PATENT MARKETS AND INNOVATION IN THE ERA OF BIG PLATFORM COMPANIES

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"[A] rivalrous structure surely has its inefficiencies. But such a structure does tend to generate rapid technical progress and seems a much better social bet than a regime where only one or a few organizations control the development of any given technology."

—Robert P. Merges and Richard R. Nelson[1]

ABSTRACT

In many industries, the arc of our contemporary economy bends towards bigness. The ubiquitous digital platform companies such as Amazon, Facebook, Netflix, Chinese companies like Baidu, Tencent, and Alibaba are the best-known examples. While some concerned onlookers propose structural remedies,[2] America's constrained antitrust law plus the logic of natural monopoly mean that increased concentration will likely continue for the foreseeable future. In this setting, it is important to preserve multiple sources of rivalrous innovation despite continuous growth in the Big Platforms. Preserving rivalry requires carving out and preserving a niche for innovative small and medium-sized companies. One way to do this is to promote and protect the secondary patent market. Sale of patents is one way small firms can remain viable in the shadow of Big Platforms. This Article argues that patent markets are superior in some cases to complete acquisition of a small firm by a Big Platform company because selling patents allows a small firm to survive as an independent entity. Recent patent system reforms support this pro-secondary market policy: the era of easy and extortionate patent litigation, traditionally associated with the secondary patent market, is coming to a close. Patent sales and licensing, at times backed by the threat of litigation, will promote small company innovation once these reforms gain traction. This is crucial; though Big Platforms are currently young and vigorous, history suggests that they will become less innovative in the long run. Preserving multiple small innovators—through the patent market and otherwise—is the best way to prepare for the future of Big Platforms.

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

2. *See, e.g.*, Lina M. Khan, *Amazon's Antitrust Paradox*, 126 YALE L.J. 710, 790 (2017).

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I. INTRODUCTION

Economic activity is always ultimately about buyers and sellers. Today, this activity increasingly takes place online. Five huge companies have emerged in the United States as makers of mass-scale markets.[3] Many other companies, both in the United States and elsewhere, are working to mediate between buyers and sellers in all sorts of industries. The basic logic of network economics pushes platform companies to continually expand in scale and scope: scale means more buyers and sellers, while scope means more markets served. What this ultimately means is that the era of the Big Platform has begun.[4]

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3. Farhad Manjoo, *The Upside of Being Ruled by the Five Tech Giants*, N.Y. TIMES (Nov. 1, 2017), https://www.nytimes.com/2017/11/01/technology/five-tech-giants-upside.html [https://perma.cc/EL5Z-B7YX] (describing the role of five tech giants on the market).

4. The word "platform" has taken on a constellation of meanings, which often vary depending on the subject matter specialty of the speaker. In business strategy, a common set of components that form the core of a machine, software system, or the like may be called a platform; an example would be Microsoft Windows. *See* Carliss Y. Baldwin & C. Jason Woodard, *The architecture of platforms: a unified view*, *in* PLATFORMS, MARKETS AND INNOVATION, 21 (Annabelle Gawer ed., 2009). Many computer programs, sold by many different companies, can "plug into" the Windows operating system, making Windows a frequently-referenced "software platform." More recently, engineers and economists have reserved the word "platform" to refer to any physical or virtual thing, place, or system that brings together multiple sellers and multiple buyers of products and/or services. These are often (and more properly) referred to as "two-sided platforms." Thus, a shopping mall (a building with multiple separate units for lease) brings together sellers and buyers of retail goods. Today, virtual platforms such as Amazon, Uber, and YouTube are much in the news because of their growing size and power. Amazon brings together buyers and sellers of a huge range of goods and services. Uber brings together (or "intermediates" between) independent drivers and riders. YouTube (along with Spotify and the like) brings together producers and consumers of content (video, audio, etc.). In a more general sense, all-purpose search engines such as Google also serve as two-sided platforms, bringing together advertisers and consumers, though in this and other cases of "ad-supported" content, ads are often an extraneous intrusion into the content or information sought by the consumer. These platforms might be said to bring together producers and consumers of information, in a format subsidized by advertisers. The advertisers *use* the platform to attract customers, even though the customers are (usually) not on the platform for the express purpose of

It is now commonplace to worry about the massive size of Big Platforms. Competition and antitrust law experts will be heavily debating these issues in the years to come. The issues will be complex—Big Platforms have also destabilized conventional assumptions and practices in fields such as employment law (e.g., Uber, Lyft, and Didi in China), local regulation (e.g., Airbnb), and taxation (e.g., Amazon).

One side of the platform debate touts the advantages of size and scale in innovative industries. A well-established school of thought says that size and the accompanying market power are the best friends that innovation could ever have.[5] In addition, legal scholar Peter Lee has shown that technological skills are deeply embedded in pioneering companies, which makes a strong case for big companies to keep growing through company acquisition.[6] The buying up of talent in the form of big companies acquiring smaller ones even has a name: "acqui-hiring."[7]

As with most technologies, online platforms are based on a wide range of innovations spanning many years, including the internet itself, mobile communications, data compression technologies, online payment systems, and GPS satellites and mapping software. These innovations represent the successful harvest of many scientific and technological seeds planted at various times over fifty years. The seeds for these technologies were planted in many different places: the public sector and universities as well as big, medium, and small companies.

This creates a cause for concern: in the era of the Big Platform, will there still be room for such a varied innovative ecosystem? Will the trend toward "bigness" and the "winner take all" nature of platform markets shut out the smaller innovators that have helped create the conditions in which the platform economy thrives?

A detailed answer would have many parts and cover many topics: the future of government research and development (R&D), the prospects for university research, and the pros and cons of innovation driven by company acquisitions. This Article stresses only one of these themes: the importance

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looking at ads. These two-sided platform companies are the ones concentrated upon in this Article.

5. *See infra* notes 48–57 and accompanying text.

6. *See generally* Peter Lee, *Innovation and the Firm: A New Synthesis*, 70 STAN. L. REV. 1431 (2018).

7. Andres Sawicki, *Buying Teams*, 38 SEATTLE U. L. REV. 651 (2015); Samantha Nolan, *Talent for Sale: The Need for Enhanced Scrutiny in Judicial Evaluation of Acqui-Hires*, 67 HASTINGS L.J. 849, 849 (2016) (stating that in "acqui-hiring[,] [t]he buying corporation purchases the target, poaches its employees, jettisons its projects, and generally kills the company"; calling for shareholder protections for the acquired firm).

of markets for technology. The term refers to the ability to transfer technologies through the mechanism of patent acquisitions—arm's length sales of discrete technologies rather than of the companies that developed them.[8] When individual technologies can be transferred to big platform companies, the smaller companies that developed those technologies can continue to exist as going concerns. The people inside these smaller companies can therefore retain the benefits of autonomy and independence, despite the vertical integration that typically accompanies the platform economy. The market for technology essentially permits vertical integration of *technologies* without requiring the swallowing up of *entire companies*—an arrangement that has some distinct advantages.[9]

The main point of this Article is to emphasize the advantages of patent markets and continuing small firm viability. At the outset, however, it must be said that there are good reasons for vertical integration in the era of Big Platforms. The growth of companies by sequential firm acquisition has real benefits. It certainly is a boon for small company founders; today's golden exit for many startups is a phone call from a Big Platform company saying "we want to buy you."[10] Meanwhile, Big Platform technologies and business strategies reward size and scope, which are often achieved faster by a combination of internal growth and external firm acquisitions. Nor does a Big Platform company buying a startup always mean that small company talent is permanently absorbed. Some startup founders are "serial

8. As explained later, most patent-related transactions these days are for patent portfolios, rather than for individual patents. *See infra* note 23 and associated text.

9. *But see* Joshua Gans et al., *When Does Start-up Innovation Spur the Gale of Creative Destruction*?, 33 RAND J. ECON. 571 (2002). The paper presents an empirical study of 100 startups and finds that the probability of cooperation with incumbent firms, as opposed to entry into product competition with them is increasing in the innovator's control over intellectual property rights, association with venture capitalists (which reduce their transactional bargaining costs), and in the relative cost of control of specialized complementary assets. The authors conclude that the propensity for pro-competitive benefits from start-up innovators in the form of product market entry reflects an earlier market failure, in the market for ideas. For Gans et al., then, a strong market for technology and/or patent market (as explored later in this Article) actually *contributes to* the concentration of power in fewer (presumably larger) firms: the opposite of this Article's thesis. Two things to note about this Article are: (1) it was written before the Big Platform companies had fully emerged, so entry into product market competition in information technology industries was more common; and (2) the "strong IP" industries studied clustered around pharmaceuticals, an industry in which entry barriers associated with the high cost of pharma research and regulatory approval mean that the entry of new, full-scale pharma firms to compete with incumbents is a very rare event.

