Reconceptualizing the Role of Intellectual Property Rights in Shaping Industry Structure

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Technological and creative industries are critical to economic and social welfare, and the forces that shape such industries are important subjects of legal and policy examination. These industries depend on patents and copyrights, and scholars have long debated whether exclusive rights promote industry consolidation (by shoring up barriers to entry) or fragmentation (by promoting entry of new firms). Much hangs in the balance, for the structure of these IP-intensive industries can determine the amount, variety, and quality of drugs, food, software, movies, music, and books available to society. This Article reconceptualizes the role of patents and copyrights in shaping industry structure by examining empirical profiles of six IP-intensive industries: biopharmaceuticals; agricultural biotechnology, seeds, and agrochemicals; software; film production and distribution; music recording; and book publishing. It reveals that exclusive rights play multiple roles in influencing industry structure, and it distinguishes their effects along two underappreciated dimensions. First, it distinguishes the effects of exclusive rights at different times, arguing that patents and copyrights contribute to the initial entry of new firms, particularly in young fields, but that over time exclusive rights facilitate industry concentration by erecting barriers to entry and serving as assets that incumbents seek to amass in mergers and acquisitions. Second, it distinguishes along the value chain within any given industry, arguing that exclusive rights most prominently promote entry in "upstream" creative functions—from creating biologic compounds to producing

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movies—while tending to contribute to concentration in downstream functions focused on commercialization, such as marketing and distributing drugs and movies. As a corollary, this Article shows that exclusive rights play multiple roles in shaping industry structure, from directly enabling entry or exclusion to subtly influencing firm behavior in ways that advance fragmentation or concentration. This Article provides legal and policy decisionmakers with a more robust understanding of how patents and copyrights contribute in myriad ways to both fragmentation and concentration, depending on context. Drawing on these insights, it explores potential interventions from antitrust law and reforms to intellectual property law—including conditioning the acquisition of exclusive rights on the size and market position of a rights holder—to ensure robust competition and innovation.

INTRODUCTION

The story of pioneering biotechnology firm Genentech illustrates the complex ways in which intellectual property rights impact the structure of innovative industries. In the 1970s, scientist Herbert Boyer and venture capitalist Robert Swanson founded Genentech,[1] a biotech firm that applies genetic engineering to develop therapeutic compounds. Genentech submitted its first patent application to the United States Patent and Trademark Office ("USPTO") on July 5, 1979,[2] and soon followed with dozens more.[3] Patents were critical to the viability of the young startup; according to Genentech itself, "The company's pursuit of patent protection for its scientific inventions ensured the company's future and made possible the development of the biotech industry itself."[4] Patents thus promoted market entry by Genentech (and other startups) in the nascent biotechnology industry. Fast-forward thirty years, and patents played a key role in biotech industry consolidation. In 2009, Roche, a global pharmaceutical firm, completed a $46.8 billion acquisition of Genentech, thus "end[ing] the independent existence of what is widely considered the world's oldest and most successful biotechnology company."[5] Among other factors, Roche sought greater access to Genentech's intellectual property[6] and to maintain exclusive rights to Genentech's portfolio of drug candidates after a contract between the companies was set to expire.[7] Roche was also motivated to acquire Genentech (and its promising drug pipeline)

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1. Jeannette Colyvas et al., *Intellectual Property Rights and Academic Health Centers*, *in* ECONOMICS, LAW AND INTELLECTUAL PROPERTY: SEEKING STRATEGIES FOR RESEARCH AND TEACHING IN A DEVELOPING FIELD 155, 160 (Ove Granstand ed., 2003). Stanley Cohen of Stanford University and Herbert Boyer of the University of California, San Francisco, developed the pioneering techniques of recombinant DNA technology, commonly known as genetic engineering. *See generally* Stanley N. Cohen et al., *Construction of Biologically Functional Bacterial Plasmids* In Vitro, 70 PROC. NAT'L ACAD. SCI. 3240 (1973); Sally Smith Hughes, *Making Dollars Out of DNA: The First Major Patent in Biotechnology and the Commercialization of Molecular Biology, 1974–1980*, 92 ISIS 541, 541–42 (2001).

2. Rory J. O'Connor, *Patent, then Publish*, GENENTECH (July 21, 2016), https://www.gene.com/stories/patent-then-publish [https://perma.cc/63N8-ZSHS]; U.S. Patent No. 4,342,832 (filed July 5, 1979).

3. O'Connor, *supra* note 2.

4. *Id.*

5. Andrew Pollack, *Roche Agrees to Buy Genentech for $46.8 Billion*, N.Y. TIMES (Mar. 12, 2009), https://www.nytimes.com/2009/03/13/business/worldbusiness/13drugs.html [https://perma.cc/V846-YEPY]. Roche had already owned a majority of Genentech since 1990. *Id.*

6. *See Bringing a Successful Partnership to the Next Level*, ROCHE 11 (July 21, 2008), https://www.roche.com/dam/jcr:95eaddc3-8392-4509-97af-ffd2b2f09db0/en/irp080721b.pdf [https://perma.cc/Z8CV-H7WY] (listing the "sharing of IP" as a "key objective[ ] of combining Genentech and Roche").

7. Taskin Ahmed, *Roche Gets Genentech for US$46.8 B*, PHARMADEALS REV., March 2009, at 11, 11.

because of a "patent cliff" of upcoming patent expirations on its own products.[8] A similar patent cliff threatened other major pharmaceutical companies as well and helped spur significant acquisitions by Pfizer and Merck that same year.[9] Whereas Genentech's creation reflects the role of patents in promoting market entry and fragmentation, Genentech's acquisition by incumbent Roche reveals how the drive to obtain, maintain, and exploit patents can promote industry consolidation.

Technological and creative industries are critical to economic and social welfare, and the forces that shape such industries are important subjects of legal and policy examination. These industries depend on patents and copyrights, and scholars have long debated the impact of exclusive rights on industry structure. On the one hand, scholars have argued that intellectual property rights promote industry concentration by creating barriers to entry and enabling rights holders to grow large by internalizing the benefits of innovation.[10] Empirical evidence certainly reveals a relatively high—though varying—degree of concentration in industries that commercialize intellectual property. For instance, in 2012 (the most recent year for which census data are available) the top four pharmaceutical companies accounted for 31.2 percent of the total value of shipments in the United States.[11] Additionally, in 2018 the Big Six major film studios—Warner Bros., Paramount, 20th Century Fox, Universal, Buena Vista (Disney), and Sony/Columbia—accounted for 83.7 percent of North American box office revenues.[12] On the other hand, more recent scholarship has argued that patents and copyrights promote industry fragmentation by facilitating new startup formation and market entry.[13] Certainly, patents play a critical role in forming new biotechnology and software companies, and copyrights help screenwriters, composers, recording artists, authors, studios, and publishers enter creative industries.[14]

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8. *Id.*

9. Pollack, *supra* note 5.

10. *See infra* Part I.

11. *See Manufacturing: Subject Series: Concentration Ratios: Share of Value of Shipments Accounted for by the 4, 8, 20, and 50 Largest Companies for Industries: 2012*, U.S. CENSUS, AM. FACTFINDER (Aug. 18, 2015), https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml [https://perma.cc/WV4C-YLJN].

12. *Combined Market Share of the "Big Six" Major Film Studios in North America from 2000 to 2018*, STATISTA, https://www.statista.com/statistics/187261/combined-market-share-of-major-film-studios-in-north-america (last visited Feb. 9, 2019) [https://perma.cc/8YC3-6LUP]; *see also Studio Market Share*, BOX OFFICE MOJO, http://www.boxofficemojo.com/studio (last visited Feb. 9, 2019) [https://perma.cc/DN9U-6K6S] (reporting market shares of movie distributors).

13. *See infra* Part I.

14. *See* CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, SEED GIANTS VS. U.S. FARMERS 5 (Debbie Barker ed., 2013) [hereinafter SEED GIANTS] (noting the importance of patent rights to the entry

This Article enters the debate by more precisely delineating the myriad roles of intellectual property rights in shaping industry structure.

To do so, this Article analyzes empirical and historical accounts of industry structure in six economically significant, IP-intensive fields: biopharmaceuticals; agricultural biotechnology, seeds, and agrochemicals; software; motion picture production and distribution; music recording; and book publishing.[15] Of course, no single article could comprehensively survey each of these disparate fields. While each industry is highly idiosyncratic and warrants extended analysis on its own, these profiles reveal common patterns regarding the impact of patents and copyrights on industry structure. Much hangs in the balance, for the structure of these IP-intensive industries can determine the amount, variety, and quality of drugs, food, software, movies, music, and books available to society.

Drawing on this empirical and historical examination, this Article argues that patents and copyrights play multiple roles in advancing both fragmentation and concentration, depending on context.[16] This Article introduces two novel distinctions to more accurately characterize the influence of intellectual property rights on industry structure. First, it introduces the dimension of time, arguing that patents and copyrights promote initial entry by new firms (and thus industry fragmentation) but that over time exclusive rights contribute to industry concentration by erecting barriers to entry and serving as assets that incumbents seek to amass in mergers and acquisitions. In short, intellectual property rights contribute to initial entry and subsequent concentration. For example, patent rights were critical to the formation of agricultural biotechnology startups that genetically engineer new plant traits and to the entry of large chemical companies like Monsanto into the agricultural field.[17] Over time,

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of chemical companies in the agricultural biotechnology industry); Ronald J. Mann, *Do Patents Facilitate Financing in the Software Industry?*, 83 TEX. L. REV. 961 (2005) (arguing that patents promote startup formation and market entry in the software industry); *cf.* Molly Shaffer Van Houweling, *Distributive Values in Copyright*, 83 TEX. L. REV. 1535, 1540 (2005) (arguing that copyright provides a mechanism to finance creativity even for low-income parties).

15. In identifying these industries as "IP-intensive," this Article adopts the analysis of the U.S. Patent and Trademark Office. *See supra* notes 74–81 and accompanying text.

16. While this Article focuses on patents and copyrights, it fully acknowledges that other intellectual property rights, particularly trademarks, also impact industry structure. *See, e.g.*, Two Pesos, Inc. v. Taco Cabana, Inc., 505 U.S. 763, 775 (1992) (noting that requiring secondary meaning to protect unregistered trade dress would disadvantage new entrants and reduce competition). This Article focuses on patents and copyrights due to space limitations and because of their similar constitutional and conceptual origins. *See, e.g.*, Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417, 439 (1984) (noting the "historic kinship between patent law and copyright law"). It reserves extended analysis of the impact of trademarks on industry structure for a future inquiry.

17. *See infra* Section II.A.2.

however, Monsanto and other large conglomerates utilized patents to block entry and promote consolidation.[18]

Second, this Article introduces the dimension of the value chain, differentiating "upstream" creative endeavors, such as creating a biologic compound or producing a film, from "downstream" commercial endeavors within the same industry, such as further developing that biologic compound into a commercial drug or marketing and distributing that film. It argues that patents and copyrights most prominently promote entry in upstream creation while tending to inhibit entry and contribute to concentration in downstream commercialization. In short, intellectual property rights contribute to upstream fragmentation and downstream concentration. For example, copyrights promote the entry of upstream creative talent such as screenwriters into the movie industry, but large incumbents like Disney leverage massive copyright portfolios that raise barriers to entry in the downstream marketing and distribution of films.[19] This Article provides legal and policy decisionmakers with a more robust understanding of how patents and copyrights contribute to both fragmentation and concentration, depending on context.[20]

In so doing, it is important to clarify and cabin this Article's causal claims regarding the role of exclusive rights in shaping industry structure. The theoretical debate on the impact of exclusive rights on industry structure focuses on patents and copyrights as direct causes of either fragmentation or concentration.[21] And it is certainly the case that exclusive rights can directly impact industry structure, such as when copyright enhances incentives for new composers to enter the music industry[22] or when patent thickets in the mature agricultural

18. *See infra* Section II.A.2.

19. *See infra* Section II.B.1.

20. Although this Article refers to both "consolidation" and "concentration," it is important to acknowledge that commentators sometimes differentiate these terms. Consolidation refers to shifting production to larger and fewer firms while concentration refers to the extent to which a small number of firms dominates most sales in an industry. *See, e.g.*, James M. MacDonald, *Consolidation, Concentration, and Competition in the Food System*, FED. RES. BANK KAN. CITY ECON. REV., Special Issue 2017, at 85, 85, https://www.kansascityfed.org/~/media/files/publicat/econrev/econrevarchive/2017/si17macdonald.pdf [https://perma.cc/P78W-EEVV]; DENNIS A. SHIELDS, CONG. RESEARCH SERV., R41224, CONSOLIDATION AND CONCENTRATION IN THE U.S. DAIRY INDUSTRY (Apr. 27, 2010), http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R41224.pdf [https://perma.cc/VE6P-TA6X]. While technically distinct, these phenomena often overlap, as consolidation of an industry into larger firms often results in a reduction in the number of firms. Additionally, as this Article uses the term, "consolidation" is somewhat more capacious in that it encompasses both vertical integration and horizontal integration, both of which result in shifting production to fewer and larger firms.

21. *See infra* Part I.

22. *See infra* Section II.B.2.

biotechnology industry block new entrants.[23] But the correlation of a particular configuration of exclusive rights with a particular industry structure does not necessarily imply causation. For instance, if other factors—such as high fixed costs or economies of scale—drive concentration in the movie industry, then the accumulation of large copyright estates by incumbents may not be a cause so much as a reflection of industry concentration.

However, one of the contributions of this Article is to highlight how exclusive rights play both direct and indirect roles in facilitating fragmentation or concentration. For example, in some cases, patents and copyrights contribute to concentration merely by serving as valuable assets that incumbents seek to amass to enhance their competitive position. For instance, incumbents' drive to accumulate copyrighted assets has contributed to significant merger and acquisition activity in the film production and distribution industry. In such cases, exclusive rights are not the "cause" of industry concentration per se, but they play important roles in motivating and enabling such concentration. Importantly, the exclusivity inherent in copyright is critical to this dynamic; if creative assets were not protected by copyrights, studios would have significantly less incentive to accumulate them in mergers and acquisitions. Additionally, the mere aggregation of intellectual property rights can confer cost advantages on incumbents (and cost disadvantages on potential entrants) that indirectly shape industry structure. More broadly, this Article highlights that the roles of exclusive rights in influencing industry structure can be rather complicated. In some cases, both the presence and absence of strong intellectual property rights can contribute to concentration. For instance, strong patents and copyrights increase barriers to entry and concentration in the biopharmaceutical[24] and music industries,[25] but the absence of intellectual property rights (though expiration or piracy) also promotes concentration by motivating mergers and acquisitions among competitors.[26] Of course, it is not surprising that businesses use and respond to exclusive rights in ways to achieve their competitive objectives. It is striking, however, that instruments designed to promote technical and creative progress[27] are often amassed and deployed in ways that promote industry concentration, which may undermine that policy goal.

23. *See infra* Section II.A.2.
24. *See infra* Section II.A.1.
25. *See infra* Section II.B.2.
26. *See infra* Sections II.A.1, II.B.2.
27. *See* U.S. CONST. art. I, § 8, cl. 8.

Before proceeding, a few caveats are in order to delineate this Article's arguments and objectives. First, this Article reveals a general pattern of intellectual property rights contributing to initial and upstream fragmentation as well as subsequent and downstream concentration in a variety of industries, but exceptions to this pattern certainly exist. In some young fields, for instance, intellectual property rights facilitate entry by a few initial firms, which then immediately assert exclusive rights to deter other potential entrants.[28] Second, while this Article draws on empirical evidence to reconceptualize the relationship of intellectual property rights to industry structure, this theoretical framework raises a host of empirical questions that invite further examination.

This Article proceeds in four Parts. Part I reviews the prevailing theoretical literature on intellectual property rights and industry structure, exploring arguments that exclusive rights promote both industry concentration and fragmentation. Part II provides empirical profiles of structural evolution in six IP-intensive industries: biopharmaceuticals; agricultural biotechnology, seeds, and agrochemicals; software; film production and distribution; music production; and book publishing. These accounts, which delve into the histories of these fields, highlight the role of exclusive rights in helping to shape industry structure, but they also reveal a host of important non-IP factors that influence industry structure as well. Part III draws on these accounts to argue that exclusive rights tend to promote initial firm entry but that over time, exclusive rights contribute significantly to industry concentration. It also argues that patents and copyrights most prominently promote fragmentation in upstream creative fields but that they tend to contribute to concentration in downstream fields focused on commercialization. It also observes that exclusive rights play multiple roles in shaping industry structure, from directly enabling fragmentation or concentration to indirectly motivating and facilitating such activity. Part IV explores several implications of these findings. It examines how antitrust law can address problematic concentration in IP-intensive industries and proposes reforms to intellectual property law that would condition the cost of obtaining and enforcing exclusive rights on an entity's size and market position.

28. *See infra* Section II.A.2 (discussing the initial entry of chemical companies into the nascent agricultural biotechnology industry and these companies' use of intellectual property rights to block entry by others); *infra* Section II.B.1 (discussing the role of patents in facilitating both entry and an initial oligopoly in the film industry).

I. PREVAILING ACCOUNTS OF THE IMPACT OF INTELLECTUAL PROPERTY RIGHTS ON INDUSTRY STRUCTURE

In conventional accounts, intellectual property rights promote innovation by providing incentives to create and develop new technological and expressive works.[29] Within a traditional economic lens, patents and copyrights solve a public goods problem in the underproduction of nonrival, nonexcludable goods, such as pharmaceuticals and movies.[30] Exclusive rights prevent free riding and provide several related incentives, such as incentives to create, disclose, and commercialize intangible works.[31] More recently, scholars have moved beyond this classic incentives focus by examining intellectual property rights' indirect impact on innovation by shaping industry structure.[32] Within this view, intellectual property rights can promote innovation not only by providing various incentives but also by facilitating forms of industrial organization that are more innovative than would be feasible absent those rights. Commentators have suggested that the most important economic impact of intellectual property rights is not on price but rather on industry structure.[33]

In previous work, I built on this latter line of scholarship to explore the relationship between patents and vertical integration. Such integration arises when upstream and downstream parties in a common value chain (such as suppliers of auto bodies and manufacturers of automobiles) integrate under common ownership.[34] Drawing on the

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29. *See, e.g.*, Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017, 1024–28 (1989) (describing various incentives afforded by patents); Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 994 (1997) ("In a private market economy, individuals will not invest in invention or creation unless the expected return from doing so exceeds the cost of doing so."). There are, of course, several noneconomic theories justifying patents and copyrights. *See* Lemley, *supra*, at 993 nn.12–13 (surveying noneconomic theories).

30. *See* Peter Lee, *Contracting to Preserve Open Science: Consideration-Based Regulation in Patent Law*, 58 EMORY L.J. 889, 900 (2009) ("As is well-recognized, the technical knowledge inherent in an invention is a public good, which is nonrival . . . and nonexcludable.").

31. *See* Eisenberg, *supra* note 29, at 1024–40 (surveying the various ways in which "patent monopolies function to promote progress"). Throughout this Article, I will use the term "innovation" in its vernacular sense to encompass innovative activity in general, which spans invention, development, and commercialization. Where appropriate, I will use "innovation" in a more technical sense to denote the process of developing and commercializing an existing invention or creative work.

32. *See, e.g.*, Jonathan M. Barnett, *Intellectual Property as a Law of Organization,* 84 S. CAL. L. REV. 785, 787 (2011) (adopting an "approach that examines how patents influence innovation behavior by influencing organizational behavior").

33. *E.g.*, Tim Wu, *Intellectual Property, Innovation, and Decentralized Decisions*, 92 VA. L. REV. 123, 123 (2006).

34. *See, e.g.*, Benjamin Klein, *Vertical Integration as Organizational Ownership: The Fisher Body—General Motors Relationship Revisited*, 4 J.L. ECON. & ORG. 199 (1988).

theory of the firm,[35] a wide literature contends that intellectual property rights, primarily patents, promote vertical disintegration. For instance, Ashish Arora and Rob Merges have argued that patents promote the entry of small, upstream, research-intensive firms (such as biotech firms) that produce patented assets, which they then license to larger downstream entities (such as pharmaceutical companies) for commercialization.[36] Along similar lines, Jonathan Barnett has argued that intellectual property rights have enabled the semiconductor industry to disaggregate between upstream "fabless" design firms and downstream foundries, which then in-license those designs to manufacture chips.[37] A corollary to these descriptive claims is the normative claim that vertically disintegrated supply chains are more efficient than vertically integrated analogues because disintegration exploits the disproportionately innovative nature of small firms and gains from specialization and trade.[38] In other work, I have shown that contrary to these accounts, patent-intensive industries exhibit a high degree of vertical integration.[39] Among other considerations, the difficulties of transferring patent-related tacit knowledge, the desire to acquire not just innovative assets but also innovative people, and strategic factors all push patent-intensive industries toward vertical integration.[40] While vertical integration may be the most efficient method of transferring and commercializing technology in certain situations, it raises significant normative concerns related to undermining specialization, decreasing independent sources of innovation, and raising barriers to entry.[41]

This Article draws upon and extends that prior work along two dimensions. First, it expands its examination of industry structure beyond vertical integration to include horizontal concentration as well. Horizontal concentration is orthogonal to vertical integration and focuses on the number and size of competitors in a field; the fewer the

35. *See generally* R.H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937).

36. Ashish Arora & Robert P. Merges, *Specialized Supply Firms, Property Rights and Firm Boundaries*, 13 INDUS. & CORP. CHANGE 451, 454 (2004).

37. Barnett, *supra* note 32, at 792–93.

38. *See* Jonathan M. Barnett, *Three Quasi-Fallacies in the Conventional Understanding of Intellectual Property*, 12 J.L. ECON. & POL'Y 1, 13–14 (2016) (arguing that innovators could lose out by "adopting over-integrated organizational forms and foregoing transactions with third parties that have comparative advantages in supplying some of the capital inputs required to reach market"); *see also* KAUSHIK SUNDER RAJAN, BIOCAPITAL: THE CONSTITUTION OF POSTGENOMIC LIFE 23 (2006) (noting the nimble managerial structures of small biotech firms).

39. *See generally* Peter Lee, *Innovation and the Firm: A New Synthesis*, 70 STAN. L. REV. 1431 (2018) (examining vertical integration in biopharmaceuticals, agricultural biotechnology, information technology, and university-industry technology transfer).

40. *Id.*

41. *Id.* at 1489–93.

competitors, the higher the degree of concentration.[42] This Article argues that intellectual property rights contribute to both upstream entry (and thus fragmentation) and downstream concentration. Second, this Article extends beyond patent-intensive industries to include copyright-intensive industries as well. Patents and copyrights contribute to both initial, upstream entry and subsequent, downstream concentration in industries that produce patented technologies, such as biopharmaceuticals, genetically modified seeds, and software, as well as industries that produce creative content, such as motion pictures, music, and books.[43]

This Article's examination of the relationship between intellectual property rights and industry concentration intersects with a long-standing normative debate over what form of industrial organization best promotes innovation.[44] Starting in the early twentieth century, political economist Joseph Schumpeter argued that large enterprises contribute most significantly to innovation and increases in standards of living.[45] He famously contended that significant size and some measure of monopoly power helped firms achieve successful innovation,[46] which in turn reinforced firm size and market power.[47]

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42. *Cf.* Dal Yong Jin, *Transforming the Global Film Industries: Horizontal Integration and Vertical Concentration amid Neoliberal Globalization*, 74 INT'L COMM. GAZETTE 405, 407 (2012) (describing horizontal integration in the media context as "the combination of two or more companies across the same level of production and distribution").

43. This Article acknowledges that there is not always a clear distinction between horizontal and vertical integration. For example, when a downstream pharmaceutical firm purchases an upstream biotech firm holding valuable biologics patents, such an acquisition is properly understood as vertical integration. *See* Lee, *supra* note 39, at 1455–66 (arguing that "tacit knowledge, human capital, and strategic considerations" motivate vertical integration in this context). If the biotech firm possesses or is developing the ability to perform downstream development, clinical trials, marketing, and distribution, however, then it may qualify as a potential competitor of the pharmaceutical company. In that instance, the acquisition of that biotech firm could be characterized as either vertical integration, horizontal integration, or both.

44. *See* Richard J. Gilbert & Hillary Greene, *Merging Innovation into Antitrust Agency Enforcement of the Clayton Act*, 83 GEO. WASH. L. REV. 1919, 1924 (2015) (discussing the respective views of Schumpeter and Arrow); *see also* Jonathan B. Baker, *Beyond Schumpeter vs. Arrow: How Antitrust Fosters Innovation*, 74 ANTITRUST L.J. 575, 577–79 (2007) (same).

45. JOSEPH SCHUMPETER, CAPITALISM, SOCIALISM, AND DEMOCRACY 82 (1942):

> As soon as we go into details and inquire into the individual items in which progress was most conspicuous, the trail leads not to the doors of those firms that work under conditions of comparatively free competition but precisely to the doors of the large concerns . . . and a shocking suspicion dawns upon us that big business may have had more to do with creating that standard of life than with keeping it down.

46. *See* Spencer Weber Waller & Matthew Sag, *Promoting Innovation*, 100 IOWA L. REV. 2223, 2226 (2015).

47. *See* SCHUMPETER, *supra* note 45, at 82; *see also* James F. Oehmke & Anwar Naseem, *Mergers and Acquisitions (M&As), Market Structure and Inventive Activity in the Agricultural Biotechnology Industry*, 14 J. AG. & FOOD INDUS. ORG. 19, 20 (2016) ("Schumpeter hypothesized that higher levels of innovative activity are more likely to occur in industries that are concentrated . . . .").

Taking a very different view, economist Kenneth Arrow influentially argued that competitive markets more reliably generate innovation than those subject to monopoly power.[48] Similarly, Robert Merges and Richard Nelson have drawn from historical examples to argue that "multiple and competitive sources of invention are socially preferable to a structure where there is only one or a few sources."[49] Viewed from either normative perspective, much is at stake in determining whether intellectual property rights promote industrial concentration or fragmentation.

Prevailing theories exhibit significant tension concerning the relationship between intellectual property rights and industry concentration. On the one hand, a wide literature argues that intellectual property rights promote industry concentration. Economist Harold Demsetz observes that intellectual property rights reward superior innovation and can contribute to monopoly power.[50] Patents and copyrights allow firms to internalize the rewards of technological and creative innovation, thus contributing to endogenous growth. Furthermore, such rewards provide capital and leverage to allow industry players to acquire other companies. In addition to enabling industry incumbents to gain market share, patents and copyrights, by definition, also create barriers to entry that hinder competition.[51] For example, Xerox aggressively asserted its patents on plain paper copying technology to prevent market entry by firms like IBM and Litton, thereby shoring up its monopoly.[52] Contemporary pharmaceutical firms employ several patent strategies—including blanketing, fencing, surrounding, and flooding—to hinder or exclude potential competitors.[53] Beyond one or a few intellectual property rights, broad thickets of exclusive rights throughout an industry can also deter entry by new firms.[54] Ultimately, intellectual property rights can confer

48. KENNETH J. ARROW, ESSAYS IN THE THEORY OF RISK BEARING 144, 156–57 (1971); *see* David McGowan, *Innovation, Uncertainty, and Stability in Antitrust Law*, 16 BERKELEY TECH. L.J. 729, 732 (2001) (describing the contrasting views of Schumpeter and Arrow).

49. Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 908 (1990).

50. Harold Demsetz, *Industry Structure, Market Rivalry, and Public Policy*, 16 J.L. & ECON. 1, 3 (1973).

51. *See* Ian M. Cockburn & Megan J. MacGarvie, *Entry and Patenting in the Software Industry*, 57 MGMT. SCI. 915, 915 (2011) (finding that patent holdings in certain software markets negatively affect rates of entry into those markets).

