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THE NATURE OF SEQUENTIAL INNOVATION

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ABSTRACT

When creators and innovators take up a new task, they face a world of existing creative works, inventions, and ideas, some of which are governed by intellectual property (IP) rights. This presents a choice: Should the creator pay to license those rights? Or, alternatively, should the creator undertake to innovate around them? Our Article formulates this "build on/build around decision" as the fundamental feature of sequential creativity, and it maps a number

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of factors—some legal, some contextual—that affect how creators are likely to decide between building on existing IP or building around it. Importantly, creators are influenced by more than just formal IP rights. We identify three other sets of factors—(1) Technological and Artistic, (2) Market, and (3) Creator—that can also affect the path of sequential innovation by encouraging either building on or building around. Our focus on creators' build on/build around decisions offers a richer, but more complex, account of the nature of sequential innovation and, in so doing, yields insights into its efficient legal regulation.

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INTRODUCTION

In 2014, Taylor Swift, an admired and popular singer-songwriter, released her fifth album, *1989*. The following year, Ryan Adams, also an admired and popular singer-songwriter, released his fifteenth album, *1989*. Adams's *1989* was a song-by-song imitation of Swift's *1989*. It may seem odd that Adams would release an album of another singer-songwriter's material. But in popular music, this is not unusual. Popular musicians often cover other musicians' songs. Indeed, as we shall see, copyright law is set up to allow them wide freedom to do so.[1] It *is* unusual that Adams decided to cover an entire Taylor Swift album, rather than a single song.[2] But Adams's decision to engage in wider imitation than is customary leads to the question this Article explores: Under what conditions would a person or a firm decide to build on already-existing creativity rather than attempt to create something new?

This question arises across the entire range of creative and innovative work. Imagine that a smartphone company is considering updating its touchscreens for an upcoming product release. To do so, it has two options: license another firm's patented technology or develop its own technology that does not infringe the other firm's patents. Or consider a movie studio that wants to produce a summer blockbuster. It can purchase the rights for an existing copyrighted story, or it can have its own writers create a new story. How should the smartphone company and the movie studio decide what to do?

Whether we are talking about Ryan Adams, a smartphone company, or a movie studio, the answer is (conceptually) the same and pretty simple. The actors should choose whichever strategy maximizes the ratio of benefits to costs.[3] The hard part is doing that calculus. As this Article demonstrates, focusing on how intellectual

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1. *See infra* Part II.A.

2. This is not unprecedented. *See* Heidi Vanderlee, *The 10 Best Full-Album Covers of All Time*, FLAVORWIRE (Jan. 21, 2010), http://flavorwire.com/62353/reinvention-as-flattery-the-best-full-album-covers-of-all-time [https://perma.cc/F55E-EKM5] (mentioning Beck's recording of "The Velvet Underground & Nico" and Rufus Wainwright's version of Judy Garland at Carnegie Hall).

3. *See infra* Part I.C.

property (IP) law affects cumulative innovation is not sufficient.[4] Doing the calculus right requires a broader model. This Article provides such a model and demonstrates how policymakers can use it.

Understanding the costs and benefits of building on existing works and technologies, versus undertaking new creative or inventive efforts, is deeply complicated. We refer to a creator's decision whether to license preexisting IP or strike out on its own as the build on/build around (O/A) decision, and it is a decision antecedent to almost all sequential innovation. A downstream[5] creator faced with a world of existing IP rights must choose whether to design around those rights or whether to pay a license fee and borrow from them.[6] The O/A decision involves weighing a wide range of factors, including the scope of existing IP rights, the costs of designing around those existing rights,[7] and a host of nonlegal, contextual factors that may point toward building on or building around in particular instances.

This Article's account of the O/A decision, and the ways in which it drives sequential innovation, draws from and extends two related but distinct literatures. First, a number of scholars have focused on the influence of IP law on sequential innovation. They have highlighted the ways in which changes to the breadth or scope of IP rights affect the pace and direction of creativity and innovation.[8]

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4. *See infra* Part II.

5. "Downstream" creators are ones who are considering licensing or designing around "upstream" rights. Of course, all upstream creators are, or were, downstream of other creators. For simplicity, we focus on individual interactions.

6. As we explain in Part I, what we call "building around" does not always result in artistic or technological improvements, nor does what we call "building on" always result in stasis. Often creators design around existing rights, but produce no new knowledge, and downstream creators often build on existing rights because they plan to improve them. *See infra* notes 309-15 and accompanying text.

7. *See infra* Part II.A.

8. *See, e.g.*, Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1581 (2003) ("In the last twenty years, legal and economic scholarship has provided valuable evidence about the complex process of innovation and how the patent system affects innovation."); Matthew J. Conigliaro, Andrew C. Greenberg & Mark A. Lemley, *Foreseeability in Patent Law*, 16 BERKELEY TECH. L.J. 1045, 1050 (2001) (discussing the law and policy arguments in favor of design-arounds in patent law); Joseph P. Fishman, *Creating Around Copyright*, 128 HARV. L. REV. 1333, 1346 (2015) (arguing the patent law concept of "inventing around" also exists in the copyright context); Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 1056 (1997) (discussing how parties' willingness to pay or license depends on multiple factors); Robert P. Merges & Richard R.

This research has not, however, typically looked beyond the influence of IP laws to consider the host of other factors, described in this Article, that influence sequential innovation.

A second cohort of scholars has applied concepts derived from Ronald Coase's seminal "theory of the firm" to innovation relationships.[9] The theory of the firm literature analyzes the factors that determine whether parties to a transaction vertically integrate, with one buying the other, or operate as separate entities.[10] This is known as the "make-or-buy" decision. In the innovation context, this approach inquires into the factors that influence whether a would-be innovator will integrate its innovation activities into the firm or contract externally to obtain them.[11]

Although this line of inquiry motivates our own questions, the existing theory of the firm literature has not previously focused on sequential innovation. Indeed, the existing literature typically frames innovation as a one-step process, starting from the premise that a firm desires to innovate and must decide whether to do so in-house or to pay another firm to innovate for it.[12] For example, a car company needing new braking technology can either develop that

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Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 880-84 (1990) (evaluating the historical effect of patent availability on innovation and industry structure in several industries); Robert P. Merges, *The Trouble with Trolls: Innovation, Rent-Seeking, and Patent Law Reform*, 24 BERKELEY TECH. L.J. 1583, 1583 (2009) (analyzing the effect of secondary markets for patents).

9. *See, e.g.*, Oren Bar-Gill & Gideon Parchomovsky, *Law and the Boundaries of Technology-Intensive Firms*, 157 U. PA. L. REV. 1649, 1671-88 (2009) (analyzing how property rights and covenants not to compete shape the boundaries of technology-intensive firms); Dan L. Burk, *Intellectual Property and the Firm*, 71 U. CHI. L. REV. 3 (2004) (analyzing doctrines of patent and copyright law under the property-based theory of the firm); Peter Lee, *Transcending the Tacit Dimension: Patents, Relationships, and Organizational Integration in Technology Transfer*, 100 CALIF. L. REV. 1503, 1508-09 (2012) (discussing the impact of tacit knowledge and the theory of the firm on markets, relationships, and organization); Robert P. Merges, *Autonomy and Independence: The Normative Face of Transaction Costs*, 53 ARIZ. L. REV. 145, 145 (2011) (arguing that "disaggregated production of IP-covered works are worth the cost" because they serve important normative values).

10. *See generally* Jason Scott Johnston, *The Influence of* The Nature of the Firm *on the Theory of Corporate Law*, 18 J. CORP. L. 213 (1993) (comparing Coase's theory to contemporaneous theories and exploring the impact of the theory of the firm on corporate law).

11. *See* Burk, *supra* note 9, at 4.

12. *See, e.g.*, Ronald J. Gilson, Charles F. Sabel & Robert E. Scott, *Contracting for Innovation: Vertical Disintegration and Interfirm Collaboration*, 109 COLUM. L. REV. 431, 434 (2009) (discussing how contracting parties manage innovation and IP rights).

technology using its own engineers, or it can contract with another firm to develop that technology for them.

This is an incomplete way to model innovation. The world is full of existing innovations, many covered by one form of IP or another. A model of innovation should account for existing IP rights by integrating (1) the sequential nature of innovation,[13] (2) the fact that innovators often confront existing IP rights,[14] and (3) the fact that would-be innovators face a decision whether to borrow from these existing rights (usually by licensing them), or innovate in ways that fall outside the scope of those existing rights.[15] With this Article, we present such a model.

Accordingly, in this Article we push the inquiry back in time, to when the firm or other creator is deciding whether to innovate at all, or simply to license existing IP rights.[16] We are interested in how the car company in our earlier example decides if developing a new braking system is worthwhile in the first place (regardless of whether the development is done internally or externally). In other words, before we can answer the question of whether a firm should contract with another to produce an innovation or whether it should innovate in-house, we first need to know whether the innovation will take place at all, or whether the firm will borrow from an existing idea instead. In a world of existing innovations and associated IP rights, virtually all make-or-buy decisions are preceded by O/A decisions.

This Article highlights the major factors that influence whether a creator or inventor is likely to build on existing works and ideas or build around them to a new solution. We have organized these factors into four categories: (1) Legal, (2) Technological and Artistic, (3) Market, and (4) Creator. Each of the four categories contains a number of factors that can affect the O/A decision. For example, with respect to the Technological and Artistic category, would-be creators may have to consider, among other things, the maturity of

13. *See infra* Part I.B.

14. *See infra* Part I.C.

15. *See infra* Part I.C.

16. As we explain in more detail below, not everything that we label "building around" produces new value, and not everything that we label "building on" involves exact duplication. Building around may produce redundant ideas, while building on may occur in furtherance of new developments. *See infra* Part I.C.

the industry or medium, the degree to which downstream creations depend on upstream inputs, and the importance of tacit knowledge.[17] While we have assigned all legal factors that influence O/A decisions to one category, we have split the nonlegal factors into three categories. The main difference between these three categories is that factors that influence the O/A decision directly through a price signal are assigned to the Market category, while factors that influence the O/A decision through the behaviors and preferences of the innovators are assigned to the Creator category. When constraints arise from the characteristics of a particular technological or artistic environment and influence O/A decisions, we assign them to the Technological and Artistic category. We have used this categorization because the channels through which factors from the four categories influence O/A decision differ substantially and the policy responses to these influences may also differ between categories.[18]

Whether firms and individuals make O/A decisions well or poorly is not simply a matter of their own success or failure—society as a whole is affected. If, for example, a pharmaceutical firm underestimates how difficult developing a new drug that does not infringe existing IP rights will be, it will waste resources on innovation and, in so doing, increase the price of the resulting drug and perhaps delay its arrival. Had its calculations been correct, the firm should have built its new drug upon existing IP rights and acquired the necessary licenses to do so. Similar problems arise if creators are inappropriately risk averse and pay to license rights that they could have easily built around. The mistaken O/A decision will result in a higher cost to produce new work. If the mistake is big enough, the new work may not be produced at all.

These examples only scratch the surface; O/A decisions pervade all areas of creativity and innovation. Just as musicians have to decide whether to borrow or create melodies and progressions, computer programmers must decide whether to borrow or innovate code. Yet despite the centrality of O/A decisions to the success of innovation, the factors affecting them have never been systematically identified and explained.

17. *See infra* Part III.
18. *See infra* Part VI.

Our focus on how context influences sequential innovation has three important policy implications. First, our account of the O/A decision helps explain how regulation may or may not influence the nature of sequential innovation by affecting the behavior of upstream and downstream creators.[19] Legal regulation, particularly in the form of changes to IP rights, can affect how downstream creators value borrowing from existing rights or designing around them. But the same regulation can also affect how upstream creators value and price their rights.[20] As we show in Part VI, the ultimate result of the regulation will be based on the difference between the magnitudes of the effects on upstream versus downstream creators.

Second, our analysis demonstrates that the enterprise of encouraging innovation through the grant of legal rights to control IP is much more complicated than the relatively straightforward IP incentive story suggests.[21] Because nonlegal factors influence so much about sequential innovation, a change to the law aimed at encouraging innovation may have effects that are difficult to predict. Accordingly, in order to engage in effective policy making, we must develop a richer and more accurate understanding of the skein of factors and relationships that affect sequential innovation.

Finally, we show that seemingly disparate questions in innovation policy are in fact connected, and the link between them is sequential innovation.[22] For example, the appropriate scope for fair use in copyright law is, in our view, often a question of what sort of rule for sequential innovation we want. Fair use rules determine which parties should get to produce other versions of a copyrighted work and whether they require licenses. We can readily see that a host of other nonlegal factors will affect this particular sequential innovation question. If, for example, consumers in some market have pronounced tastes for groundbreaking innovation versus derivative borrowing, then we might expect to see relatively little building on within that market even if the fair use doctrine were broadened to permit it. Or, imagine a market in which creators have

19. *See infra* Part VI.D.
20. *See infra* Part VI.B.
21. *See infra* Part VI.D.
22. *See infra* Part VI.D.

a particular behavioral response to risk. Let us hypothesize that creators are significantly overconfident about their ability to engage in groundbreaking innovation. Here too we might broaden the scope of the fair use doctrine and still see little effect on a market in which building on is comparatively rare. The overarching point is this: no matter what your goal is in regulating sequential innovation, no matter what values you are seeking to optimize, it is not enough to pull the levers that IP law presents. To understand how particular legal interventions are likely to affect sequential innovation, you have to know more about the context in which sequential innovation occurs, in all of its particular forms.

Accordingly, IP law and scholarship should be reoriented to consider legal interventions in the context of sequential innovation.[23] This inquiry is necessarily both more particularistic than theories of sequential innovation that would focus on legal interventions without attention to context, and overwhelmingly more empirical than theoretical.[24] Although more complex, only by considering sequential innovation in context can we understand how to effectively influence O/A decisions—an issue which should be at the heart of any policy on how to govern cumulative innovation processes.

The Article proceeds in six Parts. In Part I, we introduce the concept of O/A decisions and provide some context for understanding how creators approach them, using the existing literature discussed above. Parts II through V map out four categories of factors that influence O/A decisions and analyze how they affect whether a creator or innovator is likely to build on or build around. In Part VI, we synthesize this analysis and examine the complex interplay of the contextual factors that drive sequential innovation.

I. CUMULATIVE INNOVATION AND CREATOR DECISION-MAKING

A. Innovation, Contracts, and Firms

In his 1937 article, *The Nature of the Firm*, Ronald Coase wondered why we ever see the emergence of firms in a market

23. *See infra* Part VI.D.
24. *See infra* Part VI.C.

economy.[25] If a producer needed a particular part to make an automobile, for example, why did it not simply contract with a supplier to produce the part rather than produce the part itself?[26] To Coase, markets based on individual buyers and sellers could, in theory at least, create goods more efficiently than larger, vertically integrated firms.[27] His explanation for the existence of firms, then, turned on the role of transaction costs that hinder market exchanges.[28] In some cases, the difficulties of finding and negotiating with suppliers increased a firm's costs more than investing in the management and other capacities required to simply make the part itself.[29]

At its core, Coase's seminal article attempts to model how producers approach "make or buy" decisions.[30] In Coase's model, the decision to make or buy, and concomitantly, the "boundaries of the firm" (for example, the size or degree of integration of firms), is determined by the balance of costs associated with purchasing goods on the market versus making them internally.[31] As market transaction costs increase—relative to the costs of organizing activity within firms—so too will firm size. Firms will tend to "make" rather than "buy," and will expand accordingly.[32]

Coase's approach has been revisited and elaborated throughout the twentieth century, as economists and legal scholars have sought to understand the kinds of costs that may lead producers to inte-

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25. R.H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386, 388 (1937) ("Yet, having regard to the fact that if production is regulated by price movements, production could be carried on without any organisation at all, well might we ask, why is there any organisation?").

26. *Cf. id.* at 390.

27. As Dan Burk explains, "Modern theories of the firm ... have evolved in order to explain and justify the presence of organizational hierarchies within free market systems." Burk, *supra* note 9, at 4.

28. *See* Coase, *supra* note 25, at 390 ("The main reason why it is profitable to establish a firm would seem to be that there is a cost of using the price mechanism.").

29. *See id.* at 390-91 ("The costs of negotiating and concluding a separate contract for each exchange transaction which takes place on a market must also be taken into account.").

30. *Cf. id.* at 393-94 ("The question which arises is whether it is possible to study the forces which determine the size of the firm. Why does the entrepreneur not organise one less transaction or one more?").

31. *See id.* at 394-96.

32. Dan L. Burk, *Law and Economics of Intellectual Property: In Search of First Principles*, 8 ANN. REV. L. & SOC. SCI. 397, 407 (2012) ("Economic theories of the firm predict that the size and structure of firms will be dictated by the transaction costs experienced by the firm. Firms will decide to either make or buy inputs depending on the relative cost of each option.").

grate production capabilities within firms.[33] Over the past several years, scholars have further expanded Coase's fundamental insight into the realm of innovation and IP.[34] They recognized that modeling the "make or buy" decision becomes more complex when the desired outcome is not merely a product or service but rather an innovation.[35] Contracting with a supplier to produce a set number of widgets manifestly differs from contracting with a supplier to invent a new molecule or design a new product.[36] Agency costs, hold-up problems, and the design of effective incentives are especially

33. *See, e.g.*, Sanford J. Grossman & Oliver D. Hart, *The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration*, 94 J. POL. ECON. 691, 691-95 (1986); Oliver Hart & John Moore, *Property Rights and the Nature of the Firm*, 98 J. POL. ECON. 1119, 1120 (1990); Edward M. Iacobucci & George G. Triantis, *Economic and Legal Boundaries of Firms*, 93 VA. L. REV. 515, 518 (2007). For example, integrating production may make it easier to solve agency problems, because firms are better able to monitor otherwise unobservable behavior (although firms face their own agency problems, and employer monitoring of employees is quite obviously not costless). *See generally* George Baker, Robert Gibbons & Kevin J. Murphy, *Relational Contracts and the Theory of the Firm*, 117 Q.J. ECONOMICS 39 (2002) (exploring the relational contracts within and between firms, and discussing how integration within firms affects the temptation to renege on those contracts). Firm-based organization may also enable actors to avoid strategic hold-up problems faced by actors who make relationship-specific investments that contracts are incapable of adequately controlling (although again, firms can face these costs as well, but may be better positioned, in general, to minimize them). *See* Oliver D. Hart, *Incomplete Contracts and the Theory of the Firm*, *in* THE NATURE OF THE FIRM: ORIGINS, EVOLUTION, AND DEVELOPMENT 138, 150-51 (Oliver E. Williamson & Sidney G. Winter eds., 1991); Hart & Moore, *supra*, at 1120-22. By integrating the activities of both parties within the same organization, the firm may minimize investment inefficiencies. *Cf.* Burk, *supra* note 9, at 9.

34. For a review, see Anthony J. Casey, *Mind Control: Firms and the Production of Ideas*, 35 SEATTLE U. L. REV. 1061, 1066-68 (2012); *see also* Ashish Arora & Robert P. Merges, *Specialized Supply Firms, Property Rights and Firm Boundaries*, 13 INDUS. & CORP. CHANGE 451, 452-54 (2004); Bar-Gill & Parchomovsky, *supra* note 9, at 1653, 1656-58; Jonathan M. Barnett, *Intellectual Property as a Law of Organization*, 84 S. CAL. L. REV. 785, 787-88, 790-93 (2011); Burk, *supra* note 9, at 4; Dan L. Burk & Brett H. McDonnell, *The Goldilocks Hypothesis: Balancing Intellectual Property Rights at the Boundary of the Firm*, 2007 U. ILL. L. REV. 575, 616-17; Robert P. Merges, Intellectual Property Rights, Input Markets, and the Value of Intangible Assets 3-5 (Feb. 9, 1999) (unpublished manuscript) [https://perma.cc/ T4TA-GENR].

35. Casey, *supra* note 34, at 1068 ("The prior literature and its focus on a property-rights theory of the firm is useful but limited because it does not get us very far in analyzing how the actual creative function is organized.").

