought the task was ($r = .169$), self-reported motivation ($r = .126$), how well they understood the task ($r = .116$), self-reported education ($r = .119$), and self-reported special ability ($r = .064$). None of these factors differed across condition, except motivation, which was higher in both the Copyright (8.03) and Patent Mid (8.07) conditions as compared to the No Incentive condition (7.45).¹⁹⁸

A bootstrapped mediation analysis indicates that, as expected, any lower output in creative answer production by those in the No Incentive

196. The results do not differ if we look at the “creative answers per minute” metric.

197. Although these results are not stated as a total creativity score of between 0 and 100, as subjects were instructed, the fluency, originality, and flexibility scores given to each subject could readily be normalized to a 100-point scale. The normalization does not affect the analysis herein.

198. Scale from 0–10; Sidak adjusted p s = .048 and .026, respectively.

condition (compared to those in Copyright or any Patent condition) can be explained at least in part through lower reported motivation (95% CI: [.0091, .1159], based on 10,000 resamples). We also found that reported enjoyment of the task was highly correlated with motivation as discussed above. Those two factors (No Incentive vs. Any Rule condition and task enjoyment) alone accounted for nearly 20% of the variance in motivation across all participants ($R^2 = .19$).

We find that motivation has an impact on the generation of creative answers through persistence: Those who report higher motivation tend to spend longer on the tasks, and as a result generate a greater number of creative answers (95% CI: [.0784, .1556], based on 10,000 resamples). Note that this mediation is not significant for the “creative answers per minute” metric. That is, motivated participants are not producing answers any faster, but they simply persist longer and hence generate a higher volume of answers. If this is the case, our short time window (180 seconds per task) could explain our failure to detect significant differences between the conditions. Had we used a longer time window, variations in motivation between the conditions may have resulted in measurable differences in creative output.¹⁹⁹

In addition, although the threshold conditions did not produce any changes in creative output, we have some clues about the differences between internal motivation (such as how much one enjoys a task) and external motivation (such as how much the particular incentive condition affects output). This in turn might begin to explain some of the nuances of how and when these rules are likely to affect creative output. Future research should explore how these factors interact in a complex environment.

D. Experiment 4 – Non-Creative Task

Our findings from two of our previous three experiments suggest that subjects perform better on a variety of creative tasks when their chance to win a monetary prize is determined by a high threshold of achievement. What is unclear, however, is whether this effect is specifically related to performance on creativity tasks or whether it exists for other kinds of tasks as well.

To begin to answer this question, we performed an additional experiment using a simple addition task. Subjects were presented with ten numbers in a matrix and asked to find the two that summed to a target

199. In Experiments 1 and 2, we detected some significant differences between conditions even using short time periods similar to those used in Experiment 3. It is possible, however, that variations in performance simply show up earlier with certain kinds of creativity than they do with others.

number. Like the creativity task, this task required our subjects to engage in cognitive effort, but unlike those tasks, this task did not involve creativity. Our goal with this experiment was to isolate the role of creativity in our results. In the previous experiments, it was possible that the high threshold was simply motivating greater cognitive effort rather than motivating greater creativity. Here, we test whether the different thresholds produce different results when only cognitive effort is at stake.

Subjects were initially told that they would be playing a game in which they needed to find two numbers that added up to a target number.²⁰⁰ Subjects were shown successively a series of matrices, each of which included ten two-digit numbers and was paired with a “target” number that was the sum of only two of the numbers in the matrix. Before seeing this series of matrices, subjects were given a practice round with one matrix and associated target number to make sure that they understood the game. Subjects were then told that they would receive one point for each matrix they solved correctly (by selecting the two numbers that summed up to the associated target number) in a total of 90 seconds. They then completed the task.

As with the creative tasks in Experiments 1–3, the subjects were randomly assigned to one of the five threshold conditions. There were 30 possible matrices to solve, but the maximum number attempted in 90 seconds was 16. Although we did not make any attempt to stop participants from using alternate means to solve the problems, the time constraint and number of possible combinations makes it more costly to cheat than to simply solve the problem by inspecting and summing.

