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Incentives to Create Under a "Lifetime-Plus-Years" Copyright Duration: Lessons from a Behavioral Economic Analysis for Eldred v. Ashcroft

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INCENTIVES TO CREATE UNDER A "LIFETIME-PLUS-YEARS" COPYRIGHT DURATION: LESSONS FROM A BEHAVIORAL ECONOMIC ANALYSIS FOR *ELDRED V. ASHCROFT*

Avishalom Tor* and Dotan Oliar**

ABSTRACT

In this Article, we highlight for the first time some of the significant but hitherto unrecognized behavioral effects of copyright law on individuals' incentives to create and then examine the implications of our findings for the constitutional analysis of Eldred v. Ashcroft. *We show that behavioral biases—namely, individuals' optimistic bias regarding their future longevity and their subadditive judgments in circumstances resembling the extant rule of copyright duration—explain the otherwise puzzling lifetime-plus-years basis*

for copyright protection given to individual authors, and reveal how this regime provides superior incentives to create. Thus, insofar as the provision of increased incentives to individual authors is socially desirable, a lifetime-plus-years rule is a more effective legal means of accomplishing this goal than a rule based on a fixed term of years of a comparable expected duration.

We also find, however, that the behavioral efficacy of a lifetime-plus-years regime does not apply to the Copyright Term Extension Act (CTEA), which merely extends the "years" component of an already existing lifetime-plus-years rule. Drawing on empirical findings on intertemporal choice, as well as our preceding analysis of the lifetime-plus-years regime and our own experimental tests, we determine that the CTEA's prospective extension provides negligible additional incentives to individual authors. We conclude the extension is unjustified on incentive-provision grounds, a finding of relevance to the Court's determination in Eldred v. Ashcroft *of the constitutionality of the CTEA under the Copyright Clause.*

I. INTRODUCTION

In this Article, we begin developing, for the first time, a behavioral economic approach to copyright law.[1] Based on robust findings from the psychology of human judgment and decision-making, we construct an empirically based framework for examining how different copyright regimes impact individual authors' incentives to create. Our framework explains, although not necessarily justifies, the otherwise puzzling, unique regime controlling the works of individual authors under extant copyright law and clarifies the limits of copyright duration as a means for providing monetary incentives to create.[2]

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1. The analysis in this Article is based, in part, on new experimental evidence and analyses we report elsewhere. *See* Avishalom Tor & Dotan Oliar, Introducing a Behavioral Approach to Copyright Law: Behavioral Economic Analysis and Experimental Tests of Alternative Duration Regimes (May 10, 2002) (manuscript in preparation, data tables and statistical analyses on file with authors).

2. While the present analyses focuses on pecuniary incentives, it is largely applicable to non-pecuniary incentives as well.

The provision of incentives to create—that fundamental goal of copyright law[3]—is especially suited for a behavioral economic analysis, given its intrinsically empirical nature. Is copyright regime *A* likely to provide greater incentives to create than copyright regime *B*? And which of these two regimes better balances the provision of incentives to create against the social costs of the copyright system? We believe that these and similar questions are best answered by reference to empirical, scientific observations on human behavior.

Our analysis first highlights a previously unnoticed puzzle in the structure of copyright law, showing that the lifetime-plus-years basis for determining the duration of individual authors' copyright makes little economic sense given copyright's goal of providing incentives to create.[4] Unlike the rule governing other creators—such as patentees or authors of "works made for hire," whose copyright subsists for a fixed term of years from a legally defined moment[5]— individual authors cannot know in advance the duration of their copyright. Instead, their copyright expires after the passing of a fixed number of years following their death.[6]

Therefore, rational individual authors facing an uncertain lifetime-plus-years rule under which their copyright duration depends on their longevity will discount the value of their copyright to account for this increased risk. They will perceive such a regime, where they are required to gamble their investment in creation on

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3. *See, e.g.*, Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417, 477 (1984). For a discussion of the role of incentives in copyright law see *infra* Part II.A.1.

4. Legal scholars have pointed out that the different duration regimes of copyright law as well as the differences between these regimes and the duration of protection given to other forms of intellectual property, such as patents, are puzzling. *See, e.g.*, STEVEN SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW (forthcoming 2002) (manuscript at ch. 12, p. 23, on file with authors) ("[w]hy . . . the duration of [copyright] protection should be so much more generous than for patents, is not evident, and one surmises that it has no clear rationale.").

5. *See, e.g.*, 17 U.S.C. § 302(c) (2000) (extending copyrights for works made for hire for the shortest of ninety-five years from publication of the work or 120 years from its creation); *id.* § 154(a)(2) (patents are in force from the moment the patent issues until the passing of 20 years from the date the patent application was filed).

6. *See id.* § 302(a) (under the CTEA, individual authors enjoy a copyright term beginning from a work's creation and lasting for the author's lifetime plus seventy years).

their longevity, as providing them diminished incentives to create compared to an alternative, less risky, fixed-term copyright regime of a comparable expected duration.[7]

The puzzling lifetime-plus-years duration rule not only diminishes authors' incentives to create, but also fails to reduce the social cost of copyright. It distorts the incentives provided to different types of potential authors, depending on an arbitrary variable—their expected longevity—while simultaneously generating no lesser, and possibly even greater, social costs.[8]

From a traditional economic perspective, therefore, the law's application of a unique duration regime that provides inferior incentives for individual authors to create at a potentially higher social cost seems puzzling, especially given the law's application of a different regime to other creators.

The behavioral economic analysis of copyright law provides an answer to this puzzling choice of regime. It recognizes that potential authors, like other individuals, are "boundedly rational,"[9] being

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7. Importantly, the lifetime-plus-years puzzle does not necessarily apply to a comparison between a lifetime-only and a comparable fixed-term regime. Although creators would face a higher degree of risk when faced with a lifetime-only duration versus a comparable fixed-term duration rule, some of them might still prefer the higher-risk lifetime regime. These creators will opt for the riskier alternative if they value income during their lives significantly more than income to their heirs after their death, since the lifetime regime guarantees income throughout their lives under all circumstances, while the benefits of a fixed-term period to their heirs if they were to die early would be outweighed by the loss of income during their own lives if they were to die late. The same analysis applies, moreover, to a lifetime-plus-years regime that provides only a small number of years beyond the authors' lifetime, where a comparable fixed term would not provide a virtual guarantee of payments throughout the author's life, depending on the length on the "years" component, the distribution of authors' life expectancies, and the ratio of the utility to authors from benefits to themselves versus benefits to their heirs. *See* Tor & Oliar, *supra* note 1; *see also* Nicolas Drouhin, *Lifetime Uncertainty and Time Preference*, 51 THEORY & DECISION 145, 145-46 (2001) (criticizing the common assumption of lifetime certainty in models of choice, offering a simple model that takes lifetime uncertainty into account, and showing its effects on rational agents' decision-making).

8. For a brief explanation and discussion of the various costs generated by copyright see *infra* Part II.A.2.

9. We use a broad definition of "bounded rationality," a concept that was introduced by Herbert A. Simon. *See* Herbert A. Simon, *A Behavioral Model of Rational Choice*, 69 Q.J. ECON. 99 (1955); Herbert A. Simon, *Rational Choice and the Structure of the Environment*, 63 PSYCHOL. REV. 129 (1958).

affected by motivation and emotion and possessing only limited mental resources. Boundedly rational authors must employ simplifying decision heuristics while attempting to make the best judgments and decisions they can. These heuristics, which enable them to function reasonably well in complex environments, also lead individual authors to commit systematic, predictable errors of judgment.[10]

Using a behavioral approach, we show how two such psychological processes, known as optimistic bias and subadditivity, combine to make potential authors prone to overestimate the period during which they will enjoy the benefits of copyright under a lifetime-plus-years regime, but not under a comparable fixed-term one.[11] Boundedly rational authors thus perceive the objectively

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In Simon's terminology, however, bounded rationality denoted only the purely *cognitive* limitations of the human mind. *See also* Avishalom Tor, *The Fable of Entry: Bounded Rationality, Market Discipline, and Legal Policy*, 101 MICH. L. REV. (forthcoming Nov. 2002) (manuscript at 4 n.2 on file with authors) (discussing the distinction between these broader and narrower definitions in greater detail).

10. *See, e.g.*, Amos Tversky & Daniel Kahneman, *Judgment under Uncertainty: Heuristics and Biases*, 185 SCIENCE 1124, 1124 (1974) (emphasis added) (stating that "people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. *In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors.*"). Thus, Jolls et al. explain:

> Bounded rationality . . . refers to the obvious fact that human cognitive abilities are not infinite . . . [P]eople sometimes respond rationally to their own cognitive limitations . . . [b]ut even with these remedies, and in some cases because of these remedies, human behavior differs in systematic ways from that predicted by the standard economic model of unbounded rationality. *Even when the use of mental shortcuts is rational, it can produce predictable mistakes.*

Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1477 (1998) (emphasis added) (explaining how law and economics could be enhanced by increasing their attention to insights about actual human behavior).

11. Significantly, the behavioral phenomena we discuss in this Article are not the only ones bearing important implications for copyright law. For instance, the various psychological processes that lead to overconfident behaviors often lead creators to overestimate the *amount* of annual income they will obtain from creation and the *period* throughout which they will obtain this copyright income, irrespective of their overestimates of copyright duration under the extant lifetime-plus-years regime. Since the present Article focuses on the extant duration regime of copyright granted to individual authors,

inferior former regime as providing them with greater incentives to create than the latter regime. We further buttress this empirically based conclusion by conducting experimental tests of the relative attractiveness of these two regimes.

After applying the behavioral framework we develop to explain the lifetime-plus-years puzzle, we examine the implications of our findings together with other behavioral evidence on intertemporal choice and our own experimental test for the analysis of the Copyright Term Extension Act of 1998 (CTEA).[12] We show how the CTEA's *prospective* extension of copyright to individual authors from a term of the author's lifetime plus fifty years to a term of the author's lifetime plus seventy years provides little additional incentive to create.

Summing up the empirical evidence, we conclude that the CTEA's prospective extension given to individual authors increases the social costs of copyright without providing a significant increase in its benefits. In our concluding remarks we also show how some aspects of our analysis can be extended to the other prospective extensions under the CTEA. We find that the extended fixed term of copyright awarded to works made for hire provides no significantly greater incentives to create than those fixed-term incentives which the pre-CTEA regime had provided.

We submit that our empirically based conclusions are relevant for the constitutional analysis of whether the CTEA complies with the limited mandate given Congress "[t]o promote the Progress of Science and useful Arts" in *Eldred v. Ashcroft.*[13] Thus, although this Article does not focus on the CTEA's retrospective extension— which stands at the heart of the constitutional challenge in *Eldred*— the finding that even the prospective extension under the CTEA provides few additional incentives to create may be helpful to the Court when considering Congress's reasons for passing the CTEA. To wit, because the prospective extension has had a role in justifying the Act as a whole, the conclusion that this extension cannot stand on

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however, we leave the analysis of this and other significant behavioral effects for another time.

12. *See* Sonny Bono Copyright Term Extension Act, Pub. L. No. 105-298, 112 Stat. 2827 (1998).

13. Eldred v. Ashcroft, No. 01-618 (U.S. oral argument Oct. 9, 2002).

incentive-providing grounds casts doubt on the justification of the retrospective extension as well.[14]

Our Article therefore seeks to accomplish a number of complementary goals. First, it develops a broadly applicable behavioral economic approach to copyright law specifically and intellectual property in general. We find the application of this approach especially suited for evaluating the impact of the law's grant of intellectual property rights on individuals' incentives to create.

Second, it exposes a puzzling feature of copyright law and provides a compelling behavioral explanation, although not necessarily a justification, for its continued presence.[15]

Third, it further draws on the behavioral framework we develop to examine the efficacy of the prospective duration extension under the CTEA, finding the Act ineffective and costly—a conclusion of relevance for the constitutional analysis in *Eldred.*

Fourth and last, this Article demonstrates the potential contribution of a behavioral approach to legal analysis in the

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14. Thus, one of the reasons given at the introduction of the Copyright Term Extension Act of 1995 (the CTEA's predecessor) was "to provide a sufficient incentive for the creation of new works of authorship." 141 CONG. REC. S3390 (daily ed. Mar. 2, 1995) (statement of Sen. Hatch). This reason was also cited in two committee reports as justifying the Act. *See* S. REP. NO. 104-315, at 12 (1996) ("the promise of additional income will increase existing incentives to create new and derivative works"); H.R. REP. NO. 105-452, at 4 (1998) ("[e]xtending copyright protection will be an incentive for U.S. authors to continue using their creativity to produce works . . .").

Moreover, scholars have already pointed out that the prospective extensions have been instrumental in justifying their retrospective counterparts throughout the various statutory extensions of the copyright term. *See, e.g.,* Symposia, *The Constitutionality of Copyright Term Extension: How Long is Too Long?,* 18 CARDOZO ARTS & ENT. L. J. 651, 694 (2000) ("since 1790, it has indeed been Congress's policy that the author of yesterday's work should not get a lesser reward than the author of tomorrow's work just because Congress passed a statute lengthening the term today. That has always been a rule of equity that Congress has followed since 1790") (footnote omitted); *see also* Michael H. Davis, *Extending Copyright and the Constitution: "Have I Stayed Too Long?,"* 52 FLA. L. REV. 989, 996 (2000) (arguing that "the prospective copyright term extension was only a stalking, or even a Trojan horse, for the retrospective extension the bill brought to these owners of pre-existing works").

15. As we explain *infra* Part II.A.2., while we find that a lifetime-plus-years rule provides increased incentives to create, our analysis does not determine the absolute optimality of this duration regime.

constitutional arena—a domain that behaviorally informed legal scholarship has yet to explore.[16] We propose that insofar as the Constitution is concerned with regulating human conduct, the neglect of empirical behavioral findings may lead to incomplete, even mistaken, applications of constitutional principles to specific legal rules.

Structurally, this Article consists of four parts. In Part I, we highlight the puzzling nature of the lifetime-plus-years regime of copyright duration. In Part II, we demonstrate how a behavioral approach to copyright law provides a compelling explanation for this puzzle. Then, in Part III, we rely on the behavioral framework developed in Part II together with additional empirical evidence to expose the limited influence of the CTEA's prospective extension of far-future benefits on individual authors' present incentives to create. Finally, in Part IV, we sum up our findings and briefly apply them to the other prospective extensions under the CTEA, concluding that the various prospective extensions cannot be justified on incentive-providing grounds.

II. THE PUZZLING LIFETIME-PLUS-YEARS REGIME OF COPYRIGHT DURATION

In this Part, we explain why a lifetime-plus-years regime of copyright duration appears inferior to a comparable fixed-term regime as a means for providing individual authors with incentives to create. We begin by reviewing the incentive-providing function of copyright law. Next, we show how a lifetime-plus-years regime imposes an additional risk on rational authors, diminishing their incentives to create. We conclude this Part by highlighting some of the additional social costs of the lifetime-plus-years regime, which make the choice of this regime of copyright protection even more puzzling.