36. *See generally* Ronald J. Gilson, Charles F. Sabel & Robert E. Scott, *Contract, Uncertainty, and Innovation, in* PROMOTING INNOVATION AND GROWTH THROUGH LEGAL REFORM 223, 226-28 (2011) (describing how the shift from mass-produced standard goods to more innovative products has led companies to increasingly contract for inputs rather than making them in-house).

daunting when so much of what constitutes innovative behavior (for example, thought) is unobservable, and when the innovation that is desired is nonexcludable once it is made to appear.[37] Writing sufficiently complete contracts to mitigate these problems is well nigh impossible and certainly extremely expensive.[38]

Some have observed that in the face of these complexities, IP rights can play an important role in permitting actors to successfully negotiate over innovation and creativity. For example, Paul Heald and Robert Merges have separately explored how patent rights can help reduce transaction costs by allowing owners to coordinate investment and solve disclosure problems. That outcome, according to Coase's model, should permit more market transactions and reduce the size of innovative firms relative to a world without IP.[39] Relatedly, Oren Bar-Gill and Gideon Parchomovsky have examined how contract terms, including nondisclosure agreements, could play an analogous role in solving innovation-related hold-up problems and reducing the size of innovative firms.[40] Dan Burk and Brett McDonnell provide a somewhat more pessimistic account, analyzing the competing effects of strong IP rights on cumulative innovation and noting that, although IP rights may ease hold-up problems with initial innovation investments, they can also generate hold-up problems downstream when innovators have to contract with more and more rights holders.[41]

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37. *Cf.* Paul J. Heald, *A Transaction Costs Theory of Patent Law*, 66 OHIO ST. L.J. 473, 484 (2005) ("[I]f a transferee firm's cost of acquiring technology and the risk of post-contractual misbehavior by the transferor is sufficiently high, the firm may rationally decide to conduct its own research and development or, perhaps, to acquire the transferor.").

38. *See* Wendy Netter Epstein, *Facilitating Incomplete Contracts*, 65 CASE W. RES. L. REV. 297, 299-300 (2014).

39. *See* Heald, *supra* note 37, at 476; Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L.J. 1477, 1485 (2005); *see also* Michael J. Burstein, *Exchanging Information Without Intellectual Property*, 91 TEX. L. REV. 227, 231-32 (2012) (noting that IP is only one of several ways in which actors may solve disclosure problems).

40. Bar-Gill & Parchomovsky, *supra* note 9, at 1654-55.

41. Burk & McDonnell, *supra* note 34, at 614 (arguing that broad patent rights "entail[] new bargaining costs, and at some point bargaining may become so costly that it is not worth it, and the innovation is stopped in its track. This is the anticommons problem that has attracted much attention recently.").

B. Assuming Innovation Versus Producing It

There is, however, an important way in which the "theory of the innovative firm" literature is incomplete. The literature often assumes the existence of innovation as such and concerns itself with articulating the circumstances in which the innovation will be produced internally to the firm versus externally on the market.[42] For example, the existing literature might ask whether a pharmaceutical company will license a new compound from a biotech company or develop the compound internally via its own research and development.[43]

In focusing on these firm versus market questions, the existing literature faithfully maps the Coaseian model onto innovation. But in doing so, the literature has thus far overlooked an important difference between the production of ordinary products and services compared to the production of innovations.[44] The first, and perhaps most important, decision a potential innovator faces is *whether to innovate in the first place*.[45] Innovation is not always necessary, even

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42. *See* Casey, *supra* note 34, at 1062.

43. *See* Arora & Merges, *supra* note 34, at 456 (discussing whether a large biotech company should acquire a smaller company that developed a valuable pharmacological procedure); Burk & McDonnell, *supra* note 34, at 591 ("[N]early all of this work has been targeted toward the interaction between firms, and the decision whether to 'make or buy' a particular specialized input; that is, ultimately, whether to outsource production or whether to integrate production within a given firm."). In their writings, Dan Burk and Brett McDonnell not only look at inputs that are protected by patents or copyrights, but also at inputs that are covered by trade secrets or trademarks. *See id.* at 591-605; Dan L. Burk & Brett H. McDonnell, *Trademarks and the Boundaries of the Firm*, 51 WM. & MARY L. REV. 345, 346-47 (2009). In this respect, their analysis focuses on whether the existence of IP rights changes the size and structure of firms, irrespective of whether the IP right covers an innovation or not.

44. *See* Casey, *supra* note 34, at 1062.

45. Anthony Casey notes, "The existing literature focuses on whether a firm that specializes in post-production development will integrate with the modular unit of actual idea production however that production might be organized—on *where* the idea is produced rather than *how* it is produced." *Id.* For example, in their discussion of whether the large biotech company Genentech should integrate the smaller producer, Alkermes, Arora and Merges note, "[T]here is no hard and fast reason why Genentech could not pursue advanced delivery systems itself." Arora & Merges, *supra* note 34, at 456. But they never follow up on this question in the rest of the analysis. Casey's approach is the closest to ours, but it too asks a different question from the one that motivates our concerns. Casey is interested in how "the modular unit" of creativity will be organized, in particular when creativity may be the province of a single individual. Casey, *supra* note 34, at 1064.

for actors in creative industries.[46] Innovation is costly and worth pursuing only if its benefits exceed its costs. When innovation, or in our parlance building around, is too costly, actors might make use of freely available public domain options or license existing ideas from other parties.[47]

The existing literature misses another fact that confronts virtually every potential innovator: people do not just "have" ideas.[48] Ideas develop out of preexisting ideas, and those preexisting ideas—and the property rights attached to them—shape the choices of later-stage innovators.[49] Whether a creator chooses to build around will often depend on how much of the available "innovation space" in the field that the potential innovator wishes to enter is already owned.[50]

One of this Article's contributions is the recognition that extending Coase's theory of the firm to the context of sequential innovation requires that we reconfigure the model to place the O/A decision ahead of the "make or buy" decision. Before we ask whether an actor will make or buy an innovation, we need to first understand whether the actor will choose to build around or whether, instead, she will build on from an existing idea. Only by understanding the nature of this first decision will we be able to accurately model sequential innovation. Toward that end, this Article identifies and categorizes

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46. *See, e.g.*, Kal Raustiala & Christopher Sprigman, *The Piracy Paradox: Innovation and Intellectual Property in Fashion Design*, 92 VA. L. REV. 1687, 1765-75 (2006) (providing examples of industries, especially creative industries, with high rates of copying due to low IP-equilibria).

47. *See* William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 332 (1989).

48. Casey explains:

> These frameworks all share the common assumption that the idea is a thing that exists or can be caused to exist at will. They do not dig into how exactly the idea comes to exist in the first place or whether that production function requires a particular (sub)organization or is specialized to certain individuals.

Casey, *supra* note 34, at 1065.

49. *See* Burk & McDonnell, *supra* note 34, at 614; Jessica Litman, *The Public Domain*, 39 EMORY L.J. 965, 966 (1990) ("[T]he very act of authorship in *any* medium is more akin to translation and recombination than it is to creating Aphrodite from the foam of the sea.").

50. Dan L. Burk, Response, *The "Creating Around" Paradox*, 128 HARV. L. REV. F. 118, 121 (2015) ("'[T]hickets[,]' in which successively denser entitlements are clustered around an existing property, crowding out new follow-on creations resembling works already created[,] ... have been a concern in the patent literature, where dense clusters of exclusivity are believed to hamper follow-on innovation.").

the fundamental drivers of this initial innovation decision.[51] We develop a dynamic theory of the innovative actor,[52] in which an actor's decision to produce an innovation is not analyzed in isolation, but in the context of both legal and nonlegal factors that shape the choice between innovation and borrowing.[53] Ultimately, our theory will help guide scholars and policymakers regarding how to influence O/A decisions in a way calculated to optimize creative output.

C. The Nature of Decisions to Build On or Build Around

Our account of the build on/build around decision is based on a set of simplifying assumptions that mirror those in the theory of the firm literature. In our model, one or more upstream creators have preexisting IP rights in their works or inventions. A downstream creator has a new idea that she believes will make a valuable contribution to the market.[54] To accomplish the idea, she has two options: (1) borrow from the existing IP rights and pay a licensing fee, or (2) avoid the scope of the existing IP rights by designing or inventing around them.[55] We refer to the first strategy as "building on" and the second strategy as "building around."

Two caveats are immediately in order. First, not all of the behavior that we label as "building around" produces valuable new knowledge. As we discuss below, designing around IP rights may result in the replication of existing research and creativity, often by finding another route to provide the same product feature.[56] In addition, new uses of public domain sources count as "building around"

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51. *See infra* Parts II-V.

52. We use the term "actor" instead of firm, because at the stage of innovation that concerns us most, parties may or may not have organized themselves into firms. Our analysis includes innovative activity that takes place within a firm and also individual creativity.

53. *See infra* Parts II-V.

54. In this sense we are mirroring the assumption in the make-or-buy literature that the production of a given widget is cost-justified and that the principle question is whether the widget will be made in-house or purchased on the market. Accordingly, we ignore situations in which the downstream innovation does not get produced because doing so is inefficient, for example, where the expected benefits that the innovation generates are less than the costs of producing it either through building on or building around.

55. Burk & McDonnell, *supra* note 34, at 578 (citing Coase, *supra* note 25, at 394-96).

56. *See infra* notes 309-15 and accompanying text.

in our schema, because they do not require licensing from the original rights holder. Second, and conversely, the behavior that we label "building on" is not necessarily merely duplicative and can often result in further innovation. When downstream creators pay to license upstream IP rights, often it is because they conceive of an improvement or advance on the existing ideas that they wish to produce. The result of these strategies might still be recognized as innovative or creative if the product or service that results contains some new content or feature that builds on the preexisting work. We see this sort of "innovation through borrowing" all the time. A movie studio licensing the rights to a comic book character to create a film franchise with new storylines is a prime example of this behavior.

To begin with, we assume, as Coase did, that actors make their decisions by considering the costs and benefits of the available options.[57] Thus, actors will choose to build around if they believe the marginal benefits of doing so exceed the marginal benefits of building on.[58] Both strategies have benefits and costs for downstream creators. For example, building around existing IP rights can be risky and uncertain, because it may be difficult to anticipate how easily one can generate a new, noninfringing idea. On the other hand, if a creator builds around, she does not have to pay for a license, and she may obtain her own IP rights in her new innovation.[59] Building on existing IP rights produces the inverse set of costs and benefits. The borrower has to pay a license fee and absorb any attendant transaction costs, and she might not obtain independent IP rights in her own efforts.[60] She does, however, avoid the unpredictability of innovation and the risk that she will sink money into a barren mine.[61] If the ratio of benefits to costs seems more

57. *See* Robert P. Merges & Richard R. Nelson, *On Limiting or Encouraging Rivalry in Technical Progress: The Effect of Patent Scope Decisions,* 25 J. ECON. BEHAV. & ORG. 1, 3 (1994) ("The inventor, or the corporate research laboratory, is presumed to pick the course of action that maximizes (expected) profits.").

58. *See id.*

59. *See, e.g.*, Burk, *supra* note 50, at 120 ("[I]t would likely be in the interest of a competitor to license the existing patented invention rather than invest in developing a new substitute, so long as the license comes at a cost lower than that required to develop that substitute.").

60. *See* Heald, *supra* note 37, at 483.

61. *See id.*

favorable for building on upstream rights than for building around them, the downstream creator will build on.[62] If the converse is true, the downstream creator will build around.[63]

We begin our discussion of each of the factors that influence O/A decisions by focusing on downstream creators' behavior, but that will provide only part of the picture. In Parts II through V, we will discuss factors that make borrowing more or less costly, thereby influencing downstream creators' willingness to pay (WTP) to license preexisting innovations. For example, if the scope of existing IP rights expands, all else equal, it will be harder for downstream creators to build around those rights, driving up the costs of innovation and, simultaneously increasing the amount that downstream creators would be willing to pay to license existing creativity.[64] But this policy change does not inexorably lead to more borrowing. To understand the likely effect on the innovation process as a whole, we must take into account the effects on upstream creators of broadening IP rights. As we will show, however, not all of the factors that influence O/A decisions will produce effects on upstream and downstream creators that tend to counterbalance in this way.[65] Some factors will exclusively influence upstream or downstream creators (unless the parties have complete information about each other's reserve prices). In those cases, a shift in that factor will produce a systematic alteration of O/A decisions. In Part VI, we offer some generalizations about when we should expect to see systematic shifts in O/A decisions and when not.

II. LEGAL FACTORS AFFECTING DECISIONS TO BUILD ON OR BUILD AROUND

Perhaps the most obvious factors affecting O/A decisions are the legal rights that attach to existing creativity. Copyright and patent laws determine what is protected and for how long.[66] They also

62. *Cf.* Merges & Nelson, *supra* note 57, at 3.

63. *Cf. id.*

64. *Cf.* Landes & Posner, *supra* note 47, at 332 ("The less extensive copyright protection is, the more an author, composer, or other creator can borrow from previous works without infringing copyright and the lower, therefore, the costs of creating a new work.").

65. *See infra* Part VI.

66. *See* 17 U.S.C. § 302 (2012); 35 U.S.C. § 154 (2012).

determine how different others' efforts must be to avoid infringement, and whether others can obtain their own IP rights in their subsequent creative work.[67] This Part will review these legal rules and their influence on O/A decisions. But patent and copyright laws are not the only factors, and are not even the only *legal* factors that influence creators' O/A decisions. Other IP doctrines, like trademark and trade secret laws, and several bodies of law outside of IP—including antitrust, tax, and health law—also affect the pace and direction of sequential innovation.[68] We offer a brief example of one of these non-IP legal influences at the end of this Part. Our goal here is limited to sketching, rather than fully specifying, the complex skein of legal doctrines that interact to affect sequential innovation.

A. Patent and Copyright Law

When inventors and authors produce scientific and technical discoveries, and literary and artistic works, they can obtain patents and copyrights, respectively, in those discoveries and works.[69] The existence of these rights means that others cannot do certain things with those inventions and works for a period of time.[70] Patent law prevents others from making, using, or selling protected inventions for twenty years from the filing of the patent application.[71] Copyright law prevents others from reproducing (in whole or any substantial part), distributing, displaying, and performing protected works, or producing works based on protected works, for a period that usually runs for the full life of the author plus seventy years.[72] During these periods, if others want to engage in activities that implicate these exclusive rights, they have to receive a license from the patent or copyright owner.[73] Without a license, downstream

67. *See* 17 U.S.C. § 302; 35 U.S.C. § 154.

68. *See infra* Part II.B.

69. *See* 17 U.S.C. § 302; 35 U.S.C. § 154.

70. *Cf.* 17 U.S.C. § 302; 35 U.S.C. § 154.

71. 35 U.S.C. § 154(a)(2).

72. 17 U.S.C. § 302(a). For certain works, including, most importantly, the works of corporate (versus natural) authors, the copyright term is 95 years from its date of publication, or 120 years from its creation, whichever expires first. *Id.* § 302(c).

73. *Cf.* William M. Landes & Richard A. Posner, *Indefinitely Renewable Copyright*, 70 U. CHI. L. REV. 471, 475 (2003).

creators generally cannot borrow from protected inventions and works until the terms of protection end and the inventions and works enter the public domain.[74] Virtually all aspects of IP doctrine, then, are fundamentally regulations of sequential innovation.

The very existence of IP rights requires downstream creators to contemplate whether they should design around the inventions and works of others. In a world without IP rights, downstream creators could freely borrow from all who came before them.[75] IP rights require downstream creators to either invest resources in designing around these rights or negotiate costly licenses.[76] The longer and more completely ideas are protected, the more costly it is for downstream creators to build on them, because doing so will require a license during the term of protection.[77]

The vast majority of patented inventions and copyrighted works are most valuable shortly after their creation.[78] Although some creations have enduring value that may last for decades or even centuries after their development, most lose value quickly.[79] This is true both for the value of the creation itself and for the value of

74. *Cf.* 17 U.S.C. § 302.

75. The world of culinary creativity, where recipes are typically not protected by formal IP rights, may resemble this situation. *See* Christopher J. Buccafusco, *On the Legal Consequences of Sauces: Should Thomas Keller's Recipes Be* Per Se *Copyrightable?*, 24 CARDOZO ARTS & ENT. L.J. 1121, 1124-25, 1147-48 (2007). Of course, the absence of IP rights and the free opportunity to copy does not mean that people will not be creative. The extensive research on IP's "negative spaces" shows that people will often create new works and inventions even when they can copy those that already exist and when others can copy them in turn. *See* Raustiala & Sprigman, *supra* note 46, at 1688-93, 1764 (arguing that the absence of copyright protection for fashion designs actually appears to accelerate creation and promulgation of new designs and developing the term "negative spaces").

76. *Cf.* Landes & Posner, *supra* note 47, at 332 ("[If authors were entirely prevented from copying] they would copy works whose copyright protection had run out, or they would disguise their copying, engage in costly searches to avoid copying protected works, or incur licensing and other transaction costs to obtain permission to copy such works. The effect would be to raise the cost of creating new works—the cost of expression, broadly defined—and thus, paradoxically, perhaps lower the number of works created.").

77. *See id.* at 332 n.12.

78. *See* Landes & Posner, *supra* note 73, at 475, 499-500 (providing evidence of copyright renewal rates to suggest that most works have little or no value within a few decades).

79. For a list of twentieth-century novels that seem to have enduring value, see Christopher Buccafusco & Paul J. Heald, *Do Bad Things Happen when Works Enter the Public Domain?: Empirical Tests of Copyright Term Extension*, 28 BERKELEY TECH. L.J. 1, 38-43 (2013).

downstream innovation that borrows from it.[80] There would not be much demand to license the copyrights to most early nineteenth-century novels, nor the patents to many early modern medical devices, even if those rights still existed. To the extent, then, that IP rights last for a term that covers all, or virtually all, of the value of creations as inputs to new developments,[81] they require downstream creators to determine whether they should design around those rights or pay to license them. Waiting until the IP right expires is not an alternative.[82] In contrast, if rights expired after only two years, for example, a downstream creator might choose to neither design around the existing work nor pay to license it, but instead simply wait until the term ended.

Accordingly, for forms of creativity covered by IP rights that endure for substantially all of the economic life of the work or invention at issue, it is harder—and perhaps virtually never makes sense—for downstream authors to wait until works fall into the public domain in order to borrow from them. The amount that downstream creators are willing to pay to license rights or to spend on research and development (R&D) designing around them will increase with increasing IP duration—but only up to a point. When IP rights are made long enough to endure for a period at least as long as the anticipated economic life of the works and inventions they cover, then additional increases in term will not further affect downstream innovators' willingness to license.

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80. *See generally* Landes & Posner, *supra* note 73 (discussing factors that affect the value of copyrighted material over time).

81. Patent terms have remained relatively constant since the eighteenth century—the first Patent Act limited terms to fourteen years. *See* Patent Act of 1790, ch. 7, § 1, 1 Stat. 109, 109-10 (repealed 1793). Copyright terms, however, have expanded enormously. The first (1790) Copyright Act granted authors the possibility of two fourteen-year terms. *See* Copyright Act of 1790, ch. 15, § 1, 1 Stat. 124, 124 (repealed 1802) (entitled "An Act for the encouragement of learning"). Since then, Congress has repeatedly lengthened copyright terms, most recently in 1998 by adding an additional twenty years. *See* Sonny Bono Copyright Term Extension Act, Pub. L. No. 105-298, § 102, 112 Stat. 2827 (1998). While some works continue to have value a century or more after their creation, the vast majority do not. For a discussion of term extension and the value of copyrighted works, see Buccafusco & Heald, *supra* note 79, at 6-l0.

82. *Cf.* Buccafusco & Heald, *supra* note 79, at 6-10.

1. IP Scope

More important than the length of IP rights, however, is their breadth or scope.[83] The scope of IP rights influences the size of what we refer to as the "innovation space." This is the unowned space around existing IP rights that downstream creators can use for sequential innovation. The innovation space includes public domain material, a category composed of both works and inventions whose terms have expired and of certain ideas or building blocks that are not subject to IP rights.[84] It also includes the as-yet-unclaimed aspects of contemporary or future innovation—the works that have not yet been written and the inventions that have not yet been discovered.[85] Broader IP rights for upstream creators means narrower innovation spaces for downstream ones.[86]

IP rights vary in scope along three principal dimensions: (1) what can be protected; (2) what sorts of behaviors constitute illegal appropriation that IP rights protect against; and (3) what rights downstream creators can get, if any, in their follow-on innovations.[87] We consider each of these in turn, and we evaluate the distinct approaches of copyright and patent law. Then, we analyze how changes in scope can influence creators' O/A decisions.