Of the 1,007 participants in the sample, 32 had technical errors with the task and were not timed. These subjects are excluded from the main analyses (but are nonetheless utilized to provide some baseline information about task difficulty, as outlined below). Four additional participants are excluded for a different error which makes it unclear how much of the task they were able to complete before being moved on to the demographic questions. Of the remaining 971 participants, 27 said that we should not use their data (as described with regard to the previous experiments above). The analyses that follow are of the remaining 944 participants (except where noted).

200. A similar task design has been used by other researchers as well. See Ariely et al., *supra* note 94, at 460–61.

Across the conditions, participants answered an average of 4.24 of the problems (SD = 2.19) in the allotted 90 seconds. Below are the results of the first five problems (time expired during the 6th round or earlier for 74.9% of the participants):

Table 9²⁰¹

	Round 1	Round 2	Round 3	Round 4	Round 5
Average Time to Solve	26.40 (18.83)	19.90 (12.79)	9.65 (7.40)	12.50 (7.51)	17.81 (8.52)
Percent Correct Solutions	85%	94%	98%	97%	91%
<i>N</i>	905	797	732	606	384
Percent Correct (no time constraint)	72%	87%	97%	94%	84%

There were no significant differences across conditions in task performance. This is true for total number correct,²⁰² total number attempted,²⁰³ and percent correct of those attempted.²⁰⁴ If we look again at our representative comparison between Copyright and Patent Mid, they are not statistically different on any of the measures (all *ts* ≤ .626, *n.s.*). Below are the results from a one-way ANOVA of several key contrasts.

201. All means exclude participants whose 90 seconds expired during the round. The “no time constraint” averages are for the above described participants whose timers did not work.

202. $F(4,939) = .943$, *n.s.* All Sidak adjusted *ps* ≥ .572.

203. $F(4,939) = 1.078$, *n.s.* All Sidak adjusted *ps* ≥ .556.

204. $F(4,939) = .116$, *n.s.* All Sidak adjusted *ps* = 1.

Table 10

	Puzzles Solved Correctly	No Incentive/ Copyright Comparison	Copyright/ Patent Comparisons	No Incentive/ Pooled Patent Comparison
No Incentive	4.16 (2.23)	$t(939) = 1.48$ $p = .140, n.s.$		
Copyright	3.81 (2hh.23)		$All ts \leq .589$ $All ps \geq .556, n.s.$	
Patent High	3.84 (2.00)			
Patent Mid	3.75 (2.30)			$t(939) = 1.64$ $p = .101, n.s.$
Patent Low	3.95 (2.44)			
All Rules Pool	3.84 (2.25)	No Incentive vs. All Rules Pooled $t(939) = 1.74, p = .082 n.s.$		
Pooled Patent	3.85 (2.26)	Copyright vs. Pooled Patent $t(939) = .181, p = .857 n.s.$		
Patents vs. Each Other		$All ts \leq .856, All ps \geq .392, n.s.$		

We asked many of the same demographic questions of the participants, including age, gender, motivation on the task, how fun they thought the task was, how competitive they were, how educated they were, and how good they were at math. Age was uncorrelated with performance. Men tended to get more correct answers than women (Male $M = 4.24$, Female $M = 3.24$, $t = 5.79$, $p < .001$), but gender was distributed evenly across conditions. Unsurprisingly, self-reported education, math ability, and task enjoyment were significantly correlated with performance (all $rs \geq .089$, all $ps \leq .006$). Competitiveness also predicted performance, such that those who scored 1 point higher on the competitiveness scale produced on average 0.31 more correct answers. All of the above factors, however, were evenly distributed across conditions. Finally, participants who scored better believed they were both more likely to get into and win the lottery (both $rs \geq .176$, both $ps \leq .0001$).