10. *See, e.g.*, JOHN HAWKEY, EXIT STRATEGY PLANNING: GROOMING YOUR BUSINESS FOR SALE OR SUCCESSION 130 (2014).

entrepreneurs" who go on to start another new company after their current company is swallowed up.[11]

Even so, there are good reasons to favor a diverse economic ecosystem that includes ongoing, continuously operating small firms in highly innovative industries. As explained later, substantial research shows that small companies are by many measures more innovative than large ones. Because patent markets enable technologies to move from smaller to larger companies without requiring smaller companies to be completely swallowed up, these markets can play an important part in preserving a more diverse industry structure in innovative industries. The big firms can thrive by acquiring the technologies they need to expand and grow, while at least some smaller firms can remain independent. This gives the smaller firms a better chance to contribute new and valuable innovations down the road.

Sale of technologies gives smaller companies a route through which they can participate in incremental innovation in the platform era while retaining their independent and autonomous cultures. This could help push against the overwhelming forces driving toward centralization, consolidation, and vertical integration. It just might even foster the kind of "outsider" mentality that so often begins the process of creative destruction. The ultimate reason for fostering technology markets in the platform era is to open the way for the beginnings of whatever era will succeed it.

An active patent market would serve as a supplement to in-house R&D, which can be expected to grow along with Big Platform companies. An increase in big company research is likely, judging from earlier waves of vertical integration. Twentieth century companies such as the Pennsylvania Railroad, Carnegie Steel, General Electric, DuPont, AT&T, and the "Big Three" U.S. automakers pioneered the raw-materials-to-end-user corporate architecture. One aspect of this was the development of modern in-house R&D laboratories. There are signs that the Big Platform companies are moving in this direction, especially in the case of Amazon's 126 Lab.[12] If the

11. Most big companies require the founders and other employees of acquired companies to remain as employees for a period of time; they do this by "vesting" the big company stock over two to four years, and which is the normal compensation for the founders who sell out. *See, e.g.*, Thomas Goetz, *Startup. Get Ready for a Demotion and an Identity Crisis*, INC. MAG. (June 2019), https://www.inc.com/magazine/201906/thomas-goetz/exit-acquisition-merger-after-sale.html [https://perma.cc/US4W-WQ9G] ("[M]ost startup acquisitions come with the golden handcuffs of a two- or four-year vest . . . .").

12. Amazon's 126 Lab created the Kindle e-book reader and the Alexa voice-recognition Amazon interface. *See* Mark Gruman & Brad Stone, *Amazon Is Said to Be Working on Another Big Bet: Home Robots*, BLOOMBERG NEWS (Apr. 23, 2018), https://www.bloomberg.com/news/articles/2018-04-23/amazon-is-said-to-be-working-on-another-big-bet-home-robots [https://perma.cc/S9PZ-Y9HX]; Ry Crist, *Behind the Scenes at Alexa's*

Big Platforms follow the traditional arc, in-house R&D will very likely continue to grow.

The nature of technology also contributes to the logic of large firm size and vertical integration. Peter Lee has identified some substantial benefits from in-house R&D and outright ownership (through acquisitions) of R&D-related assets.[13] Technology is usually not a disembodied commodity that can be bundled up and sold in a store, but rather a subtle mix of codified information and hard-to-pin-down know-how. There can be little tricks to make software code harder to hack, or knowledge about the right way to tweak the settings in a metal fabrication process to get the strongest alloy possible. A company can only come to own and control these "tacit" aspects of technology by either growing technology in-house or acquiring the people, machines, and buildings of an entire company.

With the advantages of in-house research and outright acquisitions, why worry about a third path that requires an arm's-length market for technology? The answer primarily stems from two principles: diversity and autonomy. To preserve a diverse ecosystem in the era of the Big Platform, technology markets are imperative. Only through an arm's-length transaction can a distinct, separate innovative company find an outlet for its new ideas. Only with many such small companies operating on their own can we avoid the inevitable problems of "groupthink," not invented here, and the other ills of bigness. Only through a market for technology can a small team of experts constitute themselves as a specialty supplier that remains independent of a large company—in other words, an autonomous economic unit. Some may regard these values as unimportant or overblown, but those who recognize that these traits gave rise to Big Platforms in the first place will be interested in preserving them. This translates to concerns for the health and well-being of a robust market for independently developed technology. Any detailed discussion of that market, however, requires covering some basics about the nature of patents and the market for them.

II. PATENT ASSETS AND PATENT MARKETS

This Article so far has mainly discussed the patent market in terms of the contribution it makes as an alternative to full-firm mergers and acquisitions.

Laboratory, CNET (Apr. 23, 2018), https://www.cnet.com/news/behind-the-scenes-at-amazon-alexa-laboratory-lab126/ [https://perma.cc/X32H-2376].

13. Peter Lee, *Innovation and the Firm*, *supra* note 6; *see generally* Peter Lee, *Transcending the Tacit Dimension: Patents, Relationships, and Organizational Integration in Technology Transfer*, 100 CALIF. L. REV. 1503 (2012).

This Part answers questions about the nature of the assets that are transferred in this market. Why are patents a useful asset type for transferring rights over technologies? How are patents superior to the sale of technology through contracts alone? How does corporate ownership of patents interrelate with the nature of corporations themselves?

A. ARE PATENTS DIFFERENT FROM OTHER TYPES OF CORPORATE PROPERTY?

While it is convenient that a corporation can sell off a patent portfolio, it might not seem significant. After all, given that a company can sell a used machine, truck, furniture, or any other type of personal property, what is so special about patents?

In one sense, nothing. Property in a patent is no different from other property.[14] So patents are just one of many things a company can sell when and if it chooses to.

But in another sense, patents are different. A central quality of property is that it confers broad control rights on an owner. In contrast to a simple buy-sell contract, for example, selling an asset subject to a property right does not require writing down in detail all the ways the buyer can use the asset in the future.[15] Legal academics say this wide discretion in deciding what can be done with an asset is the core feature of property. The "right to exclude" everyone else from using an asset leaves property owners with almost unfettered discretion in determining how it may be used.

Economists likewise think of property as an entitlement distinct from contract. Allocating rights and duties by contract is to them a basic feature of economic activity, but it is difficult, expensive, and theoretically impossible to specify *all* the rights and duties of two contracting parties regarding an asset.

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14. Patents are exclusive rights, just as personal property is the right to exclude others from using an object:

> The right to exclude others is the essence of the human right called "property." The right to exclude others from free use of an invention protected by a valid patent does not differ from the right to exclude others from free use of one's automobile, crops, or other items of personal property.

Panduit Corp. v. Stahlin Bros. Fibre Works, Inc., 575 F.2d 1152, 1158 n.5 (6th Cir. 1978). *But see* Michael H. Davis, *Patent Politics*, 56 S.C. L. REV. 337, 386 (2004) (asserting that "[c]alling patents ordinary property, and, more importantly, treating those rights as such seems slightly irrational").

15. *See* Henry E. Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691, 1704 (2012) ("When O1 owns Blackacre, the exclusion strategy for delineating her rights, implemented through devices like the tort of trespass, protects a range of actions A1, A2, A3 . . . without the law's needing to specify these actions.").

Property rights are therefore necessary and crucial for economic exchange. Property gives an owner *residual rights*: the right to all uses of an asset *not* specified in a contract. From both a legal and economic perspective, ownership means a wide and full scope of control over the uses of an asset—known and unknown, present and future.

It is this feature of property rights that is so important for patents. A patent gives its owner control rights over all embodiments of a claimed invention. Unlike other types of assets, however, technology is not static. R&D leads researchers in many directions, many of which are unpredictable.[16] Therefore, broad control rights over many variations on a basic theme and over currently unforeseen applications of a technique or design are especially important for new technologies and R&D activity generally. This is exactly what you get with a patent.[17]

Thus, selling a machine or truck is different from selling a patent. The buyer of the machine or truck can do anything he or she wants with it (as long as the use is legal), so personal property in trucks and machines adds some value. It would be burdensome for the company to specify all the things the buyer can do with the truck or machine, and property makes this unnecessary. However, listing future uses for a truck would be difficult but not intractable. The foreseeable uses of the truck, driving, carrying, delivering, etc., are legion but not infinite.

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16. According to Henry Smith:

> [T]he uses of an asset are not just risky (e.g., with a variance in outcomes forming a probability distribution), but uncertain, in the Knightian sense. That is, the set of uses of an asset may not correspond to a known probability distribution, and nonowners may not even know the members of the set. Property law helps manage this uncertainty by not making knowledge of the uses or even the probability distributions of their values relevant to dutyholders. In previous work, I have argued that Knightian uncertainty is more conducive to property rules than to liability rules, which do require more knowledge of probabilistic information by officials or courts.

Henry E. Smith, *Institutions and Indirectness in Intellectual Property*, 157 U. PA. L. REV. 2083, 2088 (2009) (footnote omitted) (citing FRANK H. KNIGHT, RISK, UNCERTAINTY AND PROFIT 19–20, 197–232 (1921)) (distinguishing "risk" from "uncertainty" by noting that "uncertainty" is immeasurable in principle); Henry E. Smith, *Property and Property Rules*, 79 N.Y.U. L. REV. 1719, 1724–27 (2004) ("Property itself is a response to uncertainty, and property rules derive some advantage as a response to uncertainty.").