Both copyright and patent laws limit the kinds of creative endeavors that can be protected. Most prominent in copyright law is the so-called "idea/expression distinction," which allows authors to copyright their particular expressions of ideas but not the ideas themselves. Copyright law also refuses protection to any procedure, process, system, method of operation, concept, principle, or discovery. Subject matter within these categories either belongs in the patent system or is not covered by IP rights at all.[88] Patent law has

83. *See generally* Fishman, *supra* note 8, at 1383 ("Constraint scope measures how many choices within a domain a given constraint precludes."); Mark A. Lemley & Mark P. McKenna, *Scope*, 57 WM. & MARY L. REV. 2197 (2016) (discussing the scope of IP rights as fundamental to their efficacy).

84. *See* Lemley & McKenna, *supra* note 83, at 2205-06.

85. *Cf. id.* at 2206-07 (noting that all IP regimes will grant parties rights in a work—even if many features are not protectable—so long as that new work has some "point of novelty").

86. *See generally id.* (discussing the tension between current and downstream creators over the scope of creator rights).

87. *See id.* at 2204.

88. 17 U.S.C. § 102(b) (2012) ("In no case does copyright protection for an original work

similar limitations. No one can secure patents on laws of nature, physical phenomena, or abstract ideas.[89]

These limitations ensure that some innovation space will always be left for downstream creators. With respect to both copyright and patent scope limitations, court decisions interpreting those restrictions can expand or constrict the scope of the innovation space left open for follow-on creators.[90] For example, which aspects of a story's plot constitute ideas and which expression?[91] Or to what extent does genetic material constitute unpatentable products of nature?[92] Different answers to these questions will expand or contract the innovation space left to subsequent creators.[93]

The most important aspects of IP doctrines, in terms of their influence on O/A decisions, concern the scope of protection that owners receive. What rights do authors and inventors get, or, considered obversely, what sorts of behaviors constitute infringement unless licensed? Copyright law began as a right to print copies of a work.[94] Over the course of the nineteenth and especially twentieth centuries, however, it has expanded to include the exclusive rights to distribute, perform, display, and make derivative versions of the work.[95] Similarly, patent law includes broad proscriptions against making, using, or selling the protected invention.[96] Patent

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of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.").

89. *See* Mayo Collaborative Servs. v. Prometheus Labs., Inc., 566 U.S. 66, 70 (2012) (ruling on the patentability of laws of nature).

90. *See generally* Lemley & McKenna, *supra* note 83 (examining the various actions courts may take to shape validity, infringement, and defenses).

91. *See* Nichols v. Universal Pictures Corp., 45 F.2d 119, 121 (2d Cir. 1930) (determining whether defendant's work, which included some similar characters and themes as plaintiff's work, infringed plaintiff's copyright).

92. *See* Ass'n for Molecular Pathology v. Myriad Genetics, Inc., 133 S. Ct. 2107, 2117 (2013) (holding that "separating [a human] gene from its surrounding genetic material is not an act of invention").

93. *See* David Fagundes & Jonathan S. Masur, *Costly Intellectual Property*, 65 VAND. L. REV. 677, 713 (2012) (noting that the idea/expression distinction makes it easier to design around copyrights than patents).

94. L. Ray Patterson, *Copyright and "The Exclusive Right" of Authors*, 1 J. INTELL. PROP. L. 1, 3-4 (1993).

95. *See* 17 U.S.C. § 106 (2012) (listing the exclusive rights of authors).

96. *See* 35 U.S.C. § 271(a) (2012) ("Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the

law diverges from copyright law, however, in its treatment of independent creation or invention.[97] A downstream innovator will be liable for patent infringement if she makes, uses, or sells the invention, whether or not she knows about the existing invention or the patent on it.[98] In copyright law, by contrast, a second author who creates a work that already exists, but who is unaware of that work and does not copy it, is not an infringer.[99] In this respect, the doctrine of independent creation means that copyright law offers downstream creators a larger innovation space than does patent law, all else equal.[100] While would-be inventors are prevented from making, using, or selling any patented invention, whether they know about it or not, downstream copyright authors are free to create works that are similar or even identical to existing works as long as they do not copy them.[101]

Although copyright and patent laws protect owners against unlicensed uses of their creations, both of these rights allow some forms of free borrowing by downstream creators.[102] Under copyright law, infringement liability is limited to instances in which a defendant's work is "substantially similar" to a preexisting copyrighted work.[103] Jury and judicial interpretations of the term "substantial" will expand or contract the scope of the available innovation space. For example, Robin Thicke and Pharrell Williams's song "Blurred Lines" was found to infringe Marvin Gaye's song "Got to Give It Up," even though the defendants' song did not

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patent therefor, infringes the patent.").

97. *See* Clarisa Long, *Information Costs in Patent and Copyright*, 90 VA. L. REV. 465, 525-33 (2004).

98. *See id.*

99. Indeed, she can obtain a copyright in her own work even though the work already exists. *See* Sheldon v. Metro-Goldwyn Pictures, Corp., 81 F.2d 49, 54 (2d Cir. 1936) ("[I]f by some magic a man who had never known it were to compose anew Keats's Ode on a Grecian Urn, he would be an 'author,' and, if he copyrighted it, others might not copy that poem, though they might of course copy Keats's.").

100. *See* Long, *supra* note 97, at 529.

101. *See id.* at 525-33.

102. *See* Martin J. Adelman & Gary L. Francione, *The Doctrine of Equivalents in Patent Law: Questions that* Pennwalt *Did Not Answer*, 137 U. PA. L. REV. 673, 703-06 (1989) (discussing the differences between copyright's substantial similarity doctrine and patent's doctrine of equivalents).

103. *See id.* at 703-04.

incorporate much of Gaye's protected expression.[104] This holding suggests that copyright's "substantial similarity" infringement standard is triggered by quite small amounts of borrowing.[105] Similarly, the scope of patent claims may be interpreted broadly or narrowly, and how patent claims are interpreted will directly influence the freedom of firms to borrow elements of a patented technology.[106] So too with regard to patent's doctrine of equivalents, the means by which patent law imposes liability on subject matter that, while not within the formal scope of a patent's claims, are nonetheless close enough.[107]

Copyright and patent laws both make some additional provisions for downstream users, however. Both include doctrines that exempt some otherwise infringing conduct from liability. In copyright law, the most important of these provisions is the fair use doctrine, which immunizes defendants from liability for certain infringements that are deemed consistent with copyright's broader purpose of encouraging the production of new artistic and literary works.[108] Most famously, when 2 Live Crew wanted to produce a parody version of Roy Orbison's song "Oh, Pretty Woman," they were denied a license to do so.[109] They made the song anyway, and when sued by Orbison's publisher, they asserted the fair use defense.[110] The Supreme Court found in their favor, noting that a parody "can

104. *See* Williams v. Bridgeport Music, Inc., No. LA CV13-06004 JAK (AGRx), 2014 WL 7877773, at *22 (C.D. Cal. Oct. 30, 2014) (listing the minor similarities between the works).

105. *See id.*

106. *See* Edmund W. Kitch, *Property Rights in Inventions, Writings, and Marks*, 13 HARV. J.L. & PUB. POL'Y. 119, 122 (1990) ("The claims of most issued patents are so narrow that competitors can devise many ways of achieving the same thing as the subject matter of the claim.").

107. *See* Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 732 (2002) ("The scope of a patent is not limited to its literal terms but instead embraces all equivalents to the claims described."); *see also* Hilton Davis Chem. Co. v. Warner-Jenkinson Co., 62 F.3d 1512, 1521-22 (Fed. Cir. 1995) (outlining factors considered), *rev'd*, 520 U.S. 17 (1997).

108. *See* 17 U.S.C. § 107 (2012) ("Notwithstanding the provisions of sections 106 and 106A, the fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified by that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright.").

109. *See* Campbell v. Acuff-Rose Music, Inc., 510 U.S. 569, 572-73 (1994).

110. *See id.* at 573.

provide social benefit, by shedding light on an earlier work, and, in the process, creating a new one."[111]

In subsequent case law, the Supreme Court's solicitude of parody has expanded into a broader tolerance of "transformative" uses.[112] As the fair use rules are understood currently, when the downstream work is sufficiently transformative of the upstream one—by shifting its message or its purposes, or by appealing to a different audience—the downstream creator is free to produce it without having to obtain permission from the copyright holder.[113] The broader the fair use privilege, then, the less downstream creators will be willing to pay to license upstream content.

Patent law does not have broad exceptions equivalent to copyright's fair use doctrine, but some limitations on patent rights do exist. For example, patent law includes a very narrow experimental use exception.[114] In addition, the Hatch-Waxman Act allows generic manufacturers of pharmaceuticals the opportunity to develop and test drugs without risk of infringement liability.[115] Compared to

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111. *Id.* at 579.

112. *See* Authors Guild v. Google, Inc., 804 F.3d 202, 216-17 (2d Cir. 2015) (finding the search engine's creation of digital copies of books to be transformative); Cariou v. Prince, 714 F.3d 694, 706 (2d Cir. 2013) (holding defendant's use of plaintiff's photograph was transformative because it "manifest[ed] an entirely different aesthetic" from the original); Blanch v. Koons, 467 F.3d 244, 253 (2d Cir. 2006) (finding the defendant's use of plaintiff fashion photographer's photograph was transformative because it served as "commentary on the social and aesthetic consequences of mass media"); Leibovitz v. Paramount Pictures Corp., 137 F.3d 109, 114 (2d Cir. 1998) (holding a parody of a photograph in a promotional movie poster was transformative because it modified the original "in a way that may reasonably be perceived as commenting" on the original).

113. *Campbell*, 510 U.S. at 579 ("Although such transformative use is not absolutely necessary for a finding of fair use, the goal of copyright, to promote science and the arts, is generally furthered by the creation of transformative works. Such works thus lie at the heart of the fair use doctrine's guarantee of breathing space within the confines of copyright and the more transformative the new work, the less will be the significance of other factors, like commercialism, that may weigh against a finding of fair use." (citations omitted)).

114. Roche Prods., Inc. v. Bolar Pharm. Co., 733 F.2d 858, 863 (Fed. Cir. 1984) (noting that courts should not "construe the experimental use rule so broadly as to allow a violation of the patent laws in the guise of 'scientific inquiry,' when that inquiry has definite, cognizable, and not insubstantial commercial purposes"), *superseded by statute*, Drug Price Competition and Patent Term Restoration (Hatch-Waxman) Act of 1984, Pub. L. No. 98-417, § 202, 98 Stat. 1585, 1603, *as recognized in* Warner-Lambert Co. v. Apotex Corp., 316 F.3d 1348 (Fed. Cir. 2003).

115. Also known as the Drug Price Competition and Patent Term Restoration Act of 1984. Pub. L. No. 98-417, 98 Stat. 1585 (1984); *see also* Schering-Plough Corp. v. FTC, 402 F.3d 1056, 1074 (11th Cir. 2005) ("[T]he Hatch-Waxman Amendments grant generic manufacturers

copyright law's fair use doctrine, however, these exceptions are much narrower and do less to expand the innovation space for downstream creators.[116]

The final way in which IP doctrines define the scope of the innovation space is via owners' abilities to control downstream uses of their works and inventions. Here, patent and copyright laws differ significantly. Once a patent owner discloses her invention to the world, other downstream inventors are free to invent their own improvements of it and to secure their own patent rights on those improvements.[117] The owner of the downstream improvement patent cannot make, use, or sell the improvement without permission from the upstream patent owner, but neither can the upstream patent owner make, use, or sell products that incorporate the downstream patent.[118] The two inventions are subject to "blocking patents," and they require negotiation between their owners to produce products combining both of them.[119]

In copyright law, by contrast, the owner of the upstream copyright automatically obtains rights to all of the actual or potential downstream versions of her work via the derivative rights doctrine.[120] Thus, the moment that J.K. Rowling wrote the first Harry Potter novel, she immediately gained the exclusive right to produce derivations thereof, including all sequels, movies, plays, Halloween costumes, action figures, Lego sets, and even companion guides—at

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standing to mount a validity challenge without incurring the cost of entry or risking enormous damages flowing from any possible infringement.").

116. *See* Julie E. Cohen & Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 CALIF. L. REV. 1, 6 (2001) (advocating for fair use-like rights for reverse engineering in patent law).

117. *See* Merges & Nelson, *supra* note 8, at 860.

118. *See id.*

119. *See id.* ("Two patents are said to block each other when one patentee has a broad patent on an invention and another has a narrower patent on some improved feature of that invention.").

120. *See* 17 U.S.C. § 106 (2012). "A 'derivative work' is a work based upon one or more preexisting works, such as a translation, musical arrangement, dramatization, fictionalization, motion picture version, sound recording, art reproduction, abridgment, condensation, or any other form in which a work may be recast, transformed, or adapted." *Id.* § 101; *see also* Daniel Gervais, *The Derivative Right, or Why Copyright Law Protects Foxes Better than Hedgehogs*, 15 VAND. J. ENT. & TECH. L. 785, 794-96 (2013) (describing the expansion of the derivative right in U.S. law).

least those drawing a not-insubstantial amount of copyrighted expression from the original works.[121]

As a number of scholars have noticed, copyright law's derivative works doctrine substantially fetters downstream creators.[122] The derivative right consumes a substantial portion of the available innovation space remaining around a given work.[123] This makes it relatively harder for downstream authors to write around existing copyrights by taking a story in a new direction or developing a new version of a work.[124] If a downstream author produces a work that falls within the scope of the derivative right, she will receive no protection for it at all unless she can contract with the upstream rights holder.[125] This may be difficult to do, however, given the inherent risks in disclosing information. Once the downstream creator informs the upstream owner of her idea, the upstream owner is free to appropriate it without paying the downstream creator. This is what happened in *Pickett v. Prince*, where the late recording artist both sued the defendant for making a guitar in the shape of the plaintiff's unpronounceable symbol and appropriated the rights to the guitar as a derivative work.[126] Had *Pickett* been a patent rather

121. *But see* Warner Bros. Entm't, Inc. v. RDR Books, 575 F. Supp. 2d 513, 539 (S.D.N.Y. 2008) (holding a *Harry Potter* companion guide that copied some text from the *Harry Potter* books to be an infringing reproduction, but refusing to hold it also an infringing derivative work because it did not "recast the material in another medium to retell the story of *Harry Potter*, but instead [gave] the copyrighted material another purpose"). The refusal in *RDR Books* to recognize the companion guide as a derivative work is unusual. *See* Pickett v. Prince, 207 F.3d 402, 405-06 (7th Cir. 2000) (holding that the artist Prince has the exclusive right to produce guitars in the shape of his unpronounceable but copyrighted symbol); Anderson v. Stallone, No. 87-0592 WDKGX, 1989 WL 206431, at *5 (C.D. Cal. Apr. 25, 1989) (dismissing the lawsuit of an author who wrote an authorized script for a new *Rocky* movie against Stallone for using aspects of the script in his own sequel).

122. *See* Lemley, *supra* note 8, at 1017-18; Merges & Nelson, *supra* note 8, at 908 ("Our general conclusion is that multiple and competitive sources of invention are socially preferable to a structure where there is only one or a few sources. Public policy, including patent law, ought to encourage inventive rivalry, and not hinder it."); *see also* Fishman, *supra* note 8, at 1394-95 (recognizing the constraints imposed by the derivative right but arguing that these constraints may be good for downstream creators).

123. *See* Michael Abramowicz, *A Theory of Copyright's Derivative Right and Related Doctrines*, 90 MINN. L. REV. 317, 318 (2005) ("Competition among authors for consumers interested in the same subject matter thus exists only where the derivative right does not extend.").

124. *See* Fishman, *supra* note 8, at 1381.

125. *See id.* at 1381-82.

126. 207 F.3d at 405-06.

than a copyright dispute, the defendant could have obtained legal rights in his follow-on innovation and compelled Prince to negotiate with him over the production of Prince-symbol-shaped guitars.[127]

2. Owning and Licensing IP Rights

When downstream creators consider licensing upstream rights they will face various expenses. First, the license will often cost the downstream creator money, and second, the parties will have to spend time and effort transacting over it.[128] The transaction costs attending these negotiations may be so large that they swamp the value of creating the downstream work, making it cheaper to design around instead.[129] Imagine, for example, someone wanting to write a screenplay and make a movie based on a 1930s novel by an author about whom little is known and who is difficult to track down. As we noted in Part I, these sorts of transaction costs will be one of the principal determinants of whether building on prior works occurs. Any features of the IP regime that influence them will likely have significant impacts on O/A decisions.

Transaction costs tend to be lower when it is easier for parties to determine whether and with whom they need to transact. Patent law requires patentees to file applications and disclose their inventions so downstream creators can understand which inventions exist and may need to be licensed.[130] Applications also include the names of the original inventors, and the U.S. Patent and Trade Office generally tracks patent assignments.[131] Copyright law previously

127. *Cf.* Merges & Nelson, *supra* note 8, at 860 (explaining how the "dominant" holder of a broader patent can block the "subservient" holder of a narrower patent).

128. *See* Lemley, *supra* note 8, at 1055.

129. *Id.* at 1055 ("[S]ome potential improvers who would seek a license for their improvements will no longer do so because of transaction costs.").

130. *See* Heald, *supra* note 37, at 476 ("[P]atent law serves to lower transaction costs in ways previously unidentified in the theoretical literature. By establishing a title registration system for some sorts of information assets, patent ownership rules significantly reduce transaction costs compared to the available alternative systems for protection: trade secrecy and contract law.").

131. *See Nonprovisional (Utility) Patent Application Filing Guide*, U.S. PATENT & TRADEMARK OFFICE (Jan. 28, 2014), https://www.uspto.gov/patents-getting-started/patent-basics/types-patent-applications/nonprovisional-utility-patent [https://perma.cc/DZ9M-FRTW] (overviewing the patent application process, including the name requirement and the tracking process).

required authors to register their works and provide notice of ownership.[132] Beginning in 1978, however, copyright vests in the creator the moment a minimally creative artistic or literary work is fixed in a tangible medium of expression. Authors no longer need to comply with formalities in order to obtain rights to their works.[133] While patent law's efforts do not eliminate information costs, the situation in copyright law is clearly worse.[134] Thus, because copyright's lack of formalities increases transaction costs for downstream creators, it likely drives more downstream creators towards designing around existing works rather than licensing them.

Another substantial influence on the transaction costs of sequential innovation is the way IP rights are structured. Following Guido Calabresi and A. Douglas Melamed's classic formulation,[135] IP rights are generally structured as property rules, whereby downstream creators must individually locate upstream creators and negotiate licenses in order to use their works and inventions.[136] These transaction costs can be steep and will often prevent otherwise efficient licensing from taking place.[137] In other cases, though, IP rights are structured as liability rules, in which the price for licenses is set by a court or administrative body and licensing does not require individual negotiation with rights holders.[138] Compulsory licenses in IP law can substantially reduce transaction costs leading to greater borrowing from existing works and inventions.[139]

Perhaps the best example of borrowing via compulsory license is the compulsory "mechanical" license in copyright law. Downstream creators who wish to record their own versions (for example, covers) of previously recorded songs may do so by paying a preestablished

132. *See* Christopher Sprigman, *Reform(aliz)ing Copyright*, 57 STAN. L. REV. 485, 487-88 (2004).

133. *See id.* Many authors do register their copyrights, so there are some ways of determining ownership.

134. *See* Long, *supra* note 97, at 532.

135. *See generally* Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089 (1972) (setting forth a framework to integrate the analysis of property and tort law, and proposing that all "entitlements" are under either "property rules" or "liability rules").

136. *See* Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations,* 84 CALIF. L. REV. 1293, 1302-03 (1996).

137. *See id.* at 1306-07.

138. *See id.*

139. *Id.* at 1295.

rate.[140] The ease with which downstream creators may borrow has produced a wealth of recordings of existing works, including, for example, more than twenty thousand versions of the song "White Christmas" currently available on Spotify.[141] Whether or not this many versions of the song are socially desirable, it is strong evidence that compulsory licenses, at least when rates are not prohibitive, push downstream creators toward borrowing.[142]

B. Other Legal Doctrines that Influence Decisions to Build On or Build Around

As we have seen, copyright and patent laws exert substantial influence over sequential innovation. But legal scholars err if they confine their thinking to these areas of law when they consider methods for regulating innovation. A wide range of legal doctrines also influence the pace and direction of sequential innovation. Other IP fields like trademark and trade secret laws,[143] as well as law outside the domain of IP, like antitrust law,[144] tort law,[145] and health and environmental regulation,[146] can affect whether downstream creators build on existing ideas or build around them and develop their own. Recently, scholars have begun to address the linkages

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140. Downstream performers may not change the basic melody or fundamental structure of the recorded song. *See* 17 U.S.C. § 115(b)(1) (2012). Note that most mechanical licensing takes place privately through the intermediary Harry Fox Agency rather than through the compulsory license. *See infra* note 212 and accompanying text.