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16. It is telling, for instance, that a recent article reviewing a large number of behavioral applications in legal scholarship across a variety of doctrinal fields cites no application in constitutional law. *See generally* Donald C. Langevoort, *Behavioral Theories of Judgment and Decision Making in Legal Scholarship: A Literature Review*, 51 VAND. L. REV. 1499 (1998).

A. Incentives to Create: The Costly and Limited Efficacy of
Copyright

1. The importance of providing incentives to create

The justification for and the reasoning behind Copyright
legislation is primarily utilitarian-economic. Copyright law aims to
induce potential authors to benefit society by creating expressive
works. Thus, while other approaches to intellectual property exist,[17]
the Constitution, the courts, and legal scholars all recognize the
centrality of providing appropriate incentives for the creation of such
socially valuable information.[18]

The Constitution vests in Congress the power to enact copyright
legislation "[t]o promote the Progress of Science and useful Arts."[19]
This foundational principle of copyright law has been elaborated on
by the Supreme Court, which stated that "[c]opyright is based on the
belief that by granting authors the exclusive rights to reproduce their
works, they are given an incentive to create"[20] and that the
"'encouragement of individual effort by personal gain is the best way
to advance public welfare through the talents of authors and
inventors in 'Science and the useful Arts.'"[21]

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17. *See, e.g.*, William W. Fisher III, *Theories of Intellectual Property*, *in*
NEW ESSAYS IN THE LEGAL AND POLITICAL THEORY OF PROPERTY 168
(Stephen R. Munzer ed., 2001) (providing an overview and analyzing four
major theoretical approaches to intellectual property); Peter Menell,
Intellectual Property: General Theories, *in* 2 ENCYCLOPEDIA OF LAW AND
ECONOMICS 129 (Boudewijn Bouckaert & Gerrit D. Geest eds., 2000)
(reviewing various theories of intellectual property).

18. For an introduction to the economic-utilitarian analysis of copyright law
see SHAVELL, *supra* note 4; William M. Landes & Richard A. Posner, *An
Economic Analysis of Copyright Law*, 18 J. LEG. STUD. 325, 326 (1989); *see
also* Wendy J. Gordon & Robert G. Bone, *Copyright*, *in* 2 ENCYCLOPEDIA OF
LAW AND ECONOMICS, *supra* note 17, at 189 (reviewing economic-utilitarian
analyses of copyright).

19. U.S. CONST. art. I, § 8, cl. 8 ("The Congress shall have Power . . . [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.").

20. Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417, 477
(1984).

21. Mazer v. Stein, 347 U.S. 201, 219 (1954); *see also* Twentieth Century
Music Corp. v. Aiken, 422 U.S. 151, 156 (1975); U.S. v. Paramount Pictures,
334 U.S. 131, 158 (1948); Fox Film Corp. v. Doyal, 286 U.S. 123, 127-28
(1932); Kendall v. Winsor, 62 U.S. (21 How.) 322, 327-28 (1858) (referring to

Conventional economic wisdom teaches us that the creation of works of the intellect is socially desirable whenever the social value of these works outweighs the social costs associated with their production.[22] However, economics also reveals that the information embodied in new works is a public good: The consumption of information is both non-rivalrous—meaning that many can enjoy a copyrighted work without it being used up—and partially non-excludable—meaning that it is costly, and sometimes impossible, to exclude non-payers or limit their access to information.[23]

Because information is non-rivalrous and partially non-excludable, if the free copying of works by the public were legal, the price of a copyrighted work that reached the market would be driven down to the marginal cost of making its copy—a relatively small amount—instead of a higher price embodying the cost of producing the information. Anticipating their inability to charge more than the very low marginal cost of copying, however, many authors would decline to invest in creation, and the social level of authorship would tend to be inadequate, resulting in a social loss.[24]

Copyright law responds to this potential problem by providing authors with the right to prevent the free copying and enjoyment of their works, allowing them to recoup their investment in authorship. Given copyright, therefore, the price of these works will be higher

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patents); Grant v. Raymond, 31 U.S. (6 Pet.) 218, 242 (1832) (referring to patents).

22. *See* RICHARD POSNER, ECONOMIC ANALYSIS OF LAW 39-50 (5th ed. 1998) (discussing the costs and benefits of extending property and intellectual property rights); SHAVELL, *supra* note 4; *see also* Alfred C. Yen, *Restoring the Natural Law: Copyright as Labor and Possession*, 51 OHIO ST. L.J. 517, 520 (1990) ("Under the economic copyright model, the propriety of copyright's expansion rests solely on an economic cost-benefit calculation. Courts should allow copyright to expand as long as the benefits of increased creative activity outweigh its costs.").

23. *See, e.g.*, ROBERT COOTER & THOMAS ULEN, LAW AND ECONOMICS 42-43, 126-28 (3d ed. 2000).

24. *See generally* SHAVELL, *supra* note 4 (examining the social advantage of intellectual property rights). For additional formulations of this argument see, *e.g.*, Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 994-95 (1997); Michael Meurer, *Copyright Law and Price Discrimination*, 23 CARDOZO L. REV. 55, 94 (2001).

than the marginal cost of producing a copy, bringing about a better alignment of private and social incentives to create.[25]

2. Evaluating regimes of copyright duration

Copyright law's central goal is to confer on authors such rights that strike an optimal balance between the desire to provide authors with incentives to create and the desire to allow society access to works of authorship.[26]   The economic analysis of intellectual property also shows that copyright protection generates a series of social benefits and costs.[27]   Consequently, determining the optimal scope and duration[28] of copyright becomes a difficult, complex task.[29]

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25. Moreover, empirical evidence relating to the adoption, abolition, and marked shifts in intellectual property regimes worldwide supports the positive correlation between intellectual property protection and enhanced creation. During the French Revolution, for example, copyright was abolished, resulting in an almost complete halt in the production of books and serious journals. *See* Justin Hughes, *"Recoding" Intellectual Property and Overlooked Audience Interests,* 77 TEX. L. REV. 923, 965 (1999). *But see* Stephen Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs,* 84 HARV. L. REV. 281, 284-323 (1970) (questioning the extent to which copyright in books fosters creativity).

26. *See* Landes & Posner, *supra* note 18, at 326 ("Striking the correct balance between access and incentives is the central problem in copyright law."); *see also* William W. Fisher III, *Reconstructing the Fair Use Doctrine,* 101 HARV. L. REV. 1659, 1698-1744 (1988) (discussing the economics of copyright protection); Dotan Oliar, Fair Use Doctrine Over the Internet: An Economic Analysis of the Interchangeability of Duration and Scope In Copyright Protection (2001) (unpublished LL.M. thesis, Harvard Law School) (on file with authors) (analyzing the economics of copyright law and applying the the analysis to the Internet).

27. *See generally* Fisher, *supra* note 17 (discussing four major theoretical approaches to intellectual property); Menell, *supra* note 17 (reviewing various theories of intellectual property).

28. Note that although duration and scope are the most obvious determinants of the copyright entitlement, they are not the only ones. *See, e.g.,* Edmund W. Kitch, *Elementary and Persistent Errors in the Economic Analysis of Intellectual Property,* 53 VAND. L. REV. 1727, 1740-41 (2000).

29. *See, e.g.,* Frank H. Easterbrook, *Who Decides the Extent of Rights in Intellectual Property?, in* EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 405, 406 (Rochelle Cooper Dreyfuss et al. eds., 2001) [hereinafter EXPANDING THE BOUNDARIES] ("What is the right length of a copyright? No one knows."); Fisher, *supra* note 26, at 1739. In fact, copyright protection may be altogether inferior to alternative means of providing incentives to create, for example,

The exclusive rights conferred upon authors generate several kinds of social costs.[30] First, these rights often confer monopolistic power to authors, resulting in the higher, monopolistic pricing of works to consumers with an attendant deadweight loss.[31] Second, copyright protection generates administrative costs, such as the operation of the Copyright Office; litigation and enforcement costs due to disputes over copyrights and the need to subject infringers to civil and criminal penalties; and tracing costs that consumers and potential authors must bear to determine whether a particular work they seek to enjoy or use is copyrighted.[32] Third, the copyright system might draw excessive social resources towards authorship, at the expense of other, more valuable, social investment alternatives.[33] Fourth, some commentators assert that the grant of copyright to current works makes the creation of future works that are based in part on current works more costly,[34] and provides disincentives to improve existing works of authorship.[35] Last, the copyright system also generates additional transaction costs, incurred during the sale or licensing of these rights.[36]

Steven Shavell & Tanguy Van Ypersele, *Rewards Versus Intellectual Property Rights*, 44 J.L. & ECON. 525 (2001) or to a no-protection system, for example, Breyer, *supra* note 25, at 350-51 (examining a question outside the scope of this Article).

30. *See generally* Gordon & Bone, *supra* note 18, at 194-96 (discussing the costs of monopoly pricing, chilling of future creativity, transaction costs of licensing, and costs of administration and enforcement).

31. Deadweight loss is the foregone social surplus caused by the pricing out of the market of individuals who are willing to pay more than the information's marginal cost, but less than its monopolistic price. It results when authors cannot price-discriminate perfectly and charge each buyer the value that buyer attaches to the consumption of the work. *See, e.g.*, Fisher, *supra* note 26, at 1702.

32. *See, e.g.*, COOTER & ULEN, *supra* note 23, at 135-36; Landes & Posner, *supra* note 18, at 361-62.

33. *See* Glynn S. Lunney, Jr., *Reexamining Copyright's Incentives-Access Paradigm*, 49 VAND. L. REV. 483, 556-61 (1996).

34. *See, e.g.*, Landes & Posner, *supra* note 18, at 332-33. *See also* Yochai Benkler, *Free as the Air to Common Use: First Amendment Constraints on Enclosure of the Public Domain*, 74 N.Y.U. L. REV. 354, 394-412 (1999) (analyzing the disparate impact that the expansion of copyright protection entails for the authorship costs of different types of authors).

35. *See, e.g.*, Lemley, *supra* note 24, at 990-92.

36. *See, e.g.*, Robert P. Merges, *Intellectual Property and the Costs of Commercial Exchange: A Review Essay*, 93 MICH. L. REV. 1570, 1605-13 (1995).

Different duration rules are therefore likely to generate different benefits and costs. For example, a given increase in duration may increase incentives to create, bringing about a better balance between the benefits and costs of copyright. Such a duration increase, however, may also provide excessive incentives to create and generate excessive social costs, bringing about a worse copyright regime.[37]

Nevertheless, one can draw some conclusions as to the relative social desirability of different duration regimes regardless of their absolute merits. For instance, one regime is inferior to another when the former diminishes authors' incentives to create without providing society with compensating benefits.[38] Under these narrow circumstances, society would be well advised not to choose the inferior regime over its superior counterpart, irrespective of their absolute merits.

Ironically, a traditional economic analysis suggests the extant lifetime-plus-years regime of copyright duration is just that—a seemingly inferior regime of copyright duration that never should have been put in place.

B. How the Lifetime-Plus-Years Regime Appears Inferior to a Fixed-Term Regime of Comparable Expected Duration

1. A brief typology of copyright duration regimes

The duration of copyright protection may be based on a variety of different rules, as the history of American copyright law

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37. Moreover, any increase in copyright duration further diminishes public access to copyrighted creations and inevitably inflates the attendant costs of the copyright monopoly. *See, e.g.,* Yochai Benkler, *A Political Economy of the Public Domain: Markets in Information Goods Versus the Marketplace of Ideas, in* EXPANDING THE BOUNDARIES, *supra* note 29, at 271 ("[M]ainstream economics very clearly negates the superstition that if some property rights in information are good, then more rights in information are even better.").

38. Of course, this conclusion would not apply if the higher-incentives regime were to provide excessive incentives that generate social losses, while the lower-incentives regime were to provide optimal incentives. The present analysis is limited, however, to the question of why the law would use a regime that seems to diminish incentives to create without reducing the attendant social costs of the copyright system. We can answer this question without determining what absolute level of incentives is socially desirable.

illustrates.[39]   Importantly, however, we would like to compare two archetypal regimes of copyright duration—the fixed-term regime and the lifetime-plus-years regime.

Under a simple fixed-term regime, creations are protected for an invariable period of years from a legally defined moment,[40] independently of the occurrence of any later event other than the passage of time.[41]   Such a fixed term can be as short as the twenty-eight year maximal copyright term under the original 1790 Act[42] or even shorter; it may also be as long as the ninety-five year protection of works made for hire, anonymous works, or pseudonymous works under the CTEA, or even longer.[43]

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39. For instance, the copyright term shifted from fourteen years, extendable for fourteen more, see Copyright Act of 1790, ch. 15, § 1, 1 Stat. 124, 124, to twenty-eight years extendable for fourteen more, see Act of Feb. 3, 1831, ch. 16, § 2, 4 Stat. 436, 436, to twenty-eight years extendable to twenty-eight more, see Act of Mar. 4, 1909, ch. 320, § 23, 35 Stat. 1015, 1080, for lifetime of the author plus fifty years. *See* Copyright Act of 1976, Pub. L. No. 94-553, § 302, 90 Stat. 2541, 2572 (codified as amended in 17 U.S.C. § 302 (2000)), to lifetime plus seventy years (17 U.S.C. 302(a)).   Also, the term of copyright was initially counted from the filing of a prepublication title page of the work with the clerk of the district court where the author resided (from 1790 to 1869) or with the Library of Congress (from 1870 to 1908), then from the date of first publication of the work (from 1909 to 1977), then from the work's creation (1978 to date).   For an overview of the different copyright regimes in the United States since 1790, see, for example, William F. Patry, *The Copyright Term Extension Act of 1995: Or How Publishers Managed to Steal the Bread from Authors*, 14 CARDOZO ARTS & ENT. L.J. 661 (1996).

40. For simplicity, we assume that works enjoy automatic copyright protection from "creation."   In practice, however, a variety of legally defined moments may apply.   *See, e.g.*, examples, *supra* note 39.   Our comparison of the different copyright duration regimes is therefore independent of the specific legal rule according to which the copyright period begins to run.

41. More complex regimes may combine a fixed-term rule with a rule allowing for another fixed-term extension, creating an "extendable fixed-term regime," as has been the case under the 1831 Act.   *See* 17 U.S.C. § 302 (providing twenty-eight years, extendable for fourteen more).   Still other regimes may combine a fixed-term regime with a lifetime (or any other) limit, creating a "truncated fixed-term regime," as did the 1790 Act. *See* § 1, 1 Stat. at 124 (providing fourteen years of initial protection, extendable to fourteen more only if the author were still alive).   While we do not examine these variant regimes in detail, the comparison of the simple fixed-term regime with its lifetime-plus counterpart could be easily extended to these cases.

42. *See* § 1, 1 stat. at 124.

43. These works are protected under the CTEA for a term of ninety-five years from publication or 120 years from creation, whichever expires first.   *See* 17 U.S.C. § 302(c).