Two interesting factors that were correlated with performance were estimations of how many others were in the game in total, and estimations

of how many others were in the lottery (Patent conditions only).²⁰⁵ Estimations of how many others were in the game in total were evenly distributed across conditions.²⁰⁶ For the Patent conditions, estimates of how many people would make the lottery did increase with the threshold (as in previous studies), but a mediation analysis indicated that this estimate did not mediate the relationship between condition and performance.²⁰⁷

These results suggest that the different threshold conditions employed in this study do not significantly affect subjects' effort on simple cognition tasks.²⁰⁸ Thus, the differences between conditions that we observe in the earlier experiments are more likely based on a relationship between threshold level and creative performance.

E. Summary of Results

Prior research on creativity incentives suggests that in certain circumstances the provision of rewards for creative performance undermines creativity.²⁰⁹ That research indicates that monetary incentives could negatively affect creativity by either crowding out people's intrinsic motivation or causing them to choke.²¹⁰ The work by Amabile, Ariely, and others, although not directly addressed to the issue of creativity thresholds, seemed to suggest that high thresholds might similarly affect creativity.²¹¹ One implication of their research was that the high creativity threshold associated with patent law would produce poorer creative performance than copyright law's low threshold. Our results are not consistent with that prediction, and they suggest that, in fact, the opposite might be true.

In none of our experiments did subjects in the Patent conditions perform significantly worse than those in the Copyright or No Incentive conditions. This is true even in our final experiment involving non-creative cognition. Although it is difficult to tell why, the high threshold in the Patent conditions did not adversely affect subjects' performance by crowding out subjects' intrinsic motivations or causing them to choke.

205. Both Spearman $r_s \geq .162$, both $p_s \leq .0001$.

206. Kruskal-Wallis $H(4) = 7.943$, $p = .094$. A nonparametric test was used because the estimates for this question were unbounded and ranged from 0 to 2,000,000.

207. $\beta = -.0006$, 95% CI: $[-.0078, .0300]$. A CI that includes zero indicates a nonsignificant indirect effect, based on 10,000 bootstrapped resamples, as described in Preacher & Hayes, *supra* note 188. Though there was no effect of condition on performance, it is still possible for mediation to be detected. See Hayes, *supra* note 172.

208. An unreported pilot study yielded similar results. That study involved a memory task that asked subjects to name as many U.S. Presidents as they could in ninety seconds. There were similarly no statistical differences between the conditions.

209. See *supra* section II(A)(2).

210. See *supra* section II(A)(2).

211. See *supra* section II(A)(2).

Moreover, our research suggests that the opposite may be true of high thresholds—the existence of some non-trivial creativity threshold seems to have produced better results. In Experiment 1 (computational creativity), Patent subjects consistently outperformed those in the Copyright and No Incentive conditions. And the results from Experiment 2 (verbal creativity) are generally similar. The overall direction of the data is consistent, with better performance in Patent conditions, and the comparison between performance in the Copyright and Patent Mid conditions found that the high threshold produced significantly more creative answers. These findings are in accord with the research on goal setting discussed above.²¹² The results from Experiment 3 (figural creativity) suggest that part of what creativity thresholds might affect is motivation, which engenders greater persistence, and hence greater output. The impression from Experiment 4 (non-creative task) is dissimilar; we saw no difference in performance when the task did not call for creativity.

Interestingly, none of our experiments indicates any significant differences between the various Patent condition thresholds. We considered that if a choking effect were to emerge, perhaps it would do so as the threshold increased. We see no evidence of this in our data. Perhaps such an effect would have emerged if the threshold became yet more difficult to achieve (for example, a threshold cutting off all but the top 1%). Whatever effect the higher threshold seems to be having, it appears to be doing its work only by imposing a non-negligible threshold in the first place.