52. Timothy F. Bresnahan, *Post-Entry Competition in the Plain Paper Copier Market*, 75 AM. ECON. REV. 15, 16 (1985).

53. Carlos Maria Correa, *Ownership of Knowledge: The Role of Patents in Pharmaceutical R&D*, 82 BULL. WORLD HEALTH ORG. 784, 785 (2004).

54. *Cf.* Cockburn & MacGarvie, *supra* note 51, at 919 (noting that a proliferation of exclusive rights can hinder entry in the software industry).

market power,[55] raise barriers to entry, and increase industry concentration.[56]

On the other hand, a significant strand of scholarship posits that strong intellectual property rights facilitate market entry and thus industry fragmentation.[57] One instantiation of this phenomenon posits that intellectual property rights, primarily patents, promote vertical disintegration. As noted earlier, Ashish Arora and Rob Merges have argued that patents promote the entry of small, upstream biotech firms that license exclusive rights to downstream pharmaceutical companies, thus promoting vertical disintegration.[58] Empirical analysis of the semiconductor industry suggests that stronger patent rights promoted entry by specialized upstream design firms.[59] In this fashion, intellectual property rights can facilitate vertical disintegration—a form of fragmentation—in innovative industries.

More broadly, scholars have argued that intellectual property rights promote startup formation and market entry, thus facilitating horizontal fragmentation as well. Small firms and independent inventors rely heavily on patents,[60] which are critical to forming new ventures.[61] As Jonathan Barnett observed, "Contrary to natural intuitions, a market with stronger patents will sometimes induce greater entry . . . than a market with weaker or no patents by reducing the minimum size of the market into which entry can be feasibly attempted."[62] Ronald Mann argues that patents are particularly

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55. *See, e.g.*, *id.* at 915 (focusing on patents as a significant barrier to entry in many fields).

56. *See id.* (collecting accounts from the electric lamp, glass processing, and photocopying industries).

57. On a related note, some commentators observe that the ability of patents to block competitors is surprisingly weak in many industries, thus undercutting the notion that patents promote industry concentration. *See, e.g.*, Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 3 BROOKING PAPERS ECON. ACTIVITY 783, 818 (1987); Edwin Mansfield et al., *Imitation Costs and Patents: An Empirical Study*, 91 ECON. J. 907, 917 (1981); Wesley M. Cohen et al., *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)* 2 (Nat'l Bureau of Econ. Research, Working Paper No. 7552, 2000).

58. Arora & Merges, *supra* note 36, at 454.

59. Bronwyn H. Hall & Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry*, *1979-1995*, 32 RAND J. ECON. 101, 119–21 (2001).

60. Barnett, *supra* note 32, at 788; *see* Stuart J.H. Graham et al., *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L.J. 1255, 1290 fig.1, 1290 n.110, 1290–94 (2009) ("Our results, for all biotechnology companies combined, underscore that a firm's technological focus strongly influences startup executives' view of the importance of different appropriability strategies. For this group of firms, patenting is ranked as the most important means of capturing competitive advantage.").

61. *See, e.g.*, Graham et al., *supra* note 60, at 1288; Bronwyn H. Hall, *Exploring the Patent Explosion*, 30 J. TECH. TRANSFER 35 (2004).

62. Barnett, *supra* note 32, at 817.

valuable for mature software startups and have promoted entry and fragmentation in the software industry.[63] Indeed, firms that have applied for patents are more than twice as likely to enter the software market compared to similarly situated firms that have not.[64] Along similar lines, the business strategy literature has traditionally characterized "patents as indicators of entrants' technological capabilities, knowledge assets, or innovation success, rather than as barriers to entry."[65]

Although not always framed in these terms, copyright scholarship has also shown that exclusive rights on expressive works can promote market entry and industry fragmentation. The low threshold for protection and absence of a formal application process render obtaining a copyright extremely easy.[66] Screenwriters, composers, recording artists, and authors obtain copyright protection simply upon fixing their original expression in a tangible medium of expression,[67] and exclusive rights greatly facilitate their entry into cultural industries. For these and other reasons, "[c]opyright creates a mechanism that can finance creativity and dissemination even by those who are not independently wealthy."[68] Along these lines, Justin Hughes and Rob Merges analyzed data from performing rights societies and concluded that songwriters received at least $4.1 billion in copyright royalties from 2010 to 2014,[69] which suggests that exclusive rights provide meaningful income to multitudes of independent composers. Though not framed in the language of industrial organization, these observations undergird a vision of copyright as promoting upstream market entry and industry fragmentation for many creative professionals.

A variant of the fragmentation theory, elaborated most thoroughly in the copyright context, posits that intellectual property rights promote market entry by facilitating product differentiation. Drawing on the theory of monopolistic competition,[70] Christopher Yoo

63. Mann, *supra* note 14, at 967–68, 985.

64. Cockburn & MacGarvie, *supra* note 51, at 915–16.

65. *Id.* at 916.

66. *See, e.g.*, Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 345–46, 364 (1991) (holding that works that are independently created and that demonstrate a modicum of creativity satisfy the originality threshold for copyright protection).

67. *See* 17 U.S.C. § 102(a) (2012) ("Copyright protection subsists . . . in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated.").

68. Van Houweling, *supra* note 14, at 1540.

69. Justin Hughes & Robert P. Merges, *Copyright and Distributive Justice*, 92 NOTRE DAME L. REV. 513, 532–33 (2016).

70. *See* SCHUMPETER, *supra* note 45, at 79.

argues that copyrights facilitate the entry of heterogeneous expressive works to compete against existing works.[71] Repudiating the typical incentives-access tradeoff in copyright, Yoo argues that strengthening copyright protection can increase both incentives to create and access to existing creations by allowing greater competition between imperfect substitutes.[72] Such competition has the salutary effect of driving down prices and expanding consumer choice.[73] In copyright fields as well, intellectual property rights can promote market entry and decrease concentration.

In sum, there seems to be colorable theory (and some empirical evidence) suggesting that intellectual property rights promote both industry concentration and fragmentation. This Article adds granularity to this debate on several dimensions. First, it distinguishes between contexts more likely to tip toward one form of industrial organization than the other. Regarding time, it contends that intellectual property rights contribute significantly to the initial entry of new entities and the subsequent consolidation of IP-intensive industries. Regarding the value chain, it argues that exclusive rights most prominently promote upstream entry and downstream concentration. Second, this Article reveals that beyond directly impacting industry structure, exclusive rights also play more subtle supporting roles in encouraging and facilitating either fragmentation or concentration. To explore these dynamics, this Article examines how IP-based companies wield patents and copyrights in a variety of innovative fields.

II. STRUCTURAL EVOLUTION IN SIX IP-INTENSIVE INDUSTRIES

This Part offers a descriptive account of industry structure—and highlights the role of patents and copyrights in contributing to such structure—in six IP-intensive fields: biopharmaceuticals; agricultural biotechnology, seeds, and agrochemicals; software; movie production and distribution; music recording; and book publishing. In selecting these industries, this Article follows the quantitative and qualitative analyses of the USPTO, which in 2016 identified eighty-one

71. *See* Christopher S. Yoo, *Copyright and Product Differentiation*, 79 N.Y.U. L. REV. 212, 221, 236 (2004); *see also* Michael Abramowicz, *An Industrial Organization Approach to Copyright Law*, 46 WM. & MARY L. REV. 33, 39 (2004) (providing an example of copyright enabling excessive entry in the market for cookbooks); SCHUMPETER, *supra* note 45, at 99 (positing that "anyone is a monopolist who sells anything that is not in every respect, wrapping and location and service included, exactly like what other people sell").

72. Yoo, *supra* note 71, at 221.

73. *Id.* at 221–22.

IP-intensive industries.[74] To identify patent-intensive industries, the USPTO calculated the ratio of total patents from 2009 to 2013 in each North American Industry Classification System ("NAICS") industry to the average number of employees in that industry; those with a higher-than-average ratio of patents to workers were deemed patent-intensive.[75] Alternatively, the USPTO identified copyright-intensive industries as those "primarily responsible for the creation or production of copyrighted materials."[76] The USPTO analysis characterizes all six industries in this Article (or close analogues) as IP-intensive industries. On the patent side, the USPTO classifies pharmaceuticals and medicine as a patent-intensive industry.[77] While agricultural biotechnology, seeds, and agrochemicals does not appear on the list, this industry is represented by a closely related segment: pesticides, fertilizers, and other agricultural chemicals.[78] Software publishing appears as a copyright-intensive industry,[79] though the fact that the USPTO's patent analysis only covers manufacturing industries may explain why software does not also appear as a patent-intensive industry.[80] The USPTO classifies motion picture and video production; sound recording; and newspaper, periodical, book, and directory publishing as copyright-intensive industries.[81] While certainly not capturing all IP-intensive industries, this Article explores a broad cross-section of some of the most prominent and economically important patent- and copyright-intensive fields.

As these empirical profiles reveal, patents and copyrights contribute to both fragmentation and concentration within IP-intensive

74. JUSTIN ANTONIPILLAI ET AL., INTELLECTUAL PROPERTY AND THE U.S. ECONOMY: 2016 UPDATE 1 (2016), https://www.uspto.gov/sites/default/files/documents/IPandtheUSEconomySept2016.pdf [https://perma.cc/7NK4-RT49]. The USPTO analysis included industries that intensively use patents, copyrights, and trademarks, but this Article focuses on patent- and copyright-intensive industries.

75. *Id.* at 32. This analysis is limited to *manufacturing* industries because the concordance between patent fields and the NAICS upon which it relies is limited to manufacturing fields. *Id.* at 7. As such, it excludes software publishing. *See id.* at 29 fig.10 (excluding software publishing from chart depicting exports of IP-intensive service-providing industries).

76. *Id.* at 9*; see* GUIDE ON SURVEYING THE ECONOMIC CONTRIBUTION OF THE COPYRIGHT INDUSTRIES, WORLD INTELLECTUAL PROP. ORG. 51 (2003) (defining "core copyright industries" as those "wholly engaged in creation, production and manufacture, performance, broadcasting, communication and exhibition, or distribution and sale of works and other protected subject matter").

77. ANTONIPILLAI ET AL., *supra* note 74, at 33 tbl.A-1.

78. *Id.* at 48 tbl.A-10.

79. *Id.* at 50 tbl.A-10.

80. *See supra* note 75 and accompanying text.

81. ANTONIPILLAI ET AL., *supra* note 74, at 47–50 tbl.A-9. Utilizing a different metric focused on revenues, "motion picture and video industries" and "sound recording industries" are in the top four industries when ranked by IP-related revenue intensity. *Id.* at 24, 25 tbl.1.

industries at different times and in different locations on the value chain. In particular, they reveal the common role of patents and copyrights across many fields in promoting initial industry formation and firm entry as well as concentration once an industry has matured. Furthermore, they illustrate the role of patents and copyrights in promoting market entry and fragmentation in upstream functions focused on creating intellectual assets and concentration in downstream functions focused on further developing and commercializing those assets.

The argument of this Article is not that patents and copyrights are the sole or even necessarily the most important forces determining the structure of IP-intensive industries.[82] They do, however, play a variety of important roles, and this Article seeks to delineate those roles more precisely. Accordingly, this Article provides holistic profiles of IP-intensive industries that reveal myriad other, non-IP factors that also influence industry structure. In so doing, it aims to situate the effects of patents and copyrights within the broader context of economic and strategic forces that impact fragmentation and concentration. Obviously, each of these industries (and industry segments) is unique, highly complex, and warrants extended analysis. However, the necessarily brief profiles that follow reveal a kind of depth that only breadth can offer, as they illustrate some common patterns (as well as idiosyncratic differences) among these industries.

In describing structural trends, this Part will refer to a common measure of industry concentration: the proportion of market share controlled by the top four firms in a given industry. Industrial economists characterize a market as no longer competitive when four or fewer firms control forty to fifty percent of the market.[83] In such situations, dominant firms can signal their intention to raise prices, and other leading competitors will often follow suit.[84] The broader narrative profiles presented in this Part provide context for these statistics, for they illustrate that calculating industry concentration is both an art and a science. Much depends on how one defines the relevant industry in question. For example, the software industry as a whole does not appear to be highly concentrated, but individual segments (such as operating systems or security software) tend to be dominated by one or

82. *See* Peter Lee, Concentration Drivers in the Commercialization of Intellectual Property (unpublished manuscript) (on file with author) (exploring the forces that determine the structure of industries that commercialize intellectual property and concluding that these forces tend to promote concentration).

83. F.M. SCHERER & D. ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 57–94 (3d ed. 1990).

84. *Id.*

a few large players.[85] Situating these statistics within historical narratives provides valuable context for understanding the forces that shape IP-intensive industries.

A. Patent-Intensive Industries

This Section examines the impact of patents on the structure of three technology-based industries: biopharmaceuticals; agricultural biotechnology, seeds, and agrochemicals; and software. These industries are, of course, quite different. But in each of them, patents promote the entry of new firms, particularly in industrial segments that are young and positioned toward the upstream end of the value chain focused on creating new technology. For instance, patents facilitate the formation of new medical and agricultural biotechnology firms, which apply recombinant DNA technology to develop new drugs and plant traits. In the software industry, which features a more fragmented structure, patents similarly promote the entry and viability of new startups. While patents play an important role in firm entry, they also play significant roles in industry concentration, especially as wielded by older, downstream firms focused on commercialization. In biopharmaceuticals, the drive to obtain patented assets has motivated significant vertical and horizontal acquisitions by downstream pharmaceutical companies that commercialize drugs. Similarly, in the agricultural biotechnology industry, downstream commercializers like Monsanto have acquired upstream biotech firms for their patented assets and asserted broad patent portfolios that deter entry by new competitors. Mature segments of the software industry focused on commercialization often exhibit broad patent thickets that raise the cost of entry. Although far from an ironclad rule, a general pattern emerges wherein patents contribute to early, upstream entry—and thus fragmentation—as well as subsequent, downstream concentration.

1. Biopharmaceuticals

In biopharmaceuticals, patents have contributed to both initial firm entry, particularly in upstream, research-intensive fields, and

85. Expansive notions of substitutability and competition can also broaden the effective size of an industry, thus tending to lower perceived concentration. If, for instance, books compete with movies and television for consumers' attention and dollars, then the proper context for analyzing concentration may be the "media" industry rather than "book publishing" more narrowly. *See* Albert N. Greco, *The Impact of Horizontal Mergers and Acquisitions on Corporate Concentration in the U.S. Book Publishing Industry: 1989-1994*, 12 J. MEDIA ECON. 165, 177 (1999).

later industry consolidation, particularly in downstream fields focused on commercialization. To understand these dynamics, it is first necessary to distinguish two related segments in this industry: biotechnology and pharmaceuticals. The biotechnology industry arose in the 1970s from scientific advances in manipulating biological material, such as recombinant DNA technology and monoclonal antibodies.[86] Many new biotechnology firms were university startups, and they traditionally operated independently of large pharmaceutical companies.[87] Biotechnology firms produce biologic drugs or drug precursors based on biological material; biologic drugs tend to be much larger and more complex than the traditional small-molecule drugs produced by pharmaceutical companies.[88] Such biologic drugs are upstream assets that require further downstream development and clinical testing before they are ready for market.

Notably, patents have been critical to biotech firm formation and market entry,[89] thus contributing to fragmentation in this segment.[90] To help illustrate the impact of intellectual property rights on industry structure, it would be useful to consider an industry that was relatively concentrated prior to the availability of exclusive rights but then became more fragmented upon the introduction of such rights. While it is difficult to isolate the impact of exclusive rights from other factors, the history of the biotechnology industry offers just such a natural experiment. The basic techniques for recombinant DNA technology have been available since the publication of Cohen and Boyer's seminal work in 1973.[91] At the time, the biotech industry was rather small and concentrated, with 105 biotechnology companies founded prior to 1980 in the nine largest biotechnology centers in the United States.[92] However, firm entry and industry fragmentation increased substantially after 1980, a year in which several developments,

86. Arti K. Rai, *Fostering Cumulative Innovation in the Biopharmaceutical Industry: The Role of Patents and Antitrust*, 16 BERKELEY TECH. L.J. 813, 815 (2001).

87. Lee, *supra* note 39, at 1456–57, 1467 ("In the 1970s and 1980s, the biotechnology industry functioned relatively independently of the pharmaceutical industry.").

88. Ashish Kumar Kakkar, *Patent Cliff Mitigation Strategies: Giving New Life to Blockbusters*, 25 EXPERT OPINION ON THERAPEUTIC PATENTS 1353, 1353 (2015).

89. Iain M. Cockburn, *The Changing Structure of the Pharmaceutical Industry*, 23 HEALTH AFF. 10, 15 (2004).

90. *See id.* at 13 ("Many smaller firms have disappeared as leading players have consolidated, while vigorous biotechnology-based competitors have entered the industry.").

91. *See* Cohen et al., *supra* note 1.

92. *See* JOSEPH CORTRIGHT & HEIKE MAYER, SIGNS OF LIFE: THE GROWTH OF BIOTECHNOLOGY CENTERS IN THE U.S. 29 tbl.15 (2002) (listing number of companies per city). According to this report, the nine largest biotechnology centers are Boston, San Francisco, San Diego, Raleigh, Seattle, New York, Philadelphia, Los Angeles, and Washington, D.C., and their surrounding metropolitan areas. *See id.* (listing cities and surrounding areas).

including the Supreme Court's landmark decision in *Diamond v. Chakrabarty*, expanded patenting in biotechnology.[93] According to Genentech's general counsel, the Court's decision, which broadly interpreted patentable subject matter in the life sciences,[94] "made biotech patents possible,"[95] and without that decision, "the industry would never have gotten started."[96] Similarly, another commentator has observed that "[w]ithout patent rights in inventions in areas such as isolation and purification of proteins, DNA sequences, monoclonal antibodies, knockout and transgenic organisms, gene expression systems, and so on . . . many biotech companies would never have been founded."[97]

The Court's decision in *Chakrabarty* helped contribute to the "issuance of thousands of patents" and "the formation of hundreds of new companies."[98] Coincidentally, the Cohen-Boyer patent on recombinant DNA technology was also issued in 1980, and patents were helpful to early biotech firms for attracting investors to fund research and development.[99] According to one cofounder of a biotech company, "all the early patents were viewed as positive, because if you couldn't protect this intellectual property, then people were not going to invest in the field."[100] Notably, the number of biotechnology firms founded in the nine largest biotechnology centers increased from 105 prior to

93. 447 U.S. 303, 310 (1980) ("[T]he patentee has produced a new bacterium with markedly different characteristics from any found in nature and one having the potential for significant utility. His discovery is not nature's handiwork, but his own; accordingly it is patentable subject matter under § 101."). Additionally, patent rights expanded with enactment of the Bayh-Dole Act, which allowed and encouraged recipients of federal funds (including universities) to take title to patents arising from publicly funded research. *See* Bayh-Dole Act, 35 U.S.C. § 200 (2012); Peter Lee, *Patents and the University*, 63 DUKE L.J. 1, 64–65 (2013) (summarizing the passage of the Act and its effects).

94. 447 U.S. at 308–10.

95. O'Connor, *supra* note 2; *see* OFFICE OF TECH. ASSESSMENT, BIOTECHNOLOGY IN A GLOBAL ECONOMY 209 (1991), https://ota.fas.org/reports/9110.pdf [https://perma.cc/6TGF-YR53] ("The decision also provided great stimulus for the economic development of biotechnology processes and products in the 1980's.").

96. O'Connor, *supra* note 2 (quoting Sean Johnston, general counsel of Genentech).

97. Cockburn, *supra* note 89, at 15*; see also* F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 725 (2001) ("[S]ince the changes in applicable patent law beginning around 1980 . . . the U.S. biotechnology community has enjoyed particularly rapid and large advances in technology and overall prosperity . . . ."); Heather Hamme Ramirez, *Defending the Privatization of Research Tools: An Examination of the Tragedy of the Anticommons in Biotechnology Research and Development*, 53 EMORY L.J. 359, 372 (2004) ("Since the Supreme Court's decision in *Diamond v. Chakrabarty* and the enactment of the Bayh-Dole Act in 1980, the biotechnology industry has experienced rapid growth and considerable prosperity.").

98. Douglas Robinson & Nina Medlock, Diamond v. Chakrabarty*: A Retrospective on 25 Years of Biotech Patents*, 17 INTELL. PROP. & TECH. L.J. 12, 12 (2005).

99. Hughes, *supra* note 1, at 572.

100. *Id.* (quoting Edward E. Penhoet).

1980[101] to 350 between 1981 and 1990.[102] According to the Office of Technology Assessment, the period from 1980 to 1984 (immediately following *Chakrabarty*) represented a "boom era" for the founding of dedicated biotechnology companies.[103] While other factors—such as increased federal funding, commercial hype, the availability of venture capital funding, and scientific advances—surely contributed to the entry of biotechnology firms in the 1980s,[104] the influence of patents loomed large. Patents continue to play an important role for biotech startups; in a 2008 survey, biotech startup executives ranked patents as the most important means of obtaining a competitive advantage relative to other mechanisms, such as first-mover advantage and secrecy.[105]

In contradistinction to biotechnology, the pharmaceutical industry is several centuries old, and many current players evolved from nineteenth-century dye and chemical firms or apothecaries.[106] Notably, patents played a critical role in the initial formation of the modern pharmaceutical industry. For example, after passage of the German Patent Law in 1877, German dye and chemical companies such as Bayer and Hoechst began investing heavily in research and academic collaborations,[107] thus setting the stage for pharmaceutical development.[108] Pharmaceutical companies have historically applied traditional chemistry techniques to produce small-molecule drugs,[109] and they have typically combined such upstream discovery with downstream commercialization. Since the twentieth century, large vertically integrated companies that combine research, development, clinical trials, marketing, and distribution have dominated the

101. CORTRIGHT & MAYER, *supra* note 92, at 29 tbl.15.

102. *Id.*

103. OFFICE OF TECH. ASSESSMENT, *supra* note 95, at 5.

104. *See id.* at 3.

105. Graham et al., *supra* note 60, at 1290–91.

106. Am. Chem. Soc'y, *Emergence of Pharmaceutical Science and Industry: 1870-1930*, CHEMICAL & ENGINEERING NEWS (June 20, 2005), https://cen.acs.org/articles/83/i25/emergence-pharmaceutical-science-industry-1870.html [https://perma.cc/C69H-YPQS].

107. Ulrich Marsch, *Strategies for Success: Research Organization in German Chemical Companies and IG Farben Until 1936*, 12 HIST. & TECH. 23, 27–28 (1994).

108. Further illustrating a theme of this Article, as the German dye and chemical industry matured, "German companies used patents systematically to exclude competitors and preserve their market position." Ashish Arora, *Patents, Licensing, and Market Structure in the Chemical Industry*, 26 RES. POL'Y 391, 392 (1997).

109. *See* RAJAN, *supra* note 38, at 22; William S. Comanor & F.M. Scherer, *Mergers and Innovation in the Pharmaceutical Industry*, 32 J. HEALTH ECON. 106, 111 (2013); *see also* Walter W. Powell, *Inter-organizational Collaboration in the Biotechnology Industry*, 152 J. INSTITUTIONAL & THEORETICAL ECON. 197, 203 (1996); Nicole Fisher & Scott Liebman, *Are M&A Replacing R&D in Pharma?*, FORBES (Apr. 22, 2015, 6:14 AM), https://www.forbes.com/sites/nicolefisher/2015/04/22/are-ma-replacing-rd-in-pharma/#3d0f051a21d0 [https://perma.cc/2K8D-MG5L].

pharmaceutical industry.[110] Due to the significant cost and uncertainty of drug development, patents are essential to encouraging investments in research and development and to the formation and ongoing profitability of pharmaceutical companies.[111]

While patents have been critical to forming biotechnology and pharmaceutical companies, thereby promoting industry fragmentation, they have also contributed to industry consolidation. First, as I have detailed in other work,[112] there has been significant vertical integration between upstream biotechnology firms and downstream pharmaceutical companies. Historically, many biotech firms licensed patented biologics to downstream pharmaceutical companies for further development and commercialization, a vertically integrated organizational form that still prevails today.[113] More recently, however, there has been a significant trend toward vertical integration in which large downstream pharmaceutical companies have acquired promising upstream biotech firms (and their patents), thus increasing industry consolidation.[114] This is evident in a spate of vertical mergers and acquisitions in which pharmaceutical companies have brought upstream, research-intensive biotech firms "in house." Among other factors, the ability of biotech patents to confer exclusive rights over a technology while not necessarily disclosing enough knowledge to practice it commercially has led pharmaceutical companies to vertically integrate by acquiring biotech firms rather than simply license their patents.[115] For example, Roche's 2009 acquisition of Genentech was

110. *See* Cockburn, *supra* note 89, at 13; Toby E. Stuart et al., *Vertical Alliance Networks: The Case of University–Biotechnology–Pharmaceutical Alliance Chains*, 36 RES. POL'Y 477, 477–78 (2007).

111. *See* Richard E. Caves et al., *Patent Expiration, Entry, and Competition in the U.S. Pharmaceutical Industry*, BROOKINGS PAPERS: MICROECONOMICS, 1991, at 1, 1–2 ("The research-oriented sector of the [pharmaceutical] industry relies heavily on the patent system."); Richard A. Posner, *Why There Are Too Many Patents in America*, ATLANTIC (July 12, 2012), https://www.theatlantic.com/business/archive/2012/07/why-there-are-too-many-patents-in-america/259725 [https://perma.cc/NA4Z-X2JJ] (describing pharmaceuticals as the "poster child" of the patent system); Merck & Co., Inc., Annual Report (Form 10-K) (Feb. 27, 2017), http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_MRK_2017.pdf [https://perma.cc/89NZ-ZUXZ] ("The Company is dependent on its patent rights, and if its patent rights are invalidated or circumvented, its business would be adversely affected.").

112. *See* Lee, *supra* note 39, at 1455–66.

113. *See* Mark G. Edwards, *Biotechnology and Pharmaceutical Commercialization Alliances: Their Structure and Implications for University Technology Transfer Offices*, *in* 2 INTELLECTUAL PROPERTY MANAGEMENT IN HEALTH AND AGRICULTURAL INNOVATION: A HANDBOOK OF BEST PRACTICES 1227, 1228 (Anatole Krattiger et al. eds., 2007), http://www.iphandbook.org/handbook/resources/Publications/links/ipHandbook Volume 2.pdf [https://perma.cc/AH8L-JEWT]; Gary P. Pisano, *The Governance of Innovation: Vertical Integration and Collaborative Arrangements in the Biotechnology Industry*, 20 RES. POL'Y 237, 240 (1991).

114. *See* Lee, *supra* note 39, at 1457–66.

115. *See id.* at 1455–66.

motivated in significant part to realize greater product coordination between an "upstream" biotech company (Genentech) and a "downstream" pharmaceutical company (Roche).[116] In this manner, pharmaceutical companies can combine upstream discovery capabilities with their own expertise in downstream clinical trials, marketing, and distribution.