17. On this, see Smith, *Institutions and Indirectness in Intellectual Property*, *supra* note 16, at 2106 ("For property, and intellectual property especially, the discovery of options (rather than the measurement of the value of options based on known risks) is something that the indirect modular structure of property tends to foster.").

The same cannot be said about patents. A patent on a mediocre glue might make "Post-It Notes" possible.[18] Invention of a nonstick coating for cookware might enable someone to make rainproof cloth that is still breathable.[19] A patent on a mildly useful compound for one medical condition might open the door later to an effective treatment for a major disease or problem.[20] The list of examples goes on.[21]

The essence of a patent is an extrapolation from one or a few prototypes, successful experiments, or working models. Those who draft patent claims work every day in the realm of projection, extension, variation, and modification. Even within a single patent, the usual practice is to draft a set of claims that begins broadly and then becomes narrower. This pattern is repeated several times in a typical patent. Thus, from an economic perspective, the best way to conceptualize a patent is as a set of nested options. When a patent is filed or a claim is redrafted (amended), it is impossible to know for certain whether that claim will cover (read on) a valuable commercial product (embodiment) in the future. There is also a risk

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18. *See* Acrylate Copolymer Microspheres, U.S. Patent 3,691,140 (issued Sept. 12, 1972). For the story behind the invention of the post-it note, see *About Us*, 3M, https://www.post-it.com/3M/en_US/post-it/contact-us/about-us/ [https://perma.cc/FR8M-7HJS] (last visited Dec. 21, 2019).

19. A DuPont researcher named Roy J. Plunkett invented polytetrafluorethylene (PTFE), trademarked as "Teflon," in 1938. *See Robert W. Gore*, SCI. HIST. INST., https://www.sciencehistory.org/historical-profile/robert-w-gore [https://perma.cc/JRM3-ZK4Y] (last visited Dec. 21, 2019). One of Gore's co-workers was W.L. Gore, who left DuPont to develop new applications of PTFE—one of which (in research with Gore's son, Robert Gore) led to the surprising discovery that quick-stretching PTFE made a thin film that was air permeable but waterproof: Gore-Tex. *Id.* One early Gore-Tex patent is Waterproof Laminate, U.S. Patent 4,194,041 (issued Mar. 18, 1980).

20. *See, e.g.*, Douglas Martin & Guinter Kahn, *Inventor of Baldness Remedy, Dies at 80*, N.Y. TIMES, Sept. 19, 2014, at A21 (describing Gunther Kahn's discovery that a failed ulcer treatment called minxodil was quite effective at stimulating hair growth); *see also* Methods and Solutions for Treating Male Pattern Alopecia, U.S. Patent 4,596,812 (issued June 24, 1986); Rebecca S. Eisenberg, *The Problem of New Uses*, 5 YALE J. HEALTH POL'Y, L. & ETHICS 717, 724 (2005) ("[C]linical trials showing that a drug works for a new indication may support a process patent on a new method of treatment, even though the same drug has previously been used for another purpose."); *see generally* Kathryn Brown, *Repurposing Old Drugs for New Uses*, 28 DEPAUL J. ART, TECH. & INTELL. PROP. L. 1 (2017).

21. Keep in mind the distinction between the specific features of a technology and the applications for or uses of that technology. Features must be described in order to obtain a valid patent; that is the essence of the enablement requirement in 35 U.S.C. 112. But applications or uses are a different matter. Thus, one must describe in detail how to make and use a new metal alloy if that is the new invention claimed. But a valid claim to the alloy will in general cover all future applications and uses—in machinery, autos, high-speed trains, aircraft, bicycles, and even things not yet invented at the time the alloy patent is issued such as zero gravity machines or building-sized hovercraft.

that a broader claim may encompass something known in the field before the claim was filed, making that claim invalid. As a result, patent drafters are forever navigating the eternal golden braid of validity risk, legitimate extrapolation (enablement), and future coverage.[22] But the better the claims are drafted, and the more of them there are, the more likely that something of future value will be covered.

Additionally, the real-world unit of analysis these days is a patent portfolio rather than a single patent.[23] Most portfolios also include pending patent applications which, unlike issued patents, can still be amended. Their claims can be stretched, where legitimate, to cover products that have become viable or foreseeable in the interval between the filing of the original claim and the amendment. These pending applications and their claims thus have even greater option value. The result of this setup is a large bundle of ownership claims over a multitude of technological options. The options cover embodiments that may be hard or impossible to foresee, and it is equally hard to predict the market value of these unpredictable embodiments.

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22. For just one of the thousands of examples that could be cited, compare Auto. Techs. Intern., Inc. v. BMW of N. Am., Inc., 501 F.3d 1274, 1282 (Fed. Cir. 2007) ("[T]he district court was correct that the specification did not enable the full scope of the invention because it did not enable electronic side impact sensors.") (invalidating claim in patent for side door airbag sensors which covered sensors with a movable mass, i.e., mechanical sensors which sense an impact due to changes in a magnetic field, i.e., electronically because the patent specification adequately taught only the use of mechanical sensors) with Hologic, Inc. v. Smith & Nephew, Inc., 884 F.3d 1357 (Fed. Cir. 2018) (finding disclosure of a single type of lightbulb adequate to support a claim to the use of any type of light guide in a surgical instrument).

23. *See generally* Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1, 31–32 (2005) (outlining a theory of patent value in which the worth of a patent portfolio is greater than the sum of its individual parts). This Article describes two chief advantages of portfolios: (1) "scale" and (2) diversity:

> [A] well-conceived patent portfolio is in many ways a form of "super-patent," sharing many of the marketplace advantages conventionally attributed to individual patents (paradigmatically, rights to exclude others from the marketplace), only on a larger, broader scale. By aggregating the individualized value of a number of closely related patents, the scale-features of patent portfolios enable holders to realize true patent-like power in the modern marketplace to a degree which is impossible using individual patents alone.
>
> [At the same time,] the inherent diversity created by the aggregation of many different patents offers holders a range of benefits—such as the ability to address the risk and uncertainty fundamental to innovation—that cannot be easily achieved absent the creation of such structures.

Id.; *see also* Michael Risch, *Patent Portfolios as Securities*, 63 DUKE L.J. 89, 140 n.250 (2013) (quoting Parchomoysky and Wagner).

These contingent ownership claims over uncertain future technologies and market products represent a uniquely indeterminate set of assets. This makes exclusionary or residual rights uniquely valuable as a form of entitlement over them. If property as a concept did not exist before, the desire to transfer rights over future technological embodiments and R&D trajectories would have made it necessary to invent it. The fit between the core feature of property—residual rights over unspecifiable uses—and the nature of a patent is exceedingly tight.[24]

B. PATENT PORTFOLIOS AS BUNDLES OF ASSETS: RELATIONSHIP TO CORPORATE LAW THEORY

There are several ways to think about patent property. One is that patents represent investments in "unsticking" information assets from other related assets.[25] Another is that patents represent an internal form of asset partitioning. The literature on corporate law theory has given us a rich account of how the corporate form permits discrete assets to be cleaved off and moved into a distinct entity separate from the personal assets of the people behind the corporation. This is efficient; it allows company founders to put boundaries around a limited "stake" they are willing to place inside the corporation, without endangering their individual assets.[26] This is an obvious corollary to a fundamental feature of corporations—limited liability of shareholders. The asset partitioning idea examines the asset side of the corporate risk equation. By drawing a conceptual circle around corporate assets, the corporate form permits a discrete set of assets to be placed at risk without endangering others.

This idea provides a template for how to think about patent portfolios, which allow a form of asset partitioning that promotes market efficiency rather than limiting liability. Patent portfolios allow a firm to place a distinct

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24. *See* Smith, *supra* note 15, at 1702–1704 (asserting that property law uses the "modular theory," whereby the law protects a variety of rights without knowing which ones the owner will use, because it "is more explanatory than the bundle picture. It helps explain the structures we do *not* find, shows how property can be used to maximize option value, and demonstrates why innovation in property takes the institutional paths it does.").

25. *See* Eric von Hippel, *"Sticky Information" and the Locus of Problem Solving: Implications for Innovation*, 40 MGT. SCI. 429, 436–37 (1994) (describing economic conditions that encourage investments in "unsticking" information).