Finally, we should note that although we do not find as strong a difference between the Copyright and Patent conditions in Experiment 2 as in Experiment 1, that does not mean that such a difference does not exist for verbal creativity. Unlike the data for Experiment 1, in which the creativity scores were measured objectively, in Experiment 2 the data are measured subjectively, producing more noise. It is possible that whatever effect the threshold may have been having in Experiment 2 was simply drowned by the noisiness of the subjectively scored data.

Experiment 3 failed to yield significant differences between the threshold conditions, and this too may have been a difficulty with our study design. Although the scoring metrics that we used for Experiment 3 were objective measures of creativity, they may not have fully captured the variability in and complexity of creativity involved in the figural creativity task. In addition, the relationship between motivation, task persistence, and creativity suggests that the short time period of our study may have blunted differences that would have appeared with a longer duration.

212. *See supra* notes 127–28.

IV. Implications for IP Law

The experiments reported in this Article shed interesting new light on the effects of incentives on creativity and the role of thresholds in IP law. Before we spell out the implications of this research, it is important that we discuss the limitations of our experiments and the generalizability of our findings.

A. Addressing the Limitations of This Research

In these experiments, higher creativity thresholds appear to produce no worse creativity and may, in fact, produce more and better creativity than do low thresholds. The main drawback of this kind of research, however, is that it requires considerable abstraction from “real world” contexts in order to produce an experimental setting that is not so complex as to be unadministrable. The legitimacy and extent of these abstractions affect an experiment’s ecological validity (how well it tracks what happens in the real world). Here, we address four concerns about the ecological validity of our research.

First, the subjects in our experiments were all laypeople recruited from Amazon’s Mechanical Turk and not professional or amateur creators. This difference could matter for a number of reasons. For example, our subjects and “real” creators might differ in the degree to which they are internally motivated to complete the creativity tasks. As explained in Part II, research suggests that internally motivated people may respond differently to incentives than externally motivated people. Perhaps, for example, we did not find a “crowding out” effect because our subjects had little to no intrinsic motivation to crowd out and the high threshold simply motivated them to work harder than the low threshold did.²¹³

Obviously, whether this is true is subject to empirical validation. We plan to run similar experiments in the future using subjects who could be

213. Or conversely, perhaps Amazon’s Mechanical Turk subjects are very likely to be externally motivated, given that they opt to use this service to earn money for tasks. Our experiments suggest that this may be true in the sense that they are very sensitive to small differences in payouts. When we first ran our pilot experiments, we offered subjects no money to participate, but only a chance to win a \$500 prize. It took a long time to get subjects to participate, but once we did, we recorded results in a version of the Experiment 1 task that were virtually identical to those reported here. We then re-ran the pilot experiments offering subjects \$1 to participate and a chance to win a \$500 prize. Very quickly, we had enough subjects, finished data collection, and recorded results virtually identical to those reported here. At the same time, in another experiment implementing the computational-creativity task, we asked subjects whether they would prefer to be in the Copyright condition or a Patent condition. Of 186 usable participants, 86% preferred the Copyright condition ($N = 160$) and 14% preferred a Patent condition ($N = 26$). There were no statistically significant differences between those who chose the Copyright condition and those who chose a Patent condition.

thought of as specialists in these fields.²¹⁴ That said, with the removal of formalities in copyright law²¹⁵ and the rapid growth of user-generated content,²¹⁶ copyright law increasingly confronts nonprofessional creators. Much of copyrightable production now comes from nonprofessionals,²¹⁷ to whom our findings may be especially applicable.

Related to this concern is a second issue about real-world creativity contexts. Much creative production occurs within the contexts of firms or other organizations.²¹⁸ Scientists may work for companies or universities, and computer programmers, writers, and musicians may all be employed by or working for others. In these situations, creators' incentives may not be structured by the IP regime but rather by internal mechanisms such as payment, rewards, or tenure.²¹⁹ Although in some of these situations producing a protectable creation may be important for innovators' careers and compensation,²²⁰ the IP system and its thresholds may not be especially salient.²²¹

Our response to this concern includes two parts. First, it is possible that the creativity thresholds we study here have similar effects on those managers and directors who guide research and innovation within firms. Specifically, although the individual creators may not be aware of the thresholds, the directors will be and may respond similarly to those in our study. Further research could test this hypothesis.