More broadly, the desire to acquire productive patented assets and related innovative capacity has contributed to concentration in the pharmaceutical industry. The industry has experienced a decline in scientific productivity; in the first decade of the twenty-first century, the pharmaceutical industry's output essentially flat lined.[117] Between 1970 and 2010, the number of FDA-approved new molecular entities increased only slightly even though inflation-adjusted research and development ("R&D") expenditures had grown sevenfold.[118] Given the paucity of new innovations, companies have turned to mergers and acquisitions to acquire promising (patented) drugs to replenish faltering pipelines. For instance, Pfizer's $60 billion acquisition of Pharmacia in 2002 was motivated in part to obtain Pharmacia's blockbuster arthritis drug, Celebrex.[119] Similarly, Merck's $41.1 billion acquisition of rival drug maker Schering-Plough in 2009 was motivated in significant part to obtain Schering-Plough's lucrative Nasonex allergy spray and its pipeline of promising biologic drugs.[120] Beyond acquiring actual products in development, companies also seek to extend innovative capacity by acquiring firms holding strategic patent portfolios. In the pharmaceutical arena, acquiring such firms (and their patents) eases subsequent in-house innovation[121] and facilitates branching out into related fields.[122] In this context, while it is debatable whether patents are a direct "cause" of industry concentration, the drive

116. *See* Pollack, *supra* note 5.

117. *From Vision to Decision: Pharma 2020*, PWC 5 (2012), https://www.pwc.com/gx/en/pharma-life-sciences/pharma2020/assets/pwc-pharma-success-strategies.pdf [https://perma.cc/Z2UG-ZPC7] [hereinafter PWC, *Vision to Decision*]; *see* Fabio Pammolli et al., *The Productivity Crisis in Pharmaceutical R&D*, 10 NATURE REVIEWS DRUG DISCOVERY 428, 428 (2011) (reporting empirical evidence of "a long-term decline in the productivity of research and development (R&D)").

118. Comanor & Scherer, *supra* note 109, at 106. *But see* Cockburn, *supra* note 89, at 11 (observing that the quality of new molecular entities may be increasing over time, thus suggesting a higher degree of innovation than low numbers suggest).

119. Robert Frank & Scott Hensley, *Pfizer to Buy Pharmacia for $60 Billion in Stock*, WALL ST. J. (July 15, 2002, 11:59 PM), https://www.wsj.com/articles/SB1026684057282753560 [https://perma.cc/3HDD-LFP8].

120. Natasha Singer, *Merck to Buy Schering-Plough for $41.1 Billion*, N.Y. TIMES (Mar. 9, 2009), http://www.nytimes.com/2009/03/10/business/10drug.html [https://perma.cc/6AGH-WDJK].

121. *See* Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1, 33 (2005).

122. *See id.* at 38–39.

to acquire patented assets has contributed to considerable merger and acquisition activity.

The drive to obtain productive patents and increase innovative capacity has intensified in light of the "patent cliff" of recent and upcoming patent expirations, thus spurring significant merger and acquisition activity.[123] From 2013 to 2018, global pharmaceutical companies were at risk of losing $200 billion in sales because of patent expirations and generic competition.[124] Patent expirations on Lipitor and other key drugs caused Pfizer's revenues to decrease by 21.6 percent in 2012,[125] and the expiration of Bristol-Myers Squibb's patents on Plavix and Avapro caused similar revenue declines.[126] Seeking new drugs to fill their pipelines, pharmaceutical companies have engaged in both vertical acquisitions of upstream biotech firms and horizontal acquisitions of established competitors with promising assets.

These factors have contributed to significant industry consolidation. As far back as the late 1990s, the pharmaceutical industry experienced a spate of mergers and acquisitions.[127] Since 1994, Pfizer has spent more than $219 billion on large-scale takeovers.[128] In 1999 alone, Pfizer acquired Warner-Lambert,[129] Sanofi merged with Synthelabo to create Sanofi-Synthelabo,[130] and Rhone-Poulenc S.A. merged with Hoechst A.G. to create Aventis.[131] (Sanofi-Synthelabo later

123. Myoung Cha & Theresa Lorriman, *Why Pharma Megamergers Work*, MCKINSEY & COMPANY (Feb. 2014), http://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/why-pharma-megamergers-work [https://perma.cc/4JUT-5AXU] ("Megamergers have played a key role in shaping the global pharmaceutical landscape."); *see* Comanor & Scherer, *supra* note 109, at 106. *But see* David Davidovic, *The History of Bio-Pharma Industry M&As, Lessons Learned and Trends to Watch*, PM360 (May 23, 2014), https://www.pm360online.com/the-history-of-bio-pharma-industry-mas-lessons-learned-and-trends-to-watch [https://perma.cc/V4LM-TF9X] (arguing that the pharmaceutical industry is extremely fragmented with the largest companies having ten percent of market share or less).

124. *See* Anna Son, *M&A Focus: Biotechnology*, IBISWORLD 2 (May 2013), [https://perma.cc/8GNB-P6K7]; *see also* PWC, *From Vision to Decision*, *supra* note 117, at 6 (estimating that generics will eliminate $148 billion in pharmaceutical profits from 2012 to 2018).

125. Son, *supra* note 124, at 2.

126. *Id.*

127. *See* Rai, *supra* note 86, at 818.

128. Chris Lo, *Pharma Mergers: Big Business, Bad Science?*, PHARMACEUTICAL TECH. (Jan. 6, 2015), https://www.pharmaceutical-technology.com/features/featurepharma-mergers-big-business-bad-science-4467897 [https://perma.cc/EZ2C-SZPN].

129. Cha & Lorriman, *supra* note 123.

130. *See Business Digest*, N.Y. TIMES (Dec. 3, 1998), http://www.nytimes.com/1998/12/03/business/business-digest-248800.html [https://perma.cc/G8ZE-MHWG].

131. *See* David J. Morrow, *International Business; Rhone-Poulenc and Hoechst Agree on Start of a Merger*, N.Y. TIMES (Dec. 2, 1998), https://www.nytimes.com/1998/12/02/business/international-business-rhone-poulenc-and-hoechst-agree-on-start-of-a-merger.html [https://perma.cc/4XN2-EKKA].

acquired Aventis in 2004, thus producing Sanofi-Aventis.[132]) Megamergers continued through the 2000s. For example, in 2007 Schering-Plough bought Organon Biosciences.[133] In 2009, Pfizer acquired Wyeth Laboratories,[134] Merck acquired Schering-Plough,[135] and Roche acquired Genentech.[136] In 2014, Actavis acquired Forest Laboratories and Allergan.[137] According to one commentator, "During the last 30 plus years we have seen a major consolidation in the industry through mergers and acquisitions."[138] Such merger and acquisition activity has demonstrably impacted industry structure, with a relatively large set of companies developing upstream drug precursors and a relatively narrow band of companies commercializing drugs.[139] While many factors have contributed to such consolidation, the desire to acquire productive patented assets and innovative capacity (especially in light of patent expirations) has been significant.

In addition to playing important roles in mergers and acquisitions, patents also promote concentration by excluding potential new entrants. The exclusionary effects of patents deter entry of not only rival products but also rival producers. At the micro level, patents on individual drugs serve as a barrier to entry for rival, copycat therapeutics.[140] Furthermore, pharmaceutical companies engage in "evergreening" in which they attempt to extend the effective period of exclusivity of existing patents by patenting minor variations.[141] At a macro level, patents can exclude not just individual products but also entire companies from entering a market. Pharmaceutical research, development, regulatory approval, marketing, and distribution are

132. Anita Raghavan et al., *Sanofi to Swallow Aventis in a Deal Set at $65 Billion*, WALL ST. J. (Apr. 26, 2004), https://www.wsj.com/articles/SB108291923112092711 [https://perma.cc/MP5L-TYLS].

133. Julia Werdigier, *Schering-Plough Agrees to Buy Akzo Nobel's Organon Biosciences Unit*, N.Y. TIMES (Mar. 12, 2007), http://www.nytimes.com/2007/03/12/business/worldbusiness/12iht-drug.4885575.html [https://perma.cc/L7KQ-TYLV].

134. Comanor & Scherer, *supra* note 109, at 106.

135. *Id.*

136. *See* Cha & Lorriman, *supra* note 123.

137. EY, FIREPOWER INDEX AND GROWTH GAP REPORT 2015, at 2 (Jan. 2015), https://www.ey.com/us/en/industries/life-sciences/ey-firepower-and-growth-gap-report-2015 [https://perma.cc/R7W8-G7AJ].

138. Davidovic, *supra* note 123.

139. Fisher & Liebman, *supra* note 109.

140. Notably, the benefits of patent protection extend beyond the term of protection because the goodwill developed by a branded drug continues to exert some exclusionary force even after the term expires. Caves et al., *supra* note 111, at 10–11.

141. Rebecca S. Eisenberg, *The Role of the FDA in Innovation Policy*, 13 MICH. TELECOMM. & TECH. L. REV. 345, 354 (2007).

extremely expensive,[142] and these high fixed costs represent a significant barrier to entry for potential new competitors. Established pharmaceutical companies sustain these massive expenses through patent-protected revenue streams, thus giving them a significant advantage that most newcomers lack. In addition to being very expensive, pharmaceutical development is very risky.[143] Established pharmaceutical companies spread risk over many candidates by leveraging significant patent portfolios. Large patent estates allow established industry players to overcome the cost and risk of pharmaceutical development and commercialization, thus inhibiting entry by potential competitors.

The role of patents in inhibiting entry in mature, downstream pharmaceutical markets is particularly visible in the context of generic competition. Almost by definition, patents on drugs delay entry of generic competitors in pharmaceutical markets. Within the complicated statutory framework governing generic drugs,[144] brand companies "expend tremendous energy blocking generic entry by any means possible, with some companies using ever more clever and complicated strategies."[145] Brand companies have long engaged in so-called "reverse payment settlements" in which they pay generic manufacturers to settle challenges to the brand company's patents, thereby avoiding patent invalidation and delaying generic entry.[146]

In sum, patents were critical to forming the biotechnology industry and played an important role in spurring upstream, research-intensive firms to enter the field. However, as the biopharmaceutical industry has matured, downstream pharmaceutical firms focused on commercializing drugs have sought to amass patents and related innovative capacity through both vertical and horizontal mergers, thus promoting industry concentration. Additionally, the broad patent portfolios held by these incumbents raise barriers to entry, which further contribute to concentration.

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142. *See* Joseph A. DiMasi et al., *Innovation in the Pharmaceutical Industry: New Estimates of R&D Costs*, 47 J. HEALTH ECON. 20, 21 (2016) (estimating the cost to bring an FDA-approved drug to market at $2.9 billion). *But see* Aaron E. Carroll, *$2.6 Billion to Develop a Drug? New Estimate Makes Questionable Assumptions*, N.Y. TIMES (Nov. 18, 2014), https://www.nytimes.com/2014/11/19/upshot/calculating-the-real-costs-of-developing-a-new-drug.html [https://perma.cc/356R-B5S7] (critiquing the DiMasi et al. analysis).

143. *See* DiMasi et al., *supra* note 142, at 23 (estimating that 11.8 percent of drugs entering clinical trials, a relatively late stage of development, will ultimately obtain regulatory approval).

144. *See* Drug Price Competition and Patent Term Restoration Act, Pub. L. No. 98-417, 98 Stat. 1585 (1984) (codified as amended in scattered sections of 21 U.S.C. and 35 U.S.C.).

145. Robin Feldman & Evan Frondorf, *Drug Wars: A New Generation of Generic Pharmaceutical Delay*, 53 HARV. J. ON LEGIS. 499, 503 (2016).

146. *Id.*

2. Agricultural Biotechnology, Seeds, and Agrochemicals

Patents have also played important roles in initial and upstream entry as well as downstream and subsequent consolidation in the agricultural biotechnology, seed, and agrochemical industry. Modern agriculture technologies encompass a range of related businesses spanning (1) biotechnology, which utilizes genetic engineering to produce new plant traits, such as herbicide resistance or pest resistance; (2) seeds, which may incorporate genetically engineered traits; and (3) agrochemicals, such as herbicides and pesticides, which may be designed for use with specific engineered traits. Patents have facilitated the entry of upstream agricultural biotech startups and enticed chemical companies to enter the agricultural field, thus promoting fragmentation. Over the decades, however, mergers and acquisitions focused on amassing patents and the emergence of a broad patent thicket have contributed to a concentrated industry dominated by a Big Four: BASF, Bayer, DowDuPont, and Syngenta.[147]

Patents promoted the entry of both upstream biotechnology startups and large chemical companies into the agricultural industry. Agricultural biotechnology grew out of university startups in the 1980s, and during its early years featured numerous small, research-intensive firms.[148] As with medical biotech firms, patents played a crucial role in the proliferation of agricultural biotech startups. Certain asexually propagating plants have been eligible for exclusive rights since the 1930 Plant Patent Act,[149] and in 1970 Congress expanded patentability with the Plant Variety Protection Act ("PVPA"), which protected certain sexually reproducing plants.[150] Up until the late twentieth century, it was generally understood that plants were not patentable outside of those specialized regimes.[151] But a series of court decisions expansively

147. Dow and DuPont merged in 2017. *DowDuPont Merger Successfully Completed*, DOW (Sept. 1, 2017), https://www.dow.com/en-us/news/press-releases/dowdupont-merger-successfully-completed [https://perma.cc/B5AA-WH52]. Additionally, Bayer recently completed its purchase of Monsanto. *Bayer Closes Monsanto Acquisition*, MONSANTO (June 7, 2018), https://monsanto.com/news-releases/bayer-closes-monsanto-acquisition [https://perma.cc/54JC-HH77]. In the span of two years, what had previously been a Big Six became a Big Four.

148. *See* Brett D. Begemann, *Competitive Strategies of Biotechnology Firms: Implications for U.S. Agriculture*, 29 J. AGRIC. & APPLIED ECON. 117, 117–18 (1997).

149. Plant Patent Act of 1930, 35 U.S.C. §§ 61–164 (2012).

150. Plant Variety Protection Act, 7 U.S.C. §§ 2321–2583 (2012). Certificates of Protection granted under the PVPA confer exclusive rights but with important exceptions, namely that farmers are allowed to save protected seeds for replanting and researchers may conduct research on patented varieties without a license. These exceptions do not apply to utility patent protection of plants and seeds.

151. KEITH AOKI, SEED WARS 29 (2008).

interpreting patentable subject matter[152] and specifically extending utility patent protection to plants[153] spurred a dramatic increase in plant patenting.[154] This change in patenting contributed to the formation and entry of numerous agricultural biotechnology firms. According to Brian Wright and Philip Pardey, "Agricultural biotechnology startups proliferated in the 1980s and 1990s in the USA, financed by venture capitalists, often built around patented innovations produced by scientists in their laboratories, and licensed exclusively to the startup."[155]

In addition to facilitating the formation of agricultural biotech startups, patents also promoted entry by large chemical companies into the agricultural industry. The roots of today's global agriculture conglomerates lie in the chemicals industry, which in the 1970s featured over thirty major firms but by 2001 had consolidated into a Big Six.[156] Commentators observe that enactment of the PVPA in 1970 significantly spurred the entry of large chemical companies into the agricultural sphere, as the availability of exclusive rights "promised to increase returns from plant research and attracted R&D-minded multinationals."[157] The decade that followed enactment of the PVPA saw a "dizzying array of mergers and acquisitions" by large corporations like Ciba-Geigy, Pfizer, and Monsanto, which purchased numerous small seed firms.[158] A 1980 amendment that added six crops originally excluded from the PVPA further enhanced the value of these acquisitions.[159] Subsequent court decisions expanding the patent eligibility of plants further spurred large chemical companies to enter the seed industry.[160] Focusing on a different area of the value chain, the expansion of intellectual property rights also spurred growth in the

152. Diamond v. Chakrabarty, 447 U.S. 303 (1980).

153. *See, e.g.*, J.E.M. Ag Supply v. Pioneer Hi-Bred, 534 U.S. 124 (2001); *Ex Parte* Hibberd, 227 U.S.P.Q. (BNA) 443 (B.P.A.I. Sept. 24, 1985); *see also* AOKI, *supra* note 151, at 41–49 (discussing several cases expanding the patent eligibility of plants).

154. SEED GIANTS, *supra* note 14, at 5. In the fifteen years following *Ex Parte Hibberd*, the USPTO issued approximately 1,800 utility patents covering various aspects of plant germplasm. *J.E.M. Ag Supply*, 534 U.S. at 596.

155. Brian D. Wright & Philip G. Pardey, *The Evolving Rights to Intellectual Property Protection in the Agricultural Biosciences*, 2 INT'L J. TECH. & GLOBALIZATION 12, 20 (2006).

156. Philip H. Howard, *Intellectual Property and Consolidation in the Seed Industry*, 55 CROP SCI. 2489, 2491 (2015). The Big Six was comprised of BASF, Bayer, Dow, DuPont, Monsanto, and Syngenta.

157. Nicholas Kalaitzandonakes et al., *A Worrisome Crop?*, REGULATION, Winter 2010, at 20, 21.

158. AOKI, *supra* note 151, at 37.

159. *See* Pub. L. 96-574, 94 Stat. 3352, Dec. 22, 1980 (repealing Section 144, which had exempted okra, celery, peppers, tomatoes, carrots, and cucumbers from the PVPA); AOKI, *supra* note 151, at 39.

160. Howard, *supra* note 156, at 2490.

seed industry. A 1980 survey of seed companies reported an increase in the number of research programs and research expenditures on nonhybrid crops after the PVPA was enacted in 1970.[161]

The industry began to consolidate as it matured, and intellectual property rights played several roles in advancing consolidation. As I have described elsewhere, large chemical companies began acquiring upstream agricultural biotechnology firms that could genetically engineer new traits.[162] These chemical companies sought to obtain the biotech firms' patented assets as well as their related tacit knowledge concerning genetic engineering.[163] Commentators suggest that the desire to avoid high transaction costs associated with aggregating multiple intellectual assets played a key role in mergers and acquisitions, including acquisitions of biotech startups by large incumbents.[164] In addition to acquiring agricultural biotechnology firms, large conglomerates also acquired seed companies that possessed high-quality germplasm into which they could insert genetically engineered traits.[165] Acquiring smaller plant-breeding operations was an efficient means of obtaining intellectual property and know-how and was "much simpler than replication or 'inventing around' it."[166] Ultimately, these large conglomerates sought to integrate agricultural biotechnology and high-quality germplasm with their own chemical expertise to develop agrochemicals for use with genetically modified seeds.[167] Accordingly, as the agricultural biotechnology industry shifted toward commercialization and product development, it consolidated into fewer vertically integrated actors.[168] The mid-1980s to the early 2000s saw intensive merger and acquisition activity.[169] According to

161. OFFICE OF TECH. ASSESSMENT, *supra* note 95, at 110.

162. Lee, *supra* note 39, at 1467–69.

163. *Id.* at 1470.

164. Gregory D. Graff et al., *Agricultural Biotechnology's Complementary Intellectual Assets*, 85 REV. ECON. & STATS. 349, 349 (2003).

165. *Id.*; *see also* Begemann, *supra* note 148, at 120 (quoting a Monsanto executive as saying, "We believe that we need to couple our technology with superior germplasm to develop the very best hybrids."); Wright & Pardey, *supra* note 155, at 21–22.

166. JOHN L. KING, U.S. DEP'T OF AGRIC., CONCENTRATION AND TECHNOLOGY IN AGRICULTURAL INPUT INDUSTRIES 7 (2001), https://www.researchgate.net/profile/John_King15/publication/23516824_Concentration_and_Tehnology_in_Agricultural_Input_Industries/links/0c96051ddba4f06fa4000000/Concentration-and-Technology-in-Agricultural-Input-Industries.pdf [https://perma.cc/B4XQ-LJ3R].

167. Begemann, *supra* note 148, at 122 ("Three years ago, the seed and agricultural chemical industries were viewed as two separate industries. Now, . . . the seed industry and chemical industry are merging because of herbicide-resistant and insect-resistant traits in seed.").

168. *Id.* at 118.

169. William Lesser, *Intellectual Property Rights and Concentration in Agricultural Biotechnology*, 1 J. AGROBIOTECHNOLOGY MGMT. & ECON. 56, 56 (1998); Diana L. Moss,

Keith Aoki, in the decade following 1985, when *Ex Parte Hibberd* was decided, "the U.S. seed industry accelerated its transformation into a concentrated industrial landscape dominated by multinational agrichemical corporations."[170]

Throughout the 1990s and beyond, control of seed markets and ownership of seed patents were both highly concentrated. Concentration in the corn, cotton, and soybean seed markets grew throughout the decade.[171] Between 1995 and 1998, large multinational corporations purchased or entered into joint ventures with approximately sixty-eight seed companies.[172] By 1998, Monsanto controlled fifteen percent of the U.S. corn seed market, and Pioneer-HiBred (which DuPont subsequently acquired) controlled thirty-nine percent.[173] Monsanto and Pioneer-HiBred controlled twenty-four and seventeen percent, respectively, of the purchased soybean seed market.[174] In the cottonseed market, Delta & Pine Land and Stoneville (both of which Monsanto subsequently acquired), controlled seventy-one and sixteen percent of the market, respectively.[175] Concentration in R&D-intensive input industries (including chemicals, crop seed and traits, and animal genetics) rose significantly from 1994 to 2009.[176] During that period, the ratio of the agricultural chemicals market controlled by four firms grew from 28.5 to 53 percent.[177] Concentration in patent ownership paralleled concentration in market shares. In the mid- to late 1990s, the top four firms in each field held forty-one percent of corn patents, fifty-three percent of soybean patents, seventy-seven percent of tomato patents, and thirty-eight percent of patents covering Bt technology, which enhances resistance to certain insects.[178] By 2011,

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Competition, Intellectual Property Rights, and Transgenic Seed, 58 S.D. L. REV. 543, 548 (2013); Oehmke & Naseem, *supra* note 47, at 19.

170. AOKI, *supra* note 151, at 59.

171. David E. Schimmelpfennig et al., *The Impact of Seed Industry Concentration on Innovation: A Study of US Biotech Market Leaders*, 30 AG. ECON. 157, 159 (2004).

172. KING, *supra* note 166, at 6.

173. Murray Fulton & Konstantinos Giannakas, *Agricultural Biotechnology and Industry Structure*, 4 J. AGROBIOTECHNOLOGY MGMT. & ECON. 137, 138 (2001).

174. *Id.*

175. *Id.*

176. KEITH O. FUGLIE ET AL., U.S. DEP'T OF AGRIC., RESEARCH INVESTMENTS AND MARKET STRUCTURE IN THE FOOD PROCESSING, AGRICULTURAL INPUT, AND BIOFUEL INDUSTRIES WORLDWIDE 14–15 (2011), https://www.ers.usda.gov/publications/pub-details/?pubid=44954 [https://perma.cc/9BRA-C89H].

177. Keith Fuglie et al., *Rising Concentration in Agricultural Input Industries Influences New Farm Technologies*, USDA (Dec. 3, 2012), https://www.ers.usda.gov/amber-waves/2012/december/rising-concentration-in-agricultural-input-industries-influences-new-technologies [https://perma.cc/39E2-DPGZ].

178. Fulton & Giannakas, *supra* note 173, at 138.

the top ten companies accounted for seventy-five percent of all U.S. patent applications in the industry.[179]

Such patent concentration both entrenches established players and hinders potential new entrants. While the large conglomerates cross-license patents among themselves,[180] the complex intellectual property landscape deters entry by new competitors.[181] For instance, germplasm is often covered by many intellectual property rights,[182] and "[f]inancing and managing the quest for freedom to operate in the necessary inputs and processes (for example, genes, promoters, markers, and transformation technology) has been a real challenge, especially for smaller firms."[183] Monsanto (which Bayer recently acquired) deserves special mention as a dominant player that has leveraged market strength and patent holdings in a highly concentrated industry.[184] Monsanto provides Bt and Roundup Ready genes for corn, soybeans, and cotton to its own subsidiaries as well as Pioneer and other competitors.[185] From the late 1990s to the 2000s, Monsanto acquired almost forty companies, spanning agricultural biotechnology firms that genetically engineer traits and seed companies that cultivate germplasm needed to breed new varieties.[186] From 2005 to 2009, Monsanto spent $4.81 billion to acquire seed firms.[187] As of 2009, Monsanto's patented traits appeared in fifty percent of all interfirm stacks.[188] Monsanto's dominant interfirm stacks have almost achieved the status of an industry standard around which other companies must develop their technologies and seeds, thus further entrenching Monsanto's position.[189] Prior to its recent acquisition by Bayer, Monsanto controlled nearly twenty-seven percent of global commercial seed sales.[190]

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179. PIET SCHENKELAARS ET AL., DRIVERS OF CONSOLIDATION IN THE SEED INDUSTRY AND ITS CONSEQUENCES FOR INNOVATION 21 (2011), https://www.lisconsult.nl/files/docs/consolidation_seed_industry.pdf [https://perma.cc/GL3Q-6Q48].

180. Howard, *supra* note 156, at 2492.

181. Kalaitzandonakes et al., *supra* note 157, at 20.

182. Wright & Pardey, *supra* note 155, at 21.

183. *Id.*

184. *See* Lina Khan, *How Monsanto Outfoxed the Obama Administration*, SALON (Mar. 15, 2013), https://www.salon.com/2013/03/15/how_did_monsanto_outfox_the_obama_administration [https://perma.cc/FNN6-N235] (describing Monsanto's "multibillion-dollar spree to buy up seed companies").

185. Schimmelpfennig et al., *supra* note 171, at 159.

186. Diana L. Moss & Robert Taylor, *Short End of the Stick: The Plight of Growers and Consumers in Concentrated Agricultural Supply Chains*, 2014 WIS. L. REV. 337, 362 (2014).

187. SEED GIANTS, *supra* note 14, at 17 ("The company spent $4.81 billion within a five-year span (2005-2009) to acquire numerous seed firms, an average of $963 million annually.").

188. Moss, *supra* note 169, at 554–55.

189. *Id.* at 555–56.

190. SEED GIANTS, *supra* note 14, at 6.

Although different from the biopharmaceutical industry in many respects, the agricultural biotechnology, seed, and agrochemical industry has seen patents play a similar role in shaping its structure. Patents were critical to the entry of upstream, research-intensive agricultural biotechnology firms as well as the initial entry of chemical companies into the agricultural field. Once there, however, large agricultural conglomerates acquired smaller firms in part for their intellectual property and wielded patents to exclude potential entrants, thus contributing to significant industry concentration.

3. Software

Turning to an industry with a very different structure, intellectual property rights have also contributed to both fragmentation and concentration in the software industry. Software is an interesting context in which to consider industry dynamics because it is characterized as a highly fragmented industry with relatively low barriers to entry.[191] As a preliminary issue, it is important to define the boundaries of the software industry. While companies in all industries use (and sometimes develop and patent) software,[192] this Section focuses on companies that develop software as their core business.[193] This industry exhibits significant heterogeneity, as many established software firms also produce hardware, and firms vary considerably in the types of software developed and customers served.[194] While intellectual property rights have been associated with initial and upstream market entry, they have also contributed to subsequent and downstream concentration in the software industry.

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191. Robert P. Merges, Patents, Entry and Growth in the Software Industry 2–6 (2006) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=926204 [https://perma.cc/9VVU-GKYP].

192. PWC, GLOBAL 100 SOFTWARE LEADERS: DIGITAL INTELLIGENCE CONQUERS 11 (2016), https://www.pwc.com/gx/en/technology/publications/global-software-100-leaders/assets/global-100-software-leaders-2016.pdf [https://perma.cc/RGE9-HFYD] [hereinafter PWC, DIGITAL INTELLIGENCE] ("Companies like Boeing and General Electric (GE) beg the question: what defines a software company?").

193. *See* John R. Allison et al., *Software Patents, Incumbents, and Entry*, 85 TEX. L. REV. 1579, 1579 (2007) (noting that manufacturing firms outside the software industry must often employ software developers to ensure that devices run effectively); Martin Campbell-Kelly & Daniel D. Garcia-Swartz, *From Products to Services: The Software Industry in the Internet Era*, 81 BUS. HIST. REV. 735, 763 (2007) ("There has never been a universally accepted definition of what constitutes a software company . . . ."); Mann, *supra* note 14, at 965 (differentiating companies that develop and patent software from "firms that receive substantial revenues from the sale of software products or services").