Since the 1976 Act,[44] however, the duration of copyright protection for individual creations has been determined on a lifetime-plus-years basis, where works are protected for the lifetime of the author plus an additional period of a fixed number of years after the author's death.[45] The CTEA has extended this additional period, which amounted to fifty years under the 1976 Act, by another twenty years, resulting in an overall copyright duration of the author's lifetime plus seventy years for individual authors.[46]

2. A lifetime-plus-years regime imposes an additional risk on authors

The 1976 introduction of a lifetime-plus-years regime is puzzling, since this regime imposes a seemingly unnecessary risk on potential authors, diminishing their incentives to create. In fact, any given lifetime-plus-years regime inevitably imposes a greater risk on authors in comparison to a fixed-term regime whose term is the average life expectancy of authors plus a period equal to the "years" period of the lifetime-plus-years regime.[47]

A lifetime-plus-years regime increases the risk of investment in creation because it increases the variability of the distribution of future returns on creation compared to a fixed-term regime. Under the lifetime-plus-years regime, the returns on the investment in creation are a function of the author's longevity: a long-lived author enjoys a longer period of returns, while a short-lived author enjoys only a shorter period. The fixed-term regime, on the other hand, provides all authors the same period of returns irrespective of their eventual longevity.

Importantly, where the period of the fixed-term regime equals the average life expectancy of authors plus the same number of additional "years" that the lifetime-plus-years regime provides, the *expected* returns on investment in authorship are the same under both regimes. Authors of an average longevity will therefore face similar

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44. *See* 90 Stat. at 2541.

45. *See* 17 U.S.C. § 302(a).

46. *See id.*

47. For example, if the identical "plus" period of both regimes were fifty years, and the average life expectancy of creators were thirty years, a lifetime-plus-years regime would provide creators with lifetime plus fifty years of copyright protection, while a comparable fixed-term regime would provide all creators with eighty (that is, fifty plus thirty) years of protection.

returns in both cases, while their long- and short-lived counterparts will face higher and lower returns, respectively, under the lifetime-plus-years regime.

However, potential authors cannot know with certainty how long they will live at the time they must decide whether to invest in authorship. Consequently, the lifetime-plus-years regime forces them to bear the additional risk of gambling on their longevity in addition to the already present uncertainty inherent in any investment in authorship.[48]

For example, if the average life expectancy of authors were thirty years, with actual longevity ranging from ten to fifty years, and given a "plus" period of fifty years, a lifetime-plus-years regime would provide authors with variable periods of returns, ranging from sixty years for short-lived authors to one hundred years for their long-lived counterparts. A comparable fixed-term regime, on the other hand, would provide all authors with eighty years of returns irrespective of their actual longevity.

Rational authors, however, would not seek to gamble their investments in creation on their future longevity, exposing themselves to an additional risk without a rational anticipation of higher expected returns.[49] An investment in creation under the lifetime-plus-years regime that fails to provide potential rational authors with higher expected returns thus becomes less attractive than a comparable investment under a fixed-term regime.[50]

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48. On the notion of financial risk as variability, see generally RICHARD A. BREALY & STEWART C. MYERS, PRINCIPLES OF CORPORATE FINANCE 143-60 (5th ed. 1996).

49. *See also* COOTER & ULEN, *supra* note 23, at 46-49 (discussing expected utility maximization and risk attitudes); A. MITCHELL POLINSKY, AN INTRODUCTION TO LAW AND ECONOMICS 10 (1983) (noting that in decisions involving monetary outcomes economists assume that decision makers are risk neutral or, at times, risk averse).

50. Even the presence of intermediaries who are able to tolerate greater risks and would buy copyrights from authors would not fully compensate for the inferiority of the lifetime-plus-years regime, as long as this regime fails to provide higher returns on authorship given the increased risk it imposes. Additionally, most authors—who tend to overestimate the present value of their creations as we discuss *infra* Part III—will be unlikely to sell their copyright to the more objective intermediaries, which would not share authors' inflated estimates of the works' value. Regardless of behavioral differences between authors and intermediaries, moreover, estimates of the value of not-yet-existing creations frequently depend on "soft" information possessed only

3. The incentives given by a lifetime-plus-years regime to authors
with non-average life expectancies are distorted

In addition to imposing a greater risk on all potential authors, the
lifetime-plus-years regime also provides distorted incentives to
create to authors with known non-average life expectancies. For
example, under the lifetime-plus-years regime, a younger-than-
average author will anticipate a longer-than-average period of
copyright protection and will therefore have a greater-than-average
incentive to create. An older-than-average author, on the other hand,
will face the opposite situation—anticipating a shorter-than-average
period of protection—and will consequently have a smaller-than-
average incentive to create.[51]

More generally, the disparate incentives to create given to
authors of different life expectancies under the lifetime-plus-years
regime inevitably put many authors at an obvious advantage or
disadvantage as compared to the average author. This would be the
case for healthier-than-average versus less-healthy-than-average
authors, female versus male authors, or even authors of different
ethnicities, all of whom would be rationally aware of their
systematically different-from-average life expectancies.

Such systematic differences in copyright protection based on
arbitrary criteria would have been of lesser concern from the
perspective of providing the minimal necessary incentives to
create,[52] if even those potential authors with the shortest life
expectancy would still have sufficient incentives to create. If
smaller-than-average incentives to create are not always sufficient,

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by the authors, who cannot convey it convincingly to the intermediaries. *Cf.*
Tor, *supra* note 9, at 58-59 (discussing the comparable problem of divergent
expectations due to which entrepreneurs often find it difficult to sell their
innovations to incumbent firms in the industry).

51. Another, although not clearly pernicious, related effect occurs in the
case of joint authorship, where the copyright duration is determined based on
the longevity of the last surviving author, leading older authors to cooperate
with younger ones and providing them with a disincentive to cooperate with
other older, perhaps more accomplished authors. *See* 17 U.S.C. § 302(b).

52. Although systematic, arbitrary disparities between different potential
creators may legitimately raise distributive concerns.

however, the lifetime-plus-years regime will systematically diminish creation by certain classes of authors.[53]

The disparate effects of the lifetime-plus-years regime are likely to cause the most harmful distortion in the case of younger- versus older-than-average authors. This duration regime provides increased incentives to newer and less-experienced authors, while providing decreased incentives to their more mature and experienced counterparts. It is nevertheless precisely these latter authors who frequently produce the socially most valuable creations, as commentators have long noticed.[54] Apparently, therefore, the lifetime-plus-years regime might be providing greater incentives for the generation of those creations that are less valuable on average, at the cost of diminishing the incentives—and with them the likelihood of creation—for the generation of those creations that are more valuable, on average, to society.

One might argue in favor of the disparate impact of the lifetime-plus-years regime on authors of different ages that in some cases younger authors need a greater incentive to create than older authors do. This would be the case, for instance, if authors were to make a long-term decision on whether to embark on a path of continued creation rather than a case-by-case decision on whether to invest in a particular creation. In such a setting, society might be better served by encouraging younger authors to embark on the path of creation at the expense of their older counterparts.[55]

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53. Moreover, insofar as creators with greater-than-optimal incentives to create are likely to over-produce creations, society will bear an additional cost in any case.

54. For a famous, eloquent argument regarding the relative advantage of later as opposed to earlier creations of famous creators see, for example, THOMAS B. MACAULAY'S, *A Speech Delivered in a Committee of the House of Commons on the 6th of April, 1842, in* MACAULAY SPEECHES: A SELECTION 181 (N.Y. AMS Press 1979) ("That all the most valuable books of history, of philology, of physical and metaphysical science, of divinity, of political economy, have been produced by men of mature years, will hardly be disputed."). *But see* RICHARD A. POSNER, AGING AND OLD AGE 156-79 (1995) (arguing that both the timing of the peak of creative activity and its sustainability vary from one field to another).

55. This might also be the case if a lifetime of creation were to involve, for example, a significant initial investment in fixed costs—for example, in building knowledge and skill—with lower variable costs after the first creation.

Nonetheless, this pro-distortion argument is both problematic and limited in scope. The argument is problematic because young authors with rational expectations will take into account their long-term returns on investment in creation. They might be reasonably reluctant to give up future incentives for present ones, especially if they anticipate that their returns to creation will increase as they advance in their career.[56] In addition, the benefit of providing greater incentives to younger authors-by-vocation comes at the cost of providing smaller incentives to older creators who are not authors-by-vocation. Think, for example, about books written by professionals, executives, or businessmen. These are not authors-by-vocation; when they write, they usually write a small number of books at a relatively late stage in their career, after they acquire the experience and wisdom that are pre-requisites for their authorship. Their books may be of high social value; providing a smaller incentive for their authorship is a social cost.

The argument in favor of disparate duration protection based on life expectancy is also limited in scope, since most of the factors associated with variations in life expectancy among potential authors bear no relationship to the degree of incentives that the law should provide these authors. Few would argue, for example, that healthier-than-average authors need greater incentives than their less-healthy-than-average counterparts, or that authors belonging to ethnic groups with greater longevity require greater incentives than those belonging to ethnicities that are statistically associated with shorter longevity.

4. The social costs of copyright under a lifetime-plus-years regime

A comparison of the social costs of the lifetime-plus-years regime to the fixed-term alternative also fails to render the former more attractive. The direct social costs of copyright monopoly under the two regimes are similar: the former provides long-lived authors with protection that is more costly than average and short-lived authors with protection that is less costly than average. Nevertheless, the aggregate monopoly costs of the variable protection given to

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56. From a rational actor perspective, the need to discount the income from further-in-the-future creations to a greater degree than the income expected from near future ones, will temper this consideration, with the actual balance of incentives depending on the period of creation, the distribution of expected returns over time, and the discounting factor.

authors under the lifetime-plus-years regime resemble the aggregate invariable, average-based protection given to all authors under a comparable fixed-term regime.[57]

Similarly, the basic costs of administering any copyright regime, as well as the costs of enforcing copyrights and litigating disputes over them, do not seem to differ systematically between the two competing regimes.

Tracing costs, however, may be even greater under the lifetime-plus-years regime. Under a fixed-term regime, parties interested in exploiting a work need only to know the date on which the copyright begins in order to determine whether the work is still proprietary or is already in the public domain. This datum—namely, the date of creation—is readily available to the author, who also has an incentive to disclose it in order to put the public on notice.[58] Since such an action is nearly costless to the author and can be accomplished by fixing this datum on the copyrighted work, for example, it is likely to be undertaken.

Under a lifetime-plus-years regime, on the other hand, interested parties need to know the author's date of the death. This datum is non-existent at the time of creation, and often not even at publication; it may be difficult and costly to obtain as well. Moreover, the party with the information does not have an incentive to disclose it to the public; a disclosure would simply put the public—which is already on notice of the copyright's existence—on notice of the *limits* of this right.[59] Thus, under a lifetime-plus-years regime, certain obstacles may either prevent the transfer of information pertaining to copyrights' validity from the party owning this information to the parties interested in obtaining it or inflate the costs of this information transfer.

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57. This conclusion—that the overall costs of an invariable average period of protection equal those of a variable period of protection with the same average—assumes the annual monopoly costs are normally (or equally) distributed among the creations of long-lived and short-lived creators.

58. The law can also create mechanisms that induce authors to include such a notice. *See, e.g.*, 17 U.S.C. § 401(b)(2), (d) (2000) (allowing authors to include the year of first publication in a notice, and granting such an action evidentiary weight of notice). Note that the date of first publication is different from the date of creation. *See* 2 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 7.08[A][1] (2002).

59. Moreover, in some cases even the copyright owner may not know the author's date of death.

On the other hand, one could argue that a lifetime-plus-years regime might generate smaller tracing costs, as suggested by the legislative history of the 1976 Act, because under this regime all of an author's works pass into the public domain on the same date, even for those authors who produce numerous creations.[60]

Last, the additional social costs of copyright we enumerate above—including the generation of excessive social investment in authorship, the increased costs of cumulative authorship, and the increased transaction costs during the sale or licensing of copyrighted works—do not seem to differ substantially between the two alternative regimes.

In sum, our evaluation of the lifetime-plus-years regime suggests that it provides seemingly smaller incentives to create than a comparable fixed-term regime due to the increased risk it imposes on authors, while distorting the incentives given to authors with known non-average life expectancies and possibly generating increased tracing costs as compared to its fixed-term alternative.

III. THE BEHAVIORAL EFFECTS OF A LIFETIME-PLUS-YEARS REGIME

A. The Inevitable Bounded Rationality of Individual Authors

A behavioral economic perspective emphasizes that copyright is necessary to provide *boundedly rational authors with incentives to create under uncertainty.* The copyright laws must be designed to encourage authors to invest time, effort, and other resources in generating new works whose economic value to them is based on an uncertain stream of future income.

According to a traditional economic view, authors will invest in creation only and always when they determine the net present value of their potential works to be positive.[61] Our analysis in Part II has also shown that authors making rational judgments of potential

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60. *See* H.R. REP. NO. 94-1476, at 134 (1976), *reprinted in* 1976 U.S.C.C.A.N. 5659, 5750 ("All of a particular author's works, including successive revisions of them, would fall into the public domain at the same time, thus avoiding the present problems of determining a multitude of publication dates and of distinguishing 'old' and 'new' matter in later editions.").

61. *See infra* Part IV.A. for an explanation and application of the net present value rule to potential authors' decisions.

investments in creations and deciding rationally whether and how much to create based on these judgments will prefer a fixed-term regime to the extant lifetime-plus-years one.

Empirical evidence on the psychology of human judgment and decision-making reveals, however, that potential authors—like other individuals making judgments and decisions under uncertainty—do not conform to the norms of rational action.[62] Instead, a vast literature documents how individuals are merely "boundedly rational." Such real-life decision makers must employ simplifying heuristics, which enable them to function reasonably well, but also lead them to exhibit systematic predictable errors of judgment.[63]

More specifically, the psychological evidence reveals two sets of cognitive processes that are likely to cause potential authors to overestimate the duration, and consequently the value, of copyrights they obtain under a lifetime-plus-years regime.[64] These authors will perceive the rationally inferior lifetime-plus-years regime as providing them greater incentives to create than a seemingly superior comparable fixed-term regime.[65]

The first set of processes makes potential authors *overoptimistic* regarding their longevity. Overoptimistic authors believe they will live longer than the average author, and consequently overestimate the length and value of the "lifetime" component in a lifetime-plus-years regime. The second set of processes, on the other hand, leads potential authors to overestimate the combined duration of a "lifetime" plus "years" period, because the overall duration of

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62. For instructive (and somewhat complementary) reviews of this literature see Colin Camerer, *Individual Decision Making, in* THE HANDBOOK OF EXPERIMENTAL ECONOMICS 587 (John H. Kagel & Alvin E. Roth eds., 1995); Robyn M. Dawes, Behavioral *Decision Making and Judgment, in* THE HANDBOOK OF SOCIAL PSYCHOLOGY 497 (Daniel T. Gilbert et al. eds., 4th ed. 1998).

63. *See* Tversky & Kahneman, *supra* note 10, at 1124.

64. Creators will also be prone to overestimate the amount of income they will receive in each future period. *See supra* text accompanying note 11. Except insofar as this effect reinforces our present conclusions, however, it does not bear directly on the choice of duration regimes; we therefore do not discuss it in this article.