26. Known as "asset partitioning." *See* Henry Hansmann & Reinier Kraakman, *The Essential Role of Organizational Law*, 110 YALE L.J. 387, 390 (2000) (defining asset partitioning, which the authors say is the central defining characteristic of the corporation as an organizational form); *see also* Giacomo Rojas Elgueta, *Divergences and Convergences of Common Law and Civil Law Traditions on Asset Partitioning: A Functional Analysis*, 12 U. PA. J. BUS. L. 517, 554 (2010) (discussing elaborations and refinements of the asset partitioning concept).

yet related set of assets into a sellable bundle, an idea pioneered in the context of general corporate assets and contracts by Ken Ayotte. Bundling in this form has numerous advantages that apply to R&D and patents.[27] Most notably, it encourages investment in complementary assets (e.g., related patents) and prevents opportunistic holdup. Patent law requires bundling in some cases to explicitly prevent holdup.[28] There is also a general sense that parties to a patent transfer agreement have a duty to prevent holdup.[29]

27. *See, e.g.*, Kenneth Ayotte & Henry Hansmann, *Legal Entities as Transferable Bundles of Contracts*, 111 MICH. L. REV. 715, 744 (2013) (arguing that holdup is prevented by including all potentially overlapping contracts and assets in the bundle or portfolio that is sold).

28. Holdup could occur if the seller of a patent withheld one or more related, overlapping patents, so that when the buyer began making and selling a product based on the acquired patent, the seller could sue for infringement under the patent(s) that were withheld. Patent law includes a rule that formally overlapping patents (those technically subject to what is known as "double patenting") (1) must expire at the same time (through use of what is known as a "terminal disclaimer" of any term in a second patent that would otherwise extend beyond the term of the first patent); and (2) must be transferred together, as a bundle, to prevent lawsuits from multiple sources against use of a single invention. *See In re* Van Ornum, 686 F.2d 937, 948 (C.C.P.A. 1982) ("When a terminal disclaimer causes two patents to expire together[,] a situation is created which is tantamount for all practical purposes to having all the claims in one patent. Obviously, that thought contemplates common ownership of the two patents, which remains common throughout the life of the patents."); *In re* Hubbell, 709 F.3d 1140, 1145 (Fed. Cir. 2013) ("The second rationale [for double patenting] is to prevent multiple infringement suits by different assignees asserting essentially the same patented invention."). A terminal disclaimer must "[i]nclude a provision that any patent granted on that application . . . shall be enforceable only for and during such period that said patent is commonly owned with the application or patent which formed the basis for the . . . double patenting [issue]." 37 C.F.R. § 1.321(c)(3). Second, parties can include a "non-holdup" provision in a patent transfer or purchase agreement.

29. *See* Abraxis Bioscience, Inc. v. Navinta L.L.C., 625 F.3d 1359 (Fed. Cir. 2010), *cert. denied*, 132 S. Ct. 115 (2011). This case involved a $350 million asset purchase by Abraxis, including eight pharmaceutical patents. Seller company AstraZeneca agreed that it would "do, execute, acknowledge and deliver, or will cause to be done, executed, acknowledged and delivered, any and all further acts, conveyances, transfers, assignments, and assurances as necessary to grant, sell, convey, assign, transfer, set over to or vest in Buyer any of the Transferred Intellectual Property" described in the asset purchase agreement. *Id.* at 1369. It was subsequently discovered that a subsidiary company of the seller had failed to transfer ownership of relevant patents to the seller prior to the deal; this was remedied, and the seller then transferred the patents to buyer Abraxis. Unfortunately, the transfer occurred too late to confer standing on the buyer Abraxis, so Abraxis's patent infringement action against another company, defendant Navinta, was dismissed. *Id.* at 1365, 1368. On this, see Xuan-Thao Nguyen, *In the Name of Patent Stewardship: The Federal Circuit's Overreach into Commercial Law*, 67 FLA. L. REV. 127, 137–46 (2015). Apart from the standing issue, the background to the case shows the general duty to transfer all technology or project-related patents, and therefore prevent patent-related holdup.

Additionally, parties can contractually agree to an anti-holdup provision.[30] In the same spirit, patent law encourages asset bundling—the clustering of assets around a single, discrete R&D project. The bundle, (i.e., the portfolio), can in turn be cleaved off from the other assets of the firm and sold separately. Instead of reducing the risk of liability, it enhances the ability of a firm to monetize an R&D project in the form of a discrete transaction. The remainder of the firm's assets stays put, and the firm proceeds as before.

Because of asset bundling, patents represent a distinct set of property rights that exist inside the boundaries of a firm's otherwise undifferentiated assets. Those property rights are separated from the firm's other assets by recognizable legal boundaries. The legal form of the patent represents a standardized bundle of rights over assets, which consequently segregates these assets from the other unsegregated assets owned by a firm. Patents as project portfolios are therefore characterized by four attributes: (1) compartmentalization, (2) segregation or partitioning, (3) separability or "unstickability," and therefore (4) the potential for market fluidity.

Critically, a firm need not be active as a seller in the secondary patent market to benefit from that market. A firm's overall patent portfolio essentially creates a series of easy-to-exercise options. Each project portfolio (i.e., set of related patents) that goes into the overall portfolio which can be sold off if necessary, giving the firm added flexibility.[31] Just the possibility of project portfolio sales makes the firm nimbler and therefore more profitable from an option theory perspective. Markets should theoretically recognize this, but the current understanding of patent portfolios may not have developed enough to exert much influence on existing market valuations.

From the perspective of an external investor, project portfolios allow investments in a set of property rights that represents discrete and "compartmentalized" corporate assets. For example, without patents it would be expensive and difficult for an outside investor to gain ownership

30. *See, e.g.*, Intel Corp., Asset Purchase Agreement (Jan. 26, 2012) § 2.9(f) (hereinafter Codec Intellectual Property Rights) ("None of the Patents or Patent Rights retained by Seller after the Closing read on, relate to, or are otherwise infringed by the development or use of the Codec Assets (excluding the Codec Personal Property) in the manner in which Seller and its Subsidiaries have been developing such Codec Assets prior to the Closing and as reasonably anticipated in order to commercialize the Codec Assets.").

31. *Cf.* Parchomovsky & Wagner, *supra* note 23, at 33 ("The broader scope of protection ensures that a wider range of technological possibilities will be covered, which both increases the possibility that the end result of the research and development effort will be covered, and diminishes the concerns of infringement of others' patents. This "freedom of movement"—the ability to invent, implement, produce, and ship products with in-house resources—is increasingly viewed as an advantage in today's dynamic market environments, where speed and flexibility are economic imperatives.") (footnotes omitted).

over each asset standing alone. The entire firm would have to be purchased, and then the particular assets of interest would have to be separated out and split off from the residual assets of the corporation. The particular assets of interest would have to be placed into some separate ownership structure, while the remaining firm assets would presumably remain in the old firm. That old firm would then be sold off to another buyer, shut down, or the like. This would all be difficult and expensive. The hidden value of the secondary market for patents is that it permits this sort of asset divestment to take place in a much more efficient manner. Patent portfolios are comprised of identifiable, discrete assets that can be easily plucked out of the general corporate structure and sold in well-recognized markets. The patents are themselves well-defined assets; when placed in a portfolio, they represent legally distinct asset bundles that are conceptually separable from the other undifferentiated assets of the firm.

Project portfolios make the firm's boundaries more porous or permeable to outside investors. They increase liquidity for discrete assets without requiring messy and disruptive penetration of firm boundaries by outsiders. Assets from the guts of the firm can be surgically plucked out without cordoning them off and extracting them through messy and complex operations. Internal assets central to the firm can be passed outside the firm's membrane in a clean and painless operation.

Thus, secondary markets for patents play an important role in firm flexibility and liquidity. This in turn enables quicker abandonment of failed innovation strategies and a quicker pivot to other, more fruitful projects. For outside investors, it represents a way to get hold of specific firm assets without penetrating and breaking up the firm; the "going concern" value of the overall firm is preserved while particular assets are extracted and sold off.

One solution to the "winner take all" dynamic of the Big Platform era is to encourage acquisition of technology and patents in a form other than full-firm acquisitions. Understanding this alternative thoroughly requires describing the various forms that these markets can take.

C. A TYPOLOGY OF TECHNOLOGY MARKETS, AND THE ROLE OF IP RIGHTS

Moving attention away from full-firm acquisitions enables discussions about the various ways technology changes hands in arm's-length transactions. The simplest way in which technology changes hands is when it is embodied in a product: a buyer of a DVD containing accounting software or a computer printer buys embedded technology along with the physical

product. This is as true of corporate purchasers, such as Big Platform companies, as it is for consumers.

Another way technology is purchased, however, is in a more disembodied form. The purest version of this type of transaction is a technology license, an agreement by an innovator to permit a licensee to use the innovative technology. In a pure license, there is no physical product involved. The technology itself might be said to be the "product," the object of the transaction.

Intellectual property (IP) obviously plays a role in many of these transactions. IP rights of various sorts will usually cover one or more aspects of an innovative technology. So the purchase of a DVD or a computer printer may be characterized by the seller as a kind of dual transaction; the buyer receives both the physical product and any IP rights that cover features of the product. Here, the exact interplay of the personal property concepts governing ownership of physical objects and the IP concepts governing the protected features is irrelevant; what matters is that there is an IP component to this standard purchase and sale transaction.

The IP component is much more apparent in the pure technology license than in the sale of an embodiment. Technology and IP rights, in particular patent rights, are often conflated in such a transaction. An innovative software compression algorithm or superior map-rendering software technique may well be covered by one or more patents. The transfer of this innovative technology will therefore often be effectuated via a patent license agreement.