194. Allison et al., *supra* note 193, at 1580; *see id.* at 1605 tbl.4 (identifying thirty-six types of firms in the software sector).

Characterizing the role of intellectual property rights in promoting initial entry in the software industry is challenging. For much of its early history, the software industry grew rather robustly without explicit protection from copyrights and patents. In the 1950s, an oligopoly of mainframe suppliers dominated the U.S. computer industry, and these suppliers typically bundled software with hardware.[195] Over time, a distinct industry focused on developing software emerged, and by 1965 there were an estimated forty to fifty major software contractors that produced complex programs for large corporate clients[196] and multitudes of smaller contractors that provided custom software to smaller companies.[197] This segment faced low barriers to entry, and by 1967 there were about 2,800 software-contracting firms in the U.S.[198] Following IBM's 1968 decision to unbundle hardware and software, the "package" software industry accelerated dramatically.[199] This segment, however, had relatively few startups because market entry required a fully developed product, which was rather expensive.[200] With the advent of the personal computer in the late 1970s, entry into the software industry exploded again; between 1975 and 1981, several thousand new software companies emerged, after which the industry experienced a period of consolidation.[201]

More recently, intellectual property rights have played a more important role in shoring up firm entry in the software industry. Notably, in its influential 1978 report, the National Commission on New Technological Uses of Copyrighted Works ("CONTU") recommended recognizing copyright protection for computer programs in part to promote the entry of independent software firms.[202] Such firms could not rely on bundling software with hardware to appropriate revenues from their innovations, thus increasing the perceived need to protect software itself. Congress adopted CONTU's recommendation and in 1980 amended the copyright statute to include computer

195. Campbell-Kelly & Garcia-Swartz, *supra* note 193, at 80.

196. *Id.* at 81, 84.

197. *Id.* at 81, 85.

198. *Id.* at 85.

199. *Id.* at 88.

200. *Id.* at 90.

201. *Id.* at 94.

202. *Final Report of the National Commission on New Technological Uses of Copyrighted Works*, 3 COMPUTER L.J. 53, 57–59 (1981) [hereinafter CONTU Report] (reproducing the 1978 report). *But see id.* at 100 (reporting the dissenting views of Commissioner Hersey, who argued that copyright would benefit large software companies and promote economic concentration).

programs within copyrightable subject matter.[203] CONTU's recommendation and Congress's enactment suggest that, at least in the view of policymakers, copyright helped promote the entry of new firms. However, software was not subject to widespread patent protection until the 1980s and beyond.[204] Anecdotal and some empirical evidence indicate robust entry before patenting of software became common, partly because of the availability of copyright protection.[205] The growth of the early software industry in the absence of meaningful patent protection casts some doubt on the role of patents in promoting entry.

Focusing on a more recent period, however, scholars have argued that patents play an important role in promoting market entry and fragmentation in the software industry. As noted, in the early decades of the software industry, some companies relied on copyright to protect software. However, the narrowing of copyright protection,[206] expansion of patent protection for software,[207] and diffusion of personal computers and the internet contributed to a significant increase in software patenting in the 1990s.[208] Ronald Mann has influentially argued that patents promote market entry by new software ventures,[209] concluding that "[t]he effects of patents are much more likely to benefit small firms and contribute to industry fragmentation than to benefit large firms and contribute to industry concentration."[210] While the earliest-stage startups may not have the resources and motivation to obtain patents, later-stage startups benefit substantially from exclusive

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203. Pamela Samuelson, *CONTU Revisited: The Case Against Copyright Protection for Computer Programs in Machine-Readable Form*, 1984 DUKE L.J. 663, 666 n.9.

204. *See* Diamond v. Diehr, 450 U.S. 175, 191 (1981) (holding that an industrial process utilizing a mathematical equation was patentable subject matter); State St. Bank & Trust Co. v. Signature Fin. Grp., Inc., 149 F.3d 1368, 1372–73 (Fed. Cir. 1998) (articulating an expansive conception of patentable subject matter).

205. *See* Martin Campbell-Kelly, *Development and Structure of the International Software Industry, 1950-1990*, 24 BUS. & ECON. HIST. 73, 78 (1995) (noting the dearth of empirical data about the software industry from 1950 to 1980); *see also* Gottschalk v. Benson, 409 U.S. 63, 72 (1972) ("It is noted that the creation of programs has undergone substantial and satisfactory growth in the absence of patent protection and that copyright protection for programs is presently available." (quoting THE PRESIDENT'S COMM. ON THE PATENT SYSTEM, "TO PROMOTE THE PROGRESS OF . . . USEFUL ARTS" IN AN AGE OF EXPLODING TECHNOLOGY 14 (1966))).

206. *See, e.g.*, Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807, 819 (1st Cir. 1995) (denying copyright protection to a menu command hierarchy as a method of operation); Comput. Assocs. Int'l v. Altai, 982 F.2d 693, 711–12 (2d Cir. 1992) (narrowing the copyrightability of broad structural elements of software programs).

207. *See, e.g.*, *Diamond*, 450 U.S. 175 (holding that a manufacturing process employing a mathematical algorithm constitutes patentable subject matter).

208. Allison et al., *supra* note 193, at 1589–90.

209. *Id.* at 1580.

210. Mann, *supra* note 14, at 967–68; *see id.* at 986 ("Contrary to the perception that patents tilt the playing field in favor of large incumbent firms to the disadvantage of small firms, patents in this context afford a unique opportunity to the small startup.").

rights.[211] Patents allow startups to innovate with less competition, achieve "licensing equilibrium" with other companies, and signal their managerial and technical competence to the market.[212] Venture capitalists may consider a startup's patents (or patent applications) in assessing its management and market potential.[213]

To be fair, the role of patents in promoting entry of software startups is contested. Empirical research finds that although sixty-three percent of venture-backed software and internet startups held more than four patents and patent applications,[214] software entrepreneurs do not regard patents as an important mechanism for appropriating the value of innovation.[215] Furthermore, patents play a less important role in obtaining financing for software startups compared to other fields, such as biotechnology.[216] Nonetheless, Mann's analysis concludes that patents play an important role in facilitating market entry for venture-backed firms, thus promoting industry fragmentation. This is particularly important given that relatively small firms have historically generated many of the most important software innovations.[217]

While Mann's analysis suggests a fragmented software industry comprised of many small players, actual industry dynamics are more complex. Again, the dimensions of time and the value chain are illuminating. The software industry is comprised of many different segments, and a familiar pattern is for young segments to feature many new entrants and then consolidate into fewer larger players as they mature.[218] For example, while the internet created a tremendous influx of capital (and firm entry),[219] after the dot-com bubble crashed, the market weeded out weaker companies and reconsolidated.[220] Regarding the value chain, the upstream function of producing code requires relatively little capital (as does starting a software firm),[221] suggesting easy entry and fragmentation in these fields. Downstream functions

211. *Id.* at 985.

212. *Id.* at 985–90.

213. Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1505–06 (2001); *cf.* Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 637 (2002).

214. Graham et al., *supra* note 60, at 1281.

215. *Id.* at 1292.

216. *Id.* at 1308.

217. Mann, *supra* note 14, at 973.

218. Michele Boldrin & David K. Levine, *The Case Against Patents*, 27 J. ECON. PERSP. 3, 11 (2013) (noting this pattern and applying it to the software industry of the 1980s and 1990s).

219. SANDRA A. SLAUGHTER, A PROFILE OF THE SOFTWARE INDUSTRY: EMERGENCE, ASCENDANCE, RISKS, AND REWARDS 53 (2014).

220. *Id.*; Mann, *supra* note 14, at 969.

221. SLAUGHTER, *supra* note 219, at 72; CONTU Report, *supra* note 202, at 79.

such as marketing and distributing software, however, involve significant infrastructure and resources, and "[s]oftware firms producing mature products . . . usually form an oligopoly market where there are a few well-established software firms such as Microsoft, SAP, and Oracle that dominate the market."[222]

While there is some debate concerning the importance of patents to the entry of software startups, there is wider consensus that patents have created barriers to entry and contributed to subsequent industry concentration. As Michele Boldrin and David Levine observe, "It is only after the initial stage of rampant growth ends that mature industries turn toward the legal protection of patents, usually because their internal growth potential diminishes and they become more concentrated."[223] As segments mature, all companies have an incentive to acquire patents, which can produce a patent thicket.[224] Empirical research has revealed that segments within the software industry with the highest rates of patenting have fewer firms (i.e., are more concentrated) than those with moderate or low rates of patenting.[225] This finding suggests that mature segments will tend to have a "smaller number of firms with greater average rates of patenting."[226]

Empirical research by Ian Cockburn and Megan MacGarvie reveals that from 1990 to 2004, a ten percent increase in the number of patents reduced entry by three to eight percent.[227] Furthermore, segments with the fewest patents per incumbent had the sharpest increase in entry, and those with the most had the smallest increase in entry.[228] These findings led the authors to conclude that "[p]atent thickets, at least as measured here, thus appear to substantially raise entry costs."[229] Empirical research also shows that startups in markets with more patents faced longer delays in obtaining venture financing compared to markets with fewer patents.[230] Along similar lines, an influential 2003 report by the Federal Trade Commission cites several

222. SLAUGHTER, *supra* note 219, at 72; CONTU Report, *supra* note 202, at 79.

223. Boldrin & Levine, *supra* note 218, at 3.

224. Cockburn & MacGarvie, *supra* note 51, at 915–16; Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, *in* INNOVATION POLICY AND THE ECONOMY 119, 119 (Adam B. Jaffe et al. eds., 2001). *But see* Mann, *supra* note 14, at 1004 (drawing on interview evidence to disclaim the existence of a detrimental patent thicket in the software industry).

225. Allison et al., *supra* note 193, at 1606.

226. *Id.*

227. Cockburn & MacGarvie, *supra* note 51, at 915.

228. *Id.* at 920.

229. *Id.* at 931.

230. Iain M. Cockburn & Megan J. MacGarvie, *Patents, Thickets, and the Financing of Early-Stage Firms: Evidence from the Software Industry*, 18 J. ECON. MGMT. STRAT. 729, 729 (2009).

commentators who cautioned that patents raise entry costs in the software industry.[231]

In addition to constraining entry over time, patent thickets are most likely to inhibit entry in downstream segments of the software industry. Such thickets create "a dense web of overlapping intellectual property rights that a company must hack its way through in order to actually commercialize new technology."[232] Due to the accumulation of exclusive rights as one moves from upstream to downstream technologies along a value chain, patent thickets are likely to be thickest and most pernicious for downstream firms attempting to commercialize a technology,[233] such as a complex software suite.[234] Put differently, the cumulative effect of even small "patent taxes" along a value chain can be quite large for downstream firms, thus imperiling commercialization.[235] Thickets can serve as a formidable barrier to entry, leading companies to "avoid the mine field altogether" or "lose their corporate legs."[236]

Ironically, incumbents have sought to overcome the perils of thickets by acquiring more patents, thus exacerbating thickets and heightening barriers to entry. Large software companies typically accumulate significant numbers of defensive patents and engage in massive cross-licensing with each other to clear patent thickets.[237] Empirical research reveals that the increasing share of software patents held by software firms is driven by the activity of a few large industry players.[238] This result places small firms and potential new entrants at a disadvantage, for they lack the resources to amass large patent portfolios to leverage against industry incumbents. Thus, for a variety of reasons, "the acquisition of large patent portfolios by incumbents creates huge barriers to entry."[239] At the far end of the spectrum, the proliferation of patents also undergirds the emergence of patent assertion entities, known colloquially as patent trolls, which accumulate large patent portfolios, do not manufacture technologies,

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231. FED. TRADE COMM'N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY 51 (2003).

232. Shapiro, *supra* note 224, at 120.

233. *See id.* at 124 ("[T]he complements problem is at its worst when the downstream firms using the various inputs truly require each input to make their products.").

234. *Cf. id.* at 144.

235. *Id.* at 125.

236. *Id.* at 126.

237. *Id.* at 129; *see also* Mann, *supra* note 14, at 996; FED. TRADE COMM'N, *supra* note 231, at 52.

238. James Bessen, *A Generation of Software Patents*, 18 B.U. J. SCI. & TECH. L. 241, 256 (2012).

239. *Id.*; Boldrin & Levine, *supra* note 218, at 8.

and generate revenues by threatening to sue other companies for infringement.[240] Even operating companies like Texas Instruments have mined their patent portfolios to assert exclusive rights against potential infringers,[241] thus heightening barriers to entry.

In addition to creating barriers to entry, patents also promote consolidation in the software industry by driving mergers and acquisitions. Even Mann, who emphasizes the role of patents in promoting software industry fragmentation, acknowledges that patents can sometimes promote industry consolidation. For large companies, the cost of potentially infringing another company's patent may weigh against in-house development and toward simply buying the company (and its patents).[242] Put differently, "one tried and true method of settling a [patent] dispute is for the companies involved simply to merge."[243] In broader strokes, the software industry continues to undergo Schumpeterian processes of "creative destruction" in which firms abandon old technologies for new ones.[244] This process often entails large incumbents acquiring small startups and their patents.[245] For instance, the emergence of cloud computing has led large incumbents to acquire cloud-based companies, such as Oracle's recent purchase of Responsys and SAP's recent acquisition of Concur Technologies.[246]

Patents have also contributed to industry consolidation by protecting standards. Certain segments of the software industry are subject to network externalities, which arise when the value of a good or service increases as more people use it, such as when additional users join a telephone network.[247] Network markets tend to move toward standardization[248] and frequently operate as "winner take all" contests that eventually tip toward a standard that dominates the market.[249] While standards themselves can contribute to industry concentration by rendering competing platforms obsolete, this effect is heightened when standards are subject to exclusive rights. As Julie Cohen and Mark Lemley observed in an influential article, "The nexus among intellectual property rights, compatibility, and network effects is quite

240. *See* Mann, *supra* note 14, at 1023 (describing patent trolls).

241. Shapiro, *supra* note 224, at 121.

242. Mann, *supra* note 14, at 994.

243. Shapiro, *supra* note 224, at 143.

244. Campbell-Kelly & Garcia-Swartz, *supra* note 193, at 755.

245. *Id.*

246. PWC, DIGITAL INTELLIGENCE, *supra* note 192, at 14.

247. *See* Michael L. Katz & Carl Shapiro, *Systems Competition and Network Effects*, 8 J. ECON. PERSP. 93, 94 (1994) (describing "network effects" or "network externalities").

248. *Id.* at 105.

249. *Id.* at 111.

strong. To the extent that intellectual property rights confer ownership interests in a strong network standard, they may create durable market power in network markets."[250] Similarly, Carl Shapiro observes that "once a standard is picked, any patents (or copyrights) necessary to comply with that standard become truly essential."[251] Such benefits often flow to first movers whose intellectual property protects the industry standard, thus rendering such protection "extra-concentrated."[252] Patents on standards can thus contribute to concentration in the software industry,[253] where, for example, interoperability standards have led to Microsoft Windows enjoying a ninety percent market share in operating systems.[254] In this field, network effects "tend to give the leading players a competitive edge and monopoly over pricing power, which imposes a significant barrier to competition."[255]

Ultimately, patents play important roles in both initial, upstream entry and subsequent, downstream concentration in the software industry. Robert Merges observes that "[p]atents have not killed the software industry; they have not led to a slowdown in entry; and they do not appear to have had much if any effect on industry structure."[256] While this may describe the net effects of patents, exclusive rights promote entry and consolidation at different times and at different points in the value chain. Patents most saliently promote entry early in a segment's evolution and for startups transitioning from the earliest stages of formation to commercialization. Perhaps not surprisingly, the value of patents in promoting entry seems to be highest where patents (and their exclusionary effects) are already prevalent, which may explain why patents were not necessary for entry in the early decades of the software industry before patenting became

250. Julie E. Cohen & Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 CALIF. L. REV. 1, 22 (2001); *see also* Joseph Farrell, *Arguments for Weaker Intellectual Property Protection in Network Industries*, 3 STANDARDVIEW 46, 47 (1995) ("[I]ntellectual property protection is often especially *powerful* in network markets, since a de facto standard can control a market, so the legal protection is leveraged and confers stronger effective protection than in other markets.").

251. Shapiro, *supra* note 224, at 136.

252. Farrell, *supra* note 250, at 47.

253. Anne Shields, *Overview: The Software Industry Landscape*, MKT. REALIST (July 4, 2014), http://marketrealist.com/2014/07/overview-software-industry-landscape [https://perma.cc/N7CS-FMEX]; *see* Merges, *supra* note 191, at 5 (observing that proprietary "backbones" in the software industry give rise to network effects).

254. Shields, *supra* note 253.

255. *Id.*; *see also* SLAUGHTER, *supra* note 219, at 70 ("Switching costs and network externalities can cause the market to tip to a single dominant vendor or technology for a particular software genre.").

256. Merges, *supra* note 191, at 4–5.

widespread. As software segments mature, they tend to become more concentrated. Patents contribute to such consolidation by erecting barriers to entry and serving as valuable assets that incumbents seek to obtain in mergers and acquisitions. In addition to promoting initial entry and subsequent concentration, patents promote entry by upstream startups focused on writing new programs and facilitate concentration in large, downstream incumbents that commercialize products. Indeed, the software industry experiences significant merger and acquisition activity,[257] and according to the 2012 census, the top four software publishers accounted for 41.4 percent of total revenues.[258] While the software industry may appear fragmented overall, individual companies dominate particular segments, such as Microsoft in operating systems, SAP in enterprise applications, and Symantec in security.[259] For such segments, "patents, high switching costs, and the concentration of the software market create significant barriers [to entry]."[260]

B. Copyright-Intensive Industries

Shifting from technological to creative fields, copyrights (and patents) have also contributed to initial, upstream entry and subsequent, downstream concentration in film production and distribution, music recording, and publishing. Of course, these industries have very different histories, trajectories, and internal dynamics, and many forces beyond intellectual property rights help shape their structure. For example, the music industry is the most concentrated, due in significant part to pressure from digital content distribution. Notwithstanding their differences, in each of these industries, copyrights contribute to the entry of upstream creators such as screenwriters, composers, recording artists, and authors. The business of commercializing copyrighted content, however, falls to film studios and distributors, record labels, and publishing houses further downstream in the value chain, and these entities have wielded and

257. SLAUGHTER, *supra* note 219, at 53.

258. *Establishment & Firm Size: Summary Statistics by Receipts Size of Establishments for the U.S.: 2012*, U.S. CENSUS, AM. FACTFINDER (Jan. 8, 2016), https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml [https://perma.cc/QGC8-JUJU]. This category covers NAICS industry code 511210, "software publishers." *Id.*

259. *See* SLAUGHTER, *supra* note 219, at 57–58 tbl.3.1 (ranking the top thirty software suppliers of 2012). However, Microsoft alone accounts for seventeen percent of the worldwide software market. *Id.* at 59.

260. Anne Shields, *Overview: Understanding the Software Industry Cost Structure*, MKT. REALIST (July 4, 2014, 12:00 PM), http://marketrealist.com/2014/07/overview-understanding-software-industry-cost-structure [https://perma.cc/UV92-5U9A].

aggregated copyrights in ways that promote industry concentration. Furthermore, these profiles reveal that copyrights play different roles than patents in advancing various forms of industrial organization. For instance, while patent thickets in agricultural biotechnology and software can directly block the creation of technologies by potential new entrants, large copyright estates do not directly block the creation of rival expressions, but they confer significant cost advantages to incumbents, thus deterring new entrants.

1. Film Production and Distribution

Intellectual property rights contribute to both early and upstream market entry as well as subsequent and downstream concentration in film production and distribution.[261] Ironically, patents played a critical role in the initial formation and subsequent concentration of the movie industry. Thomas Edison patented foundational motion picture camera technology, and early industry participants formed the Motion Picture Patents Company ("MPPC") in 1909.[262] Patents facilitated development of the film industry, and the MPPC soon leveraged its patents to attempt to monopolize that industry.[263] According to Barak Orbach, "To prevent entry into its market, the Trust established a complex nexus of licenses and agreements that restricted transactions among machine manufacturers, film producers, distributors, and exhibitors only to licensed agents."[264] The MPPC created a subsidiary, the General Film Company, which sought "to block entry of non-licensed independents."[265] Filmmakers began to flock to Hollywood in part to evade patent infringement claims brought by these companies, which were based on the east coast.[266] Notably, antitrust and patent challenges helped weaken the MPPC and the General Film Company,

261. *See* Jin, *supra* note 42, at 406 (describing the long-standing but recently intensifying trend toward global media consolidation).

262. *See* Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502 (1917); Mark A. Lemley, *A New Balance Between IP and Antitrust*, 13 SW. J.L. & TRADE AM. 237, 252 (2007); Barak Y. Orbach, *Antitrust and Pricing in the Motion Picture Industry*, 21 YALE J. REG. 317, 331–32 (2004); Peter Edidin, *La-La Land: The Origins*, N.Y. TIMES (Aug. 21, 2005), https://www.nytimes.com/2005/08/21/weekinreview/lala-land-the-origins.html [https://perma.cc/N73A-7RAE].

263. Edidin, *supra* note 262.

264. Orbach, *supra* note 262, at 332.

265. LAWRENCE LESSIG, FREE CULTURE: THE NATURE AND FUTURE OF CREATIVITY 54 (2004); Orbach, *supra* note 262, at 332–33.

266. LESSIG, *supra* note 265, at 53; Edidin, *supra* note 262.

which contributed to increased entry by independent producers and exhibitors.[267]

The classical era, from the 1920s to the 1940s, featured a "studio system" in which vertically integrated studios combined movie production, distribution, and exhibition in one corporate entity.[268] In addition to being vertically integrated, the film industry was also horizontally concentrated, comprised of the so-called Big Eight studios: the Big Five studios (MGM, Warner Bros., 20th Century Fox, Paramount, and RKO) and the Little Three "majors" (Universal, Columbia, and United Artists).[269] The Big Eight controlled Hollywood as a "mature oligopoly"[270] and flourished during the Depression and World War II, when national crises helped shield the industry from government scrutiny.[271] This system produced the Golden Age of Hollywood, in which big stars were often bound by long-term contracts to particular studios (thus approximating vertical integration), which contributed to each studio's distinctive style and success.[272] In this fashion, "[u]p to the 1940s, the Hollywood movie industry was dominated by hierarchical and vertically integrated organizations."[273]

Following World War II, legal and cultural developments led to vertical disintegration in various parts of the value chain, particularly in upstream film production. The Supreme Court's 1948 antitrust decision in *United States v. Paramount Pictures* required the Big Five studios to end collusive behavior and sell their theater chains, thus separating production and distribution from exhibition.[274] Furthermore, courts ordered the end of contracts that had "essentially

267. Orbach, *supra* note 262, at 334–35.

268. RICHARD E. CAVES, CREATIVE INDUSTRIES 88 (2000); Tom Schatz, *The Studio System and Conglomerate Hollywood*, *in* THE CONTEMPORARY HOLLYWOOD FILM INDUSTRY 13, 14–15 (Paul McDonald & Janet Wasko eds., 2008); James Talbott, Editorial, *Will Mega-Media Mergers Destroy Hollywood and Democracy?*, 18 ENT. & SPORTS LAW. 9, 9 (2000).

269. Schatz, *supra* note 268, at 15; *see also* DAVID HESMONDHALGH, THE CULTURAL INDUSTRIES 61–62 (2d ed. 2007); Joseph Lampel & Jamal Shamsie, *Capabilities in Motion: New Organizational Forms and the Reshaping of the Hollywood Movie Industry*, 40 J. MGMT. STUD. 2189, 2193 (2003) (noting the ascendance of essentially eight studios around Hollywood by the late 1920s).

270. Schatz, *supra* note 268, at 15.

271. *Id.*

272. *Id.*; *see also* Jin, *supra* note 42, at 407–08; John M. Kernochan, *Ownership and Control of Intellectual Property Rights in Motion Pictures and Audiovisual Works: Contractual and Practical Aspects*, 20 COLUM.-VLA J.L. & ARTS 379, 406 (1996).

273. Lampel & Shamsie, *supra* note 269, at 2190.

274. 334 U.S. 131, 175 (1948); *see* CAVES, *supra* note 268, at 93; Jin, *supra* note 42, at 414; Talbott, *supra* note 268, at 9–10.

turned stars into indentured servants,"[275] thus freeing upstream creative talent from the formerly vertically integrated studios. Another important postwar development was the ascendance of television, which rapidly replaced film as the primary mass media consumption good.[276] Studios began making fewer films of higher quality to differentiate movies from television,[277] and it became less economical for studios to own large production facilities and bind actors to long-term contracts. The studios adopted the business model of United Artists, becoming financiers and distributors of motion pictures rather than producing them entirely in-house themselves.[278] The resulting "spot production" reflected vertical disintegration in upstream movie production.[279] In this model, independent producers approached studios with proposals that the studios could decide to "green light," thus providing capital and access to limited production facilities in exchange for downstream distribution rights.[280] This vertically disintegrated structure featuring spot production continued through the 1950s,[281] and by the mid-1960s, eighty percent of films were developed outside of the major studios.[282] Ultimately, the classical studio model was replaced by a contemporary structure featuring vertically disintegrated, knowledge-intensive firms utilizing networks to aggregate resources to produce movies.[283]

Within this fragmented model of film production, copyright played and continues to play an important role in promoting upstream market entry. The classical studio system featured vertically integrated organizations that directly employed writers, directors, and actors or bound them to long-term contracts.[284] With the shift to spot production, studios became "hubs" that assembled a diverse cohort of creative talent for each movie.[285] In the contemporary model, studios or producers turn to the market to find creative professionals, and copyright facilitates market entry for many of these professionals.[286] For instance, authors

275. Neal Gabler, Opinion, *Revenge of the Studio System*, N.Y. TIMES (Aug. 22, 1995), https://www.nytimes.com/1995/08/22/opinion/revenge-of-the-studio-system.html [https://perma.cc/32GV-4VJM].

276. Schatz, *supra* note 268, at 16.

277. CAVES, *supra* note 268, at 93–94.

278. Schatz, *supra* note 268, at 16.

279. CAVES, *supra* note 268, at 92.

280. Schatz, *supra* note 268, at 16; *see also* HESMONDHALGH, *supra* note 269, at 151.

281. Lampel & Shamsie, *supra* note 269, at 2196–98.

282. DAVID COOK, A HISTORY OF NARRATIVE FILM 534 (1990).

283. Lampel & Shamsie, *supra* note 269, at 2190.

284. *See id.* at 2196.

285. *Id.* at 2197.

286. *See* U.S. COPYRIGHT OFFICE, COMPENDIUM OF U.S. COPYRIGHT OFFICE PRACTICE § 808.4 (3d ed. 2014) (rev. Sept. 29, 2017) (describing numerous elements of motion picture authorship).

wielding copyrights sell film rights (based on the exclusive right to prepare derivative works) to producers,[287] who then leverage this copyrighted asset to obtain financing and production deals with studios.[288] Screenwriters write scripts with no formal agreement ("on spec") and seek to sell them to producers;[289] in so doing, they rely on copyright to prevent uncompensated appropriation by prospective purchasers. Similarly, composers and lyricists contributing to a soundtrack album rely on copyright to obtain public performance royalties,[290] thus heightening their incentive to contribute to film production. Composers and lyricists of preexisting musical works (and their publishers) receive even higher compensation for their copyrighted works,[291] thus encouraging their market entry. The entry-promoting function of copyrights is less significant for composers and screenwriters hired ex ante to produce content for a film relative to those leveraging copyrights on existing content to be incorporated into a film.[292] Even for the former, though, copyright can heighten incentives. Creative individuals exchange copyrights not only for immediate compensation but also for "residuals" based on repeated uses of a work, which can be substantial.[293] In short, copyright facilitated and continues to facilitate market entry by a wide array of creative professionals contributing to upstream film production.