214. For example, we might test computer programmers in the computational-creativity task, creative-writing students in the verbal-creativity task, and designers or engineers in the visual-creativity task.

215. See Christopher Sprigman, *Reform(alizing) Copyright*, 57 STAN. L. REV. 485, 487–88 (2004) (characterizing the Copyright Act of 1976, Berne Convention Implementation Act, the Copyright Renewal Act, and the Copyright Term Extension Act as having discarded copyright's formal procedural mechanisms).

216. See Edward Lee, *Warming Up to User-Generated Content*, 2008 U. ILL. L. REV. 1459, 1481 (noting a survey indicating nearly 50% of web users had created content of some kind for others to view on the internet).

217. *Id.* at 1460.

218. Fromer, *supra* note 9, at 1779.

219. Robert P. Merges, *The Law and Economics of Employee Inventions*, 13 HARV. J.L. & TECH. 1, 38–40 (1999) (explaining that firms and other organizations tend to provide incentives to their employees, such as awards and other recognitions); see also Fromer, *supra* note 9, at 1780 n.215 (noting that “[t]he need for expressive incentives in the law might be diminished in cases of corporate creation to the extent that firms comprehensively provide optimal expressive incentives to motivate their employees”).

220. See Ofer Tur-Sinai, *Beyond Incentives: Expanding the Theoretical Framework for Patent Law Analysis*, 45 AKRON L. REV. 243, 280 n.185 (2012) (observing the “prevalent practice among scientists and engineers to list patent applications in their resumes”).

221. Similarly, creative production frequently occurs in teams, see, e.g., Anthony J. Casey & Andres Sawicki, *Copyright in Teams*, 80 U. CHI. L. REV. 1683 (2013), which might also change the effects or salience of IP thresholds.

Additionally, our research should be relevant not just to those who are interested in designing optimal IP incentives but to everyone—including managers and directors—who is trying to structure incentive regimes to improve performance. The low threshold for obtaining a copyright implies that firms and organizations cannot use the legal standard as a legitimate measure of the quality of internally produced works. Accordingly, managers will likely need to craft their own mechanisms for encouraging and measuring creativity.²²² Our research provides evidence for how those mechanisms should be structured. Thus, even though our experiments do not perfectly model the creative process within organizations, our findings should be interesting to those who think about innovation in such contexts.²²³

Another issue worth addressing is the salience of the thresholds in our study. In real-world creativity contexts, people probably do not know precisely how creative they have to be to qualify for IP protection.²²⁴ While sophisticated inventors may understand patentability thresholds and consciously adjust their behavior accordingly, it seems unlikely that many or any authors do the same for copyright law. Accordingly, the high salience of the thresholds in our experiments deviates from many real-world scenarios. This is, however, an artifact of the current copyright law in the United States. With thresholds set as low as they are, creators need not bother thinking about whether their output will be sufficiently creative. Were those thresholds set higher, as some scholars recommend,²²⁵ creators would likely pay attention to the threshold in order to ensure that they clear it.

A final limitation of our study design is that all of our creativity tasks focus on the relatively rapid generation of answers. While these kinds of short-term tasks are widely used in social-science literature on creativity, they may miss important aspects of creativity involving the incubation and development of ideas.²²⁶ It is possible, for example, that when people are subject to intense time pressures their behavior differs from when they have plenty of time to think and create.²²⁷ It is difficult for us to predict how this

222. Cf. *id.* at 1729–35 (discussing how copyright law’s right to prepare derivative works can be used to manage team creation in firms).

223. Cf. Fromer, *supra* note 9, at 1779–81 (maintaining that creators still need incentives to create even if firms secure most IP rights).