However, for the agreement to qualify as a true technology transaction, the buyer must gain access to a new technique or family of algorithms. The buyer must acquire a capability that is attributable to the creator of the innovation, the owner of the patent.[32] This may involve a transfer of software code, algorithm flowcharts, and programming techniques, among other concepts. Whichever form it takes, the agreement must reflect the transfer of a new capability.

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32. This is phrased carefully to capture the case where engineers working for the buyer already know and use the patented technology, because they learned about it through various channels well before the buyer acquires rights to it in a formal transaction. Sometimes, in other words, the information has diffused around a field or industry well ahead of the time when a formal transfer agreement is reached. The formal agreement, in such a case, might be said to simply memorialize the information transfer, which occurred informally at an earlier time. *See generally* Robert P. Merges, *A Few Kind Words for Absolute Infringement Liability in Patent Law*, 31 BERKELEY TECH. L.J. 1 (2016).

Therefore, patent markets are different from product markets because patents do not map cleanly onto product markets. Patents typically cover technological components: small pieces of larger technologies. Examples include a part of a mobile phone antenna, a technique for compressing data to be sent over a network, or a method for encoding location information on a CD, an example we will return to later.

Patents map onto technologies. The invention in an antenna patent may form part of a mobile phone antenna. The compression algorithm may be used in a software program to transmit digital content such as music, video, or text. The popup menu may be part of a software program that handles calendaring or interfaces with travel-related websites.

Technologies, in turn, map onto products. The antenna is part of a mobile phone. The compression algorithm is part of a data streaming program used by music streaming companies or video websites. The popup menu may be part of a travel website or a suite of software for a mobile or desktop device.

Finally, products map onto markets. The mobile phone containing the antenna is sold in competition with other mobile devices, including phones, tablets, and watches. The data-streaming program is incorporated into the software of one of several music-streaming companies, or it is used by one video streaming service (e.g., Netflix) that competes with others (e.g., Amazon Prime or YouTube). The popup menu may be part of a desktop operating system such as Microsoft Windows, which competes with free operating systems such as Android for mobile; alternatively, it may be incorporated into one travel website (e.g., Kayak) that competes with others (e.g., Expedia).

This complex, multi-step "mapping" can be summarized as follows:

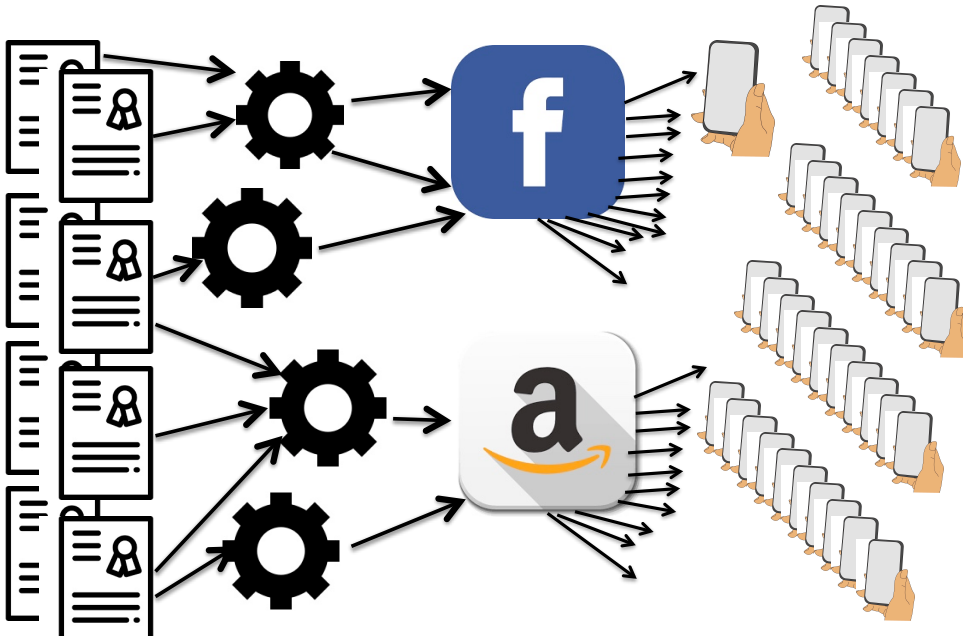
Patents → Technologies → Products → Product Markets

In the context of a winner-take-all/network goods market, this demonstrates why a "failed product" company does not equate to a company which has made no contribution. A helpful new technology may not be sold in a distinct market. It may be useful only as one small piece of an overall platform technology. The fact that an innovative small company has not succeeded in building a market for its technology may not be due to a poor technology design. It may instead be due to the reality that there is only one or a few prospective buyers for its design. If those buyers duplicate the small company's technology (intentionally or not) instead of buying it, the small

company will fail—not because its technology was a failure, but because of market imperfections in platform industries.

The overall structure of the industry can be represented this way:

Figure 1: Mapping Patents into Product Markets



In this diagram, the technologies (represented by little gears) on the left are covered by patents—sometimes by more than one of them. This illustrates that patents are not the same as technologies. The technologies, rather than the patents, are what make up the inputs into Big Platform products or services, such as the Facebook platform or the Amazon marketplace.

The acquisition of a new capability attributable to the innovator distinguishes technology transactions from transactions concerned solely with legal liability. In a purely legal transaction, the only new asset acquired by the buyer is the legal right embodied by one or more patent rights. The buyer in these cases does not learn about any new technology or acquire any new technical capabilities. It instead buys patents to protect itself from future patent infringement lawsuits, or possibly to sue competitors in patent infringement suits of its own. The transaction neither effectuates nor

memorializes the transfer of any innovation or new capability; it is a transfer of legal rights and nothing more.

There are some disputes among patent specialists about the relative volume of the two transaction types.[33] Some findings seem to show that much patent litigation has little to do with capability enhancement; the classic study shows that accused patent infringers are almost never proven to have copied any technology from the patent owner. The study concludes that because defendants in infringement cases are independent inventors, patents in those cases simply represent a tax on innovation rather than new capabilities. In a more recent study, however, Professor Colleen Chien disagrees.[34] She shows that in the field of software technology, many of the license agreements she studied involve the actual transfer of computer code, know-how, and associated technical information.[35] They were more than just settlement agreements fending off legal liability; they were transfers of new capabilities and technologies as well.

1. The Role of Patents in the Spinoff of "Orphan" Technologies

The argument so far is simple. Discrete technologies can be transferred to Big Platform companies via the market for technology; this preserves the autonomy and culture of an innovative firm while moving innovations into the hands of Big Platform companies. Anyone with experience in sophisticated corporate deals would just call this a spinoff—the transfer of some portion or unit of one firm to another, separate firm. Regardless of terminology, both the special nature of technology-intensive spinoffs and the role that patents play in enabling them merit particular attention.

Importantly, "transfer of patents" here refers to transfer of a patent portfolio, a set of related patents clustering around a discrete technology. There is a market for individual patents, which are often purchased to provide defensive protection for the buyer. These patents cover a technology or component that might be the subject of a patent infringement lawsuit brought by another patent owner. Owning a patent that covers a component

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33. *See, e.g.*, Robin Feldman & Mark A. Lemley, *Do Patent Licensing Demands Mean Innovation?*, 101 IOWA L. REV. 137 (2015) (determining that very little technology transfer accompanies most patent lawsuit settlement/licensing deals).

34. Colleen V. Chien, *Software Patents as A Currency, Not Tax, on Innovation*, 31 BERKELEY TECH. L.J. 1669, 1669 (2016).

35. *Id.* ("[T]he majority of material software licenses reported by public companies to the SEC from 2000–2015 (N=245) support true technology transfer.") (basing this statement on a study of the terms of these reported licensing agreements).

gives a potential infringement defendant "ammunition" to use against another patent owner/plaintiff in such a suit.[36]

However, the market for individual patents is beyond the scope of this Article. This discussion focuses on the transfer of a discrete technology, akin to the product of a distinct R&D project. The typical corporate R&D project results not in a single patent, but in a group of related patents—a portfolio. These patents represent core aspects of the technology, various improvements, refinements, and modifications of it, and all international corresponding patents that grow out of initial domestic patent filings related to the project. It also often includes pending applications, as explained earlier.