Copyright not only encourages entry by creative professionals, it also resolves potential coordination problems with team production of movies.[294] For an assemblage of contracting parties to produce a film effectively, control must be centralized in one or a few decisionmakers.[295] Copyright facilitates market entry by creative professionals, but negotiating the full panoply of copyright rights—including rights of reproduction, distribution, derivative work production, and public performance and display—with each contributor would entail prohibitively high transaction costs and create opportunities for strategic holdup.[296] To overcome coordination

287. Kernochan, *supra* note 272, at 412–13; *see id.* at 427 (detailing a large number of rights that authors typically convey when a producer options or purchases a book for production into a movie).

288. *Id.* at 392.

289. *Id.* at 403.

290. *Id.* at 410.

291. *Id.* at 411.

292. My thanks to Jennifer Rothman for this observation.

293. Kernochan, *supra* note 272, at 440–41.

294. *See* Dan L. Burk, *Intellectual Property and the Firm*, 71 U. CHI. L. REV. 3, 13 (2004) (explaining the applicability of the work made for hire doctrine to motion picture production).

295. Kernochan, *supra* note 272, at 383.

296. Burk, *supra* note 294, at 13.

problems, producers and studios typically employ contracts invoking copyright law provisions "stipulating that all creative contributions to a film are 'works for hire.' "[297] This designation renders either the producer or studio both the owner of the creative contributions and their legal author. Even directors are typically characterized as "workers for hire," while the producer or studio assumes the legal status of author.[298] Additionally, the high bar to be considered a coauthor of a joint work also prevents multiple ownership claims on motion pictures by creative contributors.[299] Centralizing authorship (and associated rights) in a single author allows for the most efficient production of a motion picture, which utilizes numerous independently copyrightable contributions.[300] Copyright thus encourages entry by a wide range of upstream creative professionals by both granting them rights with which to transact in the marketplace and aggregating those rights to facilitate centralized coordination.

While the film industry features broad entry by upstream creative professionals, numerous factors have driven significant consolidation in the downstream commercialization of motion pictures. The first wave of "conglomeration" proceeded in the 1960s and 1970s, when large, diversified conglomerates bought film production studios and libraries of old films.[301] Furthermore, while vertically disintegrated spot production has continued, the 1970s saw a shift in the prevailing business models in the film industry. During that period, the success of movies like *Jaws* heralded the New Hollywood era, which embraced big-budget, widely advertised blockbusters.[302] Studios sought to leverage blockbusters such as *Star Wars* and *Indiana Jones* into broad licensing and merchandizing deals spanning video games, theme park rides, and other tie-ins.[303] The film and television industry continued to evolve and consolidate in the 1980s by embracing "synergy" or "tight diversification."[304] The Reagan administration's media deregulation policies relaxed both ownership restrictions and antitrust

297. Kernochan, *supra* note 272, at 384.

298. *Id.* at 416; *see, e.g.*, Aalmuhammed v. Lee, 202 F.3d 1227, 1235 (9th Cir. 2000) (noting that Warner Bros. was the legal author of the film *Malcolm X* and that director Spike Lee was a worker for hire).

299. *See Aalmuhammed*, 202 F.3d at 1230–36.

300. As Justin Hughes argues, actors are also authors under U.S. copyright law and make copyrightable contributions to films and other audiovisual works. Justin Hughes, *Actors as Authors in American Copyright Law*, 51 CONN. L. REV. 1, 3 (2019).

301. HESMONDHALGH, *supra* note 269, at 60.

302. ARTHUR DE VANY, HOLLYWOOD ECONOMICS: HOW EXTREME UNCERTAINTY SHAPES THE FILM INDUSTRY 122 (2004).

303. Schatz, *supra* note 268, at 20–21.

304. *Id.* at 22.

enforcement,[305] thus creating an environment conducive to consolidation. While upstream film production remained vertically disintegrated, studios embraced vertical integration in downstream distribution and exhibition by acquiring multiple pipelines to deliver content, including satellite, cable, broadcast, and print.[306] Throughout the 1990s, the eight members of the Motion Picture Association of America (Disney, Columbia, Paramount, MGM/UA, Universal, Orion, Warner Bros., and 20th Century Fox), each of which coordinates movie production and distribution, together generated ninety-three percent of the domestic theatrical box office gross.[307]

By the 1990s, "synergy and tight diversification met the larger forces of globalization, digitization, and U.S. media deregulation."[308] New Hollywood flowed into Conglomerate Hollywood, which is dominated by a small number of global, integrated entertainment companies with holdings in movies, television, cable, music, publishing, and other content industries.[309] Paradoxically, Conglomerate Hollywood has even absorbed the "indie" film industry, with several large media companies acquiring formerly independent studios, as illustrated in Disney's acquisition of Miramax in 1993 and Turner Broadcasting's acquisition of New Line Cinema in 1994.[310] Starting in the mid-1990s, the film industry underwent an unprecedented wave of global mergers and acquisitions.[311] By the early 2000s, Conglomerate Hollywood was dominated by an oligopoly of six companies: News Corp., Sony, Time Warner, Viacom, Disney, and General Electric.[312] These conglomerates combined "movies, broadcast television, cable television, video, foreign video, foreign television, merchandise, theme parks, soundtrack albums, [and] books."[313] Commenting on this period, Tom Schatz observed, "The new rulers of Hollywood [are] . . . not the movie studios, but their parent companies, the media giants like Viacom (owner of Paramount Pictures), Sony (Columbia), Time Warner

305. *Id.*

306. *Id.* at 23; *see also* Jin, *supra* note 42, at 408 (observing that vertical integration has long been a hallmark of the film industry).

307. Talbott, *supra* note 268, at 10.

308. Schatz, *supra* note 268, at 25.

309. *Id.* at 27.

310. *Id.* at 29; *see also* James Lyons, *Book Review*, 56 SCREEN 282, 284 (2015) (reviewing ALISA PERREN, INDIE, INC.: MIRAMAX AND THE TRANSFORMATION OF HOLLYWOOD IN THE 1990S (2012), and YANNIS TZIOUMAKIS, HOLLYWOOD'S INDIES: CLASSICS DIVISIONS, SPECIALTY LABELS AND THE AMERICAN FILM MARKET (2012)) (discussing Tzioumakis' argument that the Miramax takeover marks the end of the "second wave of specialty divisions").

311. Jin, *supra* note 42, at 408.

312. Schatz, *supra* note 268, at 27.

313. Gabler, *supra* note 275.

(Warner Bros.), and News Corp (20th Century Fox)."[314] Disney's muscle is even more evident in its recently approved proposal to buy most of the assets of rival 21st Century Fox (including significant portions of 20th Century Fox, the major movie studio),[315] which would effectively shrink the Big Six to a Big Five. Interestingly, internet distributors have also pursued vertical integration, with Netflix, Hulu, and Amazon transitioning from distributing other studios' content to producing original content themselves.[316]

While myriad factors have contributed to downstream concentration in the financing, marketing, and distribution of movies, copyright has played a notable supporting role. Given significant uncertainty in the success of films,[317] large incumbents develop broad portfolios of copyrighted properties and rely on a few successes to subsidize many failures. This places smaller firms at a disadvantage in movie financing and production since they are "unable to spread risk across a repertoire."[318] While in this context copyright is not a proximate "cause" of concentration per se, exclusive rights are critical to a portfolio strategy that allows large firms to manage risk more effectively than small ones.

Studios amass large libraries of not only finished content but also copyrighted scripts and options on books that may never be produced into actual movies.[319] Exclusive rights on these creative prospects hinder attempts by potential new competitors to enter the field of film production. According to one observer, "[T]here are still vaults of enormous stacks of creative work in Hollywood (some undoubtedly of real value) to which the underlying authors or scriptwriters or other artistic participants can never make claim and of which they are not free to make any derivative use."[320] Writing in 1996,

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314. Schatz, *supra* note 268, at 14.

315. *See* Brooks Barnes, *Disney Makes $52.4 Billion Deal for 21st Century Fox in Big Bet on Streaming*, N.Y. TIMES (Dec. 14, 2017), https://www.nytimes.com/2017/12/14/business/dealbook/disney-fox-deal.html [https://perma.cc/KQ3K-THGV] ("[T]he Walt Disney Company . . . reached a deal to buy most of 21st Century Fox . . . in an all-stock transaction valued at roughly $52.4 billion."); Edmund Lee & Cecilia Kang, *Justice Dept. Approves Disney's Purchase of Fox Assets*, N.Y. TIMES (June 27, 2018), https://www.nytimes.com/2018/06/27/business/media/disney-fox-antitrust-comcast.html [https://perma.cc/C9JY-BY5A] ("The Department of Justice approved the Walt Disney Company's $71 billion bid for the entertainment assets of 21st Century Fox.").

316. *See* Andrew Dodson, *Analysis: Netflix Trails Hulu, Amazon, and Several Cable Networks in Quality of Original Shows*, STREAMING OBSERVER (Sept. 6, 2018), https://www.streamingobserver.com/best-original-shows [https://perma.cc/3LAK-MRJM] (discussing recent trends in original content production).

317. DE VANY, *supra* note 302, at 26, 71.

318. HESMONDHALGH, *supra* note 269, at 20.

319. Kernochan, *supra* note 272, at 430.

320. *Id.*

Neil Netanel observed that sectors featuring high levels of firm concentration, including multimedia conglomerates, were "absorbing a greater and greater share of the copyright marketplace."[321]

Copyright also contributes to concentration in the downstream distribution of content through traditional channels such as television and DVDs. Due to vertical integration, all major film studios are now part of broad conglomerates possessing multiple distribution outlets, such as DVDs, broadcast television, and cable television.[322] Distribution of libraries of copyrighted content creates significant revenue streams for major studios.[323] Additionally, huge copyright estates controlled by global entertainment conglomerates raise costs for potential new distributors. As Jonathan Barnett observed, "[S]ome of the most vigorous articulations of the too much property thesis are advanced with respect to the entertainment and other content-dependent industries, where there is a reasonable case that the most dominant firms have rich copyright estates that necessitate little recourse to outside sources for creative inputs."[324] As far back as the 1990s, Disney, which owns a significant back catalogue of films and recordings as well as television and other distribution networks, embraced the "nature of the new cultural industries; that combining ownership of content and distribution was the way forward."[325]

Potential new distributors are at a decided disadvantage when they lack films to distribute. Such new entrants would find it difficult to complete with, for example, Warner Bros., a Big Six studio that maintains a library of over 8,600 feature films.[326] Here, again, copyright plays an important supporting role in shoring up barriers to entry. Given the exclusivity inherent in copyright, vast libraries are inaccessible to new entrants without licensing fees. According to one observer, "In the highly industrialized countries like the United States, a relatively small number of giant private entities control imagery

321. Neil Weinstock Netanel, *Copyright and a Democratic Civil Society*, 106 YALE L.J. 283, 333 (1996).

322. Nicholas Rapp & Aric Jenkins, *Chart: These 6 Companies Control Much of U.S. Media*, FORTUNE (July 24, 2018), http://fortune.com/longform/media-company-ownership-consolidation [https://perma.cc/R9LV-NWBR].

323. *See, e.g.*, The Walt Disney Co., Annual Report (Form 10-K), at 36 (Sept. 29, 2018) (reporting revenues of $1.75 billion for home entertainment and $3.9 billion in television and subscription video on demand in the year ending September 2018).

324. Jonathan M. Barnett, *Property as Process: How Innovation Markets Select Innovation Regimes*, 119 YALE L.J. 384, 438 (2009).

325. HESMONDHALGH, *supra* note 269, at 143.

326. *Company Overview*, WARNER BROS., https://www.warnerbros.com/studio/about/company-overview (last visited April 2, 2019) [https://perma.cc/SCW3-CA8C].

through intellectual property laws."[327] The prospect of marrying distribution pipelines (such as cable and internet access) to copyrighted content helped motivate the recent Comcast-NBC Universal and AT&T-Time Warner mergers.[328] Such control has led commentators to question whether potential new distributors should have mandatory access to copyrighted works and whether exclusive rights create input or vertical foreclosure.[329]

Significantly, new entrants in digital distribution like Netflix, Hulu, and Amazon are the exception that proves the rule. While numerous factors, including copyright protection on existing libraries of content, have helped deter the entry of traditional film distributors, streaming services have made significant inroads. The need to license copyrighted content from major studios, however, has imposed significant operational and financial burdens on streaming services, particularly in light of plans by several studios to create their own proprietary streaming services and stop licensing to outside digital distributors.[330] Partly in response, Netflix and others have invested considerably in original programming, leading to a flourishing of new content.[331] But the copyright estates of the large studios still impose significant costs on these new entrants, which currently rely substantially on licensing content from the majors.[332]

Major studios have also lobbied to reform copyright law to shore up barriers to entry and their own market power. For instance, Disney aggressively lobbied for the Sonny Bono Copyright Term Extension Act

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327. Margaret Chon, *Postmodern "Progress": Reconsidering the Copyright and Patent Power*, 43 DEPAUL L. REV. 97, 99 (1993).

328. *See* Tim Arango & Brian Stelter, *Comcast Receives Approval for NBC Universal Merger*, N.Y. TIMES (Jan. 19, 2011), https://www.nytimes.com/2011/01/19/business/media/19comcast.html [https://perma.cc/65U9-SRJ2] ("The combination of Comcast's cable and Internet systems and NBC Universal's channels will create a media powerhouse."); Cecilia Kang et al., *AT&T Wins Approval for $85.4 Billion Time Warner Deal in Defeat for Justice Dept.*, N.Y. TIMES (June 12, 2018), https://www.nytimes.com/2018/06/12/business/dealbook/att-time-warner-ruling-antitrust-case.html [https://perma.cc/2S3C-YMXJ] ("The merger [between AT&T and Time Warner] would create a media and telecommunications powerhouse.").

329. Randal C. Picker, *Copyright as Entry Policy: The Case of Digital Distribution*, 47 ANTITRUST BULL. 423, 427–28 (2002).

330. *See* Sarah Witten, *Netflix Can Compete as Disney, Warner Bros., Enter the Streaming Space, But It Won't Be Cheap*, CNBC (Feb. 21, 2019, 7:00 AM), https://www.cnbc.com/2019/02/21/hurdles-netflix-faces-as-disney-warner-bros-enter-the-streaming-space.html [https://perma.cc/BCK2-T4U3] (noting plans by Disney, Warner Bros., and Comcast to remove their movies from Netflix and create their own streaming services).

331. *See, e.g.*, *id.*

332. *Cf.* Todd Spangler, *Netflix Licensed Content Generates 80% of U.S. Viewing, Study Finds*, VARIETY (Apr. 12, 2018, 7:20 AM), https://variety.com/2018/digital/news/netflix-licensed-content-majority-streaming-views-2017-study-1202751405 [https://perma.cc/8XZ7-5NJ4] (suggesting that notwithstanding significant investments in original programming, streaming services still rely substantially on licensing (copyrighted) content from major studios).

of 1998—dubbed the "Mickey Mouse Protection Act."[333] The Act extended the copyright term for an additional twenty years, thus postponing the time when key copyrighted content, including "Steamboat Willie" (more commonly known as Mickey Mouse[334]), would fall into the public domain.[335] According to Robert Merges, obtaining this copyright extension "was the Walt Disney Company's 'highest priority' in the 1998 legislative session of Congress."[336] Congress enacted the legislation, which later withstood a constitutional challenge,[337] thus providing "a major victory for long-standing copyright holders such as Walt Disney, AOL Time Warner and other major companies in the entertainment industry."[338] Among other effects, extending copyright protection for existing content enhanced barriers to entry for potential content distributors and increased the market power of incumbents.

Additionally, copyright undergirds the aggregation of creative content via mergers and acquisitions by the major players, which further drives industry consolidation. Disney has utilized this strategy to significant effect by acquiring Pixar, Lucasfilm, and Marvel—and their valuable copyrighted content, from *Toy Story* to *Star Wars* to *The Avengers*—thus becoming "Hollywood's runaway leader."[339] Similarly, Disney's recent acquisition of most of the assets of 21st Century Fox arose in part from a desire to obtain key copyrighted content from the latter's studio division, 20th Century Fox. In particular, Disney sought the rights to 20th Century Fox's *Avatar*, the highest grossing movie of

333. *See* Lawrence Lessig, *Copyright's First Amendment*, 48 UCLA L. REV. 1057, 1065 (2001) (arguing the Sonny Bono Act was "[t]he most recent of [a] pattern of ever-expanding copyright terms"); Richard A. Posner, *The Constitutionality of the Copyright Term Extension Act: Economics, Politics, Law, and Judicial Technique in* Eldred v. Ashcroft, 2003 SUP. CT. REV. 143, 145 (noting Disney's advocacy for the Act).

334. Posner, *supra* note 333, at 145.

335. Peter K. Yu, *The Escalating Copyright Wars*, 32 HOFSTRA L. REV. 907, 923–24 (2004).

336. Robert P. Merges, *One Hundred Years of Solicitude: Intellectual Property Law 1900-2000*, 88 CALIF. L. REV. 2187, 2236–37 (2000).

337. *See* Eldred v. Ashcroft, 537 U.S. 186, 222 (2003) (holding that the Act "remains inside the domain the Constitution assigns to the First Branch").

338. Parker H. Bagley & Renee H. Sekino, *Supreme Court Sides with Copyright Holders in* Eldred v. Ashcroft, 10 NO. 14 ANDREWS ENT. INDUSTRY LITIG. REP. 13, 13 (2003).

339. Barnes, *supra* note 315. Of course, multiple factors motivated such deals. For instance, in addition to seeking Pixar's stable of copyrighted content, Disney sought to acquire Pixar's unique technology and culture of innovation, particularly in light of Disney's own less-than-stellar animation offerings at the time of acquisition. *See* Paul R. La Monica, *Disney Buys Pixar*, CNN MONEY (Jan. 25, 2006), https://money.cnn.com/2006/01/24/news/companies/disney_pixar_deal [https://perma.cc/BJB9-ERYC]; Press Release, The Walt Disney Co., Disney To Acquire Pixar (Jan. 24, 2006), https://www.thewaltdisneycompany.com/disney-to-acquire-pixar [https://perma.cc/LH9Q-QGS6].

all time ($2.7 billion).[340] Additionally, Disney sought Fox's valuable *X-Men* franchise, which Fox obtained from Marvel before the latter company was purchased by Disney.[341] Copyright plays a crucial role in these mergers and acquisitions, for it confers the exclusive right to exploit not only these existing properties but also derivative works going forward.

While copyright encourages widespread participation by upstream creators, it and other factors play significant roles in facilitating concentration in the downstream commercialization of motion pictures.[342] According to the 2012 census, the top four firms in "motion picture and video production" accounted for 46.4 percent of all revenues.[343] Turning to "motion picture and video distribution," the top four firms accounted for 38.3 percent of total revenues.[344] In 2018, the Big Six studios—Buena Vista (Disney), Warner Bros., Universal, Sony/Columbia, 20th Century Fox, and Paramount—accounted for 83.7 percent of North American box office revenues.[345] Consolidation "remains the most basic impulse of the media business,"[346] as illustrated in AT&T's acquisition of Time Warner[347] and Disney's acquisition of various assets of 21st Century Fox,[348] both of which occurred in 2018.

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340. Ben Fritz, *Disney Deal for Fox Would End Era of the 'Big Six' Studios*, WALL ST. J. (Dec. 11, 2017, 6:26 PM), https://www.wsj.com/articles/disney-deal-for-fox-would-end-era-of-the-big-six-studios-1512907201 [https://perma.cc/D6V2-WXT8].

341. *Id.*

342. *See* Dan Sullivan & Yuening Jiang, *Media Convergence and the Impact of the Internet on the M&A Activity of Large Media Companies*, 7 J. MEDIA BUS. STUD. 21, 23 (2010) ("[T]echnological changes have led to blurring the boundaries between various media industries and also have promoted many companies to expand their footprint to other sectors previously regarded as irrelevant.").

343. *Establishment & Firm Size: Concentration by Largest Firms for the U.S.: 2012*, U.S. CENSUS, AM. FACTFINDER (Jan. 8, 2016), https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ6/0100000US/naics~512110 [https://perma.cc/K9D3-FJGK]. This category corresponds to NAICS industry code 512110. *Id.*

344. *See Establishment & Firm Size: Concentration by Largest Firms for the U.S.: 2012*, U.S. CENSUS, AM. FACTFINDER (Jan. 8, 2016), https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml [https://perma.cc/E2WM-BELR]. This category corresponds to NAICS industry code 512120. *Id.*

345. *See* sources cited *supra* note 12.

346. Michael Wolff, *Disney-Discovery? Fox-Viacom? Michael Wolff Predicts M&A Mania and a New Wave of Consolidation*, HOLLYWOOD REP. (Apr. 9, 2015, 7:00 AM), https://www.hollywoodreporter.com/news/disney-discovery-fox-viacom-michael-786744 [https://perma.cc/4MK9-3G28].

347. *See* Edmund Lee & Cecilia Kang, *AT&T Closes Acquisition of Time Warner*, N.Y. TIMES (June 14, 2018), https://www.nytimes.com/2018/06/14/business/media/att-time-warner-injunction.html [https://perma.cc/L696-MHEU] ("AT&T . . . completed its $85.4 billion acquisition of Time Warner.").

348. *See* Lee & Kang, *supra* note 315 (reporting the Department of Justice's approval of Disney's bid to acquire 21st Century Fox).

2. Music Recording

In a similar fashion, intellectual property rights have contributed to fragmentation and concentration at various times and points along the value chain in the music industry.[349] Copyrights were critical to the initial entry of industry actors and subsequent consolidation. Musical compositions—e.g., sheet music—have been expressly copyrightable in the United States since 1831.[350] In the late nineteenth century, prior to the widespread adoption of sound recording, "sheet music was the primary vehicle for disseminating popular music,"[351] and music publishers controlled the industry.[352] The late nineteenth and early twentieth centuries saw a wide diffusion of publishing houses.[353] However, these companies began to consolidate in the area of New York City known as "Tin Pan Alley."[354] Such consolidation "centralized control of an industry that had been spread throughout major cities across the United States" [355] and led to a highly successful, formulaic, and homogeneous style of popular music.[356] For a significant period, sheet music sales generated substantial revenues for music publishers.[357] Notably, music publishers utilized copyright law to enhance their market power. In 1897, in response to widespread public musical performances that offered no compensation to copyright owners, Congress enacted an exclusive right of public performance for musical compositions.[358] To better exploit this public performance right,

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349. *See* GEOFFREY P. HULL ET AL., THE MUSIC BUSINESS AND RECORDING INDUSTRY: DELIVERING MUSIC IN THE 21ST CENTURY 171–73 (3d ed. 2011) (differentiating periods of high concentration from those of high entry); *see also* Reebee Garofalo, *From Music Publishing to MP3: Music and Industry in the Twentieth Century*, 17 AM. MUSIC 318, 319 (1999) (noting several stages of structural evolution in the music industry).

350. Act of Feb. 3, 1831, ch. 16, 4 Stat. 436; *see* CRAIG JOYCE ET AL., COPYRIGHT LAW 168 n.3 (10th ed. 2016) ("Congress first expressly added musical compositions to the list of protected subject matter in 1831."); MARIA A. PALLANTE, COPYRIGHT AND THE MUSIC MARKETPLACE: A REPORT OF THE REGISTER OF COPYRIGHTS 16 (2015), https://www.copyright.gov/policy/musiclicensingstudy/copyright-and-the-music-marketplace.pdf [https://perma.cc/2YB7-XCBB] ("[I]n 1831, Congress amended the law to provide expressly that musical works were subject to federal copyright protection.").

351. Garofalo, *supra* note 349, at 319; *see also* PETER TSCHMUCK, CREATIVITY AND INNOVATION IN THE MUSIC INDUSTRY 10 (2d ed. 2012).

352. Garofalo, *supra* note 349, at 319; *see* TSCHMUCK, *supra* note 351, at 10 ("At the heart of the music industry during the last third of the nineteenth century were music publishers.").

353. *See* Garofalo, *supra* note 349, at 321–22 (noting that, before consolidation, the music "industry . . . had been spread throughout major cities across the United States").

354. *Id.* at 321.

355. *Id.* at 322.

356. *Id.*; *see also* TSCHMUCK, *supra* note 351, at 43.

357. PALLANTE, *supra* note 350, at 26.

358. Bernard Korman & I. Fred Koenigsberg, *Performing Rights in Music and Performing Rights Societies*, 33 J. COPYRIGHT SOC'Y U.S.A. 332, 336 (1986); *see* PALLANTE, *supra* note 350, at

music publishers formed the American Society of Composers, Authors, and Publishers ("ASCAP") in 1914 to coordinate the collection of royalties for public performances of their copyrighted musical compositions.[359] Additionally, to take advantage of the advent of recorded music, music publishers pushed through legislation to require "mechanical" royalties for the manufacture of records, cylinders, and piano rolls containing their copyrighted musical compositions.[360]

As the industry shifted from sheet music to recorded music, patents contributed to initial industry entry as well as subsequent cycles of consolidation and fragmentation. As with the film industry, technological advancements and patents were essential to the formation of the music industry. Thomas Edison unveiled his "talking machine" in 1877 and patented it in 1878,[361] thus ushering in the era of recorded sound.[362] As the primary asset of value in the industry shifted from sheet music to recorded music, record companies rose to prominence.[363] While exclusive rights encouraged Edison's company and other early competitors to enter the recorded music industry, patents soon threatened to stymie the industry's development.[364] This led several large players to pool their patents, thereby facilitating oligopolistic control of the industry and blocking entry.[365] Indeed, "[s]mall companies that tried to find their way into the business were flooded with patent lawsuits and soon disappeared from the market."[366] In the early twentieth century, large recording companies shored up their market dominance; in the 1910s, the two largest industry players, U.S. Victor and British Gramophone, divided the world into various regions to focus their operations.[367] Later, the expiration of the original talking-machine patents allowed new companies (introducing different musical genres) to enter the record industry,[368] thereby ushering in a new period of fragmentation.

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17 ("In 1897, Congress expanded the rights of music owners to include the exclusive right to publicly perform their works.").

359. Garofalo, *supra* note 349, at 322; *see also* TSCHMUCK, *supra* note 351, at 43–44. Notably, the dominance of copyright in the music industry helped to reinforce the tradition of European-notated music in favor of other musical forms based on rhythm or improvisation. Garofalo, *supra* note 349, at 323.

360. *Id.* at 322.

361. TSCHMUCK, *supra* note 351, at 11 & n.5.

362. Garofalo, *supra* note 349, at 323–24.

363. *Id.* at 319.

364. *Id.* at 325.

365. *Id.*

366. TSCHMUCK, *supra* note 351, at 7.

367. Garofalo, *supra* note 349, at 326.

368. *Id.* at 328.

In addition to promoting initial entry, intellectual property rights—particularly copyrights—have also promoted and continue to promote upstream entry by creative artists. The music industry value chain encompasses "upstream" functions such as songwriting and recording and "downstream" functions such as marketing and distribution of recorded music. Here it is useful to distinguish between two kinds of upstream creative functions, each with its own associated copyright: songwriters who compose musical composition and recording artists who record musical performances.[369] As noted earlier, the barriers to obtaining a copyright are very low given that copyright features a low threshold for protection, requires no application, and attaches simply upon fixing some expression in a tangible medium.[370] As such, copyright facilitates relatively low-cost entry to the music industry for both kinds of upstream creative talent.