65. Importantly, the behavioral analysis in this Part is limited to a comparison of these two regimes. The conclusion of this analysis regarding the superior incentives provided by the lifetime-plus-years regime must be tempered, however, by the general findings on the relatively limited effects of far-future benefits on present decisions. *See* discussion *infra* Part IV.

copyright under this rule is a function of two separate categories (namely, a "lifetime" category and a "years" category). Because the human mind categorizes information, a total copyright duration broken into these two separate categories appears longer than a comparable, single-category period of "years" under a fixed-term regime, a phenomenon known as *subadditivity*.[66]

B. Authors' Overestimates of their Longevity

Under the lifetime-plus-years regime, potential authors must decide whether and how much to create while being faced with significant uncertainty as to the duration of copyright protection their works will ultimately enjoy. Unlike the known period they are guaranteed under a fixed-term regime, the eventual duration and value of their copyright will be a function of their uncertain longevity.

A wealth of psychological data indicates, however, that authors are highly likely to overestimate their longevity and thus the value of copyright protection to them, exhibiting optimistic bias.[67] Hence, the bounded rationality of authors leads them to treat the riskier prospect of investment in creation under the lifetime-plus-years regime as more, rather than less, attractive, in exact opposition to the attitude rational actors would have exhibited.

Optimistic bias is likely to lead authors to overestimate their longevity both directly and indirectly. Directly, because many authors who contemplate their longevity will tend to think that they are likely to live longer than average, exhibiting the same bias they show when predicting their likelihood of succeeding in various tasks or experiencing positive personal events.[68]

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66. *See infra* Part IV.C.

67. We will not review here the findings on optimistic bias in detail, because they have been reviewed elsewhere in the legal literature. For a more formal definition of optimistic bias and a detailed, systematic analysis of this bias and related psychological processes see Tor, *supra* note 9 (manuscript at 24-33).

68. *See, e.g.*, David Dunning et al., *Ambiguity and Self-Evaluation: The Role of Idiosyncratic Trait Definitions in Self-Serving Assessments of Ability*, 57 J. PERSONALITY & SOC. PSYCHOL. 1082, 1089 (1989) (people overestimate their academic skills, leadership ability, marriage prospects, and health); David Dunning et al., *Self-Serving Prototypes of Social Categories*, 61 J. PERSONALITY & SOC. PSYCHOL. 957, 957-68 (1991) (showing how people judge positive traits to be overwhelmingly more characteristic of themselves

Importantly, however, authors are also likely to overestimate their future longevity due to the indirect impact of their optimistic bias regarding various factors that affect their life expectancy. They will tend to overestimate their good health at the time of prediction; in fact, even those authors who suffer significant illness will frequently underestimate the severity of their condition and hold unjustifiably optimistic views of their prognoses.[69] In addition to holding a biased view of their present health condition, authors will often deem themselves less vulnerable than they truly are to various health- and other risks .[70]

Optimistic bias is therefore likely to cause biased assessments and predictions of health and risks by individual authors, compounding their direct optimistic bias regarding their life expectancy prospects. This optimistic bias will frequently be

than negative attributes, and define personal attributes in idiosyncratic ways that emphasize their perceived strengths); Marsha T. Gabriel et al., *Narcissistic Illusions in Self-Evaluations of Intelligence and Attractiveness*, 62 J. PERSONALITY 143, 153 (1994) (showing a specific linkage of narcissism to self-illusion); Janet Metcalfe, *Cognitive Optimism: Self-Deception or Memory-Based Processing Heuristics?*, 2 PERSONALITY & SOC. PSYCHOL. REV. 100 (1998) (resembling positive illusions); Ola Svenson, *Are We Less Risky and More Skillful than Our Fellow Drivers?*, 47 ACTA PSYCHOLOGICA 143, 146 (1981) (discussing the belief that some people tend to be more skillful and less risky than others); Shelley E. Taylor & Jonathon D. Brown, *Illusion and Well-Being: A Social Psychological Perspective on Mental Health*, 103 PSYCHOL. BULL. 193, 204 (1988) ("[t]he mentally healthy person appears to have the enviable capacity to distort reality in a direction that . . . promotes an optimistic view of the future."); Shelley E. Taylor & Jonathon D. Brown, *Positive Illusions and Well-Being Revisited: Separating Fact From Fiction*, 116 PSYCHOL. BULL. 21, 22-23 (1994) (reviewing and discussing findings on individuals' mildly distorted positive perceptions).

69. *See* Shelley E. Taylor et al., *Attributions, Beliefs About Control, and Adjustment to Breast Cancer*, 46 J. PERSONALITY & SOC. PSYCHOL. 489, 489-500 (1984) (breast cancer patients believing they have much greater control over the course of their disease than medical findings warrant).

70. *See, e.g.*, Neil D. Weinstein, *Unrealistic Optimism About Future Life Events*, 39 J. PERSONALITY & SOC. PSYCHOL. 806 (1980); Neil D. Weinstein, *Optimistic Biases about Personal Risks*, 246 SCIENCE. 1232 (1989); Neil D. Weinstein & William M. Klein, *Unrealistic Optimism: Present and Future*, 15 J. SOC. & CLINICAL PSYCHOL. 1, 1-6 (1996) (discussing findings showing that people think themselves invulnerable to certain risks); *see also* Valerie A. Clarke et al., *Unrealistic Optimism and the Health Belief Model*, 23 J. BEHAV. MED. 367, 372-74 (2000) (healthy subjects exhibit bias in judgments of the expected risk and severity of cancer, as well as the potential benefits and costs they will experience in using screening methods).

reinforced, moreover, by desirability biases and the illusion of control.

Desirability biases occur when individuals predict future events whose outcomes are important to them, making both laypersons and experts prone to aligning their expectations with their preferences for the outcomes of such events.[71] Unlike optimistic bias, desirability biases affect judgments even where predictors know they cannot affect outcomes.[72] Authors exhibiting the desirability bias may thus overestimate, for example, the likelihood that environmental conditions affecting people's life expectancy will improve over their lifetime, that new medications will be developed that will increase longevity, or that various health risks are generally less pernicious than they really are.

Last, the combined effects of optimistic bias and desirability biases on authors' predictions of their future longevity will often be reinforced by the illusion of control. This illusion—that is, the false belief that one can control the outcomes of chance events—has been documented extensively.[73] It contributes to life expectancy optimistic bias by making authors prone to believe they would be able to control the negative eventualities they deem unlikely if these were to occur nonetheless.[74]

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71. *See, e.g.*, Elisha Babad, *Wishful Thinking and Objectivity Among Sports Fans*, 2 SOC. BEHAV. 231 (1987); Elisha Babad & Yosi Katz, *Wishful Thinking—Against All Odds*, 21 J. APPLIED SOC. PSYCHOL. 1921 (1991); David Budescu & Meira Bruderman, *The Relationship between the Illusion of Control and the Desirability Bias*, 8 J. BEHAV. DECISION MAKING 109 (1995); Donald Granberg & Edward Brent, *When Prophecy Bends: The Preference-Expectation Link in U.S. Presidential Elections, 1952-1980*, 45 J. PERSONALITY & SOC. PSYCHOL., 477, 477-79 (1983); Robert A. Olsen, *Desirability Bias Among Professional Investment Managers: Some Evidence From Experts*, 10 J. BEHAV. DECISION MAKING 65, 66-70 (1997); Roy M. Poses, M.D. & Michele Anthony, M.D., *Availability, Wishful Thinking, and Physicians' Diagnostic Judgments for Patients with Suspected Bacteremia*, 11 MED. DECISION MAKING 159 (1991) (reporting a similar "value bias").

72. *See* Tor, *supra* note 9 (manuscript at 27-28, 29-31) (drawing the distinction between the effects of optimistic bias and desirability biases and reviewing a number of additional, desirability-related phenomena).

73. *See, e.g.*, Ellen J. Langer, *The Illusion of Control*, 32 J. PERSONALITY & SOC. PSYCHOL. 311 (1975) (and the earlier studies cited therein); *see also* Budescu & Bruderman, *supra* note 71, at 110 (citing additional, more recent studies).

74. The illusion of control has been shown to both exert an independent impact on judgment and to contribute to the effects of both optimistic bias and

LOYOLA OF LOS ANGELES LAW REVIEW [Vol. 36:437

In sum, various processes are likely to lead authors to exhibit inflated expectations of longevity. These biased predictions would have provided authors no additional incentives to create under a fixed-term duration regime. A lifetime-plus-years copyright regime, however, allows potential authors' biased predictions of their longevity to impact their estimates of the value of their future copyrights, providing them with increased incentives to create. Paradoxically, therefore, the same regime that would have decreased the motivation of strictly rational potential authors to produce new creations, increases the motivation of real-world boundedly rational authors to create.

C. Subadditivity: The Effect of Splitting a Single Fixed Term into the Two Categories of "Lifetime" and "Years"[75]

Potential authors' optimistic bias regarding their future longevity is not the only psychological process leading them to overestimate the duration of the copyright they will obtain under the lifetime-plus-years regime. Many studies of human judgment suggest that a period of protection expressed as "lifetime" plus "x years" will exert a greater impact on authors' decisions than a period of a single term of years with an identical expected value.[76]

Thus, in addition to authors' optimistic bias regarding the period of copyright protection generated independently by the lifetime component of the extant duration regime, the decomposition of a longer term of years into two shorter distinctive categories of "lifetime" and "years" is likely to bias potential authors' estimates of this period even further.[77] This characteristic of human judgment is technically (and somewhat counterintuitively) known as

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the desirability bias. At the same time, however, the empirical evidence shows these latter phenomena also exist independently of the illusion of control. *See* Tor, *supra* note 9 (manuscript at 32 nn.127-28).

75. We use the terms "decomposing," "unpacking," "splitting," and "breaking down" of events interchangeably, to signify the division of a broader event into its components, since the varying technical meanings given to these terms in the literatures we review are irrelevant for the present analysis.

76. That is, a fixed period of years whose duration is the mean life expectancy of creators plus the "years" component of the lifetime-plus-years rule.

77. Optimistic bias would thus influence choices between a lifetime-only regime and a comparable fixed-term one, a case in which subadditivity would be irrelevant.

"subadditivity"—meaning that the whole is often judged *smaller* than its parts when these are evaluated separately and then added together.[78]

In the following sections, we provide a first review in the legal literature of the findings on this pervasive phenomenon. Because the literature on subadditivity is fairly technical and complex, we discuss it in some detail and highlight the differences between various findings in this domain. We begin with the evidence on subadditive judgments under uncertainty and risk—resembling the uncertain "lifetime" component of the extant duration rule—and follow with the findings on subadditivity in riskless judgment and choice—resembling the "years" component of this rule. We then show how pervasive and robust subadditivity is, although it is yet to be shown in a setting that follows closely the case of the lifetime-plus-years regime. This section concludes by presenting new evidence from a focused experiment we ran that supports our specific application of subadditivity to the question of alternative copyright duration regimes.

1. Subadditive probability judgments under uncertainty and risk[79]

The behavioral literature provides ample evidence of subadditive judgments under uncertainty—where individuals judge the likelihood of events whose probabilities are not known to them— as when potential authors estimate the uncertain "lifetime" component of their copyright duration under the lifetime-plus-years regime. This evidence suggests that such judgments tend to be subadditive because they are based on *descriptions* of events rather than on direct evaluations of the judged events.[80]

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78. *See, e.g.*, Amos Tversky & Derek J. Koehler, *Support Theory: A Nonextensional Representation of Subjective Probability*, 101 PSYCHOL. REV. 547, 548-50 (1994).

79. The decision-making literature commonly distinguishes between risky decisions—where choices are made between different prospects with known probabilities (such as lotteries)—and decisions and judgments under uncertainty. The latter category refers to situations where the probability of materialization of the possible outcomes is itself unknown (as is typically the case in the real world). *See, e.g.*, Dawes, *supra* note 62, at 530.

80. *See, e.g.*, Tversky & Koehler, *supra* note 78, at 548. This fundamental characteristic of probabilistic judgments is reflected in many behavioral phenomena described by the "heuristics and biases" literature, well beyond subadditivity. *See generally* JUDGMENT UNDER UNCERTAINTY: HEURISTICS

One basic judgmental error that demonstrates the effects of description on judgment is the conjunction fallacy. According to the rules of probability theory (and simple logic), the probability of an event that is a proper subset of another, broader class of events cannot be greater than the probability of the class. Hence, an event that is described by adding detail to the basic description of the class should never be judged as more likely than the class as a whole.[81] In fact, findings that contradict this rule reflect the ultimate subadditivity, showing how a single component, standing by itself, can appear more likely than the less detailed, broader category to which it belongs.

Many studies show, however, that people are prone to violate this simple rule when the description attached to the smaller category appears more compelling or relevant than the description attached to the broader class. This effect is strongest when an event that initially seems unlikely is supplemented by a qualifying description or a plausible cause. For example, the occurrence of "a flood in North America that drowns more than 1,000 people" seems initially unlikely, but "an earthquake in California causing a flood that drowns more than 1,000 people"—a mere subset of all the possible scenarios for a North American flood killing 1,000 people—seems more likely.[82]

AND BIASES (Daniel Kahneman et al. eds., 1982) (a leading collection of earlier articles on heuristics and biases); INTUITIVE JUDGMENT: HEURISTICS AND BIASES (Tom Gilovich et al. eds., forthcoming) (a recent, up-to-date collection of articles reviewing and presenting new findings in the heuristics and biases tradition).

81. For a brief, basic exposition of probability theory see ROBYN M. DAWES, RATIONAL CHOICE IN AN UNCERTAIN WORLD 275-92 (1988).

82. This phenomenon has been documented in numerous settings using many different types of descriptions. For a short discussion see Tversky & Koehler, *supra* note 78, at 561. On the conjunction fallacy more generally see Amos Tversky & Daniel Kahneman, *Extensional Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment*, 90 PSYCHOL. REV. 293 (1983). Additional studies show, moreover, that the similar processes can generate an "inclusion fallacy," where people judge a broad claim regarding a superordinate category (e.g., "all bank tellers are conservative") as more probable than a narrower claim regarding a subordinate category (e.g., "all feminist bank tellers are conservative") that is logically less likely. *See* Eldar B. Shafir et al., *Typicality and Reasoning Fallacies*, 18 MEMORY & COGNITION 229 (1990) (studies 1 & 3 evidence the role of typicality, while study 2 reports the inclusion fallacy).

More generally, a large number of studies show how the breaking down of a described event into its sub-components results in higher average probability judgments for the components, taken together, than for the overarching event.   For instance, when predicting the outcomes of a basketball match, the combined probabilities assigned to the events "team A beats team B by at least seven points" and "team A beats team B by less than seven points" are greater than the probabilities assigned to the event "team A beats team B," which is simply a combination of the two preceding scenarios.[83]   This effect has been documented in various contexts, including predictions of economic events such as changes in the Dow Jones Industrial Average over the next week, predictions of temperatures, and predictions of the outcomes of national sporting events, to name a few.[84]

Furthermore, the subadditivity of probabilistic judgments is not limited only to the division of events into their components along a *quantitative or numerical continuum*.   Subadditive judgments are also prevalent in cases of *categorical* unpacking, where a superordinate category (e.g., unnatural death) is broken into its more basic sub-categories (e.g., car accidents, drowning, homicide, and suicide).[85]

Many examples of how categorical unpacking causes subadditivity come from decision tree studies.[86]   Different groupings

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83. *See, e.g.,* Amos Tversky & Craig R. Fox, *Weighing Risk and Uncertainty*, 102 PSYCHOL. REV. 269 (1995) (explaining this and similar findings by reference to prospect theory, where uncertainty is represented by a weight function that satisfies bounded subadditivity).