141. Walt Hickey, *The Most-Covered Christmas Songs Ever*, FIVETHIRTYEIGHT (Dec. 14, 2015, 12:44 PM), http://fivethirtyeight.com/features/the-most-covered-christmas-songs-ever [https://perma.cc/9DZN-VVCX].

142. We discuss this issue at greater length *infra* Part VI.C.

143. *See* Robert G. Bone*, Trademark Functionality Reexamined*, 7 J. LEGAL ANALYSIS 183, 222-23 (2015) ("There are two ways that trademark protection for product features can impede downstream innovation. One way is by chilling creative modifications of existing product designs. The other way is by restricting access to basic design elements or standard design features in an industry.").

144. *See, e.g.*, Howard A. Shelanski, *Information, Innovation, and Competition Policy for the Internet*, 161 U. PA. L. REV. 1663, 1700 (2013) (discussing the relationship between IP and antitrust law).

145. *See* Gideon Parchomovsky & Alex Stein, *Torts and Innovation*, 107 MICH. L. REV. 285, 303, 305 (2008) (exploring how various aspects of tort liability may produce adverse effects on innovation).

146. *See* Ted Sabety, *Nanotechnology Innovation and the Patent Thicket: Which IP Policies Promote Growth?*, 15 ALB. L.J. SCI. & TECH. 477, 486-88 (2005).

between these fields and innovation. Space restrictions prevent us from developing each of these individually, but it will be helpful as an illustrative example to consider one unexpected legal doctrine that could influence O/A decisions—tax law.

Governments spend billions of dollars each year attempting to influence innovation through tax schemes.[147] The federal government has determined that it wants to encourage innovative research, and allowing tax deductions or tax credits for investments is one tool it uses to do so.[148] Recently, legal scholars have begun to focus on the relationship between tax law and IP.[149] For example, Daniel Hemel and Lisa Larrimore Ouellette have compared different methods of incentivizing innovation, including patents, taxes, grants, and prizes.[150]

But federal and state tax laws do not just incentivize innovation as such; they can also affect the direction and pace of sequential innovation by altering how creators think about innovating or borrowing. For example, creators can often reduce their tax burden by deducting or expensing money invested in innovation.[151] If a firm spends money to develop a new invention, the costs of R&D can be deducted from the firm's overall tax obligations.[152] This is basically a mechanism for governments to reduce the costs of engaging in R&D.[153] Importantly for our purposes, however, money spent licensing IP rights from other firms is not eligible for the same favorable tax treatment.[154] The effect, then, is to systematically favor

147. Daniel J. Hemel & Lisa Larrimore Ouellette, *Beyond the Patents-Prizes Debate*, 92 TEX. L. REV. 303, 306 (2013).

148. *Id.* at 322 ("Let's say that rather than spending $1 million on a new tunnel, the railroad spends $1 million in 2013 to research more durable tunnels and safer excavation methods. Instead of deducting this $1 million in $20,000 increments over a half-century, Section 174 allows the railroad to deduct the full $1 million in 2013.").

149. *See* Michael Abramowicz, *Perfecting Patent Prizes*, 56 VAND. L. REV. 115, 200-07 (2003) (examining the distortionary effects of taxation); Hemel & Ouellette, *supra* note 147, at 319-26; Douglas Gary Lichtman, *Pricing Prozac: Why the Government Should Subsidize the Purchase of Patented Pharmaceuticals*, 11 HARV. J.L. & TECH. 123, 129-30 (1997).

150. *See* Hemel & Ouellette, *supra* note 147, at 321.

151. I.R.C. § 174(a)(1) (2012).

152. *See* Hemel & Ouellette, *supra* note 147, at 322 (explaining how a firm that spends $1 million on research can deduct the entire amount from its tax burden in the year that the money is spent rather than only deducting a certain amount per year).

153. *Id.* at 311 (noting that government research funding via grants works similarly in this respect).

154. For example, the tax credit for increasing research activities provides credits for cer-

designing around existing IP rights rather than licensing them, since—if the two activities are expected to cost the same amount—the tax deduction will lower the burden of investing in innovation.[155] We take no stand on the desirability of using the tax code to influence these outcomes, but we simply point out the manifold legal influences on downstream creators' O/A decisions.

Tax law is far from the only area of the law that systematically favors one form of sequential innovation or the other. We hope that subsequent research will focus on the ways in which other legal regulations influence creators' O/A decisions.

III. TECHNOLOGICAL AND ARTISTIC FACTORS AFFECTING DECISIONS TO BUILD ON OR BUILD AROUND

When downstream creators contemplate building on or building around existing works and inventions, they must consider more than the scope of IP laws. In addition, individuals and firms face various technological and artistic constraints that will influence their O/A decisions. The value of building on versus building around may be affected by the maturity of the given creative field, the degree of interdependence among important advances in the field, and the role of tacit knowledge involved in creative activity, among other issues. We address these here to give a sense of the complex, multifaceted nature of O/A decisions.

When we refer to technological and artistic factors affecting sequential innovation, we mean features of the technological or artistic environment that innovators operate in. We are interested in the nature of creative or innovative production and practice within a given field, such as painting, biotechnology, software, or engineering. This aspect of our model focuses on how the activities associated with creating and developing new products affect O/A

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tain technological or experimental investments but not for adaptation or duplication of an existing business component. *See* American Taxpayer Relief Act of 2012, Pub. L. No. 112-240, § 301(b)(1), 126 Stat. 2313, 2326 (2013) (to be codified at I.R.C. § 41); *see also* Xuan-Thao Nguyen & Jeffrey A. Maine, *Acquiring Innovation*, 57 AM. U. L. REV. 775, 799 (2008) (discussing the differential tax treatment of investing in R&D versus acquiring innovation).

155. These sorts of tax laws may also systematically affect sequential innovation, because they tend to favor efforts by established corporations who have taxable revenue over start-ups that may not generate significant tax liability. *See* Hemel & Ouellette, *supra* note 147, at 337.

decisions, but it excludes issues associated with marketing, sales, and consumer preferences, which we treat in the Section on market factors.[156]

A. Innovation Spaces and the Maturity of the Field

Whether a creator will build on or build around upstream rights depends on the relative profits the creator can generate by either choice. As we noted above, the costs of building around existing ideas depend on the size of the available "innovation space" that a creator can dive into by innovating.[157] The easier it is for downstream creators to generate their own works and inventions without implicating upstream IP rights, the lower the costs of designing around and, accordingly, the less they will be willing to pay to license those rights. Over time, as a field develops, creators will enter the industry. Each act of entry by a new creator or each sequential innovation can reduce the available innovation space.[158]

As the available innovation space within the emerging field shrinks,[159] subsequent creators will be more inclined to build on existing ideas. To a considerable extent, the size of the available innovation space is related to the maturity of a field. The more mature a field is, the harder it may be to come up with a breakthrough innovation. Most likely, creators have tried out many different ways to approach the technical or artistic possibilities that the field presents. Therefore, the more mature a field is, the more difficult it becomes to build around ideas and the more we should expect to see downstream creators building on them.

For example, consider the inventions that went into developing one of the most popular musical instruments of the last couple centuries: the grand piano. Improving grand piano technology is

156. *See infra* Part IV. On this categorization, see *supra* notes 17-18 and accompanying text.

157. *See supra* notes 49-50 and accompanying text.

158. This assumes, of course, that the size of the innovation space itself is not affected by the entry of new creators or new technological innovations. If, however, the entry of a new creator does not simply fill an available spot in the innovation space, but rather reveals new opportunities for development, entry can also enlarge the available innovation space.

159. In economic terms, the innovation supply becomes less elastic in such industry. *See* Vincenzo Denicolò, *Do Patents Over-Compensate Innovators?*, 22 ECON. POL'Y 679, 691 (2007).

extremely difficult these days, as most of the innovations for this instrument were made in the nineteenth and early twentieth centuries.[160] By contrast, the available innovation space may be much larger for an instrument that has only recently been developed.[161]

The development of smartphone technology offers another example. When Apple put its first iPhone on the market in 2007, it was one of the first mobile phones that used direct finger input as its main means of interaction.[162] The Apple iPhone differed considerably from its technological predecessors. In fact, an ingenious combination of technology, design, and marketing helped to redefine a product category.[163] Subsequent phones adopted or mimicked many of the iPhone's innovations. In 2008, the first phone based on the Android operating system (called HTC Dream) was announced.[164] And 2009 saw the introduction of the first Samsung Galaxy phone.[165] As the industry has matured, the functionality and even the design of smartphones have become increasingly interchangeable.

As the smartphone market matures, innovating in this market may become increasingly difficult, generating more wholesale borrowing of existing technologies over time. Faced with this situation, at some point downstream creators may begin to invest their energy not in further refining existing products, but rather in generating new categories of works or inventions. As the smartphone example illustrates, innovating in one technology may become less prevalent

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160. *See generally* ALFRED DOLGE, PIANOS AND THEIR MAKERS (1911); EDWIN M. GOOD, GIRAFFES, BLACK DRAGONS, AND OTHER PIANOS (2d ed. 2001).

161. *See* Stefan Bechtold, Christopher Buccafusco & Christopher Jon Sprigman, *Innovation Heuristics: Experiments on Sequential Creativity in Intellectual Property*, 91 IND. L.J. 1251, 1265 (2016) (comparing the advances in grand piano technology with the development of the electroencephalophone, which uses brain waves to generate sounds).

162. *See* Cheih-Ying Chen & Huang-Chieh Chang, *Exploration of Picture E-Book Design for App Web*, *in* 3 UNIVERSAL ACCESS IN HUMAN-COMPUTER INTERACTION 291, 292 (Constantine Stephanidis & Margherita Antona eds., 2013).

163. *See id.*

164. *See* Jon Turi, *Gadget Rewind 2008: T-Mobile G1 (HTC Dream)*, ENGADGET (June 22, 2014), https://www.engadget.com/2014/06/22/gadget-rewind-2008-t-mobile-g1-htc-dream/ [https://perma.cc/4K2R-3L99].

165. *See* Simon Hill, *A History of Samsung's Galaxy Phones and Tablets, from the S1 to the S4*, DIGITAL TRENDS (Mar. 14, 2013, 3:11 AM), https://www.digitaltrends.com/android/history-of-samsungs-galaxy-phones-and-tablets/ [https://perma.cc/2HBD-86VT].

as the technology is replaced by related, new products like tablets and wearable technology. Therefore, the more mature a field becomes, the higher the incentives for new entrants may be to explore novel ideas outside of the boundaries of the matured field.[166]

As a result of these factors, the relative importance of building on versus building around could have an inverted U-shape: the amount of building on within a field increases up to a certain tipping point. Once the technological or artistic development within the field has reached a maturity tipping point, however, new creators will exit the field by inventing or designing around the field as a whole, thereby contributing to a decline in borrowing within the industry and a slow substitution of the existing technology. At some point, many industry leaders may fail because they ignore disruptive technologies that initially targeted small customer segments but later displace the industry leader's product.[167] This displacement effect is driven by the increasing fraction of decisions to innovate rather than borrow in a mature industry.

B. Dependency on Input Factors

New creations and innovations differ in the extent that they depend on upstream creations and innovations to produce marketable products. For example, the owner of a copyright in a painting can usually generate complete, marketable products entirely from the single painting. She does not need to worry about securing other IP rights in order to print and distribute copies of the painting. Many pharmaceutical patents work similarly.[168] By contrast, the owner of

166. These sorts of concerns are not isolated to scientific or technological developments. Consider, for example, the history of classical music. Following the eight modes of pitch organization used in Gregorian chant, classical music was dominated by tonality from about the seventeenth to the beginning of the twentieth century. As the available innovation space within tonality became smaller and smaller, composers were not only forced to bend the boundaries of tonality; they ultimately had to break it. It was Arnold Schönberg's twelve-tone technique and, later, serialism, which deliberately changed the rules of musical composition, that made borrowing from older composition difficult and pushed composers towards innovating. *See generally* CARL DAHLHAUS, STUDIES ON THE ORIGIN OF HARMONIC TONALITY (Robert O. Gjerdingen trans., 1990).

167. *See* CLAYTON M. CHRISTENSEN, THE INNOVATOR'S DILEMMA 25-26 (Harper Bus. 2011) (1997) (arguing that existing players often ignore major changes to their fields because they focus on incremental advancements rather than on "disruptive" alternatives).

168. In the context of new molecules with therapeutic effect, anything that would flow

a patent relating to smartphone technology is not in a position to produce smartphones simply on the basis of that patent. The owner would have to license hundreds or possibly thousands of other patents to produce phones that incorporated the invention.[169] Thus, downstream creativity will vary in the degree to which it is independently or interdependently enabled.

Having to license a substantial number of other IP rights creates enormous transaction costs for downstream creators. Normally, increases in transaction costs will tend to discourage building on rights relative to building around them, because transaction costs exhaust surplus value.[170] In the case of interdependent innovation, however, the same may not be true. When downstream creators know that they are going to have to license many other IP rights in order to create a marketable product based on their innovations, they may be more likely to simply build on one or more of those IP rights anyway. Imagine that Firm A is interested in improving one aspect of a smartphone such as its screen functionality. If the firm knows that in order to produce phones, it will have to license fifty patents from Firm B, most of which do not relate to screen function, it may choose to simply improve on Firm B's screen patents rather than design around them. Although downstream creators may be able to invent around one or a few of the rights necessary to making a marketable product, the effort required to invent around all of them may be impossible.[171] Simply licensing all of the necessary rights reduces risk and R&D costs, and it probably does not result in significantly higher transaction costs.

In a similar fashion, the availability of upstream inputs will influence downstream creativity and innovation to the extent that there are many or few available substitutes in the upstream market. Up to now, we have used examples in which a downstream creator decides whether to build on an innovation from one upstream creator

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downstream from the patentable subject matter is covered by the patent.

169. For instance, the inventor would have to license the patent for the touch screen technology, the operating system, and Wi-Fi connectivity.

170. *See supra* Part II.A.2.

171. Downstream creators may still choose to design around some rights, however, if licensing those rights is particularly expensive or if they are owned by a particularly tough competitor. Recall that our O/A decision is framed at the level of individual IP rights rather than at the level of products as a whole. *See supra* Part I.C.

or to build around it. Now imagine that, in the upstream market, two or more firms each have a patent on their own inventions, and that these inventions are (at least) partial substitutes as inputs for the downstream creator. For example, if a car manufacturer contemplates expanding its hybrid car line, it may think about whether to pay patent licenses for existing battery technologies or whether to invest in developing its own battery technology. How the car manufacturer makes this decision will depend, among other things, on how many firms offer competing battery technologies in the upstream market. If several suppliers in the upstream market offer advanced battery technologies that are partial substitutes, the upstream market may be highly competitive, which reduces firm revenues in this market even though each of these firms may own a patent on its technology. In such an upstream market, a downstream firm may find inventing around existing technologies very unattractive, as the revenues the downstream firm could make from its own patented technology may be small and could not pay back the R&D costs needed to develop the technology. Rather, the downstream firm may decide to license an existing battery technology. If, by contrast, only one upstream supplier offers an advanced battery technology, and the downstream firm thinks that there is sufficient room for additional innovation, the downstream firm may be more inclined to develop its own battery technology and not license. Therefore, the number of competitors and the size of the available innovation space on the upstream market will influence the downstream firm's O/A decision.[172]

C. Tacit Knowledge

One of the main justifications for IP law is that informational goods are expensive to produce but cheap to copy.[173] While this may be true for many creations—for example, movies are costly to write and produce but very cheap to copy in the digital era—it is not true for others.[174] Many works and inventions are hard to replicate

172. *See supra* Part I (describing the available innovation space).

173. JULIE E. COHEN ET AL., COPYRIGHT IN A GLOBAL INFORMATION ECONOMY 6 (3d ed. 2010).

174. *See* Eric von Hippel, *"Sticky Information" and the Locus of Problem Solving: Implica-*

because the knowledge needed to recreate them may be hard to codify or express.[175] Scholars refer to these creations as involving a high degree of "tacit knowledge."[176] Tacit knowledge cannot be readily described or articulated, because the people who have it are unable to explain all the steps which are necessary to recreate the creation; because no technology or standard for such codification exists; or because such codification would be prohibitively costly.[177]

Higher degrees of tacit knowledge increase the difficulty of contracting over information exchange. When tacit knowledge is high, the downstream party does not simply need to obtain the information about the creation or invention itself, but also information about how to produce it. According to Keith Pavitt, "Even borrowers of technology must have their own skills, and make their own expenditures on development and production engineering; they cannot treat technology developed elsewhere as a free, or even a very cheap, good."[178] For example, just because a firm owns the rights to produce a movie version of a successful comic character does not mean that it has the knowledge and ability to capture the features of the character that made him so successful in the first place. The same is true for technological know-how that might not be fully disclosed in the contents of a patent.

Because tacit knowledge is hard to articulate, it can be hard to prove whether a contracting party has delivered it.[179] This leads to moral hazard problems: upstream creators may not have sufficient incentives to reveal all their tacit knowledge, and downstream creators may be unable to tell whether they have received all of it until they have sunk substantial resources into the project.[180] In

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tions for Innovation, 40 MGMT. SCI. 429, 429 (1994).

175. *See id.* at 429-30.

176. *Id.* at 430 (distinguishing between information that is explicitly encoded and information that is tacitly encoded).

177. Dan L. Burk, *The Role of Patent Law in Knowledge Codification*, 23 BERKELEY TECH. L.J. 1009, 1014-16 (2008).

178. Keith Pavitt, *The Objectives of Technology Policy*, 14 SCI. & PUB. POL'Y 182, 186 (1987).

179. In contract theory terms, delivery of tacit knowledge may be observable, but it is often not verifiable. Some information about Party A may be observable by Party B, but it may not be verifiable by courts or other institutions. *See* PATRICK BOLTON & MATHIAS DEWATRIPONT, CONTRACT THEORY 24 (2005).

180. *See* Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 548-50 (2009) (explaining how mandatory disclosure in the patent system stimulates productivity by contributing to the public knowledge and helping competitors understand the metes and bounds of the

such an environment, a firm may decide to innovate by itself rather than borrow from another firm. Imagine that an upstream patent holder uses its patents to manufacture a vaccine. The downstream firm would like to improve the vaccine patent and produce its own vaccines. When the downstream firm considers licensing the patent from the upstream firm, it will have to consider whether the upstream firm will reveal all of the tacit knowledge that is not disclosed in the patent. If the downstream firm realizes that the upstream firm did not convey all of its tacit knowledge after it has already sunk costs into the improvement—for example, because they are unable to manufacture the vaccines to the same quality standards—it may be too late. Similar sorts of problems may arise with contracts over ideas for creative works.[181] The difficulties of writing contracts about idea development could lead more creators to innovate movie and TV show scripts rather than borrow from existing scripts.[182]

Tacit knowledge, by itself, does not necessarily affect creators' O/A decisions. Whether a downstream creator builds on an existing work or innovates her own solution, she will always need some degree of artistic or technical expertise. But to the extent that borrowing via licensing entails additional creation-specific costs, it makes building on rights less attractive. Thus, if the tacit knowledge is unique or relatively specialized to the particular creations being built upon, downstream creators will have to expend greater resources in mastering that knowledge. This increased cost will tend to drive down their willingness to pay to license and, thus, increase their propensity to design their own solutions.

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invention so they are better able to design around it).

181. *See* Samuel M. Bayard, Note, *Chihuahuas, Seventh Circuit Judges, and Movie Scripts, Oh My!: Copyright Preemption of Contracts to Protect Ideas*, 86 CORNELL L. REV. 603, 605 (2001) (discussing the tension between the copyright law principle of refusing protection to ideas, and the "express contract theory of idea protection, [in which] an idea-person has an enforceable contract and may sue for damages if the idea-recipient expressly promises to pay for an idea if it is used").

182. On the role of copying in the TV show format industry, see Stefan Bechtold, *The Fashion of TV Show Formats*, 2013 MICH. ST. L. REV. 451, 459-61. On the contractual tools Hollywood uses, see Jonathan M. Barnett, *Hollywood Deals: Soft Contracts for Hard Markets*, 64 DUKE L.J. 605, 617-30 (2015).