First, copyright promotes the entry of songwriters, who typically assign a portion of their rights to music publishers in exchange for up-front payments and royalties.[371] Songwriters and publishers rely on performing rights organizations such as ASCAP and Broadcast Music Inc. ("BMI") to collect royalties for public performances of their copyrighted works.[372] Notably, government action against ASCAP and BMI in 1941 led to a more equitable method of revenue distribution that "turned performance royalties into a viable revenue stream for an expanded group of composers."[373] Furthermore, many performer-songwriters sought to "retain their copyrights and . . . establish their own publishing firms, instead of assigning the rights to their labels,"[374] thereby facilitating market entry of not only composers but also publishing firms. The lure of copyright incentives can be quite compelling; according to one observer, "[Buddy] Holly's [song]writing career was thus spurred by the Copyright Act's incentive structure and an attempt to make himself more marketable."[375] Shifting to the contemporary landscape, songwriters received at least $4.1 billion in public performance royalties from 2010 to 2014.[376] In a recent survey, while musicians earned only twelve percent of their revenues directly

369. Of course, the same artist could perform both of these functions, an in the case of singer-songwriters.

370. *See supra* notes 66–68 and accompanying text.

371. PALLANTE, *supra* note 350, at 19; Peter DiCola, *Money from Music: Survey Evidence on Musicians' Revenue and Lessons About Copyright Incentives*, 55 ARIZ. L. REV. 301, 306 (2013).

372. PALLANTE, *supra* note 350, at 20.

373. Shourin Sen, *The Denial of a General Performance Right in Sound Recordings: A Policy That Facilitates Our Democratic Civil Society*, 21 HARV. J.L. & TECH. 233, 244–45 (2007).

374. *Id.* at 249.

375. *Id.* at 252.

376. Hughes & Merges, *supra* note 69, at 532–33.

from copyrights, composers in the top income bracket generated sixty-eight percent of their revenue directly from copyrights.[377] In addition to public performance royalties, songwriters (and publishers) also receive mechanical royalties (based on reproduction of musical works in phonorecords and other physical formats) and synchronization royalties (for use of musical works in commercials, video games, and other "timed" formats).[378]

Second, copyright also promotes the entry of recording artists. The shift from sheet music to recorded music culminating in the 1940s and 1950s enhanced incentives for singers and musicians who recorded their performances.[379] For example, performer-songwriters no longer had to sell musical compositions to publishers to get paid; they could earn "a considerable revenue stream" by simply recording songs they composed.[380] Recording artists typically transfer their sound recording copyrights to labels and receive compensation from record company contracts.[381] In so doing, they receive a share of revenues from sales of physical and digital singles and albums, sound recording synchronization royalties, and digital performance royalties.[382] Ultimately, copyright finances entry and facilitates dissemination for upstream musical artists, even if they lack significant resources.[383]

Of course, it is important not to overstate the copyright incentives provided to composers and recording artists. This Article argues not that copyright drives the professional choices of these individuals but that it can provide a marginal incentive to encourage entry into the music industry. As numerous scholars have noted, copyright has not fully benefited many artists whose works do not fall neatly within the strictures of copyright doctrine.[384] Additionally, for those working within the copyright system, developments such as reduced royalties from the shift to streaming platforms like Spotify mean that "many deeply talented songwriters and developing artists now question whether a career in music is realistic under the current

377. DiCola, *supra* note 371, at 304–05.

378. PALLANTE, *supra* note 350, at 69.

379. Sen, *supra* note 373, at 248.

380. *Id.*

381. PALLANTE, *supra* note 350, at 21; DiCola, *supra* note 371, at 306.

382. PALLANTE, *supra* note 350, at 69–70.

383. Van Houweling, *supra* note 14, at 1540.

384. *See, e.g.*, Sen, *supra* note 373, at 234 (observing that copyright does not grant an exclusive right of public performance to transformative contributions such as John Coltrane's original rendition of "My Favorite Things"); *id.* at 254–55 ("[M]usicians who are brilliant songwriters, but not musically literate, are largely barred from this profession."); *see also* K.J. Greene, *"Copynorms," Black Cultural Production, and the Debate over African-American Reparations*, 25 CARDOZO ARTS & ENT. L.J. 1179, 1200 (2008) (noting how the idea-expression dichotomy excludes styles of performance pioneered by African American musicians from copyright protection).

regime."[385] Additionally, composers and musicians often assign away copyrights (and related royalty streams) in one-sided deals with music companies.[386] Based on surveys of working musicians, Peter DiCola concludes that "[r]ather than providing marginal incentives to create for all musicians at all times, copyright law mostly affects the revenue of the highest-income musicians in a direct fashion."[387] Although copyright continues to encourage entry by composers and recording artists, it is important to place that incentive in context. It is also relevant to note that creators of intellectual property assets typically value them substantially higher than potential purchasers of those assets;[388] the perception of high value in a copyrighted work may motivate greater entry into the music industry than the actual value of the work would ordinarily justify.

While copyright has contributed to upstream entry, a broad set of factors has driven concentration in the downstream marketing and distribution of music. After the emergence of commercial radio broadcasting in 1920, record sales plummeted.[389] Record companies responded through consolidation, as when British Gramophone merged with the Columbia Graphophone Company to form Electric and Musical Industries ("EMI").[390] Furthermore, radio broadcasters absorbed recording companies, such as when RCA merged with Victor and CBS bought Columbia Records.[391] In the 1940s, the emergence of cheaper, more durable records and contraction in the repertoire offered by major companies spurred the formation of hundreds of small, independent labels.[392] The rise of television as the dominant national entertainment medium hampered network radio broadcasters, but small, local radio stations survived.[393] Unlike network radio broadcasters that aired live musical performances, local stations relied on playing records, thus

385. PALLANTE, *supra* note 350. According to industry insiders, the number of full-time songwriters in Nashville has decreased by eighty percent since 2001. *Id.* at 78.

386. *See* Sen, *supra* note 373, at 241–42 (discussing the reasons why formal copyright filings can be misleading); *see also* Olufunmilayo B. Arewa, *Blues Lives: Promise and Perils of Musical Copyright*, 27 CARDOZO ARTS & ENT. L.J. 573, 603 (2010) (noting that many blues musicians were bound by exploitative "race" recording contracts).

387. DiCola, *supra* note 371, at 343.

388. *See* Christopher Buccafusco & Christopher Sprigman, *Valuing Intellectual Property: An Experiment*, 96 CORNELL L. REV. 1, 5 (2010) (reporting results of an experimental study showing that creators of intellectual property "valu[e] their work more than twice as highly as potential buyers do").

389. TSCHMUCK, *supra* note 351, at 54; Garofalo, *supra* note 349, at 328.

390. Garofalo, *supra* note 349, at 329.

391. *Id.* Around this time, the Great Depression drove consolidation in the European music industry. TSCHMUCK, *supra* note 351, at 72.

392. Garofalo, *supra* note 349, at 335.

393. *Id.* at 335–36.

solidifying partnerships with record companies.[394] The willingness of local stations to experiment with new music and the emergence of independent labels set the stage for the explosion of rock 'n' roll.[395] While the proliferation of "indie" labels initially fragmented the industry,[396] the music industry soon experienced "merger mania." In one high-profile merger, Warner-Reprise, Elektra-Asylum, and Atlantic combined to form Warner Communications.[397] CBS vertically integrated to combine all stages of production and distribution, spanning recording, artistic development, marketing, and retail sales, and EMI acquired a similar group of holdings.[398]

According to one observer, "[T]he development of the music industry from the mid-1960s to the early 1970s was characterized by a growing market and a simultaneous market concentration."[399] By the late 1970s, five international firms accounted for more than seventy percent of global recorded music sales.[400] Starting in the 1980s, multinational entertainment companies came to dominate the music industry, driving global consolidation.[401] The runaway success of Michael Jackson's *Thriller* in the 1980s helped transition the big labels to a strategy of reaping "greater rewards from fewer artists."[402] Additionally, the industry experienced a CD "boom" from 1984 to 2000.[403] Music companies began leveraging music into a variety of revenue streams spanning record sales, advertising, movie tie-ins, and internet streaming.[404] Another wave of merger mania started in the 1980s,[405] including the acquisitions of large music companies by even larger multinational companies.[406] For instance, in 1998, various combinations culminated in the creation of Universal Music Group,

394. *Id.* at 336.

395. *Id.* at 337

396. TSCHMUCK, *supra* note 351, at 104.

397. Garofalo, *supra* note 349, at 337.

398. *Id.* at 338.

399. TSCHMUCK, *supra* note 351, at 133.

400. Garofalo, *supra* note 349, at 339.

401. *See id.* at 342 ("Like all capitalist enterprises, the transnational music industry tends toward expansion and concentration."). For a history of the contemporary popular music industry, see STEVE KNOPPER, APPETITE FOR SELF-DESTRUCTION: THE SPECTACULAR CRASH OF THE RECORD INDUSTRY IN THE DIGITAL AGE (2009).

402. Garofalo, *supra* note 349, at 343; *see also* KNOPPER, *supra* note 401, at 10 (discussing the transformative impact of Michael Jackson's *Thriller).*

403. KNOPPER, *supra* note 401, at 43.

404. Patrick Burkart, *Loose Integration in the Popular Music Industry*, 28 POPULAR MUSIC & SOC'Y 489, 492 (2005); Garofalo, *supra* note 349, at 343–44.

405. Garofalo, *supra* note 349, at 346.

406. *Id.*; *see* KNOPPER, *supra* note 401, at 47 (discussing Bertelsmann's 1986 purchase of RCA records from General Electric).

which controlled MCA, Universal, Geffen, A&M, Motown, Island, Mercury, London, and Interscope.[407]

More recently, several factors[408]—including widespread copyright infringement—have driven further consolidation in the music industry. Since Napster's introduction in 1999, annual U.S. music spending, adjusted for inflation, has decreased by two-thirds.[409] Napster and subsequent file-sharing websites, such as Limewire, Kazaa, and Grokster, facilitated widespread piracy and continued to depress revenues.[410] From a peak in 2000, when the major labels sold more than 785 million albums, revenues decreased significantly due to internet piracy and the shift from high-profit CDs to low-profit digital singles.[411] From 2002 to 2007, the total music market decreased forty percent.[412] Revenue pressure has motivated consolidation, and following 2004's merger between Sony and BMG, a "Big Four" (Universal, Sony-BMG, EMI, and Warner Music) dominated the industry. Additionally, copyright infringement contributed to the most significant recent consolidating event in the music industry: EMI's absorption by two competitors. Due partly to EMI's decreasing revenues from piracy, in 2011, Universal Music Group announced that it would buy EMI's recorded music arm, and Sony/ATV pledged to buy EMI's music publishing business.[413]

Additionally, record companies have consolidated to leverage larger copyright estates against downstream distributors like iTunes and Spotify. The introduction of Apple's iPod in 2001 and iTunes in 2003 ushered in a drastic change to the music business model based on internet distribution.[414] While record companies briefly experimented

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407. Garofalo, *supra* note 349, at 348.

408. Competitive pressures from other media, particularly video games and DVDs, and decreasing consumer spending helped motivate another wave of consolidation in the late 1990s and early 2000s. Burkart, *supra* note 404, at 491.

409. DANA SCHERER, CONG. RESEARCH SERV., R43984, MONEY FOR SOMETHING: MUSIC LICENSING IN THE 21ST CENTURY 2 (2016).

410. Joshua R. Wueller, *Mergers of Majors: Applying the Failing Firm Doctrine in the Recorded Music Industry*, 7 BROOK. J. CORP. FIN. & COM. L. 589, 596 (2013).

411. Steve Knopper, *How the Universal-EMI Deal Will Change the Music Industry*, ROLLING STONE (Nov. 23, 2011), https://www.rollingstone.com/music/music-news/how-the-universal-emi-deal-will-change-the-music-industry-90781 [https://perma.cc/Q4LE-7CH7].

412. BRIAN SOUTHALL, THE RISE & FALL OF EMI RECORDS 193 (2009).

413. *See* Andrew Edgecliffe-Johnson, *EMI To Be Split Between Universal and Sony*, FIN. TIMES (Nov. 11, 2011), https://www.ft.com/content/f5721134-0c86-11e1-88c6-00144feabdc0 [https://perma.cc/GK8B-JYYZ] (detailing the finalized bid for EMI's publishing business); Knopper, *supra* note 411 (noting that the EMI-Universal merger would leave only three major music labels); Wueller, *supra* note 410, at 597–604 (discussing the various stages of the EMI-Universal merger).

414. *See* KNOPPER, *supra* note 401, at 178.

with their own proprietary music portals, they were not successful,[415] and they essentially outsourced digital music distribution to the likes of iTunes,[416] Amazon,[417] and Spotify. Such digital distributors have amassed significant leverage,[418] thus weakening the major labels[419] and effectuating a "dramatic shift in power from content owners to distributors."[420] In response, the major labels have leveraged their most important asset: their libraries of copyrighted songs and associated market power. The rise of digital distribution has helped fuel consolidation among the majors, which seek greater negotiating power with distributors like iTunes.[421] Tellingly, industry actors cited the need to enhance leverage with Apple as one of the motivations behind EMI's 2011 acquisition by Universal and Sony/ATV.[422]

In other ways, as well, copyright law has helped solidify the market power of music industry incumbents and block entry.[423] As noted, in 1998, Congress enacted the Sonny Bono Copyright Term Extension Act, which extended copyright terms.[424] While Disney and other movie studios lobbied for the Act,[425] it also received support from the descendants of Tin Pan Alley composers, who stood to lose considerable revenues upon expiration of their parents' and grandparents' copyrights.[426] Additionally, copyright law has explicitly erected barriers to entry to one kind of music distribution: online

415. Olufunmilayo B. Arewa, *YouTube, UGC, and Digital Music: Competing Business and Cultural Models in the Internet Age*, 104 NW. U. L. REV. 431, 449–50 (2010).

416. Burkart, *supra* note 404, at 496.

417. *See* Jonathan M. Barnett, *Copyright Without Creators*, 9 REV. L. & ECON. 389, 392 (2013); Ryan Hibbert, *What Is Indie Rock?*, 28 POPULAR MUSIC & SOC'Y 55, 75 (2005).

418. *See* Holly Kruse, *Local Identity and Independent Music Scenes, Online and Off*, 33 POPULAR MUSIC & SOC'Y 625, 635 (2010) (noting "many music listeners may be turning to gatekeepers, like iTunes's, Amazon's, or other online commercial behemoths'" suggestions for what music to buy based on their past purchases).

419. *See* Wueller, *supra* note 410, at 589 ("[N]early every aspect of the music industry has transitioned to the digital realm, which has largely eliminated artists' reliance on the tangible . . . capabilities of [major record companies].").

420. Rob Budden, *Media: Dealing with Digital Darwinism*, FIN. TIMES (Dec. 3, 2012), https://www.ft.com/content/295de284-1e01-11e2-8e1d-00144feabdc0 [https://perma.cc/KHQ8-SGE5].

421. Press Release, Moody's Investors Service, Music Industry Consolidation Should Help Major Labels Grow Their Digital Revenue (May 21, 2013), https://www.moodys.com/research/Moodys-Music-industry-consolidation-should-help-major-labels-grow-their—PR_273725 [https://perma.cc/5D87-GWKR].

422. Budden, *supra* note 420.

423. It is also important to acknowledge areas where copyright has promoted entry by new distributors. For example, copyright law maintains a statutory mandatory licensing scheme that allows cable television providers access to copyrighted television content. 17 U.S.C. § 111(c) (2012).

424. Pub. L. 105-298, § 102, 112 Stat. 2827, 2827 (1998).

425. *See supra* notes 333–336 and accompanying text.

426. Posner, *supra* note 111, at 145.

radio.[427] While copyrighted musical compositions have long been subject to a general exclusive right of public performance, copyrighted sound recordings are not.[428] Therefore, when a radio station plays a song, the composer receives a royalty, but the recording artist does not. The emergence of online radio threatened traditional radio broadcasters, which lobbied Congress to reform copyright law to impede the entry of online competitors. Their efforts resulted in the Digital Performance Right in Sound Recording Act of 1995 ("DPRA"), which establishes an exclusive right of public performance for digital transmission of sound recordings.[429] In effect, this severely burdens prospective online radio providers by creating an additional public performance royalty they have to pay. According to Randal Picker, "[T]he DPRA looks like an unholy alliance between music creators and analog broadcasters to limit competition from digital broadcasters by creating substantial entry barriers for them, all with the corresponding consequence of insulating record-company market power."[430] Ultimately "[a]nalog radio stations are protected from digital entrants, reducing entry in radio and diversity."[431] In this fashion, legislative reforms have helped copyright block entry and promote concentration in downstream music distribution.

While copyright helps promote initial and upstream entry, it has also played a role in industry trends toward subsequent and downstream concentration. Upon EMI's acquisition in 2011, Universal's market share expanded from approximately twenty-seven percent of worldwide music sales to thirty-six percent, compared to Sony's twenty-three percent and Warner's fifteen percent,[432] and these "Big Three" accounted for eighty-eight percent of revenues in the U.S. music industry.[433] According to the 2012 census, the top four firms in "integrated record production/distribution" accounted for 86.6 percent of all revenues,[434] which reflects a high degree of concentration. Turning

427. *See* Picker, *supra* note 329, at 424 (noting that adopted policies "favor over-the-air radio").

428. *See id.* at 459 (citing RCA Mfg. Co. v. Whiteman, 114 F.2d 86 (2d Cir. 1940)); *see also* PALLANTE, *supra* note 350, at 18 (defining the distinction between musical works and sound recordings).

429. Pub. L. No. 104-39, 109 Stat. 336 (1995).

430. Picker, *supra* note 329, at 458–59.

431. *Id.* at 461; *see also* PALLANTE, *supra* note 350, at 88 ("[C]opyright owners and digital streaming services together urge that current law gives terrestrial radio unwarranted competitive advantage over new, innovative entrants.").

432. Knopper, *supra* note 411.

433. Ed Christman, *Universal Music Still Top Dog in 2012*, BILLBOARDBIZ (Jan. 3, 2013), http://www.billboard.com/biz/articles/news/1510504/universal-music-still-market-top-dog-in-2012 [https://perma.cc/K32R-8XV5].

434. *Establishment & Firm Size: Concentration by Largest Firms for the U.S.: 2012* , U.S. CENSUS, AM. FACTFINDER (Jan. 8, 2016), https://factfinder.census.gov/faces/tableservices/jsf/pages/

to music publishing, the three major players—Sony ATV Music Publishing, Warner/Chappell Music, and Universal Music Publishing Group—control sixty percent of the market.[435] The downstream music industry appears to be significantly concentrated.

3. Book Publishing

As with other IP-intensive industries, copyright has contributed to both initial and upstream entry as well as subsequent and downstream consolidation in the publishing industry. Consistent with other creative industries, the publishing industry features a value chain spanning upstream creators (such as authors who write new books) and downstream development, marketing, and distribution. Regarding upstream entry, copyright provides incentives for authors to generate new expressive works and enter the publishing market.[436] Based on a classic economic conception of copyright, exclusive rights ensure that "authors find it intellectually and financially profitable to write."[437] William Landes and Richard Posner, in their influential account of copyright, also make the straightforward assertion that copyright "provid[es] incentives to create the work in the first place."[438] Of course, it remains the case that authors derive many nonpecuniary benefits from writing that also encourage creation, such as expressive satisfaction and prestige.[439] As in other areas, the argument of this Article is not that copyright provides the exclusive incentive to enter a market but that it provides an important marginal incentive to do so. While some individuals would still produce books in the absence of copyright, exclusive rights further stimulate such upstream creation.[440]

In similar fashion, copyright is also essential to the initial formation and entry of publishing firms. Copyright provides an incentive not only for authors to write but also for publishers to

productview.xhtml [https://perma.cc/4BUA-8BVB]. This category corresponds to NAICS industry code 512220. *Id.*

435. PALLANTE, *supra* note 350, at 19.

436. Barry W. Tyerman, *The Economic Rationale for Copyright Protection for Published Books: A Reply to Professor Breyer*, 21 COPYRIGHT L. SYMP. 1, 2 (1971).

437. *Id.* at 4.

438. William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 326 (1989).

439. *See id.* at 331 (noting benefits such as self-promotion, the reinforcement of prestige, and recognition).

440. It bears noting, however, that the absence of exclusive rights may actually increase expressive creation where those creations draw from other texts (which otherwise would be copyrighted). *Id.* at 332.

publish.[441] Historically, publishers led the fight for laws establishing exclusive rights on expressive works.[442] Early copyright statutes in Venice and France granted exclusive rights to printers, not authors.[443] In modern times, copyright facilitates entry by publishers by enabling a vertically disintegrated value chain in which publishers provide high-level editing and intellectual property management without having to own costly presses and actually print books.[444]

Interestingly, copyright—or the perception of copyright—played an important role in the early success of Random House, a venerable publishing firm that subsequently evolved into industry powerhouse Penguin Random House. Random House was founded in 1925, and while it initially reprinted classic works of literature, it soon broadened its publishing activities.[445] In the 1930s, Random House achieved international notoriety for successfully defending the U.S. publication of James Joyce's *Ulysses* in court.[446] *Ulysses* was critical to Random House's early success,[447] but the U.S. copyright status of this English-language foreign text was unclear at the time.[448] Bennet Cerf, the head of Random House, clearly recognized the importance of exclusive rights. In the wake of widespread piracy of prior publications of *Ulysses*, Cerf emphasized "the importance of having as much copyrighted material in our edition as is humanly possible, in order to combat possible pirated editions which will undoubtedly come along to vex us all."[449] Upon first publication, Cerf deposited two copies with the Register of Copyrights and submitted an affidavit of U.S. manufacture, and a claim of copyright was registered for the Random House edition of *Ulysses*.[450] Although technically lacking copyright protection because of

441. Tyerman, *supra* note 436, at 2; *see also* Landes & Posner, *supra* 438, at 328 (noting that in the absence of copyright, "the author and publisher will not be able to recover their costs of creating the work").

442. Stephen Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 HARV. L. REV. 281, 292 (1970).

443. *Id.*

444. *Cf.* Barnett, *supra* note 32. My thanks to Justin Hughes for this observation.

445. *About Us*, PENGUIN RANDOM HOUSE, http://www.penguinrandomhouse.biz/about/history (last visited April 2, 2019) [https://perma.cc/FBW3-WWJX].

446. *Id.*

447. ROBERT L. BERNSTEIN, SPEAKING FREELY: MY LIFE IN PUBLISHING AND HUMAN RIGHTS 52–53 (2016).

448. *See* Robert Spoo, Note, *Copyright Protectionism and Its Discontents: The Case of James Joyce's* Ulysses *in America*, 108 YALE L.J. 633, 656 (1998) (highlighting potential challenges to the copyright status of *Ulysses*, indicating a legal case could be made that the work exists in the public domain).

449. Letter from Bennett Cerf to Paul Leon (Oct. 20, 1933), *in* THE UNITED STATES OF AMERICA V. ONE BOOK ENTITLED "ULYSSES" BY JAMES JOYCE: DOCUMENTS AND COMMENTARY — A 50-YEAR RETROSPECTIVE 278–79 (Michael Moscato & Leslie LeBlanc eds., 1984).

450. Spoo, *supra* note 448, at 654.

noncompliance with certain formalities,[451] Random House's U.S. edition of *Ulysses* enjoyed a "courtesy copyright" based on fear of litigation, industry norms, and appeal to public morals.[452] This exclusivity was crucial to the early success of an important new entrant in the publishing industry.

While copyright promotes upstream entry by authors and initial entry by publishing firms, it has also played a role in subsequent, downstream consolidation. Of course, copyright is just one of many forces that have shaped the book publishing industry, which is highly complex and dynamic. The industry is comprised of several segments, and this Section focuses on "trade books," which are books intended for a general audience.[453] This segment includes works of both fiction (e.g., romance, thrillers, and children's books) and nonfiction (e.g., history and cookbooks) and is distinguished from other segments such as academic, professional, technical, and reference books.[454] Through a long history of mergers and acquisitions, trade book publishing is now dominated by a Big Five: Penguin Random House, HarperCollins, Simon & Schuster, Hachette, and Macmillan.

Mergers and acquisitions dominate the history of book publishing.[455] HarperCollins draws its origins from the 1817 founding of J. and J. Harper, which eventually became Harper & Brothers and then Harper & Row.[456] Hachette's American roots begin with the founding of Little, Brown and Company in 1837.[457] Following the Civil War, a generalized expansion in publishing led to glutted markets and a series of mergers.[458] Established in the 1920s, Penguin, a leading British publishing house, came to acquire multiple imprints from formerly independent publishers, such as Viking, Putnam, and

451. *Id.* at 636.

452. *See id.* at 656–59 (discussing the history of "courtesy copyrights" and its application to *Ulysses*).

453. Valerie Peterson, *What are Trade Books in Publishing?*, BALANCE CAREERS (Feb. 23, 2017), https://www.thebalance.com/what-is-trade-publishing-2800076 [https://perma.cc/A83S-BMWQ]; *see also* Breyer, *supra* note 442, at 293 ("*Tradebooks* include the novels and popular nonfiction that ordinarily spring to mind when copyright is discussed.").

454. Peterson, *supra* note 453.

455. For an overview of the early history of publishing in the United States, see Elizabeth Long, *The Cultural Meaning of Concentration in Publishing*, 1 BOOK RES. Q. 3, 6 (1985) ("[H]istorically informed discussions of the industry reveal that publishing has always been a commercial as well as literary endeavor . . . .").

456. Valerie Peterson, *The Big 5 Trade Book Publishers*, BALANCE CAREERS (Dec. 31, 2018), https://www.thebalancecareers.com/the-big-five-trade-book-publishers-2800047 [https://perma.cc/WG3X-PE2Q].

457. *Id.*

458. Long, *supra* note 455, at 6.

Dutton.[459] Simon and Schuster was founded in 1924, and it has been variously owned by Marshall Field, Gulf + Western, Viacom, and CBS Corporation.[460] By 1930, "a few large publishing companies had begun to dominate the market to a limited degree."[461] By 1950, one observer noted that "publication of books in this country is concentrated in a relatively few houses."[462]

In the 1960s, with the emergence of publishing as a "big business," mergers abounded. In short succession, Random House bought Alfred A. Knopf, Inc.; the Crowell-Collier Publishing Company acquired the Macmillan Company; and Henry Holt & Co., Rinehart & Co., and the John C. Winston Company merged.[463] In 1968, Time Warner acquired Little, Brown and Company, and this combination was eventually absorbed by Hachette Book Group.[464] Between 1965 and 1985, several independently owned mainstream trade publishers went public, merged with other publishers, or were acquired by large corporate conglomerates.[465] Consolidation continued in subsequent decades, and between November 1985 and November 1986 alone, there were fifty-seven major publishing acquisitions.[466] In 1987, News Corp. acquired Harper & Row, and in 1990, it acquired William Collins & Sons to form HarperCollins.[467] In the 2000s, Hachette, which is owned by a French media conglomerate, expanded rapidly into English-language books, buying Hodder Headline and Warner Books.[468] From the early 1960s, concentration in the book publishing industry increased so that by 2006, the six largest U.S. trade book publishers accounted for ninety percent of total sales.[469]

Toward the latter end of the twentieth century, consolidation among book publishers was in part a response to downstream

459. Peter Osnos, *A New Era for Books: The Random House-Penguin Merger Is Just the Start*, ATLANTIC (Nov. 8, 2012), https://www.theatlantic.com/business/archive/2012/11/a-new-era-for-books-the-random-house-penguin-merger-is-just-the-start/264604 [https://perma.cc/VTX4-X9JL].