84. *E.g., id.; see also* Craig R. Fox, *Strength of Evidence, Judged Probability, and Choice Under Uncertainty*, 38 COGNITIVE PSYCHOL. 167, 176-88 (1999) (replicating and extending these findings).

85. For an example on the higher informativeness and utility of natural or "basic" categories in human perception and information processing see James E. Corter & Mark A. Gluck, *Explaining Basic Categories: Feature Predictability and Information*, 111 PSYCHOL. BULL. 291 (1992). *See also* Gregory L. Murphy & Mary E. Lassaline, *Hierarchical Structure in Concepts and the Basic Level of Categorization, in* KNOWLEDGE, CONCEPTS, AND CATEGORIES 93 (Koen Lamberts & David Shanks eds., 1997) (reviewing major findings on the role of basic categories).

86. "Decision trees" are schematic representations of relevant events with their judged probability or value. They are used to assist decision makers in identifying the sole or main cause of an undesired event ("fault trees"), the multiple partial contributors to a problem ("influence trees"), or the value that

of potential causes in a tree affect the probabilities decision makers assign to these causes. For example, the mean probability assigned to the residual "catch-all" category for determining a car's failure to start practically doubled (from 22% to 44%) when its description as "something other than the battery, the fuel system, or the engine" was broken into its more specific components, such as "the starting system" or "the ignition system."[87]

A recent set of experiments further highlights how different partitions of uncertain outcomes in legal cases can even bias forecasts made by experienced lawyers of the partitioned outcomes' probability.[88] In the first of these studies, lawyers judged the likely outcomes of the then undecided case of *Jones v. Clinton*, estimating

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should be assigned to an outcome ("value tree"). *E.g.*, J. Edward Russo & Karen J. Kozlow, *Where is the Fault in Fault Trees?*, 20 J. EXPERIMENTAL PSYCHOL.: HUMAN PERCEPTION & PERFORMANCE 17 n.1 (1994). Studies of fault and influence trees are discussed here, because they involve probabilistic judgments of external events, while findings in the context of value tree analyses are discussed below, because they involve riskless judgments wherein decision makers simply have to decide on the relative importance of the attributes of alternative options for them.

87. *See, e.g.*, Baruch Fischhoff et al., *Fault Trees: Sensitivity of Estimated Failure Probabilities to Problem Representation*, 4 J. EXPERIMENTAL PSYCHOL.: HUMAN PERCEPTION & PERFORMANCE 330 (1978) (showing also that the effect appears for professionals as well, and therefore cannot be attributed to decision makers' mere lack of knowledge). The subadditivity of the residual category, which has also been termed a "pruning bias" (in reference to the bias resulting from pruning the tree branches—the categories of fault causes), has been replicated and shown in various other tasks. *E.g.*, Russo & Kolzow, *supra* note 86, at 22-23 (causes of death). For other studies finding a pruning bias in fault trees for various judgments, see Laurette Dubé-Rioux & J. Edward Russo, *An Availability Bias in Professional Judgment*, 1 J. BEHAV. DECISION MAKING 223 (1988) (potential causes for a restaurant's failure); Richard D. Rennie, Determination of Probable Cause by Auditors: A Study of the Omission Effect in Fault Trees (1989) (unpublished Ph.D. dissertation, University of Alberta, Canada) (a series of studies testing the bias and its possible psychological causes), *cited in* Russo & Kozlow, *supra* this note, at 17 (discrepancies in an account balance of a business firm); Tversky & Koehler, *supra* note 78, at 551-53 (causes of death); Els C.M. van Schie & Joop van der Plight, *Getting an Anchor on Availability in Causal Judgment*, 53 ORG. BEHAV. & HUM. DECISION PROCESSES 140 (1994) (examining influence analysis, which is used to determine the relative importance of multiple contributing factors, for estimating the multiple partial causes of acid rain).

88. *See* Craig R. Fox & Richard Birke, *Forecasting Trial Outcomes: Lawyers Assign Higher Probability to Possibilities That are Described in Greater Detail*, 26 L. & HUM. BEHAV. 159, 160 (2002).

that the case would be resolved by judicial verdict as compared to other possibilities. As predicted, although median "verdict" estimates were similar regardless of how the other outcomes were presented (20%), when the "non verdict" outcome category was divided into four sub-categories (settlement, dismissal, immunity, withdrawal), the lawyers' median predictions of these possible outcomes exhibited dramatic subadditivity, increasing from 75% to 129%.[89]

The following experiments in this series yielded similar findings using a quantitative partition of the amount of a damages award in an auto accident tort case instead of a qualitative categorical partition like the one used above;[90] a product partition where the outcome of a child custody dispute was elaborated by adding a conjunction with a second uncertain event;[91] and an elaboration of the Supreme Court's venue decision in the *United States v. Microsoft* appeal.[92]

Last, because unpacking inflates probabilistic *judgments* of uncertain events, it also leads to biases in individuals' *decisions*, affecting the relative attractiveness of alternative courses of action. To illustrate, another experiment testing lawyers' predictions in the series above found a strong effect of unpacking on the hypothetical advice these lawyers would give to a junior colleague representing a tort plaintiff.[93] When the weaknesses of the plaintiff's case were described as problems with "liability," 52% of the lawyers recommended accepting a hypothetical settlement offer, but when

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89. Thus leading to a total median probability of 149%, including the "verdict" probability, in the latter case. *See* Fox & Birke, *supra* note 88, at 162-63 (study 1); *see also id.* at 166 (study 5) (providing evidence of subadditive judgment due to categorical partitions in a within-subjects design).

90. *See id.* at 163-64 (study 2) (where the lawyers' median estimates of the probability of the damages award being in one of four sub-categories summed up to 178%).

91. *See id.* at 164 (study 3) (lawyers' median predictions of the likelihood that the father will get custody were only 20%, while the sum estimates of his getting both custody and the family home and his getting only custody but not the home summed up to 30%).

92. *See id.* at 165 (study 4) (lawyers judged the probability of the elaborated event that the case would "go directly to the Supreme Court and be affirmed, reversed, or modified" as higher than the probability of the equal, but unelaborated event, that the case would "go directly to the Supreme Court").

93. *See id.* at 166-67 (study 5).

these weaknesses were described as problems with "duty, breach, or causation," 74% of them recommended accepting the offer.[94]

Taken together, these findings reveal that judgments of uncertain events which are broken into smaller components, in various settings, show significant subadditivity. They also indicate, unsurprisingly, that decision makers' choice of behavior tends to reflect the subadditivity of judgments under uncertainty as well. In addition to the studies revealing subadditive judgments under uncertainty, moreover, there is evidence that even risky judgments— where the probabilities of the judged events are known to decision makers—are subadditive as well.

Thus, one of the most robust empirical characteristics of human decision-making is the tendency to overweight the importance of small, known probabilities[95] (e.g., preferring a 0.5% chance of winning $2,000 to a 1% chance of winning $1,000).[96] Consequently, a single event in a lottery (e.g., a 1% chance of winning $1,000) will appear more attractive to decision makers when it is broken into two components with an equal outcome but a smaller probability (e.g., two events, each with a 0.5% chance of winning $1,000), as

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94. *See id.*

95. Importantly, the overweighting of small probabilities should be distinguished from the common overweighting of unlikely events of an *unknown* probability due to the well-known availability heuristic. Although in reality the two phenomena often combine to bias choices concerning small probability events, there is also evidence that people tend to *underestimate* very low probability events of low availability. *See, e.g.,* Daniel Kahneman & Amos Tversky, *Prospect Theory: An Analysis of Decision Under Risk,* 47 ECONOMETRICA 263, 280 (1979) (noting the distinction between the estimation of probabilities of uncertain events—which is subject to the availability heuristic—and the later overweighting of small probabilities that are known or already estimated during their transformation into decision weights—which determine the impact of these probabilistic events on actual choices).

96. Formally, a subadditive probability weighting function across the whole range of probabilities that are greater from zero (i.e., impossibility) and smaller than one (i.e., certainty) results because, in addition to overweighting small probabilities, people underweight uncertain events as compared to certain ones, and exhibit subproportionality—the finding that for any fixed ratio of probabilities, the ratio of decision weights is closer to unity when the probabilities are lower than when they are high. *See, e.g., id.* at 280-84; *see also* Drazen Prelec, *The Probability Weighting Function,* 66 ECONOMETRICA 497 (1998); Amos Tversky & Daniel Kahneman, *Advances in Prospect Theory: Cumulative Representation of Uncertainty,* 5 J. RISK & UNCERTAINTY 297 (1992) (further developments in modeling the weighting function).

evidenced by recent studies on "event-splitting effects" that violate expected utility norms.[97] Recently, scholars studying these latter effects have shown that decision makers may even have a fundamental preference for alternatives offering a larger *number* of positive outcomes over those offering fewer such outcomes.[98]

In the case of the lifetime-plus-years regime, however, only the "lifetime" component of the duration rule is uncertain (or risky) since potential authors do not know in advance their ultimate longevity with certainty. The "years" component of this duration rule, on the other hand, is certain, and therefore might not be subject to the same impact of subadditivity as is the uncertain (or risky) lifetime component. The following section therefore presents evidence for subadditive decision-making in situations that more closely resemble the years component, where decisions are riskless—requiring decision makers only to express their preference and attitudes.

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97. *See, e.g.*, Chris Starmer & Robert Sugden, *Testing for Juxtaposition and Event-Splitting Effects*, 6 J. RISK & UNCERTAINTY 235 (1993) (early development of the notion of event-splitting effects).

98. *See* Steven J. Humphrey, *More Mixed Results on Boundary Effects*, 61 ECON. LETTERS 79, 81-82 (1998) (offering two models for interpreting event-splitting effects as preferences over numbers of outcomes, positive and negative compared to a reference point); Steven J. Humphrey, *Probability Learning: Event-Splitting Effects and the Economic Theory of Choice*, 46 THEORY & DECISION 51, 71-73 (1999) [hereinafter Humphrey, *Probability Learning*] (discussing the possible reasons for these effects, reporting experimental tests, and concluding that the frequency of outcome plays a role in decision-making but generally does not outweigh the influence of outcome probability enough to lead decision makers to prefer lower expected value (stochastically dominated) options on average); Steven J. Humphrey, *The Common Consequence Effect: Testing a Unified Explanation of Recent Mixed Evidence*, 41 J. ECON. BEHAV. & ORG. 239 (2000) (offering further evidence for the role of outcome frequency in choice, although not as a sole determinative factor); Steven J. Humphrey, *Are Event-Splitting Effects Actually Boundary Effects?*, 22 J. RISK & UNCERTAINTY 79 (2001) [hereinafter Humphrey, *Boundary Effects*] (providing evidence that event-splitting effects are not driven by the frequency of zero outcomes but, rather, by a preference for more positive and fewer negative outcomes); *see also,* William S. Neilson, *Some Mixed Results on Boundary Effects*, 39 ECON. LETTERS 275 (1992) (reviewing findings showing that when alternative risky gambles involve the same number of outcomes, frequently observed expected utility violations diminish).

2. Subadditivity in riskless decision-making

Studies examining *riskless decisions*—where individuals make judgments and choices of events whose outcomes are certain— provide evidence that mirror the findings on the impact of splitting events in uncertain and risky decisions. These studies reveal the already familiar pattern, where the breaking down of events or categories into smaller components increases their overall perceived attractiveness.

For instance, one series of studies examined people's estimates and preferences regarding alternative energy sources for UK electricity.[99] Strikingly, participants making judgments concerning nuclear energy versus other sources rated nuclear energy as significantly less attractive when the "other sources" category was broken down into more specific components, such as oil, coal, or hydro. This result is especially surprising because attractiveness ratings are supposed to reflect preferences, requiring no probabilistic (or other) inferences about states of the world. These participants were not required to make estimates about external events, but merely to describe what they would like to see happen.[100]

Similar findings have been observed in studies of "multiattribute utility measurement," wherein participants evaluated, for example, alternative future jobs differing on a number of attributes, including job security, income, and career opportunities. Researchers manipulating the degree of detail in attribute descriptions found that an increase in detail increased the overall weight of the particular

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99. *See* Joop van der Plight et al., *Comparative Judgments and Preferences: The Influence of the Number of Response Alternatives*, 26 BRIT. J. SOC. PSYCHOL. 269, 273-75 (1987) (experiment 2).

100. Interestingly, moreover, the effect of category breakdown on preference ratings was significantly stronger than its impact on percentage responses (although the latter judgments were biased significantly as well), suggesting that expressions of preference may be even more malleable to this manipulation than probabilistic judgments, and therefore that these findings also indicate the effects cannot be attributed only to a lack of information about alternative sources. The other experiments in this study yielded similar results, with the same participants giving higher ratings to energy sources presented alone than when presented with other sources on an earlier occasion. This suggests that a lack of information alone cannot explain the findings (experiment 1, at 271-73), and shows a similar effect in a design that controlled the potential effect of estimates on preferences by having participants express preferences first and make estimates later (experiment 3, 276-78). *See id.*

attribute (e.g., job security) in the participants' judgments, and correspondingly decreased the weights of the other attributes (i.e., income and career opportunities) in the job choice decision.[101]

In fact, subadditivity has also been found in the form of a "part-whole" bias in individuals' riskless valuations of consumer goods.[102] Studies of this bias show that research participants exhibit an implicitly higher valuation for a commodity when it is broken into its components.[103] Using an experimental market where participants traded local restaurant vouchers, these researchers found that both the willingness to pay and the willingness of participants to accept were significantly lower for a voucher for a full meal than for separate vouchers for individual courses.[104]

An increase in the number of judged categories, attributes, or events not only increases their perceived *weight, attractiveness, and valuation*, but also inflates perceptions of *numbers, quantities*, and *frequencies*. Thus, scholars have identified a "numerosity heuristic," where decision makers sometimes use the number of units into which a stimulus is divided as a proxy for judging amount or likelihood.[105]

As is the case with other decision heuristics, numerosity often provides a useful proxy for amount, since the two variables are frequently correlated.[106] For example, a larger number of food units

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101. *See* Martin Weber et al., *The Effects of Splitting Attributes on Multiattribute Utility Measurement*, 34 MGMT. SCI. 431, 437-41 (1988); *see also* Mary Poyhonen et al., *Behavioral and Procedural Consequences of Structural Variation in Value Trees*, 134 EUR. J. OPERATIONS RES. 216 (2001) (showing that the division of attributes biases their weighting for individual participants, as well as for the mean judgments across participants).