IV. MARKET FACTORS AFFECTING DECISIONS TO BUILD ON OR BUILD AROUND

When contemplating whether to build on or build around existing rights, creators will not simply focus on IP rights or technological capabilities. Individuals and firms making O/A decisions also face a host of market factors likely to bear on their choice. In our categorization, market factors influence the O/A decision directly through price. For example, consumers' tastes and preferences will often shape downstream creators' behavior by affecting the demand for the creators' works and, thereby, the prices creators can charge.[183] O/A decisions will also be affected by aspects of the competitive market (the degree of competition in a market influences market prices); the existence of third-party intermediaries (decreasing costs of operation and, as a result, market prices); and the extent to which borrowing produces agency costs. We will describe these briefly here. Each is a subject on which we need significant research.

A. Consumer Tastes for Similarity Versus Novelty

From the economic perspective that we adopt here, creativity and innovation have value primarily to the extent that consumers are interested in purchasing products that contain works and inventions.[184] And in general, from the perspective of an economically motivated actor, whether a given act of innovation is worth undertaking is determined by assessing whether consumers are willing to

183. Of course, factors from other categories can also influence market prices: whether an innovation depends on an input factor or whether the industry in which the innovation occurs is mature can have an impact on prices. Also, legal rules can influence market prices. In fact, over thirty years ago, Lawrence Friedman noted that economic theory views the law as a "giant pricing machine." Lawrence M. Friedman, *Two Faces of Law*, 1984 WIS. L. REV. 13, 13. Despite the admirable omnivorousness with which economic models ingest everything and process it into an economic question, we still think that a substantial difference exists in whether an O/A decision is influenced by price, or by another factor that may indirectly influence price, but more immediately impacts the innovator's non-cost-related O/A considerations. We have structured our categorizations accordingly. *See supra* notes 17-18 and accompanying text.

184. *See* Jeanne C. Fromer, *A Psychology of Intellectual Property*, 104 NW. U. L. REV. 1441, 1444-45 (2010).

pay for it. But consumer tastes for novelty are not uniform, and they may differ systematically between media, genres, and technological fields.[185] These differences in consumer tastes, then, will influence creators' O/A decisions, because the differences tend to make certain kinds of creativity—either building on or building around—more valuable.

At a general level, people may have varying tastes for novelty between the fields typically governed by copyright law and patent law, respectively. As Jeanne Fromer has emphasized, many consumers of copyrighted creativity object to excessive novelty.[186] History abounds with examples of artists whose advancements of previous works were considered extreme and intolerable to contemporary audiences. According to many accounts, members of the audience for Igor Stravinsky's *The Rite of Spring* rioted upon experiencing the ballet and orchestral work for the first time.[187] Yet while many people find novel art excessively challenging and disorienting, people are rarely upset by a new pharmaceutical that vastly outperforms existing options.[188] Consumers typically object to excessive newness in scientific or technological achievements only when they are required to make substantial efforts to learn how to use new technologies.[189]

Consumers' aggregate tastes for novelty also tend to vary among creative genres and media. Although it might seem like consumers will value novelty, in some cases they indicate preferences for a high degree of similarity. For example, consumers seem quite receptive to "tweaking"[190] in music. We see this in popular music, where many musicians cover songs written by others, performing and rerecording

185. *See id.* at 1471-74, 1479-83 (contrasting the degrees of newness consumers will accept in scientific fields versus artistic fields).

186. *See id.* at 1479-80 (describing the futile efforts of Harry Partch who created "a forty-three-tone scale, developed his own form of musical notation for the scale, created musical compositions for this scale, and invented new instruments that could play all forty-three tones").

187. *See* MODRIS EKSTEINS, RITES OF SPRING: THE GREAT WAR AND THE BIRTH OF THE MODERN AGE 21-39 (1989).

188. *See* Fromer, *supra* note 184, at 1472 ("More importantly, our culture is typically happy to accept technological inventions that flout accepted conventions and make great leaps in newness.").

189. *See id.* at 1473 ("When an invention does not require its users to learn anything new or change their usage patterns, they are inclined to adopt the invention more readily.").

190. *See infra* note 296 (defining "tweaking").

preexisting material with variations.[191] Few people object to Joe Cocker's renditions of classic rock & roll songs or Jimi Hendrix's version of Bob Dylan's "All Along the Watchtower" because the performers did not write new compositions. We see an even more pronounced openness to borrowing in jazz. Although new jazz compositions are valued, many musicians rework a set of standard pieces.[192] Creativity, in this context, does not mean doing something entirely new, but rather doing something old in a new way.[193]

We also see openness to similarity in "functional" sorts of creativity. For example, in software, user interfaces and application programs look very similar, and successive versions of programs often borrow heavily from previous versions and improve them incrementally.[194] Consumers primarily value utility rather than newness when they purchase software.[195] From the consumer perspective there is a cost to newness. Radical changes in software often require the consumer to invest in learning to use the new offering.[196] The strongest versions of this preference involve the existence of network effects associated with upstream technologies.[197] If many consumers have adopted and become used to a

191. *See supra* note 141 and accompanying text (noting the thousands of cover versions of popular Christmas tunes available on Spotify).

192. Jazz standards are musical pieces "that a professional [jazz] musician may be expected to know." THE NEW GROVE DICTIONARY OF JAZZ 1155 (Barry Kernfeld ed., 1994). Jazz musicians often add predetermined alterations to an underlying jazz standard, "creating an arrangement that better comports with the idiom." Note, *Jazz Has Got Copyright Law and That Ain't Good*, 118 HARV. L. REV. 1940, 1943 (2005).

193. Perhaps the starkest form of consumer preference for borrowing is the development of canonical French cuisine in the nineteenth century. Chefs were not expected to develop their own unique recipes, but instead to master the preparation of dishes documented in standard sources like the cookbooks of Antoine Carême and Auguste Escoffier. *See* Buccafusco, *supra* note 75, at 1148 ("While literary authors had solidified a norm (if not a practice) of individual creative composition by the late eighteenth and early nineteenth centuries, cuisine seems to have held on to a process of 'serial collaboration' based on minor modifications to canonical recipes." (footnotes omitted)).

194. *See* Fromer, *supra* note 184, at 1505-06 (describing how programmers who write computer source code are more concerned with problem solving than problem finding, and as such, are less concerned with a large degree of newness).

195. *See id.* at 1472 ("Once society becomes convinced of an invention's utility and so long as it can integrate the invention into the fabric of its members' lives, it will tend to embrace the invention, even if the invention is very new.").

196. *See id.* at 1473.

197. On network effects in general, see Michael L. Katz & Carl Shapiro, *Systems Competition and Network Effects*, 8 J. ECON. PERSP. 93 (1994). On the implications of network effects

certain technology, switching them to a new technology may be difficult. For example, once consumers got used to the QWERTY keyboard, offering a product with a different layout became a difficult proposition for downstream creators.[198] The same is true for creativity that interacts with digital media platforms like Facebook.[199] When network effects could impede the adoption of new technologies, downstream firms may lean towards building on prior creations in such markets.

In other creative fields, we see very little consumer tolerance of similarity. For example, in the world of stand-up comedy, both comedians and audiences value newness.[200] Comedians share a norm that prohibits appropriation of others' jokes, even with attribution.[201] More broadly, comedians seldom engage in the reworking of existing jokes. Although several comedians may hit upon comedic themes at about the same time (often driven by events in the news), they typically disclaim intent to copy. Those identified as intentional copyists are derided and even subjected to informal sanctions from their fellow comedians.[202]

Traditionally, the visual arts have provided an excellent example of the limited market for similarity between works. It is incredibly rare to find a downstream visual artist who paid to license the work of an upstream artist in order to make her own version of it.[203] In the visual arts, creators are expected to produce novel paintings that express their own ideas in unique ways. This is not to suggest that artists do not borrow from one another regularly. They do so all of the time, as many examples in art history attest.[204] These forms

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for the legal system, see generally Mark A. Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 CALIF. L. REV. 479 (1998).

198. *See* Lemley & McGowan, *supra* note 197, at 594 n.481.

199. *See* Julie E. Cohen, *Law for the Platform Economy*, 51 U.C. DAVIS L. REV. (forthcoming 2017) (manuscript at 10-11), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2991261 [https://perma.cc/BVD4-PUEB].

200. *See* Dotan Oliar & Christopher Sprigman, *There's No Free Laugh (Anymore): The Emergence of Intellectual Property Norms and the Transformation of Stand-Up Comedy*, 94 VA. L. REV. 1787, 1789-90 (2008).

201. *See id.* at 1812.

202. *See id.* at 1809-12 (exploring copyright protection for stand-up comedy and noting that social norms provide a substitute for IP law).

203. *See* William M. Landes, *Copyright, Borrowed Images, and Appropriation Art: An Economic Approach*, 9 GEO. MASON L. REV. 1, 1 (2000).

204. Consider the relationship between Pablo Picasso and Georges Braque's versions of

of borrowing are not what we mean by "building on." In these cases, downstream creators do not license upstream IP rights. Instead, they make use of the idea/expression distinction or the fair use doctrine to evade those rights.[205] Accordingly, in our model, their behavior constitutes a form of building around. Indeed, it is the very strength of the assumption of originality among artists and consumers alike that makes appropriation art—the wholesale copying of another's work—so interesting.[206] Sherry Levine's re-photographing of Walker Evans's photographs is meant, in part, to challenge the extent to which people expect originality in visual art.[207]

In other art forms, we see consumer preference for novelty from time to time. When Hungarian composer György Ligeti wrote the orchestra piece "Atmosphères" in 1961, he produced a radically new compositional style involving micropolyphonic textures.[208] This composition not only made Ligeti famous,[209] but it also met consumer preferences for novel acoustic expressions of that time. This is exemplified by the fact that Stanley Kubrick used the piece in his science fiction movie *2001: A Space Odyssey*.[210]

These examples illustrate that consumer acceptance of similarity varies widely among different creative fields. To the extent that consumers have consistent preferences for either novelty or similarity, downstream creators will feel constrained to shape their behavior accordingly. Creators considering whether to borrow or innovate must keep consumer acceptance in mind when making that decision. Thus, creators in fields in which borrowing is well accepted have greater latitude, all else equal, to tweak existing creativity. In other cases, however, where consumers prefer or even demand novelty, downstream creators will feel less constrained to pay for

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analytic cubism or Picasso's reworking of a painting by Edouard Manet.

205. *See* Landes, *supra* note 203, at 8-11.

206. *See generally* Darren Hudson Hick, *Appropriation and Transformation*, 23 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 1155 (2013); Landes, *supra* note 203.

207. *See* Hick, *supra* note 206, at 1178.

208. *See* DAVID COPE, TECHNIQUES OF THE CONTEMPORARY COMPOSER 101-06 (1997).

209. *See* PAUL GRIFFITHS, MODERN MUSIC AND AFTER 266 (3d ed. 2010); Interview by Istvan Szigeti with György Ligeti (July 29, 1983), http://ronsen.org/monkminkpinkpunk/9/gl4.html [https://perma.cc/YS7Y-UFC2].

210. *See* Alex Ross, *Space Is the Place*, NEW YORKER (Sept. 23, 2013), http://www.newyorker.com/magazine/2013/09/23/space-is-the-place [https://perma.cc/4V6N-TLCX].

upstream rights. Designing around those rights will be a key feature of creativity in such fields.

B. Market Intermediaries

If downstream creators want to build on an existing idea or solution, they will have to engage in licensing agreements with upstream creators. As we have noted previously, whether such licensing agreements are feasible will depend on the transaction costs of negotiating, concluding, and enforcing such agreements.[211] The existence of substantial transaction costs can erode the surplus value generated by the downstream creation, making it more cost effective to build around existing rights. To the extent, then, that mechanisms exist to reduce transaction costs, downstream creators will tend to engage in more borrowing, all else equal. Third-party market intermediaries can play an important role in facilitating such agreements.

In the realm of copyright law, the Harry Fox Agency offers a third-party mechanism for licensing cover versions of songs that supplements the existing legal regulation of compulsory licenses.[212] In some technological fields, patent pools attempt to enable access to large bundles of patents.[213] In patent pools, companies agree to cross-license patents relating to a particular technology.[214] They facilitate licensing by offering access to dozens, hundreds, or even thousands of patent licenses at the same time.[215] Patent pools can thereby reduce transaction costs and make borrowing attractive to downstream firms.[216] Relatedly, technology transfer offices at universities assist firms in identifying relevant inventions at a

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211. *See supra* Part II.A.2.

212. *See* Merges, *supra* note 136, at 1378 (discussing the Harry Fox Agency and compulsory licenses under 17 U.S.C. § 115 (1994)).

213. *See* Rudy Santore, Michael McKee & David Bjornstad, *Patent Pools as a Solution to Efficient Licensing of Complementary Patents? Some Experimental Evidence*, 53 J. L. & ECON. 167, 169 (2010).

214. *See* Ryan Lampe & Petra Moser, *Patent Pools, Competition, and Innovation—Evidence from 20 US Industries Under the New Deal*, 32 J.L. ECON. & ORG. 1, 1-2 (2016).

215. *Id.*

216. On various dimensions of the patent pool debate, see generally Nancy Gallini, *Cooperating with Competitors: Patent Pooling and Choice of a New Standard*, 36 INT'L J. INDUS. ORG. 4 (2014); Lampe & Moser, *supra* note 214; and Santore, McKee & Bjornstad, *supra* note 213.

university and in concluding licensing agreements for these technologies.

Such collective rights organizations can make it cheaper for downstream creators to identify and locate upstream rights holders and facilitate licensing deals between both parties. If a downstream firm operates in an environment with smoothly functioning intermediaries that facilitate licensing deals with upstream firms, the downstream firm may be more inclined to enter into such a deal, compared to an environment in which transaction costs are higher. The more efficiently the licensing market functions, the less attractive it becomes for a downstream firm to build around.[217]

V. CREATOR FACTORS AFFECTING DECISIONS TO BUILD ON OR BUILD AROUND

The choice of whether to build on existing rights or to build around them is ultimately a decision made by creators. Accordingly, to understand creators' O/A decisions, we must know something about how creators specifically, and people more generally, make decisions.[218] O/A decisions have many features that have been extensively studied by behavioral scientists. Creators must weigh risks and uncertainties, and they must determine the value of things that they and others have created. In this Part, we analyze these and other aspects of O/A decision-making.[219]

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217. So-called "patent trolls" or "non-practicing entities" (NPEs) may influence markets for IP licensing as well. Many who are concerned about NPE behavior suggest that they increase transaction costs, because they assert patents of little or no value that must be licensed or designed around. *See* James Bessen & Michael J. Meurer, *The Direct Costs from NPE Disputes*, 99 CORNELL L. REV. 387, 420 (2014). Others, however, suggest that NPEs can operate as market middlemen who ease the transaction costs of licensing patents. *See* David S. Abrams, Ufuk Akcigit & Gokhan Oz, The Patent Troll: Benign Middleman or Stick-Up Artist? 2-3 (Apr. 28, 2016) (unpublished manuscript) (on file with authors).

218. Merges and Nelson pay some attention to these sorts of creator factors. They write: "Beliefs about the consequences of choosing one path or another are presumed to be influenced as much by the past experience of an individual or organization and theories formed on the basis of that experience, as on objective information about a particular new situation." Merges & Nelson, *supra* note 57, at 5.

219. While this category focuses on the behavior of creators, we investigate in our market category how consumer preferences, through demand and price signals, influence O/A decisions. On the categorization in general, see *supra* notes 17-18 and accompanying text.

Before discussing the creator-level influences on O/A decisions, we want to note some important limitations on the research discussed below. First, much of this literature focuses on individual decision-making, but a large percentage of creativity emerges from groups.[220] Both formal groups, like design firms, pharmaceutical companies, and movie studios, and informal groups, like joint authors, collaborators, and open source communities, confront these sorts of decisions. It is not entirely clear how the findings of studies on individual decision-making will translate into the context of group decision-making.[221] In some cases, groups may blunt the tendencies of individuals to make irrational decisions.[222] In other cases, though, groups may magnify these effects.[223] Further research is needed to fully understand the differences between individual and group O/A decision-making.

The second potential limitation of the research discussed below is that it does not always emerge from creative settings. For example, the literature on risk and uncertainty aversion is vast, but not much research focuses on how creators evaluate and respond to risk.[224] One of the key features of the behavioral science research of the last quarter century is that context matters.[225] People do not typically calculate costs and benefits in a coolly rational way; instead, they evaluate particular choices with reference to how those choices are framed.[226] Accordingly, although people might exhibit

220. Anthony J. Casey & Andres Sawicki, *Copyright in Teams*, 80 U. CHI. L. REV. 1683, 1685-86 (2013).

221. *See* CASS R. SUNSTEIN & REID HASTIE, WISER: GETTING BEYOND GROUPTHINK TO MAKE GROUPS SMARTER 2 (2015) ("*Do* groups usually correct individual mistakes? Our simple answer is that they do not. Far too often, groups actually amplify those mistakes.").

222. Joachim Ramm, Sigve Tjøtta & Gaute Torsvik, *Incentives and Creativity in Groups* 5 (CESifo Working Paper Series No. 4374, 2013), http://ssrn.com/abstract=2319864 [https://perma.cc/968X-XA8J] (arguing that working in groups facilitates creative problem solving).

223. *See* SUNSTEIN & HASTIE, *supra* note 221, at 2, 5-6.

224. For an older study, see John A. Glover & Fred Sautter, *Relation of Four Components of Creativity to Risk-Taking Preferences*, 41 PSYCHOL. REP. 227, 229 (1977) (reporting that risk seekers performed better on flexibility and originality measures but that the risk averse performed better on elaboration measures); *see also* Florian Ederer & Gustavo Manso, *Is Pay for Performance Detrimental to Innovation?*, 59 MGMT. SCI. 1496, 1498, 1501, 1506-07 (2013) (exploring the interaction between monetary incentives for creative problem-solving and risk aversion).

225. *See generally* DANIEL KAHNEMAN, THINKING, FAST AND SLOW (2011) (explaining that from the perspective of decision-making, what you see is all there is).

226. *See* Amos Tversky & Daniel Kahneman, *The Framing of Decisions and the Psychology*

risk aversion in one context, they might seek risk in another.[227] We need more research on the particular situations associated with innovative decision-making.

Finally, applying general social science research to O/A decisions may prove challenging due to differences in the relevant populations. Although in general, people tend to be risk averse in most situations, the kinds of people who make creative choices may systematically differ from the general public.[228] Thus, we must understand the extent to which the particular populations of interest are going to exhibit certain behavioral tendencies.

A. Risk and Uncertainty Aversion

Making decisions about creativity and innovation is notoriously difficult. In many markets related to patent and copyright law, profits are highly skewed: a few new products will be cash cows, while most will be money losers.[229] This complicates the decision whether to invest in innovation. It is difficult to estimate the market value for a work that has not yet been created.[230] Investors can only speculate about whether people will want to see a movie about a postapocalyptic water-covered world. Even industry insiders claim

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of Choice, 211 SCI. 453, 457-58 (1981).

227. *See* Elke U. Weber, Ann-Renée Blais & Nancy E. Betz, *A Domain-Specific Risk-Attitude Scale: Measuring Risk Perceptions and Risk Behaviors*, 15 J. BEHAV. DECISION MAKING 263, 264 (2002) ("[I]ndividuals do not appear to be consistently risk seeking or risk averse across different domains and situations even when using the same assessment method, as documented in both laboratory studies and managerial contexts." (citation omitted)).

228. *See* Kenneth R. MacCrimmon & Donald A. Wehrung, *Characteristics of Risk Taking Executives*, 36 MGMT. SCI. 422, 431-33 (1990) (reporting a survey revealing that the most risk seeking business executives tend to be the most successful).

229. On patent-related industries, see F.M. Scherer, *The Innovation Lottery*, *in* EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 3, 7-12 (Rochelle Cooper Dreyfuss et al. eds., 2001). On the movie industry, see Arthur De Vany, *The Movies*, *in* 1 HANDBOOK OF THE ECONOMICS OF ART AND CULTURE 615, 641 (Victor Ginsburgh & David Thorosby eds., 2006). On the music industry, see Ken Hendricks & Alan Sorensen, *Information and the Skewness of Music Sales*, 117 J. POL. ECON. 324, 332-33 (2009). On the book industry, see Alan T. Sorensen, *Bestseller Lists and Product Variety*, 55 J. INDUS. ECON. 715, 724-25 (2007).