When collected in project portfolios, patents represent an interesting asset class that is distinct from general equity in a firm. They represent a form of internal asset partitioning that creates important efficiencies. Project portfolios make it easy to sell off the products of distinct R&D projects. This increases firm-level flexibility by making it easy to sell off the products of lines of research that have not panned out, which in turn enhances firm liquidity. The secondary market for patent portfolios allows firms to sell off assets associated with (1) abandoned, (2) re-directed, or (3) multi-application research projects in a relatively efficient way. Each of these transactions has some unique features that are worth taking a moment to describe.

a) Abandoned Projects

Abandoned projects are perhaps the most common source of patent portfolios. Companies of all sizes are constantly opening new lines of research. Except for the most truncated R&D projects, each of these lines will typically lead to at least a handful of patents. But the nature of research is subject to a number of well-known vicissitudes. Markets shift, often due to

36. As is well known, defensive acquisitions do no good against a pure patent troll or Patent Assertion Entity (PAE): these patent owners do not themselves make or sell any products, they are simply patent holding companies. This means that a defendant cannot assert its patents against a troll or PAE, because these entities are incapable of infringing any patents. *See* 35 U.S.C. § 271(a) (defining infringement as making, selling, using, importing, etc., embodiments of a claimed invention). As with all aspects of patent markets and patent litigation, however, there are some delicate gradations between pure trolls and pure traditional "producing" companies. Sometimes for example a producing company will supply patents to a separate firm for the sole purpose of suing and harassing a rival of the producing firm. This kind of "privateering" arrangement could incite the rival firm into a strategic response: filing an infringement lawsuit against the producing firm that supplied patents to and sponsored the privateer. The point is that defensive patents might be useful in the overall strategic game between rival producing firms, even if they are not directly useful as counter-ammunition in a specific suit brought by a (privateering) troll or PAE.

consumer preferences; technology changes, often in unforeseen ways; senior management changes its mind about the importance of some product or line of business; new units are acquired; or company politics assert their influence. In each case, what had been a priority even in the recent past may be rapidly de-emphasized. As ideas come in and out of favor, research projects follow. When an R&D project is abandoned, the secondary market for patents may permit the firm to recoup some of the R&D investment it would otherwise lose entirely. Other companies may not have given up on the technology, or they may try to use it in existing products in ways not available to the firm that developed it. Regardless, there may well be buyers for technologies that an originating firm has given up on. If so, the secondary market then allows for easier exit from abandoned research lines and therefore permits quicker transitions to new, more promising lines of research.

b) Re-Directed Research

Some companies also re-direct an R&D project from one goal to another. This may render some patents in the project portfolio less essential. For example, a project to write software code designed to signal a car driver about impending danger might be re-directed when the company decides it wants to make a fully autonomous (self-driving) vehicle. Research on how best to signal and assist a driver will therefore no longer be useful to the company, but other companies may have an interest in it. If an automaker wants to improve its danger signaling, it might purchase the first company's patents that cover this function. Alternatively, if the automaker already has a well-functioning driver signaling system, it might still purchase the patents for "defensive" use to ward off future patent infringement suits from third parties. In either case, some of the project portfolios may be sold in a patent transaction that benefits both the R&D company and the automaker.

c) Multi-Application Research

It frequently happens that an R&D project aimed at solving one problem yields technology that serves that goal but is also useful for other applications. For example, years ago the DuPont Company set out to create a permanent "nonstick" coating that could be used to make various surfaces less likely to accumulate detritus. Thus was born Teflon, whose first application was as a nonstick coating on cooking pans. A DuPont researcher familiar with Teflon (polytetrafluoroethylene, or PTFE) quickly saw that its unique features had a wide array of potential applications. This researcher, W.L. Gore, founded his own company without objection from DuPont and created the GoreTex material, hikers' and backpackers' friend. Because

DuPont determined that it did not have any continuing interest in PTFE, Gore was able to spin off a separate company.[37]

This scenario has been repeated many times since. One example involves Magnolia Software, a small startup in the mobile phone software field. It was founded in 2000 by an Israeli entrepreneur named Haim Harel, who had founded a number of other startups earlier in his career.[38] Magnolia invested somewhere near $60 million over the next ten years to develop what it called Mobile Transmit Diversity (MTD) technology, which makes more efficient use of mobile bandwidth on the "uplink" side of mobile communications (when data is sent "upward" from a mobile phone or other device to the local cell tower or other hub, and hence out onto the mobile network).[39] Though Magnolia continues to sell both hardware and software versions of its MTD technology, it sold more than fifty of its MTD-related patents to Google in June 2012 for an undisclosed amount.[40] Based on what we know, Magnolia is using the proceeds from its patent sale to fund ongoing operations; this presumably includes continuing R&D. This case study lends credence to the main point that the market for technology can help preserve a going-concern R&D firm. This market provides a payday for past R&D while freeing up the company to continue innovating in the future.

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37. The pertinent history is recounted in W.L. Gore & Assocs. v. Carlisle Corp., 381 F. Supp. 680, 685 (D. Del. 1974).

38. *Team*, MAGNOLIA BROADBAND (last visited Dec. 30, 2019), http://www.magnoliabroadband.com/index.php?option=com_content&view=article&id=55&Itemid=49 [https://perma.cc/CZ5Y-AYYW]. For an example of Harel's research, see Sherwin Wang & Haim Harel, *Increase of Reverse Link Capacity of the 3G CDMA Network by Mobile Transmit Diversity*, 2007 IEEE RADIO & WIRELESS SYMP. (Apr. 23, 2007), https://ieeexplore.ieee.org/document/4160729 [https://perma.cc/CFQ5-XHLB].

39. Mark Hearn, *Google's Patent Buyout From Magnolia Broadband Now Official*, TECHNOBUFFALO (June 18, 2012), https://www.technobuffalo.com/googles-patent-buyout-from-magnolia-broadband-now-official [https://perma.cc/BB3T-TFKZ].

40. According to the Magnolia CEO, "[t]his transaction is a milestone for Magnolia Broadband. It provides a return to our investors and funding for continued development of Magnolia's MTD technology." *Id.* And, according to a trade press report: "[i]nterestingly, although the [Magnolia] MTD patent portfolio was acquired by Google, Hautanen [the CEO] noted that 'The software, which can be embedded into any mobile broadband device remains the property of Magnolia Broadband and will be made available to mobile device vendors and chipset companies.' " Rik Myslewski, *Intel, Google Ink Patent Deals with InterDigital, Magnolia Broadband*, REGISTER (June 18, 2012), https://www.theregister.co.uk/2012/06/18/intel_google_patent_deals/ [https://perma.cc/9QN5-6WKP].

2. *Failed Product Companies and the Market for Patents*

Disputes over the social value of the secondary market are often tied up with differences of opinion over the volume and value of patent litigation.[41] The tip of the spear in these disputes takes the form of arguments over patents that come from failed-product companies. These are companies that started life with the best intentions; their founders hoped they were creating the next Google, Microsoft, or Intel. As often happens with small companies, however, things did not work out as planned. Whether the intrepid startup never made a saleable product or was beaten soundly in the marketplace, the end result is the same; in these cases, dreams of greatness died a certain death. When the battle is over and defeat is at hand, what is left is often just a few loyal employees, some scattered assets, and often a great deal of debt. Among the scattered assets left at the end are the firm's patents, often thought to have the most potential value. Sometimes this leads the failed product company to undergo a metamorphosis; it turns into a patent-holding company, hoping to license its patents and litigate if necessary in the process. Other times, the failed company sells its patents to another firm. Perhaps it sells to an operating company looking for patents to bulk up its portfolio. Perhaps it sells instead to a patent aggregator such as RPX or Intellectual Ventures. Or perhaps it sells to a PAE or an entity that looks like a classic patent troll.[42]

Viewpoints on how we should feel about these companies vary but generally form a spectrum.[43] On one end are operating companies who complain that the name says it all—these are failed companies. They did not

41. *See* Michael J. Burstein, *Patent Markets: A Framework for Evaluation*, 47 ARIZ. ST. L.J. 507, 507–08 (2015) ("Taking seriously the analogy between patent markets and financial markets, I demonstrate that there are numerous circumstances in which even well-functioning patent markets will fail to promote innovation . . . .").

42. *See* Colleen Chien, *Startups and Patent Trolls*, 17 STAN. TECH. L. REV. 461, 479–81 (2014) ("Some small companies have been able to sell or monetize their patent portfolios to support ongoing or new practicing business ventures. . . . A successful patent assertion campaign can support the business, or help fund a transition, for example, to another operating company business model or full-time patent assertion.").

43. *Compare* Xuan-Thao Nguyen, *Zombie Patents and Zombie Companies with Patents*, 69 FLA. L. REV. 1147, 1155–56 (2017) (criticizing failed product companies and advising the Federal Circuit to disfavor them in patent cases) *with* Michael Risch, *Licensing Acquired Patents*, 21 GEO. MASON L. REV. 979, 988 n.29 (2014) (arguing that sale of patent after firm fails can encourage firm founders to try another startup, and become "serial entrepreneurs"). Good or bad, failed product companies are a definite presence among companies that assert patents. *See* Robin Feldman et al., *The AIA 500 Expanded: The Effects of Patent Monetization Entities*, 17 UCLA J.L. & TECH. 1, 40 (2013) ("Many of the individuals in the samples appeared to be inventors who had tried to operate companies and when they failed, switched to litigation as a way of monetizing their patents.").

deliver real innovations that society wants and needs. Allowing them to extract money from the winners after the fact of their loss does no one any good. This is especially so, the argument goes, because these companies in general sue successful product companies for infringing patented inventions which the successful companies themselves invented on their own. Failed companies take advantage of the rule in the patent law that independent invention is no defense to infringement. The firms and people that hold the patents of failed product companies engage in lawsuits designed to extract rents from the companies that succeeded on their own and transfer payments to holders of patents as the last, sad harvest of failure. This is, as economists say, simple rent-seeking—taking wealth from one who earned it and giving it to another whose business is to seek out and partake in well-deserved pockets of wealth without helping to create it or build it up.