224. See Shyamkrishna Balganesh, *The Normativity of Copying in Copyright Law*, 62 DUKE L.J. 203, 266 (2012) (calling copyright’s originality threshold “vague”); Christopher A. Cotropia, *Modernizing Patent Law’s Inequitable Conduct Doctrine*, 24 BERKELEY TECH. L.J. 723, 776 n.273 (2009) (observing that patent law’s “standard for nonobviousness is very unclear”).

225. See *supra* text accompanying notes 51–55.

226. We are indebted to Pam Samuelson for this observation.

227. See Teresa M. Amabile et al., *Assessing the Work Environment for Creativity*, 39 ACAD. MGMT. J. 1154, 1161 (1996) (discussing research on time pressure and creativity).

difference might affect our results. Would subjects with more time focus more on internal motivation than external incentives or would high thresholds become even more salient? Again, further research could answer these questions.

B. Implications

We began this research with two opposing views of the probable effects of patent law's high threshold on creativity. On the one hand are legal scholars who suggest that a higher, patent-like threshold in copyright law would promote more and better creativity as creators strove to meet it. They argue that a higher creativity threshold in copyright law would motivate creators to produce better works. On the other hand, some social-science research by Amabile, Ariely, and others cautions about the effects of high external incentives. Their research indicates that higher rewards for creativity could crowd out intrinsic motivation or lead to choking. When applied to the issue of creativity thresholds in IP law, their work seems to suggest that patent law's high threshold could be undermining creative performance relative to copyright law's trivially low threshold.

Our experiments were designed to directly test the effects of high creativity thresholds in IP law, and our results are generally inconsistent with the predictions based on this social-science literature and consistent with the reasoning of the legal scholars. We see no evidence of crowding out or choking when subjects face high patent-like thresholds. Further, we see some evidence that high thresholds actually produce better creativity.

What are we to make of these results? First, there seems to be little reason to fear negative effects caused by high creativity thresholds, at least for creators who are externally motivated. This, of course, does not mean that the research by Amabile, Ariely, and others is wrong. That research makes clear that, when it comes to incentives and creativity, context matters a lot.²²⁸ Our results are consistent with this focus on context—while directly giving subjects high monetary incentives for performance without instructing them that they ought to be creative may reduce creativity, structuring those incentives through IP-like probabilistic thresholds and instructing them to act creatively may not. More research will be needed to fully understand the psychological mechanism that distinguishes these situations, but this suggests a promising avenue for future experiments. This finding is important not just for IP law but also for innovation research more broadly. It indicates that incentives structured as probabilistic thresholds rather than as direct pay-for-performance targets and that are clear as to the goal of performance may not undermine creativity.

228. *See supra* section II(A)(2).

Second, the experiments reported in this Article give some qualified support to arguments of legal scholars who advocate heightening copyright law's low creativity threshold. Clearly in Experiment 1 and somewhat less so in Experiment 2, the higher Patent threshold resulted in better creativity than the lower Copyright threshold. These findings give empirical backing to the standard economic assumptions about motivation and incentives: Higher is better.

We should be clear—our research is not close to answering with finality the question of whether copyright law should impose a higher threshold on creators. As we explained above, scholars have offered multiple justifications for the differences between patent and copyright thresholds.²²⁹ Among the various arguments for where copyright and patent thresholds should be placed, the differing incentive effects of thresholds is only one of many. Even if our findings gave unqualified support for the claim that higher thresholds produce better creativity, those creativity benefits would have to be weighed against the costs of imposing a higher threshold, including information, error, adjudication, and psychological-preference costs.

Nonetheless, as a matter of direct legal implications, our research suggests a number of further inquiries about IP incentives. First, our results suggest that the effect of IP thresholds on creativity may vary significantly depending on the specific type of creativity at issue. Additional research is needed to understand fully which types of creative work are responsive to incentives in the way that the rational-choice model predicts and which types are less so. It is possible, for example, that the computational creativity in Experiment 1 is more sensitive to high thresholds than the divergent thinking verbal and figurative creativity in Experiments 2 and 3. If so, one might posit that higher thresholds are more appropriate in patent law than they are in copyright law. Our findings do not establish that this is the case, but they do suggest that the question is a good target for future research.