102. This bias was originally found in studies using contingent valuation—a common method for evaluating environmental public goods, where scholars have given it various explanations other than subadditivity, and only later replicated for trades of consumer goods. *See, e.g.*, Kevin J. Boyle et al., *An Investigation of Part-Whole Biases in Contingent-Valuation Studies*, 27 J. ENVTL. ECON. & MGMT. 64, 69-70 (1994) (finding no statistically significant difference in the willingness to pay of independent samples of nonusers to prevent two thousand, twenty thousand, or two hundred thousand migratory waterfowl deaths, and examining different explanations for this phenomenon).

103. *See* Ian Bateman et al., *Does Part-Whole Bias Exist? An Experimental Investigation*, 107 ECON. J. 322 (1997).

104. *See id.* at 327-31 (using a design that controlled for wealth effects, strategic choices, and other confounding variables).

105. Brett W. Pelham et al., *The Easy Path from Many to Much: The Numerosity Heuristic*, 26 COGNITIVE PSYCHOL. 103 (1994).

106. *See id.* at 105.

typically indicates the presence of a larger amount of food in the natural environment,[107] and an eight-room house is typically larger than a five-room house (although contrary cases clearly exist as well).[108]

Thus, experiments using a variety of judgment tasks have shown that numerosity can cause subadditivity effects in visual judgments of the area of a circle that was divided into many separate pieces; in solving addition problems containing more elements while being cognitively taxed by another task; in rapid estimates of the total monetary value of American coin arrays; in hypothetical choices of a course of action with more positive outcomes and fewer negative ones, even when preferred choices were normatively less attractive; and in global judgments of a person (e.g., "compared to the average person, how talented is Tom?") based on lists of nine identical descriptive traits, when these nine traits were listed one by one as opposed to being divided into three groups only.[109]

In sum, the findings on riskless decision-making show that people exhibit significant subadditivity even in settings where no uncertainty or risk are involved. These latter situations closely resemble the "years" component of the lifetime-plus-years duration regime. Apparently, even in the absence of any risk, authors are likely to overweight the combination of different, shorter periods of copyright protection as compared to a single period of equal objective length.

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107. *See id.* at 103-04 (reviewing evidence of a numerosity effect in divisions of food reinforcements in animal studies).

108. *See id.* at 105.

109. *See id.* at 109-25 (experiments 1-5). For related findings on the effects of category splitting on frequency estimates in judgment and memory see Robert F. Belli et al., *Decomposition Can Harm the Accuracy of Behavioral Frequency Reports*, 14 APPLIED COGNITIVE PSYCHOL. 295, 296-300 (2000) (decomposition of categories in survey questions leads to over-reporting of past events); Klaus Fielder & Thomas Armbuster, *Two Halfs [sic] May Be More Than One Whole: Category-Split Effects on Frequency Illusions*, 66 J. PERSONALITY & SOC. PSYCHOL. 633 (1994) (showing evidence and examining the causes of increases in the subjective frequency on splitting of event categories); Matthew Mulford & Robyn M. Dawes, *Subadditivity in Memory for Personal Events*, 10 PSYCHOL. SCI. 47 (1999) (showing that subadditive judgments exist, not only for external events, but also for memories of personal events, depending on the level of specificity with which questions are asked).

3. The pervasiveness and robustness of subadditivity

The psychological literature reveals that subadditivity is a widespread characteristic of human judgment and choice. We have shown that the splitting of categories, events, or outcomes biases both judgment and choice under risk and uncertainty alike.[110] Moreover, even expressions of preference and riskless judgments of events, amounts, and quantities exhibit subadditivity.

Additionally, behavioral studies from the last decade show that subadditivity is more pervasive than previously thought, affecting judgments that were previously believed immune from this decision error. For instance, the studies that established the existence of subadditivity have shown it occurs when an event is broken into its mutually exclusive and exhaustive components. In this setting, subadditivity means that the sum of the separately evaluated components—which objectively *equal* the original event—is greater than the original event.[111] Recent studies nonetheless show that the effects of partitioning uncertain events on judgment may be strong enough so that even the sum of non-exhaustive components—which objectively comprise only a *subset* of the broader category—may be greater than the overarching category.

To illustrate, basketball fans predicting the outcomes of the 1996 NBA playoffs exhibited significant subadditivity when judging the odds that one of four leading teams in one conference (Chicago, Orlando, Indiana, and New York) would win the playoffs as

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110. In fact, the subadditivity under uncertainty is typically even greater than under risk, since the impact of the psychological factors that bias the latter—when probabilities are known—are compounded by the fact that probabilities are not clearly quantified under uncertainty. *See, e.g.*, Tversky & Fox, *supra* note 83, at 278-79 (finding, in a variety of tasks, that probability judgments exhibit a smaller degree of subadditivity as compared to decision weights, which supports a two-stage model for judgment under uncertainty that begins with a probability assessment and is then transformed by a risky weighting function); *see also* Craig R. Fox & Amos Tversky, *A Belief-Based Account of Decision Under Uncertainty*, 44 MGMT. SCI. 879 (1998) [hereinafter Fox & Tversky, *A Belief-Based Account*] (developing a more detailed account of this two-stage model and providing further evidence for its predictive power).

111. *See, e.g.*, Russo & Kozlow, *supra* note 86, at 17 (describing the pruning bias and stating, "[t]he only legitimate difference between the branch probabilities of the full and pruned trees is that the probabilities of the three branches cut from the full tree should be completely transferred to the pruned tree's catchall category, 'All Other Problems.'").

compared to other fans judging the odds that the winner would be from that conference (i.e., the Eastern conference). Since each conference included eight teams that qualified for the playoffs, however, the odds of the four leading teams in each conference were judged by participants to be greater than a broader category containing eight teams, of which they were only a subset.[112]

Similar findings have been observed in the domain of choice as well. In one study, for instance, participants were willing to pay higher dollar amounts for a health insurance policy covering hospitalization for the subset category of "all diseases and accidents" than they were willing to pay for a broader policy covering hospitalization for "any reason."[113]

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112. *See* Fox & Tversky, *A Belief-Based Account, supra* note 110, at 886. Recent findings on violations of "binary complementarity" provide another example of the pervasiveness of subadditivity. Binary complementarity is the finding that when people are asked about two mutually exclusive and exhaustive events (that is, when they are presented with explicit disjunctions), their subjective probability judgments are typically additive, summing to about 100%. *E.g.*, Tversky & Koehler, *supra* note 78, at 549. Recent studies suggest, however, that under various circumstances, even such straightforward judgments show subadditivity. *See, e.g.*, Peter Ayton, *How to be Incoherent and Seductive: Bookmakers' Odds and Support Theory*, 72 ORG. BEHAV. & HUMAN DECISION PROCESSES 99, 107-12 (1997) (presenting evidence of non-complementarity of explicit disjunctions in horse-race betting, discussing these findings, and reviewing other studies to this effect); Paul D. Windschitl, *The Binary Additivity of Subjective Probability Does Not Indicate the Binary Complementarity of Perceived Certainty*, 81 ORG. BEHAV. & HUMAN DECISION PROCESSES 195 (2000) (presenting evidence of non-complementarity even in the presence of superficially additive probability judgments of mutually exclusive and exhaustive events). *See also* Lorraine Chen Idson & David H. Krantz, *The Relation Between Probability and Evidence Judgment: An Extension of Support Theory*, 22 J. RISK & UNCERTAINTY 227 (2001) (presenting a model that accounts for non-additivity even in binary partitions); Derek J. Koehler et al., *The Enhancement Effect in Probability Judgment*, 10 J. BEHAV. DECISION MAKING 293 (1997) (showing how the judged probability of a set of mutually exclusive and exhaustive hypotheses increases with the degree to which the evidence is compatible with these hypotheses, and explaining how it is consistent with support theory); Kimihiko Yamagishi, *Proximity, Compatibility, and Noncomplementarity in Subjective Probability*, 87 ORG. BEHAV. & HUMAN DECISION PROCESSES 136 (2002) (presenting evidence and an explanation for binary noncomplementarity).

113. J. E. Johnson et al., *Framing, Probability Distortions, and Insurance Decisions*, 7 J. RISK & UNCERTAINTY 35 (1993). Moreover, subadditivity for component events that are only a subset of the composite event has been found

The processes of subadditivity are also robust enough to impact decisions when decision makers—in both experimental and real world settings—have clear financial incentives to make accurate probability judgments. For example, in another study testing NBA playoff outcome predictions, subjects were told that some participants would be selected at random to play one of the choices they made hypothetically in the experiment and could win up to $160.[114] These subjects still made subadditive judgments.[115]

One study examining subadditivity in judgments of the likelihood of various causes of death in the United States controlled directly for the effect of monetary incentives on performance. The researchers informed half of the sixty participants in each experimental condition that the five subjects making the most accurate judgments (i.e. 1/6 of them) would receive an additional payment of $20 each.[116] A comparison of the performance of the two groups—those who received versus those who did not receive monetary incentives for accurate performance—revealed that the participants in both groups exhibited statistically significant but indistinguishable levels of subadditivity in their judgments, showing that the added incentives for accuracy caused no reduction in the impact of subadditivity on judgments.[117]

Even more strikingly, gamblers in fixed odds betting markets for soccer and horse racing in England appear to exhibit a costly, systematic, and pronounced subadditivity as well.[118] The published

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even for memory of personal events. *See* Mathew Mulford & Robyn M. Dawes, *Subadditivity in Memory for Personal Events*, 10 PSYCHOL. SCI. 47 (1999).

114. *See* Fox & Tversky, *A Belief-Based Account*, supra note 110, at 882-87 (study 1). Monetary incentives for performance were also used in the various event-splitting studies by Humphrey. *See* Humphrey, *supra* note 98, at 80.

115. *See* Fox & Tversky, *A Belief-Based Account*, supra note 110, 882-87 (study 1).

116. *See* Tversky & Koheler, *supra* note 78, at 551 (study 1).

117. *See id.* at 552. In another experiment in the same series, the researchers provided a similarly structured incentive to all participants. These participants still showed significant subadditivity in judgments of the percentage of U.S. married couples with a given number of children. *See id.* at 553 (study 2).

118. In these markets, bookmakers advertise the odds in the form on an odd ratio x-y (e.g., 4-6), which translates to a probability of $100y/(x+y)$ for the bettor (i.e., 60%). Hence, if y occurs, the bettor gets back y (i.e., six) plus a winning of x (i.e., four). *See* Ayton, *supra* note 112, at 101-03 (explaining the characteristics of this betting form in greater detail).

betting odds for soccer matches are typically subadditive: the odds for an outcome of one team (e.g., England) winning over another (e.g., Switzerland) are lower than the sum of the odds for the gambles on the smaller sub-events of that team (i.e., England) leading for the first half then winning, trailing the first half then winning, and having a first half draw followed by a win.[119]

Horse race betting odds show a similar pattern. An analysis of the published odds for a randomly selected list of forty races has revealed a clear relationship between the number of horses in the race and the sum probability of the bets. In all the races, moreover, the probabilities summed to more than 100%.[120] This increasing subadditivity is apparently no bar to bettors, however, who continue betting on larger horse races and more specific scenarios of soccer match outcomes although they are offered consistently worse returns for betting in these settings.[121]

4. Subadditivity and the psychological effect of a "lifetime-plus-years" copyright duration

Our review of the evidence of subadditivity has shown its pervasiveness in diverse domains, biasing human behavior in a variety of judgment and decision-making tasks. As might be expected, researchers identifying these phenomena have proposed a number of different psychological mechanisms that may underlie them.[122] However, regardless of the various specific explanations, some general patterns emerge from the evidence on subadditivity.

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119. *See id.* at 104-06.

120. *See id.* at 107-08. These findings are quite striking since it should be obvious to all gamblers that only a single horse will win the race (and the probability of all bets together can therefore be no greater than one).

121. *See id.* at 113.

122. *E.g.,* Fielder & Armbuster, *supra* note 109, at 634-36 (loss of information during categorization); Humphrey, *Probability Learning, supra* note 98, at 52-53 (categorical memory for frequency); Derek J. Koehler, *Probability Judgment in Three-Category Classification Learning,* 26 J. EXPERIMENTAL PSYCHOL: LEARNING, MEMORY, & COGNITION 28, 29-31 (2000) (the compatibility of the evidence with competing hypothesis); Pelham, *supra* note 105, at 103-07 (number of stimuli); Tversky & Koehler, *supra* note 78, at 549 (the support of evidence based on availability, memory, and attention); Yamagishi, *supra* note 112, at 136 (similarity); *see also* Daniel Read, *Is Time-Discounting Hyperbolic or Subadditive?,* 23 J. RISK & UNCERTAINTY 5, 10 (2001) (suggesting that the statistical phenomenon of regression to the mean, which biases estimates under risk and uncertainty

First, the effect of splitting events may appear even when the sub-events are similar, as when they belong to the same qualitative category, but is more pronounced when the sub-events appear more distinctive from one another.[123] This should not come as a surprise, since the literature on human (and animal) cognition shows that categorization is fundamentally important and quite effective for the processing of information about the environment,[124] but also leads to inevitable perceptual and judgmental errors. For example, people find stimuli of the same perceptual category to resemble one another more than they do on an objective scale, while showing the opposite tendency for stimuli belonging to different perceptual categories.[125] The division of events into smaller components should therefore be reasonably expected to induce a greater degree of subadditivity when

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towards the mean, may also have a role in subadditive judgments because it generates overestimates of small quantities and underestimates of large ones).

123. *Compare* Pelham, *supra* note 105 (discussing evidence on the numerosity heuristic, a case where divisions merely create "more of the same"), *with* Fischoff et al., *supra* note 87; Dubé-Rioux & Russo, *supra* note 87; Rennie, *supra* note 84; Russo & Kolzow, *supra* note 86, at 22-23; Tversky & Koehler, *supra* note 78, at 551-53; van Schie & van der Plight, *supra* note 87 (discussing the findings on fault tree biases when events are divided into distinct sub-categories).

124. *See, e.g.,* James E. Corter & Mark A. Gluck, *Explaining Basic Categories: Feature Predictability and Information*, 111 PSYCHOL. BULL. 291 (1992). In this article, Corter and Gluck explain:

> Categorization is one of the most basic cognitive functions. Why is the ability to categorize events or objects important to an organism? An obvious answer to this question is that categories are important because they often have functional significance for the organism. Another familiar answer is that grouping objects into categories allows for efficient storage of information about these groups of objects.

Id. at 291; *see also* David J. Freedman et al., *Categorical Representation of Visual Stimuli in the Primate Prefrontal Cortex*, 291 SCIENCE 312, 312 (2001) ("Categorization is fundamental; our raw perceptions would be useless without our classification of items . . . .").