On the other end of the spectrum are failed-product companies who feel wronged in one way or another. They may feel that their ideas were in fact borrowed or that they helped make possible some aspects of the technology that is now dominated by successful product firms. At the extreme they may feel that one or more big, successful companies stole their ideas outright. They may also feel that their ideas were in some ways superior to those championed by the now-successful firms. They lost out not due to inferiority, but due to random developments or "path dependencies" early in the history of the industry; those developments ended up rewarding the successful firms for essentially unimportant or random reasons. Viewing things this way, a failed product firm may feel that its contribution is no less meritorious than that of a successful company. The failed company should therefore be paid for the unacknowledged contribution it made to the early development of the industry it worked so hard to create. Failure in the product market, in this view, does not mean total failure and ought not to preclude these firms from getting some compensation for their valuable early contributions.

One team of researchers summarized the issue this way:

> Failed startups . . . have little ongoing business. They may feel that the alleged infringer unfairly beat them in the marketplace. The alleged infringer may have the opposite view of the marketplace battle, and these underlying divergent views may affect the patent case. This divergence in views between failed startup plaintiffs and defendants may make disputes more difficult to settle, resulting in longer disputes. Failed startups also have investors who may desire some return, via the patent lawsuit, on their otherwise lost capital.[44]

44. Christopher A. Cotropia et al., *Heterogeneity Among Patent Plaintiffs: An Empirical Analysis of Patent Case Progression, Settlement, and Adjudication*, 15 J. EMP. LEG. STUD. 80, 89

The best study of these companies primarily includes companies that continue to manufacture some products while licensing patents covering products these companies once made but no longer do:

> Examples of formerly manufacturing entities include IBM, MOSAID (now Conversant), and General Electric. General Electric continues to make products, but also engages in extensive licensing of its large patent portfolio, including many patents covering technology that it does not manufacture. It is unsurprising, given the lack of precision in the rhetoric, that these companies have been attacked as "patent trolls," despite their past or ongoing commitment to manufacturing.[45]

a) Failed-Product Companies and Patent Litigation: Ex-Post Market Making

Failed-product companies that would rather not sell their patents to third parties can use another strategy; they can license instead. A number of studies on different types of patent plaintiffs finds that there are a few companies that pursue this approach.[46] When it happens, the usual battle of competing narratives is joined—the failed company scrapes the bottom of the barrel by becoming a troll, while the proud pioneer just wants recognition

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(2018). On patent sales as a way to earn back some money for investors, compare Michael Risch, *The Layered Patent System*, 101 IOWA L. REV. 1535, 1575–76 (2016) ("Venture capitalization, or lack thereof, is a potential source of concern for the failed startups [studied]. Not one of the failed startups [which were studied, and which litigated one or more patents] . . . had venture funding. The reasons for this are unknown. The failed startups could have failed precisely because they had no financing, and venture-backed firms were savvy enough to sell their patents and remain in operation.") (footnotes omitted).

45. Kristen Osenga, *Formerly Manufacturing Entities: Piercing the "Patent Troll" Rhetoric*, 47 CONN. L. REV. 435, 440 (2014) (footnotes omitted); *see also* David L. Schwartz, *On Mass Patent Aggregators*, 114 COLUM. L. REV. SIDEBAR 51, 52 (2014) ("While there are patent holders who abuse and exploit the patent litigation system, there also are patent holders with meritorious claims who have been unfairly denied compensation. This is true for companies that both do and do not manufacture. The critics also lump together a wide variety of seemingly different actors, including individual inventors, failed startups, research and development companies, mass patent aggregators, and Wall Street speculators who buy a single patent for purposes of enforcement. The correct analysis of the costs and benefits of patent trolls is quite complicated, and far beyond the simple narrative based upon whether the owner of the patent manufactures products.").

46. *See* Cotropia et al., *supra* note 44, at 94 (categorizing patent lawsuit plaintiffs) ("Failed Operating or Start-up Company: A company that originally invented the patent-in-suit and attempted to commercialize the technology. At present, the company sells no products and its primary business appears to be patent litigation. An example of the Failed Operating or Start-up Company is Broadband Graphics LLC."). Cotropia's data showed that failed companies brought 4% of such litigation in 2012. *See* Christopher A. Cotropia et al., *Unpacking Patent Assertion Entities (PAEs)*, 99 MINN. L. REV. 649, 692 (2014).

of its path-breaking innovations that paved the way for successors in the marketplace. Litigation of this type tests some of the points made in this Article, particularly how patents capture value for early contributors who lose out over time to ultimate winners such as the Big Platform companies. This litigation also affects the secondary market for the failed-product company's patents; the value of "first generation" patents which Company B wants to sell may be affected by the litigation prospects of other "first generation" patents that Company A has chosen to license (and later, litigate) on its own. Litigation prospects essentially affect the value of patents even when they are not destined for immediate litigation.

A good example of this scenario is the patent enforcement campaign waged by the creators of the Blackberry handheld device that hit the market in 1999. Among its other features, Blackberry introduced a version of "instant text messaging," which helped make its device a big hit in the 2000s. Blackberry sales grew steadily during the decade, reaching a peak of almost $20 billion in 2011. Only five years later, sales were down to $2.2 billion and the company had lost money for four straight years.[47] Blackberry went from having 20,000 employees in 2011 to approximately 4,000 in 2018.[48] While Blackberry did introduce a "smart phone" as an outgrowth of its original handheld "digital assistant," the introduction of a new iPhone in 2013 effectively killed Blackberry as a player in the smartphone market.[49]

Beginning around 2015, Blackberry seems to have transitioned to selling corporate-level security software. It puts its still-valuable brand on low-cost mobile phones sold by others, but it is no longer a major player in the high-end smartphone market that it contributed heavily to the creation of. This U.S. market, of course, belonged almost exclusively to Apple and Samsung/Android in 2018. These two companies have undoubtedly emerged as the winning platforms thus far in the smartphone market.

Like many pioneers who later lose out in the product market, Blackberry turned to licensing its patents to the product market winners. The specific

47. At the end of 2007, the company had a market capitalization of more than $60 billion. This had fallen to $4 billion by August 2016. *See* DEBORAH HIMSEL & ANDREW C. INKPEN, THE RISE AND FALL OF BLACKBERRY (Harvard Business Publisher 2017).

48. David Friend, *BlackBerry cuts jobs, shifts employees as part of turnaround plan*, STAR (July 21, 2015), https://www.thestar.com/business/tech_news/2015/07/21/blackberry-cuts-jobs-shifts-employees-as-part-of-turnaround-plan.html [https://perma.cc/3P9M-ZKXY]; Arne Holst, *BlackBerry's number of employees from 2017 to 2019*, STATISTA (May 15, 2019), https://www.statista.com/statistics/995125/blackberry-number-of-employees/ [https://perma.cc/VQK7-VAJW].

49. *See* John McDuling, *Investors are starting to think Blackberry has a future*, QUARTZ (June 30, 2014), https://qz.com/228123/investors-are-starting-to-think-blackberry-has-a-future/ [https://perma.cc/35U5-X7RV].

technology Blackberry claimed to have originated is instant messaging, or text messaging. Blackberry devices included a texting feature as early as 2005 through its Blackberry Messenger (BBM) application, which ran on its handheld devices.[50] Blackberry asserted patents on several texting features, including an encryption technique[51] used to keep messages secure.[52]

Another Blackberry patent (U.S. Patent 8,429,236)[53] asserted against Facebook describes an adjustable communication rate between an application running on two interconnected devices. The invention adjusts the communication rate depending on whether users on both devices are actively using the application at the same time. Status updates are exchanged infrequently when the applications are in background mode and not being actively used; this conserves transmission bandwidth and power consumption by the devices. A texting application like WhatsApp or WeChat, for example, will check every so often to see if a new message has been sent. When the application is not being actively used, the time between status updates is long. But when the system detects that two users are using the same application simultaneously—for example, when an active texting session is underway—the transmission of status updates accelerates. Each mobile phone "prioritizes" the texting application in terms of transmission bandwidth and power consumption. The two phones return to background mode when the texting session is over, which means less frequent updates and less power consumption.

If the '236 patent is adjudged to be valid and a solid incremental advance in the messaging field, Blackberry has a reasonable claim to compensation. Although this small feature of messaging software is one of many features that collectively make up the user experience of messaging with Facebook and Instagram, it still adds some value to the user experience. It would therefore still be one of the building blocks on which Big Platform

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50. *See* Complaint for Patent Infringement at 15, Blackberry Ltd. v. Facebook, Inc., 2018 U.S. Dist. LEXIS 221047 (C.D. Cal. Aug. 2, 2018) (No. 2:18-cv-01844).