230. Heald, *supra* note 37, at 502 ("Patent valuation depends on fixing the value of the future income stream generated by the patent right, as opposed to the value of the invention. The problems in predicting the behavior of markets over time make most valuation, even after a patented product is marketed, little more than a 'guesstimate.'").

to find it close to impossible to predict a movie or TV show's likelihood of success.[231] Academy Award-winning screenwriter William Goldmark captured this notion in his well-known remark: "Nobody [in Hollywood] Knows Anything."[232] Similarly, it is difficult to anticipate how easy it will be to invent around competitors' IP rights.[233] How much time and effort will it take a team of scientists to accomplish a similar goal in a new way? Fortunes are made and lost on these sorts of decisions.

To be more precise, innovation decisions are characterized by both risk and uncertainty.[234] Risk and uncertainty both involve imperfect information about the future, but they differ with respect to the nature of that imperfection.[235] A risky decision is one in which the decision maker does not know the outcome of a decision, but she does know the distribution of possible outcomes.[236] For example, tossing a fair coin is risky: we do not know whether the result will be heads or tails, but we know the probabilities of those two outcomes.[237] An uncertain decision, by contrast, is one in which the decision maker knows neither the outcome nor the distribution of outcomes.[238] For example, playing Russian roulette without knowing how many bullets are in the revolver is an uncertain situation.[239]

In many behavioral science experiments, people exhibit substantial uncertainty aversion.[240] For example, people prefer gambles in which they know the probabilites to those in which they do not, even though there is no reason to think that the uncertain gamble is

231. *See* De Vany, *supra* note 229, at 619, 623-24.

232. WILLIAM GOLDMAN, ADVENTURES IN THE SCREEN TRADE: A PERSONAL VIEW OF HOLLYWOOD AND SCREENWRITING 39 (1983).

233. *See* Abramowicz, *supra* note 149, at 184 n.215.

234. *See* FRANK H. KNIGHT, RISK, UNCERTAINTY AND PROFIT 197-232 (Univ. of Chi. Press reprt. ed. 1985) (1921).

235. *See* Gilson, Sabel & Scott, *supra* note 36, at 225-26.

236. *See id.* at 225.

237. As Gilson, Sabel & Scott, explain, "Risk exists when future states of the world can be estimated probabilistically." *Id.*

238. *See id.* at 225-26.

239. *See id.*

240. *See, e.g.*, Larry G. Epstein, *A Definition of Uncertainty Aversion*, 66 REV. ECON. STUD. 579 (1999) (proposing a new definition and methodology for studying uncertainty aversion); *see also* Mark J. Machina & Marciano Siniscalchi, *Ambiguity and Ambiguity Aversion*, *in* 1 HANDBOOK OF THE ECONOMICS OF RISK AND UNCERTAINTY 729, 745-48 (Mark J. Machina & W. Kip Viscusi eds., 2014) (summarizing seminal experiments on ambiguity aversion). Uncertainty aversion is also known as ambiguity aversion. Epstein, *supra*, at 579.

worse than the merely probabilistic one.[241] For example, imagine a choice between drawing balls from two different opaque jars. If you draw a blue ball you get $10. Most people would rather draw from a jar that has fifty blue balls and fifty red balls than from a jar that has an unknown percentage of blue and red balls.[242]

If creators behave the way most of the people in these experiments do, then this should increase downstream creators' willingness to pay (WTP) to license from upstream creators. As we have noted, the O/A decision is beset by uncertainty—about the scope of legal protection, the ease of innovating, and the size of the relevant market.[243] Faced with the uncertain prospect of generating their own idea, which might be impossible, costly, and infringe on existing rights, creators may be unduly attracted to the "sure thing" associated with licensing.[244] All else equal, uncertainty-averse creators will tend to shy away from building around for their own solutions, and will, instead, tend to rely on those already disclosed in the prior art.[245] Accordingly, the amount of money that they will be willing to pay to build on existing IP will be systematically higher than rational choice theory would predict.[246]

Studies of people's responses to risky decisions present somewhat more complicated evidence than do those of uncertain decisions. The leading account of how people make risky decisions, known as prospect theory, suggests that people evaluate options based on how

241. *See* Roger Sherman, *The Psychological Difference Between Ambiguity and Risk*, 88 Q.J. ECONOMICS 166, 166 (1974); *see also* Barbara E. Kahn & Rakesh K. Sarin, *Modeling Ambiguity in Decisions Under Uncertainty*, 15 J. CONSUMER RES. 265, 270 (1988) (finding that the degree of ambiguity aversion may depend on the context of the decision).

242. *See* Kahn & Sarin, *supra* note 241.

243. James Gibson, *Risk Aversion and Rights Accretion in Intellectual Property Law*, 116 YALE L.J. 882, 884 (2007) ("The copyright doctrines that determine where private entitlement ends and public privilege begins are inherently ambiguous.").

244. *Id.* at 890-91 (describing the "license, don't litigate" tendency).

245. *Id.*

246. It is possible that downstream creators can insure against some uncertainty via errors and omissions insurance or similar products. In addition to uncertainty aversion, creators may also be subject to risk aversion. How this affects behavior of creators has not been studied empirically. Depending on whether O/A decisions are approached in a loss or a gain frame, the behavioral impact on cumulative innovation may differ. *See id.* at 884 (arguing that downstream creators will tend to be risk-averse in the face of potential infringement liability). *But see* Steven J. Horowitz, *Copyright's Asymmetric Uncertainty*, 79 U. CHI. L. REV. 331, 366-67 (2012) (arguing, on the contrary, that downstream users of works will treat liability as a "loss" and be risk-seeking with respect to it).

those options are framed and that different frames produce different decisions.[247] Rather than evaluating all risks equally, for example, people compare the risk at issue to a baseline: Does the risk involve me losing something that I have? Or, does the risk involve me gaining something that I don't have? People respond to these frames differently.[248]

If people face a choice between two options with the same probabilistic value, one of which entails a certain loss (for example, losing $5) and the other has a chance of avoiding the loss altogether (for example, 50 percent chance of losing $10 and 50 percent chance of losing nothing), people tend to prefer taking the risk (the "Loss Frame").[249] On the contrary, people given a choice between two options, one of which entails a certain gain (for example, receiving $5) and the other of which has a chance of not gaining anything (for example, 50 percent chance of getting $10 and 50 percent chance of getting nothing), people tend to be risk averse (the "Gain Frame").[250] They prefer the certainty of the $5 to the risk of getting nothing at all.[251]

Because the framing of an option affects people's risk preferences, in order to understand how risk affects creators' O/A decisions, we need to understand how these decisions will likely be framed. Unfortunately, this question has not yet been studied empirically, but the problem presents two possibilities.[252] One is that the O/A decision will be approached in the Loss Frame.[253] Creators may

247. *See* Daniel Kahneman & Amos Tversky, *Prospect Theory: An Analysis of Decision Under Risk*, 47 ECONOMETRICA 263, 286-87 (1979); Tversky & Kahneman, *supra* note 226, at 457-58.

248. *See* Daniel Kahneman & Amos Tversky, *Choices, Values and Frames*, 39 AM. PSYCHOLOGIST 341, 342-44 (1984); Kahneman & Tversky, *supra* note 247, at 268-69; Tversky & Kahneman, *supra* note 226, at 453-55.

249. *See* Kahneman & Tversky, *supra* note 247, at 268.

250. *See id.* at 265-67.

251. *See id.*

252. James Gibson argues that downstream creators will tend to be risk averse in the face of potential infringement liability. Gibson, *supra* note 243, at 884. Steven Horowitz, by contrast, argues that downstream users of works will treat liability as a "loss" and be risk-seeking with respect to it. Horowitz, *supra* note 246, at 365 ("Prospect theory suggests the counterintuitive conclusion that potential users may enjoy greater use of copyrighted works under an unpredictable regime of access rights than under a clearer one.").

253. For example, the creator might think: "I could lose $1000 from my movie if I pay a license fee, or I could lose either $1,000,000 or $0 if I don't pay a license." This Loss Frame would, according to prospect theory, result in risk-seeking behavior.

consider the payment of a licensing fee to be a certain loss, and they may be willing to take the risk of building around the existing IP rights to avoid paying the fee even though that might lead to larger payments down the road. Or, creators might approach O/A decisions in the Gain Frame, resulting in risk aversion and a higher willingness to pay to license existing rights.[254] Given the existence of excessive optimism among creators discussed below,[255] we tend to think that the latter is more likely correct, but future research should be able to provide the answer.

Importantly, however downstream creators respond to uncertainty and risk, we anticipate that these factors will have effects on O/A decisions that are more asymmetric, and therefore easier to model, than some of the factors discussed above. This is because the behavioral influence is likely to be felt only by downstream creators and not by upstream creators.[256] Of course, it is possible that upstream creators will anticipate that downstream creators will exhibit higher WTP for licenses and, accordingly, increase the price of those licenses.[257] The effect is likely to be less explicit here than it will be for variations in the strength of IP rules or changes in market conditions. Accordingly, we can be more confident that an alteration in downstream creators' tolerance for risk or uncertainty will in fact systematically influence their O/A decisions.

B. Valuing Past and Future Creativity

One of the key features of any O/A decision involves estimating the value of creativity. When considering whether to license existing IP rights, a downstream creator must determine the value of those rights, and she must compare her estimate to the price that the rights holder charges.[258] In addition, the downstream creator must

254. Thus, the creator might think: "I could make $1,000,000 from my movie for sure if I pay a license fee or I could make either $2,000,000 or $0 from my movie if I don't pay for a license."

255. *See infra* notes 280-83 and accompanying text.

256. *See supra* notes 243-46 and accompanying text.

257. *See* Gibson, *supra* note 243, at 900-03.

258. *See* SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 141 (2004) ("Probably the most important obstacle [to licensing] is asymmetric information as to the value of the innovations. The second innovator has an incentive to overstate his costs to the first patent holder, in order to convince the patent holder that, absent an ex ante license, he would not

estimate the probable value of her own creative efforts.[259] She must attempt to gauge how easy it will be to invent around the existing rights and how much value her creative efforts will return.[260] Both upstream creators and downstream creators must determine how large they think the total innovation space is (that is, the total market for innovations of this type) and how much of that space upstream creators' rights currently occupies.[261] Recent research on creativity, including a series of our own articles, suggests that systematic biases and anomalies will often beset these judgments.[262]

Consider first the behavior of the upstream creators who own the rights to the existing patented inventions or copyrighted works. Having created these new innovations, creators must then determine how much they are worth.[263] An enormous body of research suggests that owners of objects tend to systematically overvalue them relative to potential purchasers.[264] For all sorts of goods, the least amount of money that owners are willing to accept to sell their goods is typically substantially more than the most that they would have been willing to pay to purchase them in the first place.[265] This gap between willingness to accept (WTA) and willingness to pay

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invest. Of course the first patent holder will not necessarily believe this representation." (footnote omitted)).

259. *See* Heald, *supra* note 37, at 502 & n.143.

260. *See id.* at 502-03.

261. *See id.* at 502.

262. *See* Christopher Buccafusco & Christopher Sprigman, *Valuing Intellectual Property: An Experiment*, 96 CORNELL L. REV. 1, 4 (2010); Merges & Nelson, *supra* note 57, at 5 ("Beliefs about the consequences of choosing one path or another are presumed to be influenced as much by the past experience of an individual or organization and theories formed on the basis of that experience, as on objective information about a particular new situation.").

263. *See* James Bessen & Eric Maskin, *Sequential Innovation, Patents, and Imitation*, 40 RAND J. ECONOMICS 611, 613 (2009) ("[I]f a patent holder is not as well-informed about a rival's potential future profits as the rival is himself, she may have difficulty setting a mutually profitable license fee, and so ... licensing may fail.").

264. *See, e.g.*, Daniel Kahneman, Jack L. Knetsch & Richard H. Thaler, *Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias*, 5 J. ECON. PERSP. 193, 194 (1991) [hereinafter Kahneman, Knetsch & Thaler, *Anomalies*]; Daniel Kahneman, Jack L. Knetsch & Richard H. Thaler, *Experimental Tests of the Endowment Effect and the Coase Theorem*, 98 J. POL. ECON. 1325, 1339 (1990) [hereinafter Kahneman, Knetsch & Thaler, *Experimental Tests*]. For applications of this literature to the legal sphere, see Samuel Issacharoff, *Can There Be a Behavioral Law and Economics*?, 51 VAND. L. REV. 1729, 1734-37 (1998); and Russell Korobkin, *The Endowment Effect and Legal Analysis*, 97 NW. U. L. REV. 1227, 1256-93 (2003).

265. Kahneman, Knetsch & Thaler, *Anomalies*, *supra* note 264, at 194.

(WTP) has been called the endowment effect, and it can produce substantial market inefficiencies.[266] Contrary to the predictions of the Coase Theorem, which suggests that goods should flow smoothly and efficiently to their highest valuing users in a low transaction costs environment,[267] the endowment effect results in sticky initial distributions of goods and inefficient markets.[268]

In a recent experiment, Buccafusco and Sprigman provided evidence of an enhanced endowment effect when the goods to be sold were not simply owned by one party but *created* by that party.[269] In this experiment, painters who were given an opportunity to sell their paintings' chances of winning a quality-based cash prize demanded substantially more money than did others who were given the same opportunity for paintings created by someone else.[270] This substantial valuation gap—which we termed the *creativity effect*—seemed to be primarily driven by creators' systematically higher estimates of the quality and, thus, likelihood of success of their works.[271] When viewing the other paintings in the competition, creators thought that their own works were substantially better than the others and thus, much more likely to win the prize.[272] To the extent that this effect prevails in innovation markets, it could have profound effects on O/A decisions. Upstream creators will tend to systematically overvalue their own works when establishing licensing rates for them.[273] They will tend to believe that their own inventions and works are more creative than they actually are and, thus, that they cover a larger share of the innovation space than they actually do.[274] Overvaluation by creator-licensors will tend to

266. Jennifer Arlen, Matthew Spitzer & Eric Talley, *Endowment Effects Within Corporate Agency Relationships*, 31 J. LEGAL STUD. 1, 3 (2002).

267. *See id.*

268. *Id.*

269. *See* Christopher Buccafusco & Christopher Jon Sprigman, *The Creativity Effect*, 78 U. CHI. L. REV. 31, 36-40 (2011).

270. *See id.* at 37-39.

271. *See id.* at 39-43.

272. For another study finding a similar result, see Michael I. Norton, Daniel Mochon & Dan Ariely, *The IKEA Effect: When Labor Leads to Love*, 22 J. CONSUMER PSYCHOL. 453, 453-58 (2012) (finding that subjects who assembled boxes, folded origami, and built Legos attached substantial value to their creations).

273. *See* Buccafusco & Sprigman, *supra* note 269, at 39-43.

274. *See id.*

lower the likelihood of licensing and lead, in turn, to inefficiently high levels of building around by downstream creators.

Of course, the degree to which people and firms will be subject to creativity effects will vary. Decision-making that is undertaken within principal-agent relationships or institutions may reduce the magnitude of the effect.[275] In addition, to the extent that the works being exchanged involve repeated transactions of similar kinds of goods, the market may correct biases over time.[276] For example, inventors who repeatedly produce similar inventions may become less subject to optimistic assessments of the quality of new ones.[277] We should note, however, that creative goods are rarely, if ever, fungible with previous goods.[278] Creators may tend to think that, although the market did not highly value their prior efforts, their latest ones are just that much better.

Upstream creators are not the only ones who have to estimate the size of the innovation space. Downstream creators, too, must attempt to value the upstream creators' efforts. To a large degree, the value of the existing IP is determined by how easy it is to build around.[279] When making this determination, downstream creators will be influenced, we predict, by the same sort of optimism bias that affects upstream creators. Some evidence from one of our experiments illustrates this point. In a set of experiments that we ran about O/A decisions, subjects were given the choice to borrow from an existing solution to a creativity problem or to create their own solution and receive a bonus payment.[280] Throughout these experiments, a large cohort of subjects chose to innovate even when

275. *See* Jennifer Arlen & Stephan Tontrup, *Does the Endowment Effect Justify Legal Intervention? The Debiasing Effect of Institutions*, 44 J. LEGAL STUD. 143, 146 (2015) (arguing that endowment effects can be overcome by trading through institutions, such as by using voting or trading within agency relationships); Arlen, Spitzer & Talley, *supra* note 266, at 18-22 (finding diminished endowment effects in principal-agent relationship).

276. *See* John A. List, *Does Market Experience Eliminate Market Anomalies?,* 118 Q.J. ECONOMICS 41, 41-43 (2003).

277. *Cf. id.* (discussing the negligible endowment effect on market participants with intense trading experience).

278. *See* Buccafusco & Sprigman, *supra* note 262, at 11.

279. *See* Landes & Posner, *supra* note 47, at 332 ("The less extensive copyright protection is, the more an author, composer, or other creator can borrow from previous works without infringing copyright and the lower, therefore, the costs of creating a new work.").

280. *See* Bechtold, Buccafusco & Sprigman, *supra* note 161, at 1267-71, 1278-79, 1284-85, 1288.

it made no financial sense.[281] In one version, 85.7 percent of subjects chose to innovate even though it was impossible to find a better solution than the existing one.[282] Much of this behavior was driven by subjects' optimistic beliefs about how easily they could create around the given solution.[283]

To the extent that creators or firms on either side of the O/A decision suffer from these sorts of valuation biases, we should expect to see more building around and less building on.[284] This will tend to be the case when little market correction exists and when creators make one-off transactions.[285] Valuation biases may also arise in situations in which the creators feel stronger emotional attachment to their works.[286] For example, the author of a screenplay may feel particularly reluctant to give up creative control to a different director if she is deeply attached to her work. This is not to suggest that valuation biases are necessarily more likely in copyright-related transactions, though. The macho culture of computer programming or engineering may generate a degree of optimism bias that dwarfs that of coffee shop poets or classical music composers.

C. Tastes for Pioneering and Tweaking

In his foundational article on the boundaries of the firm, Coase sought to explain why some products were made within a firm and some were developed through market transactions. One suggestion he considered, and then quickly discarded, was that some workers might have a "taste" for working within firms or on their own.[287]

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281. *See id.* at 1275-76, 1281, 1285-90.

282. *See id.* at 1289.

283. *Id.* at 1289-1291. Some of the behavior may also have been determined by creators' preferences to innovate rather than to borrow. We discuss this possibility in the next Part.

284. *See* Arlen, Spitzer & Talley, *supra* note 266, at 3 (explaining upstream creators' endowment effect); Bechtold, Buccafusco & Sprigman, *supra* note 161, at 1267-71, 1278-79, 1284-85, 1288 (suggesting downstream creators' tendency to overvalue their ability to innovate will lead to more innovating).

285. *See* List, *supra* note 276, at 41-43.

286. *See* Buccafusco & Sprigman, *supra* note 269, at 41; *see also* Carey K. Morewedge et al., *Bad Riddance or Good Rubbish? Ownership and Not Loss Aversion Causes the Endowment Effect*, 45 J. EXPERIMENTAL SOC. PSYCHOL. 947, 948 (2009) ("People may demand a lot for their [goods] because they actually *like* them, and they may like them simply because they are theirs.").

287. Coase, *supra* note 25, at 390. He explains: "The price mechanism ... might be supersed-

Some people might like to work in groups, while others might prefer to work alone.[288] Whether or not he was right to discard the suggestion in the context of vertical integration, we wish to reclaim Coase's discarded suggestion, which we consider to be relevant for understanding O/A decisions.[289]

To a Coaseian, whether one should build on existing IP or build around it is purely a question of relative costs and benefits: Which option is more cost effective?[290] In some circumstances, though, a key factor in this decision is whether one tends to enjoy novelty more than similarity, or vice versa.[291] Some people may enjoy the thrill of coming up with a new solution to a problem even though existing solutions exist and are perfectly serviceable.[292] In other work, we have referred to these people as "pioneers."[293] They may value "big" ideas, or they may feel pleasure from coming up with their own approaches.[294] By contrast, other people may feel more comfortable working on relatively minor adjustments to existing ideas.[295] We call these people "tweakers."[296] They may get pleasure from refining others' ideas or wringing the last bit of inefficiency out of a previous solution.[297]

Although pioneers tend to get more attention and praise, tweakers are often just as important for creative development.[298] Beetho-

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ed if the relationship which replaced it was desired for its own sake. This would be the case, for example, if some people preferred to work under the direction of some other person." *Id*.

288. *See id.*

289. Arora and Merges note the "preference of many engineers and scientists to work in smaller and more intimate organizations." Arora & Merges, *supra* note 34, at 452 (quoting CHRIS FREEMAN & LUC SOETE, THE ECONOMICS OF INDUSTRIAL INNOVATION 239 (3d ed. 1997)).