460. Peterson, *supra* note 456.

461. Long, *supra* note 455, at 6.

462. CHARLES F. BOUND, A BANKER LOOKS AT BOOK PUBLISHING 8 (1950).

463. Philip Benjamin, *Publishers of Books Are Turning to Mergers*, N.Y. TIMES, July 31, 1960, at F1.

464. *Company History*, HACHETTE BOOK GROUP, https://www.hachettebookgroup.com/company-history (last visited Feb. 28, 2019) [https://perma.cc/E3LK-5YH8].

465. Long, *supra* note 455, at 4.

466. Robert E. Baensch, *Consolidation in Publishing and Allied Industries*, BOOK RES. Q., Winter 1988–89, at 7.

467. *Operating Companies: Harper Collins Publishers*, NEWS CORP, https://newscorp.com/business/harper-collins/ (last visited Feb. 28, 2019) [https://perma.cc/RA6E-HCUN].

468. Ben Hall, *Books: Consolidation Is the Big Story*, FIN. TIMES (Aug. 31, 2009), https://www.ft.com/content/79c84068-957c-11de-90e0-00144feabdc0 [https://perma.cc/2A6N-WYE8].

469. A. ARIS & J. BUGHIN, MANAGING MEDIA COMPANIES 84 tbl.5.1 (2009).

consolidation in book distribution. Historically, thousands of independent, local bookstores dominated book distribution, where they tailored their inventories to particular tastes.[470] However, even by the late 1940s, book distribution was relatively concentrated.[471] Over several decades, book distribution became increasingly consolidated in chains such as B. Dalton and Waldenbooks,[472] and by the late 1980s, the ten largest bookstore chains accounted for fifty-seven percent of total annual retail sales. Eventually, local and midsize bookstores were supplanted by national superstores like Barnes & Noble and Borders,[473] which eventually merged with and acquired each other.[474] Starting in the mid-1990s, Amazon created a new online supply chain and substantially discounted books,[475] thus gaining a tremendous competitive advantage. Consolidation among physical booksellers thus spurred a round of consolidation among publishers in the 1990s.[476]

The emergence of e-books has further motivated coordination and concentration among publishers, who seek to leverage their portfolios of copyrighted works to enhance bargaining power against downstream digital distributors, particularly Amazon. In 2007, Amazon introduced a sea change in book distribution by introducing the Kindle, which initiated the rise of e-books.[477] Amazon conscientiously undercut prevailing prices for physical books, thus building demand for e-books and relying on Kindle sales for profits.[478] By 2009, Amazon commanded a ninety percent market share in e-books and a similarly dominant position in e-book readers.[479] That same year, Arnaud Nourry, head of Hachette (then the number two publisher) called consolidation among publishers the best way to "stand up" to Amazon, Google, and other dominant retailers.[480] Notably, to counter the power of downstream

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470. Osnos, *supra* note 459.

471. Long, *supra* note 455, at 7. Unlike later eras, at this time department stores played a prominent role in book distribution. *Id.*

472. *Id.* at 4.

473. Osnos, *supra* note 459.

474. Baensch, *supra* note 466, at 10 (describing Barnes & Noble's 1987 acquisition of B. Dalton Booksellers).

475. Osnos, *supra* note 459.

476. Lina M. Khan, *Amazon's Antitrust Paradox*, 126 YALE L.J. 710, 766 (2017).

477. *Id.* at 757.

478. Waller & Sag, *supra* note 46, at 2238.

479. United States v. Apple Inc., 952 F. Supp. 2d 638, 649, 670 (S.D.N.Y. 2013), *aff'd*, 791 F.3d 290 (2d Cir. 2015).

480. Hall, *supra* note 468; *see* Jack Shafer, *Mergers Alone Won't Save Book Industry*, REUTERS (Oct. 26, 2012), http://blogs.reuters.com/jackshafer/2012/10/26/mergers-alone-wont-save-book-industry [https://perma.cc/VYY8-55WM]. Four of the Big Five (HarperCollins, Simon & Schuster, Hachette, and Macmillan) have struck distribution deals with Amazon since 2014. Jeffrey Trachtenberg, *Amazon, HarperCollins Reach Multiyear Publishing Deal*, WALL ST. J. (Apr. 13,

distributors, publishers have sought to leverage their most valuable asset: their portfolios of copyrighted works. In response to Amazon's price cuts on e-books, five major publishers, along with Apple, agreed to adopt a system where publishers would establish the retail price of e-books and provide Apple with a thirty percent commission for each e-book sold.[481] The Department of Justice ("DOJ") ultimately brought suit; the five publishers signed consent decrees barring them from restricting e-book retailers' ability to set prices, and Apple was found liable under Section 1 of the Sherman Act for unreasonably restraining trade.[482] In addition to colluding, publishers have also sought to increase their leverage against Amazon through mergers and acquisitions to amass even larger portfolios of copyrighted works.[483] In 2013, Penguin merged with Random House, producing a combined group that controls approximately twenty-five percent of the English-language publishing market.[484] Commentators observed that the merger provided the combination with "unmatched leverage against Amazon.com."[485] Furthermore, it may spur additional mergers.[486]

The present publishing landscape is comprised of a few conglomerates spanning numerous divisions, imprints, and publishing lines.[487] For instance, the new Penguin Random House conglomerate encompasses Anchor, Ballantine, Crown, Doubleday, Dutton, Knopf, Pantheon, G.P. Putnam's Sons, Viking, Jonathan Cape, Fawcett, Grosset & Dunlap, and Jeremy P. Tarcher.[488] Many of these formerly independent firms are now mere "imprints" at the large publishing house used to brand different lines of books. Thus, while copyright may

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2015, 8:44 PM), https://www.wsj.com/articles/amazon-harpercollins-reach-multiyear-publishing-deal-1428971720 [https://perma.cc/SNK2-RPLG].

481. Khan, *supra* note 476, at 758; Waller & Sag, *supra* note 46, at 2238–39.

482. *United States v. Apple*, 791 F.3d at 297.

483. Khan, *supra* note 476, at 766.

484. Budden, *supra* note 420; Jane Ciabattari, *Now There Are 5*, LIBR. J. (Sept. 3, 2013), https://www.libraryjournal.com/?detailStory=now-there-are-5 [https://perma.cc/6L3U-JCNA]; *see* Michael Kozlowski, *The Consolidation of the Publishing Industry Continues – News Corp Acquires Harlequin*, GOOD E-READER (May 2, 2014), https://goodereader.com/blog/e-book-news/the-consolidation-of-the-publishing-industry-continues-news-corp-acquires-harlequin [https://perma.cc/X59Z-GSB3].

485. Julie Bosman, *Penguin and Random House Merge, Saying Change Will Come Slowly*, N.Y. TIMES (July 1, 2013), http://www.nytimes.com/2013/07/02/business/media/merger-of-penguin-and-random-house-is-completed.html [https://perma.cc/ULE8-YY67].

486. *Id.* At the time, there was speculation that News Corp., which owns HarperCollins, would acquire Simon & Schuster, which was owned by CBS. Budden, *supra* note 420.

487. *See The Big Five US Trade Book Publishers*, ALMOSSAWI (June 20, 2016), https://almossawi.com/big-five-publishers [https://perma.cc/W49V-PEGP].

488. Boris Kachka, *Book Publishing's Big Gamble*, N.Y. TIMES (July 9, 2013), https://www.nytimes.com/2013/07/10/opinion/book-publishings-big-gamble.html [https://perma.cc/7RQU-FV3B]; Osnos, *supra* note 459.

have promoted the initial entry of publishing houses, subsequent mergers and acquisitions have led to significant consolidation. Following the Penguin-Random House merger, the remaining four publishers scrambled to increase in size. Commentators observe that the book publishing industry features considerable concentration, driven in substantial part by mergers and acquisitions.[489]

In addition to protecting and facilitating the transfer of assets that incumbents seek to amass in mergers and acquisitions, copyright also contributes to consolidation by erecting formidable barriers to entry against potential new publishers. As Stephen Breyer noted in an influential article,

> Copyright may also injure the public by allowing publishers selling different books to restrict competition within the industry. . . . [T]he power to accumulate these exclusive licenses to publish may . . . inhibit such competition. This power may, for example, allow a few publishers to build "stables" of popular writers. . . . If, as a result, new entry becomes difficult, well-established publishers may find that they have obtained the power to raise their prices and to resist authors' demand for higher royalties.[490]

Shifting away from trade books, Breyer's historical study suggests that the high profits in the college text publishing sector indicate a possible "entry barrier" problem.[491] Ultimately, copyright is one of several factors contributing to concentration in book publishing, where, in 2012, the four largest players accounted for 40.6 percent of all revenues.[492]

C. Caveats and Qualifications

Although varied in their unique characteristics, the six IP-intensive industries profiled here all exhibit a similar pattern in the effects of patents and copyrights on industry structure. It is of course important to emphasize the idiosyncratic nature of these disparate fields and the importance of both IP and non-IP factors in shaping

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489. There is significant consolidation in other forms of publishing as well, such as academic scientific publishing. *See* Vincent Lariviere et al., *The Oligopoly of Academic Publishers in the Digital Era*, PLOS ONE (June 25, 2015), https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0127502&type=printable [https://perma.cc/4AEU-9GWG]; Rishma Parpia, *Scientific Publishing Industry Has Become an Oligopoly*, VACCINE REACTION (Sept. 10, 2015), https://thevaccinereaction.org/2015/09/scientific-publishing-industry-has-become-an-oligopoly [https://perma.cc/WU7E-AKAF].

490. Breyer, *supra* note 442, at 318–19; *see* Tyerman, *supra* note 436, at 26 (observing that the absence of copyright would likely lead to greater market share by copiers, which would lead publishers to reduce initial print runs of books).

491. *Id.* at 319.

492. *Establishment & Firm Size: Concentration by Largest Firms for the U.S.: 2012*, U.S. CENSUS, AM. FACTFINDER (Jan. 8, 2016), https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml [https://perma.cc/P3HD-SFV3]. This category corresponds to NAICS industry code 511130, "book publishers." *Id.*

industry structure. For example, in biopharmaceuticals, declining productivity and patent expirations have helped drive concentration. In the agricultural biotechnology, seed, and agrochemical industry, current consolidation in many ways reflects the concentrated nature of the chemicals industry that absorbed it. The software industry has responded to a variety of technological shocks—from the unbundling of software from hardware to the development of the personal computer to the emergence of the internet—with both fragmentation and consolidation. Unique legal developments, such as judicial rulings separating film exhibition from production and distribution and Reagan-era deregulation, have significantly impacted the structure of the film industry. The music and book publishing industries have consolidated in significant (though not exclusive) part in response to the power of internet-based distribution and copyright infringement. The diversity of evolutionary processes among these industries, however, should not elide a striking commonality: patents and copyrights have played important roles in early, upstream entry and subsequent, downstream concentration.

As noted above, the goal of this Article is to reveal a general pattern of how intellectual property rights help shape industry structure, but of course exceptions to this pattern exist. For example, in the agricultural biotechnology and film industries, patents promoted the entry of new firms, which then rather quickly sought to wield intellectual property rights against other potential new entrants.[493] In short, exclusive rights can deter entry and shore up concentration even in very young industries. Additionally, as explored more thoroughly in the next Part, exclusive rights play multiple roles in shaping industry structure, from directly enabling entry or exclusion to more subtly influencing firm behavior in ways that promote fragmentation or concentration.[494]

Furthermore, it is important to acknowledge the structural heterogeneity and dynamism of each of these fields. This Article has emphasized the contribution of intellectual property rights to the entry of small upstream entities and the consolidation of large downstream incumbents, but entities of all sizes operate throughout the value chain. Indeed, the characterization of the software industry as comprised of "boulders, pebbles, and sand"[495] is an apt description for most innovative industries. In the biopharmaceutical industry, independent contract research firms conduct clinical trials and perform other

493. *See supra* Sections II.A.2, II.B.1.

494. *See infra* Section III.C.

495. Campbell-Kelly & Garcia-Swartz, *supra* note 193, at 755–56.

functions related to downstream drug development.[496] Furthermore, "indie" film studios, record labels,[497] and publishers[498] all contribute to the downstream marketing and distribution of movies, music, and books. Additionally, it is important to note that the large corporations that dominate IP commercialization can exhibit significant internal heterogeneity. Consolidated industries may not be as "consolidated" as initially perceived.[499] Within a single company, multiple sources of creativity and autonomous decision points can approximate an innovation ecosystem comprised of formally separate entities. For instance, the global media conglomerates that dominate movie production and distribution are far-flung empires comprised of dozens of different subsidiaries, units, and divisions. Several decades ago in the music industry, large record labels typically had one critical artists and repertoire ("A&R") executive, such as Mitch Miller at CBS, who made enterprise-defining decisions over which artists to sign and what repertoire to produce.[500] However, recent consolidation has also created more internal plurality, with many more decision nodes within global music companies.[501] For instance, in the 1990s, Polygram alone had over fifty local subsidiaries, many of them with separate A&R divisions for different genres.[502] Ultimately, while downstream IP commercialization remains quite concentrated, it is important to acknowledge internal heterogeneity within large industry players.

III. RECONCEPTUALIZING THE ROLE OF INTELLECTUAL PROPERTY RIGHTS IN SHAPING INDUSTRY STRUCTURE

These empirical accounts shed new light on the long-standing debate over the role of intellectual property rights in shaping industry structure. Recall that scholars have long argued that exclusive rights create barriers to entry and exacerbate concentration, while more recent scholarship emphasizes that patents and copyrights promote company formation, market entry, and industry fragmentation.[503] Drawing on the forgoing accounts, this Part argues that exclusive rights

496. Comanor & Scherer, *supra* note 109, at 111.

497. *See* Kachka, *supra* note 488.

498. *See id.* (noting that edgier varieties of fiction are migrating to specialized publishers like Graywolf, Milkweed, and McSweeney's).

499. *Cf.* Lee, *supra* note 39, at 1453–55 (describing semi-integration in which acquired firms maintain a semi-autonomous existence within a broader corporate home).

500. Michael Christianen, *Cycles in Symbol Production? A New Model To Explain Concentration, Diversity and Innovation in the Music Industry*, 14 POPULAR MUSIC 55, 89 (1995).

501. *Id.* at 90.

502. *Id.* at 90–91.

503. *See supra* Part I.

contribute to both fragmentation and concentration in different contexts. In particular, it adds the illuminating (and overlapping) considerations of time and the value chain. Regarding time, it argues that patents and copyrights facilitate the initial entry of new firms but that over time industry incumbents often absorb those entrants and use exclusive rights to inhibit entry, thus reconcentrating the field. Regarding the value chain, it argues that exclusive rights most prominently promote entry in upstream fields engaged in initial creation while tending to deter entry and shore up concentration toward the downstream end of the value chain focused on commercialization. Furthermore, it contends that patents and copyrights play multiple roles in shaping industry structure, from causal agents that directly impact structure to instruments that more subtly motivate and facilitate firm behavior leading to fragmentation or concentration.

A. Time: Initial Entry, Subsequent Consolidation

Early on, patents and copyrights facilitate initial company formation and industry entry, but incumbents later leverage large intellectual property estates to acquire competitors (in part for their patent and copyright portfolios), and the accumulation of exclusive rights in an industry over time raises barriers to entry. As indicated above, this dynamic is evident in the biopharmaceutical industry.[504] Patents are essential to the formation of new biotechnology firms and pharmaceutical companies due to the high cost and uncertainty of research and development.[505] Following the initial entry of biotechnology firms, many global pharmaceutical companies, leveraging vast patent portfolios, vertically integrated and acquired such firms,[506] thus increasing industry consolidation.[507] Furthermore, global pharmaceutical companies have also acquired numerous formerly independent pharmaceutical companies that were once new entrants.[508] Notably, the "patent cliff" and the desire to acquire profitable patented assets significantly motivated such mergers and acquisitions.[509] In this fashion, patents contribute to both initial entry and subsequent consolidation.

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504. *See supra* Section II.A.1.

505. *See* Cockburn, *supra* note 89, at 15.

506. *See* Lee, *supra* note 39, at 1455–66 (arguing that vertical integration is prevalent in patent-intensive industries like the biopharmaceutical industry).

507. In this fashion, patents seem to support natural business cycles of early fragmentation and later consolidation. *Cf.* OFFICE OF TECH. ASSESSMENT, *supra* note 95, at 6 (noting, in 1991, the inevitable consolidation of dedicated biotechnology companies).

508. *See supra* notes 123–138 and accompanying text.

509. *See supra* Section II.A.

A similar dynamic prevails in the agricultural biotechnology, seed, and agrochemical industry. As with medical biotechnology, patents were critical to the formation of agricultural biotechnology companies in the 1980s.[510] Additionally, changes in patent law and the lure of plant patents promoted the initial entry of chemical companies into the agricultural biotechnology industry.[511] Once large chemical conglomerates like Monsanto entered the agricultural field, they quickly acquired large numbers of small firms and cultivated significant intellectual property portfolios, thus shoring up barriers to entry for new entities.[512] The Big Six (now Big Four) agrochemical companies cross-licensed patents among each other and benefited from a broad patent thicket that inhibited new entry.[513] In some ways, these developments suggest the emergence of an industrial anticommons[514] over time that stymied both product development and new firm entry. In the early days of the agricultural biotechnology industry, the relative dearth of patents limited their ability to block new entry; however, as the industry matured and patents proliferated, their entry-denying effects increased.

The phenomenon of exclusive rights contributing to initial entry and subsequent consolidation also applies to segments of the software industry. While the software industry as a whole is more than a half-century old, technological shifts have continuously created new segments, such as operating systems for personal computers, web browsers, security, and cloud computing. A familiar pattern is for many new entrants to participate early in a segment, which over time coalesces around a small number of players. Intellectual property rights contribute to both processes. Although the early software industry experienced robust growth and entry prior to widespread patenting, scholars like Ronald Mann, focusing on later periods, have argued that patents are critical to software startups, thus facilitating market entry and industry fragmentation.[515] In this context, however, it may be necessary to modify the "exclusive rights promote initial entry" thesis. As Mann's empirical work reveals, patents are most relevant not for the earliest-stage startups but for later-stage startups nearing commercialization.[516] Here, patents may not motivate the initial entry

510. *See supra* notes 97, 154–155.

511. *See supra* notes 162–190 and accompanying text.

512. *See supra* note 156 and accompanying text.

513. Howard, *supra* note 156, at 2492; Kalaitzandonakes et al., *supra* note 157, at 20.

514. Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698, 698–701 (1998).

515. *See, e.g.*, Mann, *supra* note 14, at 967–68.

516. *Id.* at 985.

of startups so much as sustain those startups that survive to commercialization. Tellingly, however, mature segments of the software industry feature a small number of firms with greater rates of patenting.[517] Large patent portfolios provide defensive leverage and facilitate cross-licensing, advantages that new entrants cannot afford. Furthermore, patents on technical standards tend to lock in incumbents and lock out competing platforms. For a variety of reasons, most segments are dominated by a small number of incumbents that have acquired many former new entrants.

Shifting to a different set of industries, intellectual property rights have also contributed to initial entry and subsequent consolidation in creative fields. Ironically, patents covering motion picture and sound recording technologies were critical to the entry of firms that formed the early film and music industries.[518] Once there, these firms utilized patents to restrict entry by potential competitors. For example, Edison's MPPC asserted exclusive rights against potential new entrants in the film industry,[519] and several large players in the early music recording industry pooled their patents to maintain an oligopoly.[520] Copyrights were essential to the entry and viability of new publishing houses,[521] and a similar narrative applies to new film studios and record labels.

Over time, the drive to exploit and aggregate copyrights has contributed to industry concentration in copyright-intensive fields. Movie studios, recording companies, and major publishers (many of which are parts of the same international conglomerates) amass huge copyright estates in films, scripts, musical compositions, sound recordings, and books. The proprietary nature of vast libraries of valuable content raises entry costs for potential new distributors. Additionally, the desire to shore up revenues in light of massive piracy has motivated consolidation in the music industry. In the music and publishing industries, major players have consolidated to leverage larger copyright estates against downstream digital distributors like iTunes and Amazon. While copyright is not driving such consolidation per se, it helps facilitate corporate strategies of stockpiling proprietary content to enhance competitive position. The film and music industries have coordinated to reform copyright law to extend exclusive rights,

517. Allison et al., *supra* note 193, at 1606.

518. *See supra* notes 262–268, 361–363 and accompanying text.

519. Edidin, *supra* note 262.

520. Garofalo, *supra* note 349, at 325; *see also* TSCHMUCK, *supra* note 351, at 14.

521. *See supra* notes 441–452 and accompanying text.

which further raises barriers to entry and promotes industry consolidation.

B. Value Chain: Upstream Fragmentation, Downstream Concentration

The value chain offers another axis on which to differentiate the effects of intellectual property rights on industry structure. This Article argues that patents and copyrights most prominently promote entry toward the upstream end of the value chain focused on initially creating an intellectual asset, such as a biologic drug or a movie. However, patents and copyrights have a greater tendency to block entry toward the downstream end of the value chain focused on commercialization, marketing, and distribution. While there is some overlap between this phenomenon and the dynamic of initial entry/subsequent concentration described above, they are analytically distinct. In short, exclusive rights contribute to upstream fragmentation and downstream concentration.

The upstream/downstream distinction is evident in the role of patents in medical and agricultural biotechnology. Patents are critical for the entry of new, upstream biotech firms developing biologic drugs or drug precursors.[522] Such firms, however, typically lack the size, resources, and expertise to conduct downstream clinical trials, marketing, and distribution.[523] Such capabilities fall within the realm of large pharmaceutical firms, which amass significant patent portfolios in part to mitigate risk and subsidize numerous failures on the way to commercializing a few blockbuster drugs.[524] These size efficiencies, undergirded by large patent portfolios, serve as a significant barrier to entry for potential competitors in the downstream commercialization of drugs. Patents are thus critical for both the entry of new upstream firms and the exclusion of potential downstream competitors. The fact that downstream pharmaceutical firms are increasingly vertically integrating with upstream biotech firms only corroborates this thesis, as large patent estates (and the revenues that they generate) are crucial to such consolidation. An analogous dynamic obtains in the agricultural biotechnology, seed, and agrochemical industry. There as well, patents facilitate the entry of upstream agricultural biotech firms, which rely on exclusive rights for startup formation and to attract capital.[525] However, patents are also critical to consolidation in downstream commercialization among the Big Four, which cross-license transgenic

522. Cockburn, *supra* note 89, at 15.

523. *See supra* Section II.A.

524. *Id.*

525. SEED GIANTS, *supra* note 14, at 5; Wright & Pardey, *supra* note 155, at 20.

gene patents among themselves and benefit from a broad patent thicket that excludes potential competitors.[526]

Patents also promote upstream entry and downstream concentration in the software industry. Patents are important for some software startups as they transition toward commercialization, thus enhancing fragmentation toward the upstream end of the value chain focused on writing code.[527] However, downstream development, marketing, and distribution are highly capital-intensive activities better suited for large firms. These "established software firms are increasingly relying on software patents to . . . prevent competitors from entering or competing in a market segment."[528] Thus, downstream commercialization of software tends to be dominated by patent-intensive incumbents like Microsoft. Verticality influences how intellectual property rights impact industry structure in a different way as well. The software industry features relatively high concentration in certain "backbone" products, such as operating systems, which leverage standardization and network effects. But it features greater fragmentation in ancillary products, such as applications, that run on such backbones.[529] For instance, while Microsoft Windows occupies a dominant position in the operating system market, numerous companies produce applications that run on that platform.[530] Intellectual property rights controlling industry standards thus promote concentration at the platform level[531] and can facilitate the participation of numerous application-level firms.

Turning to traditional content industries, copyrights also contribute to both upstream entry and downstream concentration. Unlike the historic studio system of "Old Hollywood," the contemporary movie industry is vertically disintegrated toward the upstream end of the value chain focused on movie production. There, ad hoc assemblages of independent producers, directors, and talent, ultimately bound by copyrights and contracts, engage in one-off "spot production" to produce films.[532] Scripts (protected by copyright) facilitate entry by a wide range of independent creators and serve as the kernels around which

526. Howard, *supra* note 156, at 2492; Kalaitzandonakes et al., *supra* note 157, at 20.

527. Mann, *supra* note 14, at 967–68.

528. SLAUGHTER, *supra* note 219, at 73.

529. Merges, *supra* note 256, at 6–8.

530. *Id*.

531. *Cf.* Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CALIF. L. REV. 1889, 1901–02 (2002) ("Because one or more members of the [standard-setting organization] likely owns a patent covering the standard, that company will effectively control the standard; its patent gives it the right to enjoin anyone else from using the standard.").

532. CAVES, *supra* note 268, at 92; *cf.* HESMONDHALGH, *supra* note 269, at 22 (noting the prevalance of ad hoc production by "independents" in cultural industries).

numerous entities organize to produce motion pictures. However, downstream studios wielding significant size and infrastructure grounded in vast copyright portfolios provide financing, marketing, and distribution.[533] The size, infrastructure, and intellectual property estates of these large downstream distributors shore up barriers to entry, thus promoting concentration. While new entrants in digital distribution have increased both the number of players and sources of content, the copyright-protected libraries of the major studios still raise costs of entry.

Copyrights also help drive upstream entry and downstream concentration in the music and book publishing industries. As discussed above, the low cost, low threshold for protection, and absence of a registration requirement render obtaining a copyright extremely easy, which reduces barriers to entry for independent songwriters, recording artists, and authors.[534] Such entry promotes fragmentation in the upstream production of creative content. Perhaps the exemplar of upstream fragmentation arises in the book publishing industry, where the ease of obtaining copyright protection and the low cost of internet distribution have facilitated self-publication by numerous independent authors.[535] For the vast majority of commercially valuable creative content, however, development, marketing, and distribution are capital-intensive processes handled by large corporate entities. These downstream incumbents leverage (and continually seek to expand) vast copyright portfolios, thus contributing to industry consolidation. In the music industry, for example, major companies have merged with and acquired each other to expand copyright portfolios and market power to counter decreased IP-related revenues from piracy.[536] In book publishing, major players have responded to the downstream leverage of Amazon with mergers and acquisitions, thus shoring up their market power by amassing ever-larger copyright estates.[537] In sum, intellectual property rights play important roles in upstream fragmentation and downstream concentration.

533. Schatz, *supra* note 268, at 16.

534. *See supra* notes 66–69 and accompanying text.

535. *See* Kachka, *supra* note 488 (noting rise of self-publishing amidst industry consolidation); *see also* Ciabattari, *supra* note 484 (same).

536. *See supra* notes 408–413 and accompanying text.

537. *See supra* notes 477–485 and accompanying text.

C. Beyond Causation: The Multiples Roles of Intellectual Property Rights in Shaping Industry Structure

In addition to showing how exclusive rights contribute to both fragmentation and concentration, this Article also reveals the multiple roles that intellectual property rights play in shaping industry structure. Prevailing theoretical debates[538] address the role of exclusive rights as direct causes of fragmentation or concentration. And as these empirical profiles have shown, patents and copyrights can directly impact industry structure. For instance, patents are important to the viability of mature startups in the software industry,[539] and they create formidable barriers to entry when asserted by incumbents in the agricultural biotechnology, seed, and agrochemical industry.[540]

However, one of this Article's contributions is to reveal a host of subtle, indirect ways that patents and copyrights contribute to industry structure beyond proximately causing fragmentation or concentration. For example, declining scientific productivity in the biopharmaceutical industry has led incumbents to acquire other firms for their patented assets.[541] In such a scenario, it is not quite precise to characterize patents as a "cause" of industry concentration, though the fact that a firm's innovative assets are patented is important to its value as an acquisition target. In many cases, the mere status of patents and copyrights as valuable assets that firms seek to accumulate contributes to concentration, particularly in mature, downstream industry segments. For instance, the drive to acquire patented and copyrighted technological and expressive works has helped motivate numerous mergers and acquisitions in fields as diverse as biopharmaceuticals, agricultural biotechnology, and film production and distribution, and

538. *See supra* Part I.