125. *See, e.g.,* Joachim Krueger & Russell W. Clement, *Memory-Based Judgments About Multiple Categories: A Revision and Extension of Tajfel's Accentuation Theory*, 67 J. PERSONALITY & SOC. PSYCHOL. 35 (1994) (reviewing the findings on providing additional evidence on these effects of categorization); *see also* Klaus Fielder, *Explaining and Simulating Judgment Biases as an Aggregation Phenomenon in Probabilistic, Multiple-Cue Environments*, 103 PSYCHOL. REV. 193 (1996) (suggesting that many judgmental biases result from processes of categorization in uncertain environments, and reviewing relevant evidence).

the divided components belong to qualitatively different categories—appearing more different from one another.[126]

Second, many studies suggest that the number of components into which an event is split has a significant impact on the degree of subadditivity observed, regardless of other contributing cognitive mechanisms.[127] This again follows from the usefulness of numerosity as a proxy for estimating quantity and frequency.[128] An increase in the number of components, moreover, tends to increase the difficulty of the judgmental task, making the integration of the information provided by the different components more complicated. This additional complexity, in turn, leads boundedly rational actors to rely on mental heuristics more than they would when faced with a less complex task, fostering a higher degree of subadditivity.[129]

These conclusions indicate that potential authors will be prone to perceive the lifetime-plus-years regime as providing them with greater incentives to create than a comparable fixed-term duration of copyright protection. The anticipated duration of their copyright under the latter is manifested in a single category of years. The extant regime, on the other hand, unpacks the description of copyright duration into two separate and very distinct categories—a category of lifetime and a category of years.

The integration of these two categories with one another is unlikely, since they do not use the same measurement metric. This difference between the two categories is not merely superficial. The

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126. *Cf.* Yuval Rottenstreich & Amos Tversky, *Unpacking, Repacking, and Anchoring: Advances in Support Theory*, 104 PSYCHOL. REV. 406 (1997) (discussing the finding that people tend to "repack" separate components to a greater degree—and therefore show less subadditivity—when these components are more similar to one another).

127. *See, e.g.*, Ayton, *supra* note 112, at 107-08 (horse race betting); Fox & Tversky, *A Belief-Based Account*, *supra* note 110, at 883-84 (in judgments of NBA playoff outcomes); Humphrey, *Boundary Effects*, *supra* note 98, at 90 (in monetary gambles); Pelham et al., *supra* note 105, at 107-09 (in various judgmental tasks); Weber et al., *supra* note 101, at 439 (in multiattribute utility measurement).

128. *See* Pelham et al., *supra* note 105, at 105.

129. *Cf. id.* at 109 (proposing "that the degree to which people ... [will] overinfer quantity from numerosity will depend, in large part, on the degree to which] ... their higher-order cognitive resources .... [are taxed at the time they render their judgments]" and showing the effect of cognitive difficulty on participants' reliance on the numerosity heuristic in a number of tasks).

lifetime category is qualitative and uncertain or risky (probabilistic), while the years category is quantitative and fixed.

Apparently, the lifetime-plus-years regime uses the bounded rationality of authors, relying on the combined impact of their optimistic bias regarding their future longevity and the subadditivity of their estimates of a copyright duration comprised of two cognitively distinct periods.[130] Exploiting these two robust biases, the lifetime-plus-years regime provides authors with greater incentives to create than a comparable fixed-term duration would have provided them. It accomplishes this result, however, by possibly generating greater tracing costs[131] and distorting the relative incentives to create given to some classes of authors.[132]

The behavioral analysis of the lifetime-plus-years regime therefore reveals its superior incentive-providing capacity. Nevertheless, the present findings do not prove conclusively that this regime is a more efficient means of providing incentives to individual authors all considered, although this may be the case. It is possible, for instance, that the possibly increased tracing costs and distortion of incentives to authors with known non-average life expectancies are large enough to overcome whatever increased incentives to create the lifetime-plus-years of copyright duration provides all authors. A final determination of this question, however, would have to await a more precise calibration of both the

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130. Ironically, the strong effect of these two behavioral phenomena may be somewhat tampered if the discounting of future benefits is also subject to subadditivity. If this is the case, the breaking of a fixed term into smaller components would result in a greater discount for the components taken together than for the single fixed term. One recent study suggests as much, at least for short term discounting, finding that participants exhibit higher discounting rates in choices between smaller future benefits and larger present ones when an overall two-year period is broken into three eight-month components. *See* Read, *supra* note 122, at 19-21. However, the evidence for this type of subadditivity is limited, and appears to contradict many robust findings regarding choice over time. *See* Shane Frederick et al., *Time Discounting and Time Preference: A Critical Review*, J. ECON. LITERATURE (forthcoming) (manuscript at 16-17, on file with authors). Furthermore, the focused tests we describe herein show a strong positive impact of subadditivity on preferences under a lifetime-plus-years regime, despite the possible contradictory effect of time discounting subadditivity. *See* discussion *infra* Part III.D.

131. *See supra* Part II.B.4.

132. *See supra* Part II.B.3.

economic costs of the two regimes and the magnitude of the incentivizing impact they generate.

D. Experimental Tests of the Lifetime-Plus-Years Effect

To further buttress our application of the empirical behavioral evidence, we conducted a focused experiment, which we report in detail elsewhere as part of a larger study.[133] Our findings show, as we hypothesized based on the preceding analysis, that decision makers find a lifetime-plus-years stream of payments significantly more attractive than a stream lasting for a comparable fixed-term period. We also find that the effects of optimistic bias and subadditivity are independent of one another, and are each responsible for a distinctive additional increase in participants' favorably biased perceptions of a lifetime-plus-years duration.

Participants in our study rated how attractive they found two alternative streams of future payments, assuming the life expectancy for individuals of their sex and age were to live another forty-five years.[134] As expected, a significant proportion of the participants showed optimistic bias regarding their own longevity. More than one-third of these participants found a lifetime-based payment— which could be either shorter or longer than forty-five years depending on their actual longevity—more attractive than the safer option of definitely receiving a stream of profits for forty-five years. This finding contradicts the traditional economic prediction that rational actors will always prefer a safer option to a riskier one when both provide the same expected returns.[135]

Participants' choices also revealed very strong subadditivity. When rating the attractiveness of an alternative under which they and their heirs would receive a fixed stream of income for ninety-five years as compared to receiving this stream for their lifetime plus fifty years after their death, the overwhelming majority of participants

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133. *See* Tor & Oliar, *supra* note 1.

134. This assumption was reasonable for these participants, who were graduate and undergraduate students at Boston-area universities and colleges.

135. Importantly, the experiment also controlled for the possibility that these participants had a much greater preference for payments to themselves as compared to payments to their heirs after their death. Such a preference, if present and strong enough, could lead even non-optimistic, risk-averse participants to prefer a lifetime benefit to a fixed-term one. *See* Tor & Oliar, *supra* note 1; *see also* discussion *supra* note 7.

preferred the risky alternative, and only 14% opted for the economically sound, risk-free payment.

Thus, the addition of a fixed period of fifty years to both payment alternatives in the basic choice task (of lifetime versus forty-five years) caused a dramatic increase in participants' preference for the riskier, lifetime-plus-years alternative. We cannot attribute this pattern to optimistic bias since the added period was fixed and unrelated to longevity. This pattern is, however, precisely the subadditive pattern predicted from breaking a single "ninety-five years" period into two separate periods belonging to distinctive categories of "lifetime" on the one hand, and "fifty years" on the other.

IV. EXTENDING FAR-FUTURE BENEFITS TO INFLUENCE PRESENT DECISIONS: THE LIMITS OF THE LIFETIME-PLUS-YEARS EFFECT

The CTEA has extended copyright duration given to individual authors by twenty years, from lifetime plus fifty years to lifetime plus seventy years. We therefore examine in this Part whether this change is likely to provide significant marginal incentives to create beyond those already in existence under the pre-CTEA regime. First, we discuss the proportionally small present economic value of far-future income. Second, we describe the evidence on the limited behavioral impact of far-future events on present decisions. Third and finally, drawing on our analysis in Part III, we show that those behavioral factors responsible for the basic impact of the lifetime-plus-years regime are absent from the CTEA's extension. We thus conclude that the prospective extension has only a negligible impact on potential authors, and support this conclusion with a focused experiment we conducted.

A. The Economics of Far-Future Benefits

The CTEA's prospective twenty-year extension impacts the returns to individual authors beginning fifty years after their death. The economic theory of finance provides a simple and clear normative rule for determining the current value of this added future stream of potential income—the net present value (NPV) rule.[136]

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136. *See, e.g.*, BREALY & MYERS, *supra* note 48, at 11-28, 85-108 (discussing net present value and the opportunity cost of capital).

According to the NPV rule, one should invest in a project, such as a new work, only if the present value (PV) of the future income from that project (net of the costs that must be invested in the project) is positive.[137] To determine the present value of future income one must take into account the time-value of money, which in the case of risk-free investments is typically the interest rate.[138] Assuming an annual interest rate r of 5%, for example, $1.00 today has a future value of $1.05 a year from today. The reverse arithmetic is used for determining the present value of $1.00 a year from today, which given the same 5% interest rate is approximately $0.95 (1/1.05).

We can apply the same principle to determine the present value of any monetary sum expected to be earned at any period in the future. However, because the interest rate is annual, one must calculate the accumulated discount rate for the period under consideration. This discount function takes an exponential form, such that $1.00 received n years in the future has a present value of $1/(1+r)^n$.[139] Hence, the present value of $1.00 that will be received fifty years from today, for instance, is $1/(1.05)^{50} = 0.09.

Using the PV calculus we find that the per-dollar value of the twenty-year extension provided by the CTEA is very small, due to the exponential nature of the discount function, with its specific extent depending on the rate of interest and the author's longevity. For example, for r of 5%, the total value of a stream of one-dollar annual payments is $19.48 for the first seventy-five years from today (representing a lifetime of twenty-five years after creation plus the additional fifty years of copyright under the 1976 Act), but only

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137. *See* BREALY & MYERS, *supra* note 48. In fact, the rule requires NPV *maximization*, meaning that the investment has to provide the author with the highest NPV of all investments available, after discounting the various present values to account for the risks these investments involve. Therefore, estimates of the extension's effect on potential authors obtained without taking into account alternative investments overstate the extension's impact.

138. PV calculations based on the interest rate for risk-free investment are highly conservative, overstating the value of the extension to creators. Most potential authors face a great degree of uncertainty regarding the far-future returns on creation beginning more than fifty years after the investment in creation. To calculate NPV properly, one must discount the expected return sufficiently to compensate for the risk involved, resulting in substantially smaller present values.

139. *See id.* at 12-13.

$0.33 for the additional twenty years provided by the CTEA's extension (a present value increase of less than 2%).

Furthermore, as the rate of interest increases, the present value of future income diminishes.[140] Similarly, the longer an author lives, the further is the future the date at which the extension's benefit will begin accruing, and the smaller the present value of the extension to the author.[141]

In sum, the economic theory of financial decision-making uses an exponential discount function to determine the present value of future income. The basic characteristics of this function indicate that the additional income resulting from the CTEA's extension amounts to but a very small proportion of the present value of the lifetime plus fifty years of income to which potential authors have already been entitled under the 1976 Act. A minor incremental benefit of this kind, therefore, provides but minute marginal incentive to potential rational authors.[142]

B. The Psychology of Far-Future Benefits

The CTEA's extension provides rational potential authors with small additional objective economic incentives to invest in creation. Because actual authors are only boundedly rational, however, we must examine how these real-life actors are likely to perceive the extension subjectively. Could it be, for example, that boundedly rational authors perceive this extension as more beneficial to them

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140. Thus, while the PV of the extension for every one-dollar paid annually throughout the extension's term, assuming $r = 5\%$ is $0.33, the PV of the extension assuming $r = 7\%$ is only $0.06 for the same twenty-year period.

141. For example, assuming $r = 5\%$, the total PV of the extension to an author who dies merely ten years after creation (i.e., an extension effective between years sixty to eighty post creation) is $0.67 for twenty years of one-dollar payments. However, these twenty years of one-dollar payments are worth only $0.16 for an author who dies forty years after creation (i.e., extension effective between years ninety to one-hundred-ten post creation). Importantly, this effect will be compounded by the increased uncertainty of far-future returns: to wit, the longer the pre-extension period, the lower the risk-discounted PV of the extension.

142. *Cf.* Landes & Posner, *supra* note 18, at 363 ("[T]he author who publishes a work at age thirty and dies at age eighty has one hundred years of copyright protection, and even in the unlikely event that the work will still generate a substantial income in the one hundredth year, the present value of that expectation will be virtually zero . . . .") (discussing the PV of copyright under the 1976 Act).

than is objectively the case? After all, we have already shown that the seemingly inferior lifetime-plus-years regime provides greater incentives to create than traditional analyses recognize. However, a review of the behavioral findings on intertemporal choice—namely, decisions involving tradeoffs among costs and benefits occurring at different points in time—provides little reason to believe that boundedly rational authors will perceive the CTEA's extension as providing greater incentives to create than traditional economic analysis would predict.[143]

Much like the empirical findings in other decision-making domains, behavioral research on intertemporal choice shows that people do not follow the normative principles (e.g., the "discounted utility" model) suggested by economic theory when making decisions involving intertemporal tradeoffs.[144]

Hyperbolic discounting—that is, the finding that people do not discount future outcomes at a constant rate—is probably the most extensively researched intertemporal choice phenomenon.[145] Empirical findings show that instead of applying a constant discount rate, decision makers exhibit extremely high discount rates for outcomes occurring in the short term, but that these rates decline gradually over time.[146] In one typical early study, for example, subjects specified the amount of money they would require in one month, one year, and ten years to make them indifferent to receiving $15 at present. The median responses were $20, $50, and $100 respectively, implying in turn median annual discount rates of 345%

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143. Intertemporal choice has been one of the major foci of behavioral decision-making research in the last two decades, providing many interesting insights into this important and ubiquitous domain. *See generally* CHOICE OVER TIME (George Loewenstein & Jon Elster eds., 1992) (an excellent collection of articles introducing the economic theory and behavioral findings on intertemporal choice).

144. The normative foundations for the commonly used framework for intertemporal choice—the discounted utility model—are less sound than those of its expected utility counterpart. *See, e.g.*, George Loewenstein & Drazen Prelec, *Anomalies in Intertemporal Choice: Evidence and an Interpretation*, 107 Q.J. ECON. 573 (1992) (discussing the discounted utility model and its normative justification). For present purposes, however, we are only interested in those robust *descriptive* findings on intertemporal choice, regardless of whether the phenomena they record are normatively justified or not.

145. *Id.* at 573.

146. *See* Frederick et al., *supra* note 130, at 15-16.

over the one-month horizon, 120% over the one year horizon, and 19% over the ten year horizon.[147] These findings show a typical time discounting pattern that better fits a hyperbolic function than an exponential model such as the NPV rule (or the more general discounted utility model).[148]

A recent comprehensive review shows, however, that while marginal discount rates clearly decline over time, the correlation between time horizon and discount rate is almost exactly zero when excluding studies of short time horizons (i.e., less than one year). This review finds that beyond short time horizons, discount rates remain stable, hovering around a 25% discount regression line.[149]

To make these findings more concrete, consider the valuation of a one-dollar annual stream of income for an individual using a 25% long-run discount rate. This individual values the first thirty years of annual payments at $4.00. Any additional period beyond thirty years, however, no matter how long, will not increase the present value of the payment at all.[150]

In other words, to the extent that potential authors exhibit time discounting preferences similar to those observed in numerous studies of intertemporal choice, they would be indifferent to the additional future stream of payments the CTEA provides them.[151]

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147. *See* Richard H. Thaler, *Some Empirical Evidence on Dynamic Inconsistency*, 8 ECON. LETTERS 201, 204-05 (1981).