290. *See* Coase, *supra* note 25, at 390-91.

291. *See* Bechtold, Buccafusco & Sprigman, *supra* note 161, at 1276.

292. *Id.*

293. *Id.*

294. *Id.*

295. *Id.*

296. *See* Ralf R. Meisenzahl & Joel Mokyr, *The Rate and Direction of Invention in the British Industrial Revolution: Incentives and Institutions*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY REVISITED 443, 446 (Josh Lerner & Scott Stern eds., 2012) (defining tweaking as "the myriad of small and medium cumulative microinventions that improved and debugged existing inventions").

297. *See* Bechtold, Buccafusco & Sprigman, *supra* note 161, at 1276.

298. *See* Meisenzahl & Mokyr, *supra* note 296, at 447 ("The economic success of inventors depended, among other things, on their ability to find tweakers to get the bugs out of the invention, and implementers to construct, install, and operate it.").

ven's pioneering advances beyond the classical period are justly praised, but so is Bach's refinement of the principles and practice of baroque music.[299] And Ralf Meisenzahl and Joel Mokyr have argued that Britain's success during the industrial revolution owed at least as much to the tweaker engineers and mechanics as it did to paradigmatic heroic inventors.[300]

Some people may exhibit consistent preferences for pioneering, while others may generally prefer tweaking. In a recent study, we showed that subjects who tended to innovate new solutions rather than borrow from existing solutions tended to score higher in the personality factor associated with openness to experience.[301] It is also possible, however, that people may be pioneers with respect to one kind of creativity and tweakers with respect to another. Jimi Hendrix was a pioneering guitarist, but he was often at his best when he was covering others' songs.[302] The same may be true for fan fiction authors, who like to work from an existing set of characters to develop their own stories and themes.[303]

To the extent that people have stable preferences for pioneering or tweaking, then, we should expect to see deviations from a purely economic prediction of their O/A decisions. All else equal, pioneers will tend to engage in more building around, while tweakers will tend to engage in more building on. The distribution of pioneers and tweakers in the population, or in a given field, will affect the prices

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299. *See* Margaret A. Boden, *Précis of* The Creative Mind: Myths and Mechanisms, 17 BEHAV. & BRAIN SCI. 519, 522 (1994) (discussing tweaks and transformation in Western classical music).

300. *See* Meisenzahl & Mokyr, *supra* note 296, at 445-46.

301. Bechtold, Buccafusco & Sprigman, *supra* note 161, at 1277-78.

302. For example, Hendrix's cover of Bob Dylan's "All Along the Watchtower" is often regarded as a cover song that is better than the original. *See, e.g.*, Michael Gallucci, *10 Cover Songs Better than the Originals*, ULTIMATE CLASSIC ROCK, http://ultimateclassicrock.com/cover-songs-better-than-originals [https://perma.cc/7KQ5-D4TG].

303. Perhaps the most famous example of fan fiction is the fiction associated with the *Star Trek* fandom. *See, e.g.*, Francesca Coppa, *A Brief History of Media Fandom*, *in* FAN FICTION AND FAN COMMUNITIES IN THE AGE OF THE INTERNET: NEW ESSAYS 41, 45-48 (Karen Hellekson & Kristina Busse eds., 2006) (chronicling the emergence of *Star Trek* fan fiction). Fan fiction may also inspire entirely new works. For example, the successful romance novel *Fifty Shades of Grey* actually began as a fan fiction spin-off of the equally successful *Twilight* novels. *See* Natasha Bertrand, Fifty Shades of Grey *Started out as* Twilight *Fan Fiction Before Becoming an International Phenomenon*, BUS. INSIDER (Feb. 17, 2015, 1:22 PM), http://www.businessinsider.com/fifty-shades-of-grey-started-out-as-twilight-fan-fiction-2015-2 [https://perma.cc/UEP2-2NCR].

that are paid for licenses and the kinds of creativity that are ultimately produced. Any given field is likely to include both pioneers and tweakers, although the relative proportions of each may differ.

As in the other parts, we cannot provide a single set of predictions about how creators will make O/A decisions. The contexts of these decisions vary along too many dimensions to enable them to be easily generalized. Nonetheless, we can offer a variety of guidelines for determining whether to expect more building around or more building on, all else equal. In situations that involve uncertainty, or that tend to attract a higher proportion of tweakers, we predict greater than usual degrees of building on. By contrast, in situations involving higher degrees of risk that are more subject to creativity effects and optimism bias, or that involve a larger proportion of pioneers, we predict greater than usual degrees of building around.

VI. REGULATING SEQUENTIAL INNOVATION

The U.S. Constitution grants Congress the power "[t]o promote the Progress of Science and useful Arts" by establishing copyrights and patents to incentivize authors and inventors.[304] Certainly, encouraging creativity and innovation are laudable policy goals, and new ideas and technologies have been major drivers of improvements in social welfare. But, as we argued at the outset, building around is not inherently more valuable than building on. Sometimes building around is costly and wasteful. Sometimes building on is efficient, as, for example, when it promotes desirable standardization. The broader point is that the goal of IP policy is not to maximize creativity and innovation, but rather to *optimize* creativity and innovation. And IP law is not the only regulatory tool for accomplishing this task. In this Part, we utilize the framework developed above to illustrate the different ways in which policymakers might optimize the mix of building on and building around in particular creative fields.

304. U.S. CONST. art. I, § 8, cl. 8.

A. Optimizing Creativity Through Building On and Building Around

The principal goal of U.S. innovation policy, including IP laws, is promoting social welfare. Patent and copyright laws in particular serve this goal by solving a public goods problem for information and by assisting creators to recoup the costs of their investments in new inventions and works.[305] But this does not mean that social welfare is best served by policies that generate more new things.[306] Producing new inventions and works is costly and should be undertaken only when the benefits they promise to generate exceed their costs.[307] These costs include the actual R&D expenditures required to generate them, the static efficiency costs that exclusive rights created by IP impose on consumers by limiting competition in markets for a particular innovation, and the dynamic efficiency costs that creating IP rights imposes on downstream creators and users who must pay more for access to existing technologies implicated when they engage in sequential innovation.[308]

The same tradeoffs are at stake in creators' choices to build on existing ideas or to build around them. Because both strategies have costs as well as benefits, social welfare is rarely—if ever—maximized by simply maximizing one or the other. As we described above, building on is often valuable, because it relies on existing knowledge to reduce R&D and risk.[309] And while the term "building on" may sound static and rooted in the status quo, most examples of building on employ prior ideas in new creative ways. Building around, by contrast, sounds valuable and exciting, but—at least as we have defined the term—it is not always. All we mean by building around is designing around existing IP rights, so they do not have to be licensed. Sometimes this leads to valuable new creations and inventions, but other times it simply involves investing resources

305. WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 20 (2003).

306. *See* Barton Beebe, Bleistein, *the Problem of Aesthetic Progress, and the Making of American Copyright Law*, 117 COLUM. L. REV. 319, 341-42 (2017). On socially wasteful patent races, see LANDES & POSNER, *supra* note 305, at 300-01.

307. *See* LANDES & POSNER, *supra* note 305, at 20-21.

308. *See id.* at 16-21.

309. *See supra* Part V.A.

into products that are not meaningfully different or better than those that came before.[310]

There is an emerging scholarly literature on the relative benefits of designing around existing IP rights.[311] Some commentators suggest that designing around is socially wasteful, because it does not produce new value, but merely replicates existing ideas with the added cost of new R&D.[312] If the world already had one perfectly good erectile dysfunction drug or boxing movie, did it really need a second?[313] The additional innovative effort, if all it does is simply reinvent the wheel, is redundant and wasteful.[314] It may nonetheless occur when the private value to the competitor in rent seeking is greater than the social benefit generated by spending those resources elsewhere.[315]

Sometimes, however, having multiple approaches to the same problem can be helpful. When a group of creators applies different techniques to solve a problem—whether technological or artistic—the probability of finding an acceptable answer increases.[316] This is especially true when the variety of acceptable answers to the problem increases. For example, there might be relatively few ways

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310. Building around and building on have no more inherent normative valence than do making or buying in the standard theory of the firm literature. Both terms are descriptions of different behaviors that can be wise or unwise, beneficial or harmful, depending on the circumstances. And just as regulators may want to alter the amount of vertical integration in a given field, so too may they want to alter the amount of building around or building on in a given field.

311. *See, e.g.*, Nancy T. Gallini, *Patent Policy and Costly Imitation*, 23 RAND J. ECONOMICS 52 (1992) (proposing an optimal patent with a broad scope against imitations and an adjusted patent life).

312. William W. Fisher III & Felix Oberholzer-Gee, *Strategic Management of Intellectual Property: An Integrated Approach*, 55 CAL. MGMT. REV. 157, 171 (2013) ("'Inventing around' an incumbent's technology is socially wasteful, at least if the non-infringing technology developed by the newcomer offers no functional advantage.").

313. Or third, fourth, fifth ...? *See* Bill Simmons, *Sports Movies Continue to Evolve*, ESPN (Dec. 23, 2010), http://www.espn.com/espn/page2/story?page=simmonsnfl2010%2Fweek16 picks [https://perma.cc/95ST-Q9JP] ("Since 'Rocky' captured the Academy Award for Best Picture in 1976, Hollywood has churned out an average of one boxing movie per year.").

314. *See* Abramowicz, *supra* note 123, at 344-45 (giving an example of how market entry by second creator simply takes away 50 percent of profit from existing creator without any increase in consumer welfare); Abramowicz, *supra* note 149, at 190 ("Inventing around presents similar problems of excessive and functionally redundant innovative activity as patent races.").

315. *See* Dan L. Burk, *Inventing Around Copyright*, 109 NW. U. L. REV. 547, 557 (2015).

316. *See id.* at 555-57.

to increase the fuel efficiency of automobiles but many different ways to paint a still life. Furthermore, designing around existing IP rights may also beneficially increase competition and lead to technological spillovers, as new parties discover solutions to problems that they may not have set out to solve.[317]

Our goal in this Article is not to resolve this question one way or the other, either generally or in the context of any particular creative field. In fact, we argue that no single correct answer exists. In some circumstances, social welfare will be maximized when creators engage in a high degree of building on one another's inventions. In others, however, having different creators, each adopting separate approaches to a problem, will achieve better results. We leave to others the challenging task of determining the optimal mix for any given field. Instead, we offer an analysis of the tools that regulators have at their disposal if they want to alter the mix of building on and building around. This analysis is more complicated than those provided in the relatively simplistic, linear, and static ways in which the incentive theory of IP is often claimed to drive innovation. But appreciating this complexity is necessary in order to answer the important normative issues that undergird legal regulation of innovation. Policymakers and scholars must grapple with the multivalent factors that influence sequential innovation if they are going to regulate it.

B. Bargaining over Sequential Innovation

When policymakers attempt to influence sequential innovation they cannot, typically, change creators' behaviors directly. Instead, they attempt to manipulate behavior by altering the incentives attached to different conduct—that is, by affecting the relative costs of building on or building around. Incentives are neither static nor solitary. Because creativity builds on and around existing creativity, incentives depend on the interaction between upstream and down-

317. *See* State Indus., Inc. v. A.O. Smith Corp., 751 F.2d 1226, 1236 (Fed. Cir. 1985) ("One of the benefits of a patent system is its so-called 'negative incentive' to 'design around' a competitor's products, even when they are patented, thus bringing a steady flow of innovations to the marketplace."); Fishman, *supra* note 8, at 1336 (arguing that the existence of constraints on creativity may improve rather than hinder it).

stream creators bargaining over innovation and borrowing. The nature of that bargaining, in turn, depends on how creators value different options. Here, we analyze bargaining over sequential innovation. We will use an example of a policy that expands the scope of upstream IP rights and shrinks the innovation space for downstream creators, but the analysis is similar for all such changes whether brought about by legal regulation or changes to the other factors.

The key to understanding O/A bargaining is determining how upstream and downstream creators will set their reservation prices for licensing. The upstream creator's reservation price is the least amount of money that she would be willing to accept (WTA) to allow the downstream creator to license her IP rights.[318] The downstream creator's reservation price is the most amount of money that he would be willing to pay (WTP) to license those rights.[319] Ignoring the existence of transaction costs, any time that the downstream creator's WTP is greater than or equal to the upstream creator's WTA, we should see building on take place. In such a case, it is more efficient for the parties to agree to license the IP rights than for the downstream creator to innovate around them. Given the existence of some "bargaining zone"[320] between the parties, they should agree to a license fee that falls somewhere between the upstream creator's WTA and the downstream creator's WTP.[321] By contrast, when the most that the downstream creator will pay to license is less than the least amount of money that the upstream creator will accept, building on will not occur and the downstream creator will build around.[322]

How, then, will creators' reservation prices be established? Let us start with the downstream creator. We will call him Desmond. This is the easiest case. Desmond will base his WTP on the net benefits

318. Korobkin, *supra* note 264, at 1231.

319. *Id.*

320. *See* Russell Korobkin, *A Positive Theory of Legal Negotiation*, 88 GEO. L.J. 1789, 1791-94 (2000) [hereinafter Korobkin, *Positive Theory*]; Russell Korobkin, *Aspirations and Settlement*, 88 CORNELL L. REV. 1, 5-6 (2002) [hereinafter Korobkin, *Aspirations*].

321. Given the existence of some bargaining zone and thus some surplus from the transaction, the price of the bargain will be determined by things like bargaining power, hard bargaining, information asymmetries, and behavioral effects.

322. *Cf.* Korobkin, *Aspirations*, *supra* note 320, at 56-57.

he expects from building on (but not including the price of the license) compared to the net benefits he expects when building around.[323] Suppose that Desmond thinks that he will make $2 per sale if he innovates (Value of Building Around) and $8 per sale if he borrows (Value of Building On) perhaps because he will have to spend more on R&D if he builds around. Accordingly, his WTP would equal the difference between the Value of Building On and the Value of Building Around. Here, he would be willing to pay $6[324] or less for a license. He would be indifferent between building on and paying a license fee of $6 and building around, so his reservation price is $6.

Now let's look at the upstream creator. We will call her Ursula. In a normal world of selling widgets, the seller's WTA is based on her costs. If it costs Ursula $20 to make a widget, she is willing to sell it for any amount greater than that. When licensing IP, however, the seller's costs are harder to estimate. For some sellers of IP, there may be little or no cost, because all they are doing is selling a license. For example, a patent troll who does not manufacture anything will only face an opportunity cost: if she gives A an exclusive license, she cannot give B an exclusive license.

Things change when the upstream seller is actually a manufacturer of a product based on the IP right. Now, Ursula's costs are going to be determined by the effects on her rents from granting a license. If she licenses Desmond to use her IP, she may face competition from him that will lower the amount that she can charge for her products. But she also has to be concerned that if she does not grant a license, she may lose rents when Desmond builds around her IP. Ideally, she wants Desmond to adopt the strategy that lowers her rents the least. So her reservation price (WTA) is determined by the rents she obtains if the downstream creator builds around minus the rents she obtains if the downstream creator builds on.

Imagine that Ursula is making $10 per unit. If she is going to make $7 per unit if Desmond builds around her, and only $3 if he builds on her work, Ursula wants Desmond to build around. In

323. Of course, if both of these numbers are negative, then he simply does not create at all and does something else with his life.

324. 8x$ - 2x$ = 6x$, where x is the number of units sold.

order to do so, she will charge him a positive license fee to build on, and her WTA is $4.[325] She is indifferent between him building on and paying $4 and him building around. If he pays any more than $4 to build on, she is better off than if he builds around.

Now look at the comparison between these two cases: Ursula is willing to accept any amount above $4 to grant a license, and Desmond is willing to pay any amount less than $6 to purchase a license. Thus, the bargaining zone covers this gap. Assuming transaction costs are less than $2, they should reach an agreement for a license somewhere between $4 and $6; the exact price will be determined by bargaining power and other negotiating factors.

Importantly, note that the price for a license can be negative. When the upstream seller stands to lose more money if the downstream creator builds around than if he builds on, the upstream seller would prefer to encourage him to license. To do so, she might actually pay the downstream creator to "license" rather than to build around. This is basically what happens in pharmaceutical cases in which a patent is about to expire, and the owner pays generic entrants not to build around.[326]

With this basic sense of how reservation prices arise, we can begin to consider how regulation influences bargaining over IP. What happens to the downstream creator's WTP and the upstream creator's WTA when, for example, a law increases the scope of the upstream creator's IP rights?

For the downstream creator, Desmond, whose WTP is Value of Building On less the Value of Building Around, an increase in the scope of IP will probably decrease the Value of Building Around, since it shrinks the innovation space. Whereas, before, the Value of Building Around was $2 per unit, now it may be only $1 per unit. The Value of Building On will likely remain the same ($8), so now, Desmond's WTP will be $7 higher.[327] On its own, that will increase the likelihood of building on, because there is now a bigger bargaining zone between Ursula's WTA ($4) and Desmond's WTP ($7).

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325. $7*x* - $3*x* = $4*x*.

326. *See* C. Scott Hemphill, *Paying for Delay: Pharmaceutical Patent Settlement as a Regulatory Design Problem*, 81 N.Y.U. L. REV. 1553, 1557-58 (2006).

327. $8*x* - $1*x* = $7*x*.

But how might the increase in IP scope affect Ursula's WTA? Presumably, when scope expands, the value of the remaining innovations decreases. Recall that Ursula's WTA is determined by her rents if Desmond builds around less her rents if Desmond builds on. Accordingly, the first term (her rents if Desmond builds around) is likely to increase because the innovating solution that Desmond creates will tend to eat into her rents less when the scope of her rights broadens. Fewer valuable solutions will be left for him to attempt. Instead of making only $7 if Desmond builds around, Ursula may now make $8 per unit. If Ursula makes $8 when Desmond builds around and $3 when he builds on, her WTA would be $5.

Combining these two effects, we can see what happens to bargaining. In this example, the magnitude of the effects on the downstream and upstream creators is the same, so all we see is a shift in the bargaining zone.[328] Instead of the price of a license falling between $4 and $6, it will now fall between $5 and $7. We will not see any more bargaining or innovating than in the previous example, but we can predict that the price of licensing will increase. When the change in the IP regime has symmetric effects on the value to both downstream and upstream creators, there will be no change in building on versus building around, and only a change in license fees.

But consider a different example instead. What if the change in IP scope has a bigger influence on the upstream creator's rents than it does on the downstream creator's benefits? For example, the increase in scope means that Ursula now makes $9 instead of $7 if Desmond builds around and still $3 if he builds on. Now Ursula's WTA is $6.[329] If Desmond's WTP stays at $7, then the change will decrease the likelihood of borrowing, because the size of the bargaining zone has shrunk. There is only a $1 difference between them, so there is more likelihood that either transaction costs will swamp the surplus or that bargaining anomalies will prevent a deal. As the literature recognizes, the larger the bargaining zone, the more likely there will be a deal.[330]

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328. *See* Korobkin, *Positive Theory*, *supra* note 320, at 1797.

329. $9*x* - $3*x* = $6*x*.

330. *See, e.g.*, Korobkin, *Positive Theory*, *supra* note 320, at 1791-94; Korobkin, *Aspirations*, *supra* note 320, at 6.

Thus, changes in IP scope can influence the likelihood of building on and building around, but only if they create asymmetric effects on the parties. If the change shrinks the bargaining zone, then licensing is less likely, and vice versa. And, of course, it is possible that the change could eliminate licensing entirely if there were no bargaining zone at all—that is, if the least the upstream creator would accept is higher than the most the downstream creator would pay.

C. Generalizing About Building On and Building Around

From the foregoing analysis, we can articulate a few generalizations about how different factors are likely to influence downstream creators' O/A decisions and sequential innovation more broadly.

First, reductions in transaction costs will almost always lead to more building on, all else equal. For downstream creators to build on from their upstream colleagues, they must license IP rights, which involves finding and negotiating with those colleagues. In a frictionless world, upstream and downstream creators would often agree to licenses and split the surplus produced by the new innovation; the surplus represents the bargaining zone from the prior discussion.[331] In many instances, however, transaction costs will be greater than the surplus value, and licensing will not take place. For example, if there is a $2 per unit bargaining zone between the upstream creator's WTA and the downstream creator's WTP, but it costs $3 per unit for the parties to negotiate a license agreement, the license will not arise and the downstream creator will build around. Accordingly, we will tend to see more building on when transaction costs are lower.