539. *See supra* Section II.A.3.

540. *See supra* Section II.A.2. In making these causal claims, this Article focuses on the primary effects of patents and copyrights in the current business and economic landscape. However, one way to investigate causation is to posit a counterfactual world without patents and copyrights and consider how industry structure would differ from the status quo. This Article acknowledges that eliminating exclusive rights could give rise to secondary effects with very different implications for industry structure. For example, consistent with this Article's argument, the elimination of patents and copyrights could lead to significant entry of new drug distributors (akin to generic entry) and movie distributors given that these entrants could appropriate innovative creations for little to no cost. But it is also possible that the absence of patents and copyrights could lead to even more concentrated industries. For instance, in the absence of exclusive rights, innovative biopharmaceutical and movie companies could instead pursue trade secrecy, vertical integration, and tight controls on drug distribution and movie exhibition to prevent uncompensated appropriation. The infrastructure and resources needed to keep nonrival assets away from potential free riders might necessitate even larger incumbents and result in even more concentrated industries.

541. *See supra* Section II.A.1.

this in turn increases industry concentration. Furthermore, beyond motivating merger and acquisition activity, the accumulation of large numbers of patents and copyrights mitigates risk and enhances freedom to operate for incumbents, thereby providing them with a comparative advantage relative to potential new entrants. For example, large libraries of copyrighted films owned by Disney and Warner Bros. generate income for those companies and create barriers to entry for traditional and streaming distributors. In such a scenario, it is not clear that exclusive rights are the "cause" of concentration in a direct sense, but they do play a supporting role in such concentration. Finally, further illustrating the myriad effects of exclusive rights on industry structure, both the presence of intellectual property rights (e.g., by creating thickets) and the absence of those rights (e.g., by imperiling revenues and motivating mergers and acquisitions) can contribute to industry consolidation.

IV. IMPLICATIONS, PRESCRIPTIONS, AND FUTURE DIRECTIONS

The industrial dynamics explored in this Article raise several important implications, normative considerations, and additional questions for further study.

A. Implications

First, this Article sheds new light on the intersection of intellectual property rights and private ordering. Scholarly accounts of private ordering have highlighted its ability to compensate for the shortcomings of patents and copyrights. In this salutary narrative, industry players reduce transaction costs and enhance efficiency by, for instance, voluntarily committing assets to the public domain, asserting Creative Commons licenses,[542] or forming collective rights organizations.[543] While these activities are largely beneficial, this Article shows that industry players also employ private ordering and intellectual property rights for self-serving gain, often to the detriment of social welfare.[544] For instance, large agricultural biotechnology, seed, and agrochemical companies have cross-licensed patents among

542. Robert P. Merges, *A New Dynamism in the Public Domain*, 73 U. CHI. L. REV. 183, 183–84 (2007).

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

544. *Cf.* Lemley, *supra* note 262, at 237 ("[W]e are currently (and mistakenly) conditioned to think of private property and private ordering as efficient in and of themselves, rather than as efficient only in the context of robust market competition.").

themselves while creating broad thickets that exclude potential entrants.[545] Similarly, software companies amass huge portfolios that deter new entry.[546] In the movie and music industries, the early patent pools that benefitted industry incumbents also restricted entry and competition.[547] Of course, it is not surprising that businesses deploy patents and copyrights in ways that advance their strategic objectives. It is notable, however, that incumbents are using instruments designed to promote technical and creative progress[548] in ways that promote industry concentration, which may undermine that policy goal.

Second, while this Article has jointly considered patents and copyrights to illustrate their commonalities, it is important to distinguish between the differential impacts of patents and copyrights on industry structure. While both types of exclusive rights can promote entry by small entities, patents require significant time and expense to procure whereas copyrights are available immediately at basically no cost. Thus, it is far easier for a songwriter to get a copyright on her musical composition than for a software startup to obtain a patent on its key technology. Indeed, while Ronald Mann has stressed the importance of patents for promoting the entry of software firms, he notes that the earliest-stage startups do not bother with patents because of the daunting nature of small-firm litigation, management focus on other matters, and the limited value of exclusivity for pre-revenue companies.[549] In addition to their high cost, the significant time involved in prosecuting patents (averaging about two years[550]) inhibits their ability to facilitate entry. Alternatively, the immediacy of obtaining copyrights enhances their ability to promote market entry by small entities and individuals who cannot wait to commercialize creative properties. In sum, copyrights are a more accessible vehicle for promoting market entry relative to patents for small, resource-poor entities.

Going further, even in newly developing industries, patents have significant potential to block entry, while such potential is more limited for copyrights. While this Article has emphasized the entry-promoting function of patents in nascent industries and industry segments,

545. *See supra* Section II.B.

546. *See supra* Section II.C.

547. *See supra* Sections II.C, II.D.

548. *See* U.S. CONST. art. I, § 8, cl. 8.

549. Mann, *supra* note 14, at 981–85.

550. *See Visualization Center: Traditional Total Pendency*, U.S. PAT. & TRADEMARK OFF., https://www.uspto.gov/corda/dashboards/patents/main.dashxml?CTNAVID=1004 (last visited Feb. 14, 2019) [https://perma.cc/7CC8-RTJ4] (reporting a traditional total pendency of 23.8 months for January 2019).

patents can certainly deter entry into these fields as well. The scope of patents is governed by claims, which often cover much more technological "real estate" than what a patentee actually invented.[551] Furthermore, patents confer a general right to exclude others from making a technology even if an infringer independently invents it.[552] Alternatively, copyrights only cover the expressive work itself (and substantially similar variations),[553] and they only prohibit copying of the protected work.[554] Even in a young industry, it is possible for a broad patent to significantly inhibit entry. For example, a broad patent awarded in 1992 to Agracetus covering all forms of genetically engineered cotton caused significant controversy and raised concerns that "[s]ome smaller companies could even be forced out of business if they have to pay licensing fees for use of the patented technologies."[555] And as noted above, early patents held by Edison's MPPC barred potential entry by competing startups in the movie industry.[556] Copyrights are narrower in that they only cover the protected material and close variations and do not prohibit independent creation. Therefore, at a schematic level, the ability of an individual copyright to exclude new entrants is more limited compared to an individual patent.[557]

B. Normative Analysis and Prescriptions

Although this Article's primary aim is to describe the various effects of intellectual property rights on industry structure, some preliminary normative considerations are in order. The empirical profiles presented here raise concerns about the concentrated nature of downstream industries that commercialize intellectual property as well as the prevalence of vertical integration in certain innovative fields. Of course, the optimal structure for promoting innovation in any given industry is uncertain and is likely to depend on the particularities of

551. *See* Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1743–46 (2009) (discussing the concept of "peripheral claiming" and the difficulty in defining boundaries of patent claims).

552. 35 U.S.C. § 271 (2012).

553. Smith v. Jackson, 84 F.3d 1213, 1218 (9th Cir. 1996).

554. 17 U.S.C. § 106 (2012).

555. Richard Stone, *Sweeping Patents Put Biotech Companies on the Warpath*, 268 SCIENCE 656, 656 (1995).

556. *See supra* notes 262–266 and accompanying text.

557. From the perspective of substitutability, however, even narrow copyrights can confer significant power. For instance, consumers may not regard other talking animals, superheroes, and science-fiction characters to be adequate substitutes for Mickey Mouse, Iron Man, and Darth Vadar.

specific fields.[558] That being said, while consolidation may shore up salutary incentives to innovate,[559] such concentration raises classic antitrust concerns over harms to competition, decreased consumer choice, and higher prices. Furthermore, such concentration raises special considerations in the context of IP-intensive industries, for it may dampen innovation[560] and harm democratic deliberation.[561] Additionally, the high degree of vertical integration in some IP-intensive areas is cause for alarm, especially in light of renewed awareness of the dangers of such industrial organization.[562]

Although a comprehensive account of antitrust approaches to industry concentration lies beyond the scope of this Article,[563] a few thoughts are in order. The extent to which antitrust intervention is warranted in any given case depends largely on the normative aims and ideological commitments of antitrust law, which are contested and evolving. For instance, the Chicago school of antitrust, which has largely dominated since the 1970s, has prioritized efficiency, consumer welfare, and competitive prices as the overarching aims of antitrust law.[564] Thus, for example, if Bayer's acquisition of Monsanto does not lead to higher prices, the impetus for antitrust intervention is mitigated. Indeed, this emphasis on consumer welfare and price may help explain antitrust authorities' general reluctance to prevent

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558. *See* McGowan, *supra* note 48, at 732–33 ("The impact of competition on innovation furthermore depends on many firm and industry-specific factors that complicate the task of making such predictions." (quoting Richard J. Gilbert & Steven C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 63 ANTITRUST L.J. 569, 576 (1995))); *see also* Joseph Kattan, *Antitrust Considerations in Innovation-Driven Markets*, 21 CAN.-U.S. L.J. 115, 117 (1995):

> There is not yet a universally accepted consensus as to the kind of market structure that best facilitates innovation, although many believe that a moderately concentrated structure—with the top four firms holding perhaps a fifty percent aggregate market share—is likely to be the most fertile ground for innovation.

But see Thomas M. Jorde & David J. Teece, *Innovation, Cooperation and Antitrust*, 4 HIGH TECH. L.J. 1, 3 (1989) (arguing that firms in fragmented, innovative industries, such as microelectronics and biotechnology, should be largely exempt from antitrust law).

559. *See id*. at 17 (arguing that horizontal linkages among firms can compensate for deficiencies in firms' ability to appropriate the rewards of innovation).

560. Tim Wu, *Taking Innovation Seriously: Antitrust Enforcement If Innovation Mattered Most*, 78 ANTITRUST L.J. 313, 315 (2012) ("[I]t is clear that high barriers to entry in a given industry, whether maintained by a monopoly or an oligopoly, can discourage product innovation by new firms.").

561. Talbott, *supra* note 268, at 11.

562. Steven C. Salop, *Invigorating Vertical Merger Enforcement*, 127 YALE L.J. 1962 (2018).

563. For a particularly lucid account of the intersection of innovation, industry structure, and antitrust, see McGowan, *supra* note 48. A broader treatment of the antitrust implications of consolidation in IP-intensive industries appears in Lee, *supra* note 82.

564. Richard A. Posner, *The Chicago School of Antitrust Analysis*, 127 U. PA. L. REV. 925, 932 (1979) ("The Chicago school has largely prevailed with respect to its basic point: that the proper lens for viewing antitrust problems is price theory.").

significant consolidation in IP-intensive industries. But scholars have posited other aims of antitrust law, such as protecting small firms[565] and competitive structures featuring many players,[566] and wide consensus has emerged that promoting innovation is also a legitimate aim of antitrust law.[567] Even within the current landscape that focuses on efficiency, scholars have challenged the Chicago school's rather laissez-faire approach to vertical integration.[568] While vertical integration can optimize commercialization of innovative products,[569] contemporary antitrust scholarship has advocated for greater scrutiny of vertical mergers,[570] which can harm competition when one or both merging parties operate in imperfectly competitive markets.[571] Notably, the ills of horizontal and vertical consolidation can work in tandem, as input and customer foreclosure arising from vertical integration is more likely to be problematic in concentrated markets with few players.[572]

Even within the accepted view that innovation is an important aim of antitrust law, complexities still remain. First, as noted above, identifying instances of "problematic" industry concentration is difficult given that no consensus exists regarding the optimal industry structure for fostering innovation.[573] One key inquiry is whether such concentration is likely to create dominant monopoly power or lead to

565. McGowan, *supra* note 48, at 750–52.

566. Khan, *supra* note 476.

567. *E.g.*, Michael A. Carrier, *Unraveling the Patent-Antitrust Paradox*, 150 U. PA. L. REV. 761, 801 (2002); Khan, *supra* note 476, at 721–22.

568. Posner, *supra* note 564, at 927; Salop, *supra* note 562, at 1963; *see also* Lee, *supra* note 39, at 1497 ("Chicago school scholars dismissed the perceived dangers of leverage by reasoning that there was only a single monopoly profit available to an integrated entity; accordingly, they concluded that vertical integration must be motivated by efficiency and not a desire to extend a monopoly.").

569. Jorde & Teece, *supra* note 558, at 21 (explaining that the needs of today's innovators are more extensive than what is embedded in the price of a product, and thus, vertical mergers help with coordination between components); Salop, *supra* note 562, at 1980 (discussing the efficiency benefits of vertical mergers).

570. *See* Lee, *supra* note 39, at 1497–99 (discussing the weaknesses of the Chicago school's approach to vertical integration and suggesting how courts should evaluate vertical mergers under the antitrust laws); Michael H. Riordan & Steven C. Salop, *Evaluating Vertical Mergers: A Post-Chicago Approach*, 63 ANTITRUST L.J. 513, 518 (1995) (explaining how vertical mergers can be used to evade price control regulations and engage in price discrimination); Salop, *supra* note 562, at 1963 ("[I]n our modern market system, vigorous vertical merger enforcement is a necessity, particularly in markets where economies of scale and network effects lead to barriers to entry and durable market power.").

571. Salop, *supra* note 562, at 1972; *see* Khan, *supra* note 476, at 792–94 (discussing how the current approach to antitrust enforcement does not account for anticompetitive harms that can arise from vertical integration).

572. *See* Salop, *supra* note 562, at 1967 (explaining the issues surrounding foreclosure and vertical mergers in the context of the *Brown Shoe* case).

573. *See supra* note 558 and accompanying text.

collusion.[574] That being said, the DOJ and the Federal Trade Commission ("FTC") have recognized that competition often spurs innovation and that mergers can lead to a reduction in innovation.[575] Second, within an innovation framework, the antitrust implications of patents and copyrights are not limited to "classic" cases involving refusals to license intellectual property or placing conditions on such licenses.[576] Such cases, which have attracted significant scholarly attention,[577] primarily fall under Section 2 of the Sherman Act, which prohibits improper practices related to monopolization.[578] Beyond that factual predicate, however, IP-intensive companies are frequently the targets of mergers and acquisitions that may raise antitrust concerns under Section 7 of the Clayton Act.[579] For example, the FTC brought suit against Roche based on perceived harms to innovation competition related to Roche's acquisition of Genentech.[580] Third, most of the antitrust scholarship and case law on innovation tends to focus on R&D-intensive and patent-intensive industries like pharmaceuticals.[581] Antitrust theory and doctrine are less well developed regarding creative industries such as films, music, and literature.[582] However, antitrust doctrine should take seriously the prospect that industry concentration in these fields may inhibit the development of innovative cultural products. Fourth, if antitrust authorities determine that intervention is warranted for a proposed merger or acquisition, they will have to choose among a variety of potential remedies. So-called behavioral remedies that require a particular kind of conduct through consent decrees may be ineffectual and require significant monitoring.[583] Therefore,

574. *See* Robert Pitofsky, *Challenges of the New Economy: Issues at the Intersection of Antitrust and Intellectual Property*, 68 ANTITRUST L.J. 913, 914 (2001) ("Antitrust is concerned primarily with cartels and the acquisition or maintenance of monopoly power by unacceptable means.").

575. U.S. DEPT. OF JUSTICE & FED. TRADE COMM'N, HORIZONTAL MERGER GUIDELINES 23 (2010).

576. *See, e.g.*, Carrier, *supra* note 567, at 771–72 (providing an example of the conflict between patent and antitrust cases).

577. *E.g.*, *id.*; Herbert Hovenkamp, *Antitrust and Innovation: Where We Are and Where We Should Be Going*, 77 ANTITRUST L.J. 749 (2011); McGowan, *supra* note 48.

578. 15 U.S.C. § 2 (2012).

579. 15 U.S.C. § 18 (2012); *cf.* Baker, *supra* note 44, at 592 (noting the role of antitrust law in challenging horizontal mergers that may reduce the number of innovators in a market).

580. Kattan, *supra* note 558, at 118–19.

581. *See, e.g.*, Carrier, *supra* note 567.

582. There is, however, a voluminous literature on the antitrust dimensions of media consolidation, especially as it relates to the production and generation of news and democratic discourse. *See, e.g.*, Howard A. Shelanski, *Antitrust Law as Mass Media Regulation: Can Merger Standards Protect the Public Interest?*, 94 CALIF. L. REV. 371 (2006); Maurice E. Stucke & Allen P. Grunes, *Toward a Better Competition Policy for the Media: The Challenge of Developing Antitrust Policies that Support the Media Sector's Unique Role in Our Democracy*, 42 CONN. L. REV. 101 (2009).

583. Salop, *supra* note 562, at 1992.

structural remedies such as mandated divestures of certain lines of business are more appropriate.[584] Thus, for instance, the DOJ conditioned Bayer's 2018 takeover of Monsanto on the sale of $9 billion of agricultural assets to rival BASF.[585] In the view of antitrust regulators, this divesture was necessary to maintain a competitive landscape. At the extreme, courts could enjoin certain mergers and acquisitions from being consummated.[586]

While antitrust is an important tool to address undue industry consolidation, changes to patent and copyright law itself may also be helpful.[587] This analysis, however, reveals a cautionary tale, for policymakers must be cognizant of unintended consequences when attempting to modify intellectual property rights due to their varied impacts on industry structure. Extending the previous discussion, policymakers may regard concentration in downstream markets as problematic enough to warrant intervention. However, attempts to narrow patents rights, which would mitigate the market power of large industry incumbents, can also prevent new entities from forming and competing against such incumbents. The Supreme Court's recent decision in *Association for Molecular Pathology v. Myriad Genetics*, which ruled that isolated DNA is not patentable subject matter,[588] was lauded by many as enhancing access to Myriad's previously patented genetic diagnostic tests for breast and ovarian cancer.[589] Myriad had utilized its patents to enjoy a virtual monopoly on such testing in the United States, and the Court's decision ushered in new competition.[590] However, this and other decisions narrowing patentable subject matter[591] raise concerns that small biotech firms may not be able to

584. *Id.* at 1992–93.

585. David McLaughlin et al., *Bayer Wins U.S. Approval for Monsanto After Two-Year Quest*, BLOOMBERG (May 29, 2018, 10:48 AM), https://www.bloomberg.com/news/articles/2018-05-29/bayer-wins-u-s-nod-for-monsanto-nearing-end-of-two-year-quest [https://perma.cc/T8FZ-UF8Q].

586. Salop, *supra* note 562, at 1993.

587. *Cf.* Hovenkamp, *supra* note 577, at 750 ("[I]t is not the purpose of antitrust to fix defects in other regulatory regimes, particularly when those regimes are federal.").

588. 569 U.S. 576, 580 (2013).

589. Peter Lee, *The Supreme Court's* Myriad *Effects on Scientific Research: Definitional Fluidity and the Legal Construction of Nature*, 5 U.C. IRVINE L. REV. 1077 (describing the *Myriad* litigation and its implications for access to clinical genetic diagnostic tests).

590. *See* Editorial, *Myriad Diagnostic Concerns*, 31 NATURE BIOTECH. 571 (2013), https://www.nature.com/articles/nbt.2638 [https://perma.cc/F969-M465] ("Ambry Genetics, Bio-Reference Laboratories, Pathway Genomics and Gene by Gene all announced lower-priced *BRCA*1/*BRCA*2 tests within 24 hours of the ruling."). Myriad, however, quickly brought suit against several of the new competitors. Lee, *supra* note 589, at 1087.

591. *See, e.g.*, Mayo Collaborative Servs. v. Prometheus Labs., Inc., 566 U.S. 66, 73 (2012) (holding that a method to enhance the therapeutic efficacy of a drug does not comprise patentable subject matter); Ariosa Diagnostics, Inc. v. Sequenom, Inc., 788 F.3d 1371, 1373 (Fed. Cir. 2015)

form and attract capital, thus hampering industry entry and, ultimately, competition. Weakening intellectual property rights can harm both large incumbents and new entrants that would otherwise compete against them, thus rendering the net social impact of such changes indeterminate.

In the copyright sphere, concerns that rights holders exercise undue control over creative works have motivated proposals to introduce a new system of formalities, including requirements to register, provide notice of, record transfers of, and renew copyrights.[592] Such a proposal would likely lead to greater access to copyrighted works, thus diminishing the market power of large, downstream industry incumbents. However, it may disproportionately impact independent, upstream creators, such as screenwriters, composers, musicians, and authors, who lack the legal sophistication to register their copyrights,[593] thus imperiling their entry into creative fields. While measures to mitigate (or strengthen) intellectual property rights may ultimately be warranted, legal and policy decisionmakers should consider the varied impacts of such interventions on small, upstream creators and large, downstream incumbents.

This analysis suggests that policymakers should focus less on wholesale changes to patents and copyrights (which may produce undesirable and unintended consequences) and instead pursue more granular modifications to intellectual property regimes that explicitly consider the identity of rights holders and how they are likely to use exclusive rights. In particular, this Article proposes that policymakers modify intellectual property law in light of the differential effects of exclusive rights when wielded by new entrants versus large incumbents. Not all patents and copyrights contribute equally to social welfare. For instance, the first patent for a startup is more likely to promote investment, market entry, and competition (and its attendant social benefits), while the thousandth patent for a large incumbent is more likely to contribute to barriers to entry (and its attendant social ills). This analysis suggests promoting patent ownership by early-stage, smaller entities while creating greater obstacles for obtaining additional patents for established companies with large portfolios. This could be achieved by calibrating patent fees, which include fees for

(holding that a method for diagnosing fetal abnormalities using cell-free fetal DNA does not comprise patentable subject matter).

592. *See* Christopher Sprigman, *Reform(aliz)ing Copyright*, 57 STAN. L. REV. 485, 549, 555 (2004) (proposing a new system of formalities in which noncompliance would subject copyrighted works to a default license).

593. *See id.* at 558 (acknowledging that some authors will mistakenly not comply with formalities).

obtaining and maintaining patents.[594] For example, the USPTO could dramatically increase patent fees depending on the number of patents that an applicant already owns. In this manner, a startup would pay significantly less for its first patent than an incumbent would pay for its thousandth. By a similar logic, patent fees could be radically lower for smaller entities compared to larger ones, a rationale already reflected in the patent system's discounted fees for small and micro entities.[595] This would be particularly helpful given that cost is the most cited reason why technology startups do not obtain patents.[596] This proposal could extend to copyrights as well. While copyrights are currently obtained for a price of essentially zero, Congress could increase the cost of obtaining and enforcing copyrights for large entities relative to small ones.

These proposals to modify patent and copyright law would have to counter gaming strategies wherein large companies create small shell companies to obtain intellectual property rights at a discount or small companies transfer their rights to large incumbents on the secondary market. Again, the principal aim of this Article is descriptive and conceptual rather than prescriptive, and such a proposal would need further elaboration. However, given the welfare benefits of a small number of exclusive rights wielded by small entities and the welfare costs of broad intellectual property portfolios wielded by incumbents, such calibration is worth considering.

C. Future Directions

Broadening our perspective, this Article's observations suggest greater attention to the role of intellectual property rights in shaping industry structure. As noted, traditional patent and copyright scholarship has focused on the role of exclusive rights in providing incentives to create and develop new technological and expressive works.[597] This is a valuable and challenging line of inquiry, which has explored both the static effects of exclusive rights on the availability and price of patented and copyrighted goods[598] as well as the dynamic effects of exclusive rights on cumulative innovation.[599] As this Article

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594. Michael D. Frakes & Melissa F. Wasserman, *Does Agency Funding Affect Decisionmaking?: An Empirical Assessment of the PTO's Granting Patterns*, 66 VAND. L. REV. 67, 78 (2013).

595. 37 C.F.R. § 1.16 (2018); Peter Lee, *Toward a Distributive Agenda for U.S. Patent Law*, 55 HOUS. L. REV. 321, 348–50 (2017).

596. Graham et al., *supra* note 60, at 1310.

597. *See supra* text accompanying note 29.

598. *See, e.g.*, Lemley, *supra* note 29, at 996.

599. *See, e.g.*, Merges & Nelson, *supra* note 49, at 842–44.

has shown, however, intellectual property rights can also significantly impact innovation by influencing the structure of innovative industries. While some scholars have richly pursued this line of inquiry,[600] more attention to the structural implications of patents and copyrights is warranted.

Along these lines, the theoretical contributions of this Article define a framework for further empirical examination of the effects of intellectual property rights on industry structure. This Article has relied on empirical evidence to argue that patents and copyrights play particularly important roles in early and upstream entry as well as subsequent and downstream consolidation in innovative industries. These are testable hypotheses, and this Article calls for further empirical examinations to elucidate and quantify these phenomena across a diverse set of industries.

Finally, this Article illustrates that patents and copyrights operate in dynamic, constantly evolving industries that are subject to myriad forces beyond intellectual property rights themselves. This Article has focused on the long-standing scholarly debate over whether exclusive rights promote industry fragmentation or concentration. The empirical profiles presented throughout this Article, however, reveal a host of non-IP forces that also determine the structure of IP-intensive industries. In subsequent work, I will further explore such forces, which include non-IP barriers to entry, economies of scale and scope, competitive considerations, and investor pressures.[601] Notably, such forces tend to push IP-intensive industries toward concentration, particularly toward the downstream end of the value chain focused on commercialization.[602] Such consolidation in technological and creative fields raises normative concerns over harms to competition, access, and innovation.[603] While it is important to understand the complex ways in which intellectual property rights impact industry structure, it is also important to contextualize these effects within the broader economic and business forces that shape innovative fields.

CONCLUSION

This Article has shed new light on the long-standing debate over the effects of intellectual property rights on industry structure. An influential body of theory holds that intellectual property rights

600. *See, e.g.*, Arora & Merges, *supra* note 36; Barnett, *supra* note 32; Burk, *supra* note 294.

601. *See* Lee, *supra* note 82.

602. *Id.*

603. *See supra* notes 573–575 and accompanying text.

promote industry concentration by allowing rights holders to internalize the benefits of innovation and exclude potential new entrants. Conversely, recent scholarship has argued that intellectual property rights promote industry fragmentation by facilitating new entity formation and market entry. This Article has argued that exclusive rights contribute to both fragmentation and concentration, depending on context.

This Article has introduced two novel distinctions to clarify these effects. First, it has distinguished along time, arguing that patents and copyrights promote the initial entry of new firms but that industry incumbents wielding significant intellectual property estates often absorb those new entrants and erect barriers to entry, thus enhancing subsequent concentration. Second, it has distinguished along the value chain, arguing that patents and copyrights promote entry by upstream creators but facilitate concentration by downstream firms focused on commercializing technological and creative goods. Additionally, this Article has revealed that patents and copyrights both directly impact industry structure and play important supporting roles in enabling fragmentation and concentration.

These findings provide legal and policy decisionmakers with a more robust understanding of the nuanced ways that intellectual property rights operate in real-world industrial contexts. While antitrust has an important role to play in mitigating undue concentration, identifying the optimal industry structure for promoting innovation is a daunting task. These findings also suggest exercising caution before attempting wholesale modifications to intellectual property rights given their varied (and opposing) effects on industry structure across time and the value chain. Furthermore, they suggest calibrating the acquisition, maintenance, and enforcement of these rights depending on the size of the rights holder and how it is likely to use those rights. Finally, while it is important to understand the contribution of intellectual property rights to industry structure, this empirical examination reveals a broader array of economic and strategic forces that shape highly innovative fields and warrant further study.