Relatedly, if different kinds of creativity respond differently to thresholds and incentives, then we must ask whether patent and copyright laws are properly calibrated across their respective subject matter. This inquiry is particularly important given that both patent and copyright laws concern fields of heterogeneous creativity, and in particular, both divergent and convergent thinking.²³⁰ Copyright law and patent law apply different thresholds for protection, but each applies its own threshold with little variation across a very wide variety of different types of creativity (everything from motion pictures to software to shampoo bottle labels for

229. *See supra* subpart I(B).

230. *See supra* section II(A)(1).

copyright, and a similarly wide range from pharmaceuticals to cell phone interface designs to the business method of online one-click ordering for patents).

Our experiments also suggest opportunities for further calibration of creative incentives within IP fields. For example, the standard method for increasing authors' incentives in copyright law has been to lengthen the copyright term—that is, to give authors more rights.²³¹ But, if creativity in a wide enough number of areas within copyright's jurisdiction can be stoked by higher thresholds, then it may be that raising the creativity threshold for protection might be a more important and less expensive method to produce valuable creative contributions. The use of higher copyright thresholds, at least in certain areas, could “buy” more creativity at a lower social price.

Finally, it is worth contemplating whether and how the results of our study might have differed if our subjects had been professional or serious amateur creators. The subjects in our experiments are not professional creators. Moreover, given that they are choosing to participate in Mechanical Turk, there is a strong chance that they are extrinsically rather than intrinsically motivated. If that is correct, the sort of low threshold set up by copyright seems to have no motivating effect versus payment of a (very small) flat fee, at least at the level of reward (the prospect of winning \$500) offered in our experiments. This does not mean that copyright law is not motivating creators in the real world. It is entirely possible, and indeed likely, that if the potential reward were significantly higher, we would see even low thresholds driving performance gains above the No Incentive condition. With a high enough reward, we might see a sort of “tournament effect” in which the low prospect of a very high reward may motivate people to invest heavily in competition for success in especially lucrative and status-conferring creative fields like acting and popular musicianship.²³² Similarly, we suspect that if our subjects were internally motivated professional creators working on creativity tasks that were within their field, we would see even low thresholds driving some performance gains—perhaps because the creators value the prospect of reward not simply for its expected monetary value but as a token of the importance of the creative effort that the subject values intrinsically. But our findings do suggest that

231. *E.g.*, Kelly Trimble, Comment, *Are Copyright Firms Incentive Intermediaries?*, 20 UCLA ENT. L. REV. 137, 142 n.19 (2013) (noting that “[i]ncreasing the copyright term duration is a common legislative incentive tool”).

232. *See* Peter DiCola, *Money from Music: Survey Evidence on Musicians' Revenue and Lessons About Copyright Incentives*, 55 ARIZ. L. REV. 301, 308–09, 339 (2013) (concluding, based on a survey of more than 5,000 musicians, that “[s]tronger copyright enforcement might provide . . . [musicians] incentives to move up the income ladder in a winner-take-all kind of market”).

at least for relatively low-stakes creativity involving nonprofessional creators who are motivated externally, low thresholds may not create significant incentives.

Conclusion

This study is the first to test the effects of IP laws' varying creativity thresholds on creators' behavior. In at least some domains, our experimental results seem to align with standard assumptions about incentives and motivation, in that increasing thresholds stimulate more creativity. All in all, the work that incentives do in IP systems seems much more nuanced and complex than is asserted in legal scholarship. Fundamentally, these results make clear that the central asserted rationale for copyright and patent laws—incentives for creation of valuable works—is open to investigation. We hope that future experimental and other empirical work will continue to shed more light on structuring incentives to be creative.