The registration and publication requirements of patent law and the compulsory mechanical licensing for music copyrights are examples of strategies for lowering transaction costs. By contrast, the difficulty of establishing ownership of copyrighted works is a feature of modern copyright law that raises transaction costs.[332] Market or technology factors will also influence transaction costs, including the degree of tacit knowledge inherent in certain creative endeavors.

331. *See supra* notes 318-22 and accompanying text.
332. *See supra* Part II.A.2.

If tacit knowledge is high, it can be hard to transfer, increasing the costs of borrowing.[333]

Second, the effects of changes in the scope of the innovation space are often ambiguous. As our account of sequential innovation bargaining explained, changes in IP scope can affect both the upstream creator's WTA and the downstream creator's WTP to license. Too often, scholars seem to assume that expanding IP rights will have a predictable, unidirectional effect—typically to increase the demand for licenses. But this need not be the case.[334] As we just demonstrated, a change to the scope of IP protection can have multiple outcomes. It could create or destroy the existence of a bargaining zone, making building on possible or impossible. It could broaden or narrow the size of the bargaining zone, making building on respectively more or less likely. Or, it could not affect the size of the bargaining zone, but instead, simply shift the price of licensing up or down. In addition, expanding IP rights might render both building on and building around inefficient, and the downstream creator might instead choose to work in a separate field entirely.

All of the above is true even before we consider the other, contextual factors that influence O/A decisions. In addition to legal policies, a shift in popular tastes or the continuing maturity of a field can affect how valuable licensing IP rights is compared to inventing around them. But whether these changes will ultimately alter creators' O/A decisions depends on whether they cause symmetric or asymmetric changes to upstream and downstream creators' prices.

Accordingly, the effects of changes in the scope of the innovation space on O/A decisions are often ambiguous. They will tend to be driven by the magnitudes of the resulting changes in WTP and WTA. Whether the former or latter is more likely in a particular context depends on whether upstream or downstream creators are more sensitive to changes in innovation space. How these potentially offsetting reactions balance in practice can be assessed only empirically, and only in context. This aspect of O/A decision-making, like others that we have described, cannot be fully understood through theorizing.

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333. *See supra* notes 177-79 and accompanying text.

334. *See supra* note 8.

Finally, we predict that most of the creator factors described in Part V will have unidirectional influences on creators' O/A decisions, but they will not consistently favor either building on or building around. Unlike changes in the innovation space, where upstream creators will be at least somewhat sensitive to the effects on downstream creators, we do not anticipate strategic pricing based on behavioral biases. Upstream creators are less likely to know about downstream creators' overoptimism or uncertainty aversion, and downstream creators are less likely to anticipate upstream creators' creativity and endowment effects.[335] Accordingly, to the extent that one of these biases is operative, it will tend to have a predictable effect on sequential innovation. Note, however, that the biases do not all point in the same way. Some, like uncertainty aversion in downstream creators, suggest increased building on, but others, including upstream creativity effects, indicate greater building around. Empirical data may ultimately provide a richer understanding of when and how these factors will influence innovation and creativity.

D. Sequential Innovation: IP Doctrine and Beyond

At least since Edmund Kitch's classic article describing a "prospect theory" account of IP law and sequential innovation,[336] scholars have been interested in how various aspects of legal doctrine influence creativity and innovation. This research has considered the optimal length and breadth of IP rights as well as the questions about the economic desirability of designing around those rights. In so doing, it has focused almost exclusively on IP doctrine.[337] In our framework, IP doctrine is only one of the factors that influences creators' O/A decisions.[338] The progress and direction of sequential innovation will be influenced at least as much by the others factors that we illuminate: market, technological and artistic, and creator. Whether a given creator builds on or builds around is as much a

335. *See supra* Parts V.A-B.

336. *See* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 266 (1977).

337. *See supra* note 8 and accompanying text.

338. In fact, IP doctrine is only one of the legal factors that we discuss in Part II. Other relevant areas of law include antitrust, contract, and tax laws. *See supra* Part II.B.

question of the nature of the competition she faces, the nature of the tastes of consumers, and the nature of her own behavioral preferences and biases as it is one of copyright or patent law.

To the extent, then, that policymakers desire to regulate aspects of sequential innovation, they must consider the full range of decision-making inputs. Policymakers typically regulate by altering legal rules to shift the costs and benefits of desired outcomes. But because O/A decisions are complex, regulating sequential innovation is also complex. Changing one aspect of creators' decisions may not have the intended effect when other factors more strongly influence them. Although our account of sequential innovation complicates the regulatory picture, it also offers the possibility of using different tools to accomplish some goals. If policymakers wish to affect creators' O/A decisions, our framework suggests that they should consider manipulating any of the factors that may influence those decisions. In some cases, shaping O/A decisions via the other factors may be more efficient than using IP law. Indeed, our analysis provides policymakers with four guidelines that they should consider before regulating.

First, if policymakers want to optimize innovation and creativity, changing IP regimes may be a successful strategy if the innovation environment is not dominated by other factors. History provides a clear example of regulators altering the ratio of innovating to borrowing by manipulating IP regimes. In the early twentieth century, Congress was concerned about the power of the Aeolian Company in the market for player piano performances of musical compositions.[339] Aeolian owned the important patents on player piano technology, and it began to lock up licensing deals with musical composers to produce player piano versions of their songs.[340] Other producers of player piano rolls would be forced to either find or create their own music to record, or attempt to license compositions from the monopolist, Aeolian. Fearful that this situation would result in excessive prices and too little musical output, Congress created the compulsory license for mechanical reproductions of

339. *See* Robert P. Merges, *Of Property Rules, Coase, and Intellectual Property*, 94 COLUM. L. REV. 2655, 2671 & n.62 (1994) (citing ALI KOHN & BOB KOHN, THE ART OF MUSIC LICENSING 310-11 (1992)).

340. *See id.*

songs.[341] Thereafter, once producers recorded and released a copyrighted musical composition to the public, other companies would be able to record the same song with their own musicians upon the payment of a predetermined fee to the owner of the composition.

In our terms, the story of the mechanical license illustrates an attempt to increase the amount of borrowing by reducing its costs. Congress was concerned that innovating would be too difficult for Aeolian's competitors, because they would have to create their own musical compositions to record. Congress was also worried about Aeolian's—probably imaginary, or at least transitory—monopsony power as a dominant force in the market for purchasing licenses to produce player piano rolls' reproductions of popular musical compositions. The combination of expensive designing around plus elevated prices from lack of competition stirred Congress to find a solution that would make borrowing easier. Here, it involved an alteration to the way in which copyrights are protected—by a liability rule for cover songs rather than a property rule.[342]

In much of the rest of copyright law, however, legal rules will often push downstream creators towards building around rather than building on. The combination of copyright's broad derivative works right and the idea/expression distinction makes attempting to license upstream works less appealing. As we described above, the derivative works right gives upstream creators control over almost all of the downstream uses of their work.[343] Subsequent creators must license upstream rights prior to developing their own works, or they risk losing their efforts and being sued for copyright infringement. The idea/expression distinction further enhances the appeal of designing around existing works, because it limits the upstream authors' control to their particular expressions rather than to the generic ideas underlying them.[344] Thus, while the derivative works right discourages downstream creators from developing their own *Star Trek* stories, the idea/expression doctrine enables them to produce other science fiction works.

341. *See id.*
342. *See id.*
343. *See supra* notes 120-27 and accompanying text.
344. *See supra* notes 88-93 and accompanying text.

This regime for channeling sequential innovation makes sense from the perspective of certain assumptions that policymakers could hold. Copyright law grants the originator of a character or storyline the opportunity to work out that story's trajectory without the interference of others and without fear of being blocked from particular paths if she does not get to them first.[345] But it also allows other authors the opportunity to create within the same genre without fear of liability.[346] The high degree of building around that will result may be optimal if policymakers believe that original authors are best positioned to direct the future uses of their works,[347] and that the public is best served by having lots of different works within the same genre rather than lots of versions of the same work.[348] Note that we express no opinion on whether these statements are true as empirical matters. We merely seek to explain the presumptions about the desirable mix of building on and building around that are built into current copyright doctrine, and how regulators can manipulate IP laws to produce different mixes of building on and building around based on their goals.

Second, although it may be attractive for policymakers to change IP regimes in order to optimize innovation and creativity, they have to be attentive to unintended consequences of such changes. Consider a situation in which copyright law altered its rules with respect to attribution, or the author's right to be named as the creator of a work. Currently, U.S. copyright law does not provide authors with a default right to attribution, unlike many European countries.[349] Instead, if authors desire attribution when they license their works to others, they must contract for it.[350] Thus, if a band licenses its song to be used in a commercial, it must specifically request that its name appear in the ad.[351] If copyright law switched this default, giving authors the initial right to attribution, but allowing them to

345. For example, Harper Lee's copyright in *To Kill a Mockingbird* entitled her to take as long as she needed to continue to tell her story in a subsequent novel. *See* Abramowicz, *supra* note 123, at 325-26.

346. *See id.*

347. *See* Kitch, *supra* note 336, at 266.

348. *See* Beebe, *supra* note 306, at 391-93.

349. *See* Stefan Bechtold & Christoph Engel, The Valuation of Moral Rights: A Field Experiment 2-3 (Mar. 25, 2017) (unpublished manuscript) (on file with authors).

350. On the preferences of U.S. and European authors for attribution rights, see *id.* at 21.

351. *See id.*

sell it, there should be little economic difference in outcomes. Whenever authors value attribution more than licensees value not providing it, attribution will occur, and vice versa. The small shift in the default legal regime should not make much of a difference.

But as recent experimental evidence by Sprigman, Buccafusco, and Burns shows, changing the default rights for attribution could produce enormous behavioral differences.[352] Because of the "stickiness" of the status quo and people's aversion to selling things that they own, authors are likely to demand substantially more to part with attribution than they would have been willing to pay to obtain it.[353] The endowment effect generates a behavioral bias that is much stronger than the simple change in legal rules would have predicted as a matter of economic theory.[354] Accordingly, because authors with a default attribution right will demand higher prices to license their works, we may see less building on and more building around in the downstream market. Returning to our example, the advertising agency will be more likely to commission its own music or use public domain music than to license existing copyrighted music.

Third, although it may be attractive for policymakers to change IP regimes in order to optimize innovation and creativity, such changes may sometimes have little effect when other factors dominate creators' O/A decisions. Consider the result when U.S. copyright law extended protection to architectural works in 1990, and the legal entitlement structure for these works changed dramatically.[355] This change, however, likely had no effect at all on the pace or direction of sequential innovation.[356] Considered from a legal point of view, this seems startling: an entire class of works, all of a sudden, began to receive copyright protection, and building on what previously would have been entirely legal would now constitute infringement.[357] But considered in light of the other factors that

352. *See* Christopher Jon Sprigman, Christopher Buccafusco, & Zachary Burns, *What's a Name Worth?: Experimental Tests of the Value of Attribution in Intellectual Property*, 93 B.U. L. REV. 1389, 1431 (2013).

353. *See id.* at 1393.

354. *See id.* at 1396.

355. *See* Architectural Works Copyright Protection Act, Pub. L. No. 101-650, 104 Stat. 5089, 5133 (1990).

356. David E. Shipley, *The Architectural Works Copyright Protection Act at Twenty: Has Full Protection Made a Difference?*, 18 J. INTELL. PROP. L. 1, 59 (2010).

357. *See id.*

influence creators' O/A decisions, it makes complete sense. Market factors suggest that consumer demand—in this case, the purchasers of works of high-end architecture—often desire novelty.[358] It is the rare builder of a concert hall or high-rise who is content to construct one very similar to a neighbor's. In addition, technological factors relating to the difficulty of copying others' designs augur strongly in favor of building around instead of building on. Unlike a novel, where the costs of original creative effort are high relative to the costs of producing copies of the work, in architectural works, the costs of constructing the building are often much greater than the designers' creative costs. Moreover, actually copying existing works is difficult—architectural works are not digital files that can be reproduced at the touch of a button.

On the other hand, with respect to mass-market architecture, such as the design of suburban tract houses and strip malls, the introduction of copyright also has had little effect, but this time the dominant mode is building on.[359] Consumers of mass-market architecture have little taste for novelty—most want their houses and commercial buildings to blend with the structures already existing in the community.[360] If you believe that the law has a tight and singular relationship to incentives, following the introduction of copyright, we should have seen an outpouring of design creativity in mass-market architecture. We have not, because consumer tastes for building on predominate over the change in legal rules.[361] We suspect that many other fields will share important similarities with architectural works, where changes in the structure of IP entitlements will produce little effect on downstream creators' innovation behavior. Market, technological, and creator factors will influence creators more strongly than the scope of legal protection. To the extent that this contention is true, it has important implications for attempts to regulate sequential innovation. Policymakers often attempt to manipulate actors' behavior by altering the structure of legal entitlements. But when legal entitlements are not the

358. *See id.* at 6.

359. *See id.*

360. *See id.*

361. Most of the litigation surrounding architectural works involves mass-market housing that emerges from contract disputes. *See* CRAIG JOYCE ET AL., COPYRIGHT LAW 216-17 (8th ed. 2010).

strongest catalysts for people's behavior, changing them will not do much good—or much damage. New legislation will be mostly wasted effort.

Fourth, before policymakers change IP regimes in order to optimize innovation and creativity, they should consider whether other regulatory interventions outside IP law would be more effective or less costly. Varying IP doctrines may not be the most efficient way for policymakers to affect creators' behavior. The standard account of sequential innovation by IP scholars treats IP law as the chief determinant of creator behavior.[362] Likewise, it treats changes in IP doctrine as the principle mechanism to regulate sequential behavior.[363] Thus, altering the length and breadth of IP rights can regulate the pace or path of sequential innovation. Our analysis in Parts II through V indicates, however, that many factors other than IP doctrine will influence the nature of sequential innovation. Technological, market, and creator factors will often shape creators' decisions as much as the current state of IP law. In many—perhaps most—cases, IP law may play no role at all in creative output.[364] In a large percentage of the remaining cases, the influence of the other factors will swamp the effect of a change in legal entitlements.[365] While the legal change might increase or decrease the costs of building around, those costs will be inframarginal for many creators and innovators, and sequential innovation will not be affected.[366]

For example, if legislators believe that a given creative field involves wasteful designing around, and want to encourage downstream creators to build on existing ideas, they might consider opportunities for altering other aspects of the O/A decision. As we noted above, one way to encourage building on is to reduce transac-

362. *See*, *e.g.*, Landes & Posner, *supra* note 47, at 338 ("The more difficult it is for copiers to avoid infringing the author's copyright by substituting other inputs for the protected part of the author's work, because the protected part is bigger, the larger will be the increase in the copiers' marginal cost.").

363. *See, e.g.*, Lemley, *supra* note 8, at 1056; Merges & Nelson, *supra* note 8, at 868.

364. *See* JESSICA SILBEY, THE EUREKA MYTH: CREATORS, INNOVATORS, AND EVERYDAY INTELLECTUAL PROPERTY 277 (2015) (noting that IP law rarely plays a role in creators' initial decisions about whether and how to create).

365. *See id.*

366. *See id.*

tion costs between upstream and downstream creators.[367] Perhaps the legislature could find ways of lowering the costs of sharing information or of creating opportunities for upstream and downstream creators to find one another. Or imagine a situation in which regulators are concerned that too few firms own the patent rights to a valuable technology, and that the small number of suppliers of upstream rights is compelling downstream firms to wastefully design around those rights. The government could attempt to purchase all or most of the upstream patents and license them to downstream firms to reduce the costs of building on. If one firm owned the patents to a valuable medical treatment, for example, the government could purchase those patents and agree to license them to other firms at lower rates than the upstream firm was charging. While this might be expensive for the government in the short term, operating as a de facto patent pool could ultimately avoid wasteful duplicative research and speed the development of improvements. This solution, which involves a manipulation of the market factors that influence O/A decisions, could be more efficient than a wholesale alteration of patent law. Or imagine that a policymaker wants to encourage creative reuse of computer code in order to facilitate a flourishing software industry. Rather than fine-tune patent and copyright protection for computer software, it may be more effective to focus on labor laws and employee mobility, thereby facilitating the free flow of tacit knowledge.[368] Or think of a technological area

367. *See supra* Part II.A.2.

368. This is, arguably, the story of Silicon Valley. *See* ANNALEE SAXENIAN, REGIONAL ADVANTAGE: CULTURE AND COMPETITION IN SILICON VALLEY AND ROUTE 128, at 35 (1994); Ronald J. Gilson, *The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 128, and Covenants Not to Compete*, 74 N.Y.U. L. REV. 575, 577 (1999); Matt Marx, Deborah Strumsky & Lee Fleming, *Mobility, Skills, and the Michigan Non-Compete Experiment*, 55 MGMT. SCI. 875, 887 (2009); Matt Marx & Lee Fleming, *Non-Compete Agreements: Barriers to Entry ... and Exit?*, 12 INNOVATION POL'Y & ECON. 33, 54 (Josh Lerner & Scott Stern eds., 2012); Matt Marx, Jasjit Singh & Lee Fleming, *Regional Disadvantage? Employee Non-Compete Agreements and Brain Drain*, 44 RES. POL'Y 394, 403 (2015). On antitrust investigations and class action lawsuits in which Silicon Valley firms agreed to restrain the lateral hiring of high-tech employees, see *United States v. Adobe Sys., Inc.*, No. 10-CV-1629, 2011 WL 10883994, at *2 (D.C. Cir. Mar. 18, 2011) (enforcing the settlement between the Department of Justice's Antitrust Division and several Silicon Valley companies); *In re High-Tech Emp. Antitrust Litig.*, No. 11-CV-02509-LHK, 2015 WL 5159441, at *1 (N.D. Cal. Sept. 2, 2015) (approving class action settlement among Adobe, Apple, Google, Intel, and some of their employees); and *In re Animation Workers Antitrust Litig.*, 123 F. Supp. 3d 1175, 1214 (N.D. Cal. 2015).

that builds on the combination of many innovative inputs. In such area, policymakers should think twice before attempting to encourage sequential innovation through patent law. This may be an ineffective strategy because high transaction costs will impede the necessary license agreements. Rather, policymakers should consider turning to tax incentives in order to create ex post rewards for sequential innovation.[369]

This is not to suggest that legislators should always regulate innovation through non-IP factors. It might be incredibly difficult, for example, for legislators to shift consumer demand for built on versus built around works. Regulating consumer taste will often be challenging. For some of the factors discussed in this Article, it may also be more complicated for legislators to gather reliable information on how they impact sequential innovation, compared to other factors.[370] Instead, we suggest that policymakers consider the full range of factors that influence O/A decisions to determine which ones provide the most efficient and reliable means for affecting outcomes. This will involve considerations of comparative institutional competence, the costs and benefits of regulating creative fields collectively or independently, and the likelihood of positive and negative externalities to regulation.[371] But ultimately, the framework that we offer here promises to make regulating sequential innovation more efficient and successful.

Our multifactor approach to sequential innovation begins the process of expanding policymakers' regulatory toolkit—although, as we have emphasized throughout this Article, a lot of work remains to be done before regulatory interventions are much more than a shot in the dark. Instead of focusing solely on variations in copyright and patent laws to influence creators' behavior, legislators, judges, and scholars should consider manipulating the full range of factors that affect creators. This is, foremost, an endeavor that requires policymakers to gather a substantial amount of information. Such information includes the maturity of the technology in the

369. *See* Hemel & Ouellette, *supra* note 147, at 377-78 (arguing that the field of battery technology meets these criteria).

370. *See supra* Part VI.B.

371. *See* Brett M. Frischmann & Mark A. Lemley, *Spillovers*, 107 COLUM. L. REV. 257, 300 (2007).

relevant market; input substitutability; the role that tacit knowledge, business practices, and market intermediaries play in the industry; consumer preferences for novelty; and the ability of innovators to make accurate O/A decisions. Only by considering how these and other factors interact will policymakers be able to make an informed decision on whether they should change IP doctrines.

CONCLUSION

This Article has provided a new way to conceptualize the nature of sequential innovation and its relationship to law. Regulating sequential innovation is not merely a matter of manipulating the scope of IP laws but instead requires a rich understanding of the multiple factors that influence the behaviors of creators and inventors. If scholars and policymakers aim to optimize cumulative innovation, they should not merely strive for optimizing copyright or patent law. Rather, they should analyze the complex interaction between IP law and contextual factors that enable more targeted and effective regulatory interventions.