148. *See, e.g.*, Kris N. Kirby, *Bidding on the Future: Evidence Against Normative Discounting of Delayed Rewards*, 126 J. EXPERIMENTAL PSYCHOL.: GEN. 54, 64-68 (1997); *see also* Frederick et al., *supra* note 130, at 15 & n.12 (citing various studies showing that hyperbolic functions fit the empirical findings on intertemporal choice better than exponential functions). *See generally* David Laibson, *Intertemporal Decision Making, in* ENCYCLOPEDIA OF COGNITIVE SCI. (Lynn Nadel ed., 2002) (providing a good overview of normative and descriptive models of intertemporal choice).

149. *See* Frederick et al., *supra* note 130, at 16 figs. 1a, 1b (the estimated 0.8 discount factor in figure 1b translates to a 25% discount rate, since the discount factor is defined as $1/(1+r)$).

150. This somewhat counterintuitive result is the outcome of the annuity equation according to which the PV of an annuity is $C/r(1+r)^t$, for an annual cash flow of C, an interest rate of r, and a period of t. The PV limit of an infinite annuity is therefore simply C/r. *See, e.g.*, BREALY & MYERS, *supra* note 48, at 38-41.

151. Two related and robust findings that are likely to contribute to this effect are, first, the tendency to discount gains more than losses and, second, the tendency to discount small sums much more than larger sums. *See generally* Frederick et al., *supra* note 130, at 18-19 (summarizing the findings

To wit, the extension provides additional payments to potential copyright owners no earlier, and typically much later, than after the passing of fifty years from creation, given the lifetime-plus-50-years provision in the 1976 Act. At this far-future point, however, the present value of each payment already approaches zero for an author using a 25% discount rate.[152] Hence, the very low value of the extension for rational economic actors using lower discount rates diminishes to a nullity for authors exhibiting empirically observed time preferences.[153]

We nevertheless suggest that these striking conclusions may not be fully applicable to the case at hand. One limitation of the numerous studies of intertemporal choice is their focus on short- to mid-length periods of time. The 25% discount factor, for example, was estimated for the period between one to fifteen years into the future.[154] Conceivably, when longer periods of payments are under consideration, decision makers might apply lower discount rates under which the CTEA's far-future extension would still provide some additional marginal incentives to create.[155]

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on the "sign effect" and the "magnitude effect" and citing various studies reporting these findings). Thus, because authors are likely to perceive future income from authorship as gains, they are likely to discount them to a greater degree. Additionally, since authors can anticipate only relatively small average expected returns to creation, they would discount these future returns even further. The latter effect, however, may be countered by authors' optimistic bias regarding the ultimate future value of their creation. *See, e.g.,* Tor & Oliar, *supra* note 1 (discussing this effect); *cf.* the discussion of "soft" information regarding the future value of creations, herein. *See* discussion *supra* note 50.

152. Interestingly, the application of the estimated 25% discount rate yields a value of $3.99 for a twenty-eight year annuity (and a limit value of $4.00 at thirty years), precisely the duration of copyright protection under the 1790 Copyright Act. *See* Tor & Oliar, *supra* note 1.

153. Notice, moreover, that this conclusion holds even if the overall picture emanating from present studies overestimates the discount rate significantly. Using the equation for the limit value of an annuity we find that an extension becomes ineffective beginning at year thirty-eight for a 20% discount rate, with a total value of $5.00, and beginning at year sixty for a 15% discount rate, with a total value of $6.67 (in the latter case, the added value between years fifty and sixty is $0.01).

154. *See* Frederick et al., *supra* note 130, at 16 fig. 1b.

155. Notice that the extension benefits authors with an average life expectancy of twenty-five years after creation, for instance, only between years seventy-five and ninety-five post creation. For this additional period to have

In fact, a few recent studies examining discounting over the long term provide some tentative support for this contrary argument, finding lower discount rates for judgments of far-future monetary outcomes, with rates lower than 10% for outcomes thirty years in the future and almost no discounting at all for outcomes three hundred years in the future.[156]

These findings may therefore suggest that the CTEA's far-future extension may have an even greater, or at least no lesser, impact on decision makers than standard economic principles dictate. Nonetheless, evidence supporting the claim of very low discounting rates in the long run is limited, and therefore requires further replications and extensions before it can be relied on with confidence.[157]

Furthermore and importantly, even using a low 4% discount rate—as some studies have found for a one-hundred years time horizon[158]—the marginal incentives provided by CTEA would still be limited. To wit, the present value of annual payments under the rule of the 1976 Act, assuming a twenty-five year average life expectancy of authors and with this discount rate, would amount to $23.68 for every $1 payment stream over the first seventy-five years (i.e., twenty-five years of a lifetime plus the additional 50-year term). The present value of the twenty-year extension, on the other hand, would only amount to an additional $0.72. This sum, although greater than the miniscule present value under the objectively

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any incentivizing effect on creation, however, potential authors must not apply an annual discount rate greater than 10.2%!

156. *See* Gretchen B. Chapman, *Time Preferences for the Very Long Term*, 108 ACTA PSYCHOLOGICA 95, 106-09 (2001) (Experiment 2: reporting similar findings for non-monetary outcomes such as life-saving measures); *see also* Maureen L. Cropper et al., *Preferences for Life Saving Programs: How the Public Discounts Time and Age*, 8 J. RISK & UNCERTAINTY 243, 248-57 (1994) (finding decreasing discount rates for life-saving measures); Maureen L. Cropper et al., *Rates of Time Preference for Saving Lives*, 82 AM. ECON. REV. 469 (1992) (explaining that the public attaches a lower priority to lives saved in the future, even when the time horizon is short) [hereinafter Cropper et al., *Preferences for Life Savings Program*].

157. For other potential problems with interpreting the results of these studies see Chapman, *supra* note 156, at 114-15.

158. *See, e.g.*, Cropper et al., *Preferences for Life Saving Programs*, *supra* note 156.

appropriate discount rate, still amounts to only 3% of the present value of the pre-CTEA copyright period.

C. The Limits of Effective Lifetime-Plus-Years Extensions

The intertemporal discounting literature indicates that potential authors are unlikely to value future streams of income much more than the small value they would assign this income if they were to use the normative NPV rule, although the specific factors determining the magnitude of discount rates for far-future monetary outcomes are yet to be identified. This unclear state of the empirical findings on the extent of long-term discounting further highlights the importance of our evidence and analysis on the role of optimistic bias and subadditivity under the lifetime-plus-years regime. Without the specific evidence on these behavioral forces we provide, it would be difficult to determine whether the difference between the latter regime and its fixed-term counterpart, even under the shorter lifetime-plus-50-years rule of the 1976 Act, is truly significant for potential authors.[159]

Insofar as the CTEA's prospective extension is concerned, however, the behavioral factors underlying the unique impact of the lifetime-plus-years regime are absent. Optimistic bias, which makes potential authors prone to overestimate their future longevity, has no impact on the perceived value of an extension of only the "years" component of copyright duration. In the same vein, the strong effect of subadditivity on judgment is unlikely to impact authors' perceptions of the extension's value. Absent the addition of a distinctive new component to the duration rule, the mere increase of the number of "years"—an already existing category—would probably not be perceived by potential authors as a conceptually different representation.

To further buttress these logical conclusions, we conducted two experiments in which participants rated the attractiveness of different term increases for an already guaranteed stream of payments for

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159. In fact, if these authors were to apply very high discount rates in the long-term as well, they would not care at all about the differing effects of the two regimes, which occur no earlier than fifty years after creation, even in the extreme case of an author dying immediately after creation. *See supra* notes 149-52 and accompanying text.

lifetime plus thirty years.[160] As expected, participants did not find an extended period of lifetime plus seventy years significantly more attractive than the shorter period of lifetime plus fifty years.[161]

Furthermore, when determining their willingness to pay at present for these far-future extensions, the participants exhibited median implied discount rates of approximately 4%-4.5%. Their median valuation of every dollar received annually by their heirs between thirty and fifty years after their death amounted to a total of $.50, while for a longer forty-year extension effective between years thirty to seventy years after their death it amounted to $.80.[162]

These findings are in line with the recent evidence on intertemporal choice in the long-term. Apparently, at least when asked explicitly to value far-future monetary extensions, decision makers apply a lower discount rate than they do in the short- and mid-term. This lower rate, which is also lower than the discount rates traditionally used by economists to determine the present value of risk-free investments, nevertheless yields low present values for far-future extensions. These low values, as evident from our findings, are insufficient to make experimental participants show a statistically significant preference for a forty-year extension beginning thirty years and ending seventy years after their death over a much shorter twenty-year extension beginning at the same time. The lack of a difference between decision makers' reactions to the two extensions, which result in payment periods comparable to the pre-CTEA and post-CTEA duration rules respectively, further highlight the unlikely impact of the extension on authors' incentives to invest in creation.[163]

Finally, our experimental findings also suggest that copyright law could probably have obtained an effect as strong as the two

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160. The thirty-year period was chosen to allow for a comparison of a stream of lifetime plus fifty years to another of lifetime plus seventy years from a common baseline.

161. *See* Tor & Oliar, *supra* note 1.

162. *See id.*

163. As a matter of fact, our experimental test probably overstates the effect of the prospective extension, since it compares a forty-year to a twenty-year extension. In reality, however, the effect of the CTEA on potential individual authors should be measured by comparing a lifetime-plus-50-years period to a lifetime-plus-70-years period. Under this comparison, the small (though already insignificant) difference between pre- and post-CTEA regimes is likely to shrink even further.

lifetime-plus-years rules we tested by breaking the duration rule explicitly into additional categories. Such an additional breakup could have been accomplished, for example, by defining the term of copyright as the lifetime of the author plus the lifetime of the authors' children and an additional twenty years after the children's death. Under this rule, the "lifetime" component would generate optimistic bias similar to that we observed under the extant regime, and the breaking of the period into the latter category plus another "children's lifetime" category would have likely generated subadditivity as well.[164] Ironically, such a definition could have resulted in a shorter average copyright period (since the average author would probably not have children living more than fifty years after her death), thereby decreasing the direct social costs of copyright while increasing, or at least maintaining, its present incentive-providing effect.[165]

V. Conclusion

Our behavioral analysis in this Article reveals that the extant, seemingly inferior lifetime-plus-years regime provides boundedly rational authors with increased incentives for investing in creation. These real-life authors are prone to overestimating the duration of copyright their works will enjoy under the lifetime-plus-years regime. They are therefore likely to make greater investments in creation under this regime, whose attendant social costs may also be greater than the costs of a comparable fixed-term regime.

We have also shown that the unique behavioral impact of the lifetime-plus-years regime does not extend to the additional twenty years provided by the CTEA, a conclusion supported by empirical

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164. *See id.* In fact, our experimental findings show that this later rule is perceived as equally or even more attractive, and is valued more highly by participants than the other two rules.

165. We do not suggest, however, that a "lifetime-plus-children's-lifetime" regime would be overall superior to the extant rule. Although that may be the case, such a conclusion would also have to take into account the other costs and benefits of this regime (e.g., the likely increase in tracing costs it would generate, the disincentive to authors not planning to have children, or the inducement of authors to bear children later in life to obtain extended copyright protection). We also do not suggest that any long-term copyright protection is socially optimal overall.

findings from the behavioral literature as well as our own focused experimental tests.

The traditional economic aspects of our findings regarding far-future extensions within a given regime can probably be extended to the case of works made for hire as well. Such works have also been awarded a twenty-year extension to the fixed-term of copyright they enjoyed before the CTEA, whose effective impact takes place only after the passage of seventy-five years from creation at the earliest.[166] According to the NPV rule, the per-dollar present value of the added income between years seventy-five and ninety-five is very small, even when using a highly conservative annual interest rate of 5%.[167] This traditional view might well apply to those firms deciding to invest in works made for hire, whose evaluation of far-future benefits could plausibly accord with the normative rule.[168] For such works, therefore, the CTEA's prospective extension also appears to provide very limited marginal incentives to create.[169] The constitutional analysis of the CTEA in *Eldred* could benefit from this finding when examining whether the Act is within the mandate given to Congress to enact copyright legislation.[170] Thus, although the constitutional

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166. *See* 17 U.S.C. § 302(c) (2000) (assuming a work has been published immediately after its creation, because § 302(c) protects these works for the shorter of ninety-five years from publication or one-hundred-twenty years from creation, while the 1976 Act's rule provided only the shorter of seventy-five years from publication or one hundred years from creation).

167. *See* discussion *supra* Part IV.A.

168. Note, however, that the behavioral finance literature provides ample evidence for boundedly rational judgment and decision-making in and by firms, even in intensely competitive settings. *See, e.g.,* Shlomo Benartzi & Richard H. Thaler, *Myopic Loss Aversion and the Equity Premium Puzzle*, 110 Q.J. ECON. 73 (1995) (discussing specific evidence of short time horizons in firms' investment decision-making); Tor, *supra* note 9 (showing that bounded rationality can survive and prosper even while the market disciplines many boundedly rational actors).

169. Note that for decision makers applying the NPV rule with a reasonable discount factor, taking into account the risks involved in investment in creation, even the pre-CTEA regime may provide little additional incentives to create as compared to far shorter duration regimes.

170. *See* U.S. CONST. art. I § 8, cl. 8. Another important policy question that is beyond the present analysis is whether society can legitimately exploit the bounded rationality of potential creators to provide them with greater incentives to create without increasing the objective value of their copyright. On the one hand, such a policy arguably abuses governmental power to benefit society at the expense of some of its citizens. On the other hand, one may

challenge to the Act has focused on the CTEA's retrospective extension, both this extension and the Act as a whole have been justified, to a degree, by the asserted need to provide incentives for new creation via the prospective extension.[171]

In this Article, we have applied, for the first time, a behavioral economic analysis to fundamental features of copyright law, solving the puzzle of the unique, seemingly inferior duration regime of copyright for individual authors. We have relied on our analysis, together with additional empirical findings and new experimental evidence, to expose the limited incentive-providing efficacy of the CTEA.

In addition, our analysis also indicates the possibility of developing an empirical foundation for determining of the proper boundaries of copyright law based on a meaningful, testable definition of its incentive-providing mandate.

Finally, we hope our analysis will alert legal scholars who study those numerous constitutional doctrines that seek to impact individuals' conduct, to the important, yet unexplored, role that behavioral insights can and should play in these constitutional domains.

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assert that the behavioral impact of a lifetime-plus-years regime truly increases the utility of creators and accords with their preferences, although it will not benefit most of them as much as they expect. *Cf.* Jolls et al., *supra* note 10, at 1541-45 (discussing the possibility of governmental reliance on and exploitation of the bounded rationality of citizens as a basis for regulation).

171. *See supra* note 14 and the accompanying text.