51. Blackberry (RIM) in 2009 acquired the company (Certicom, Inc.) that actually pioneered this encryption technique. *See* Motek Moyen, *BlackBerry: Make Certicom Patents Licensing More Affordable*, SEEKING ALPHA (Oct. 11, 2014), https://seekingalpha.com/article/2554945-blackberry-make-certicom-patents-licensing-more-affordable [https://perma.cc/SF9M-L8QN].

52. *See* U.S. Patent No. 7,372,961 (issued May 13, 2008). This patent was filed first in Canada (Blackberry's home country) in December 2000. The invention claimed in this patent was originally created by employees of Centicom, Inc., the Canadian company that was acquired by Blackberry (RIM) in 2009.

53. *See* Transmission of Status Updates Responsive to Recipient Application, U.S. Patent No. 8,429,236 (filed Apr. 8, 2009) (issued Apr. 23, 2013).

companies have built their successful social media systems. Blackberry's devices might be failed products, and Blackberry itself might be considered a failed or diminished company. Nevertheless, some of the Blackberry *technologies* must be considered successes. Given the "winner take all" nature of the platform markets in which instant messaging is now embedded, the only compensation Blackberry will get for its contributions is through a patent licensing program—a program backed by patent litigation, as they so often are.

b) Summary: The "Two Period" Nature of Patents and Patent Litigation

The points made in this Article regarding the good fit between property theory and patents depend largely on the way patent claims capture future options. The essential quality of a property right is residuality; all uses of an asset not carved out by illegality or the like are permitted to the owner—without the need to specify or even know about the long list of these uses. Similarly, patent claims cover a host of unspecified and perhaps unknown variations and applications of a basic inventive concept. Essentially, patent claims can be valuable if and when they cover *future embodiments* of an invention.

Contrast this with patent litigation, where courts often impose a retroactive obligation on the patent infringer to the patent owner. It is retroactive in that it imposes the obligation from the moment an infringer can be proven to have incorporated a validly claimed invention in its product—even when no voluntary deal was struck by the parties and the infringer knew nothing about the patentee's patent at that time.

When claims are issued, they cover many possible future manifestations of the claimed technology. In litigation, these claims are applied retrospectively to the activities of an accused infringer—by looking back from the time of the patent infringement suit to the time when infringement began. The question is whether the patent claims cover what the defendant was doing once they are construed fairly. The future-orientation of the claims is often what permits a finding of infringement, even though that finding is not arrived at until later. Claims by their nature create the possibility of future infringement when they are issued by the patent office, but often this obligation is imposed by a court retroactively—sometime after the infringing behavior began and only after the patent has been litigated.

III. PATENT MARKETS, MERGERS, AND R&D: WHAT DO THE DATA SAY?

Thus far, this Article argues that the legal system should show some solicitude for the secondary patent market. The crux of this argument is that selling patent portfolios allows companies to both innovate and retain continuity as going concerns. Their continued existence, in turn, has advantages over full-firm acquisitions. This raises the question of what happens to the R&D and innovation capacities of a firm after it has been acquired. If acquired firms are more innovative across the board, this would undermine the comparative benefits of the patent market.

There is a fair amount of consensus, though far from universal agreement, on every aspect of this issue.[54] From the point of view of innovation, big is not always bad and in fact can be pretty good. Most researchers conclude that overall innovation, usually measured by number of patents,[55] improves after a merger or firm acquisition. If overall innovation

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54. One study summarizes the competing schools of thought from the economic subfield known as industrial organization (IO):

> [T]here are different arguments regarding the effect of firm size on . . . R & D productivity. While some studies argued that because, in large firms, R & D costs can be spread over its [larger] output, these firms can realize higher R & D returns, [but] other researchers argue that, due to some of the characteristics of large firms, such as a loss of marginal control or high level of bureaucratic control, R & D performance actually decreases.

Negin Salimi & Jafar Rezaei, *Evaluating Firms' R&D Performance Using the Best-Worst Method*, 66 EVAL. & PROG. PLAN. 147, 148 (2018). For a classic example from the "bigger is better school" based on a simple economic model, see Steven Klepper & Wesley M. Cohen, *A Reprise of Size and R&D*, 106 ECON. J. 925 (1996) (stating that larger firms can spread R&D costs across more divisions and products, so have an advantage in the scale of R&D they can conduct). For an overview of the field, the literature, and the debates, see generally MORTON I. KAMIEN & NANCY L. SCHWARTZ, MARKET STRUCTURE AND INNOVATION (1982); FREDERIC MICHAEL SCHERER & DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE (1990).

55. In most of the studies we are reviewing, innovation levels pre- and post-merger are measured by using various patent-related variables. Studies employ either the sheer number of patents before and after, or their quality (often determined, as is conventional, by the number of times the patents are cited in other patents and research studies). The simple objection to this measure is that it is usually large companies that make these acquisitions—bigger buys smaller. And bigger companies usually have a more aggressive mandate to build out their patent portfolios. The gains in numbers of patents, then, may show not a truly higher rate of innovation but simply a greater propensity to acquire patents per dollar of R&D spent. As for the citation data, though it can often by helpful, citations are susceptible to a number of well-known limitations. It might well be that in many cases the higher number of citations come from the greater visibility that comes with patents issued to larger companies. It could mean quality, in other words, but it might also simply signal prominence.

were the only concern, the case for a patent market looks shaky. However, a consistent body of research also shows that radical innovation decreases with firm size. A newly acquired firm becomes part of a larger company, and large companies rarely succeed in paradigm-shifting innovations. Before elaborating on this point about radical innovation, it helps to understand why many studies connect increased innovation with post-merger firms and large firms in general.

Two explanations have been given over the years as to why bigger may be better. The first arises from market power and is known as the Schumpeterian Hypothesis, after economist Josef Schumpeter.[56] High profit margins result from the oligopolies or monopolies enjoyed by big companies, and this provides money for increased R&D. The second answer springs instead from the nature of technology; this theory is captured by the term "synergy." Multiple related researchers working in proximity with each other combine findings and ideas in ways that increase the productivity of the entire collective group. Talented researchers, previously isolated in "silos," now share ideas with others from related fields; this is a fertile formula for innovation. The whole of the combined research teams ends up being greater than the sum of its individual parts.

Schumpeter's argument for the benefits of bigness would generally regard mergers as a good thing. Typically, "mergers reduce . . . product market competition and [therefore] increase expected payoffs from employee innovations"[57] due to the increased size and market power of the post-merger firm. From this perspective, the market power that so concerns

56. *See* JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM AND DEMOCRACY (1942); *see also* FREDERIC M. SCHERER, INNOVATION AND GROWTH: SCHUMPETERIAN PERSPECTIVES 222–37 (1984) (analyzing the Schumpeterian Hypothesis in light of studies that seem to discredit it). The idea that monopoly power leads to innovation is associated with the later writings of Schumpeter such as the 1942 volume just cited. This book includes the famous idea of "the perennial gale of creative destruction," which describes the "process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one . . . ." *Id.* at 82–83. This "later" Schumpeter is often contrasted with an earlier string of writings in which he emphasized small firms and individual entrepreneurs. *See* RICHARD R. NELSON & SIDNEY WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE 39–40 (1982) (citing Joseph Schumpeter's 1936 book, *The Theory of Economic Development*, as a good expression of "earlier Schumpeter").

57. Paolo Fulghieri & Merih Sevilir, *Mergers, Spinoffs, and Employee Incentives*, 24 REV. FIN. STUD. 2207, 2233 (2011). *But see id.* at 2233 (noting that the merger does also result in some disincentives to innovation).

antitrust authorities is beneficial because firms with market power are more secure in the pursuit of ambitious and long-term-oriented R&D.[58]

A comprehensive study verified that there are benefits from integrating the R&D efforts of acquiring and acquired firms; the talk of "synergies" as a rationale for mergers has a strong basis in truth.[59] This study had two primary findings. First, firms acquire other firms more often when the "technological overlap" between the two firms is high—when they are familiar with and can effectively evaluate the quality of the acquired firm's R&D activity. This is an aspect of what is known in technology studies as "absorptive capacity."[60] Second, acquisitions are dominated by big and successful companies—"larger firms, as well as firms with faster sales growth, better operating performance . . . and higher prior year stock returns."[61] The logic of "bigger is better" is surely at work here. The larger a firm, the more products and research projects it has.[62] With more projects comes a greater chance for synergies.[63] Large firm size and the accompanying resources to capitalize on

58. Note that one study found high R&D productivity in small *and* large firms, but not in the mid-sized firms that stand between them. *See* Kuen-Hung Tsai & Jiann-Chyuan Wang, *Does R&D performance decline with firm size? A re-examination in terms of elasticity*, 34 RES. POL'Y 966, 973 (2005) (finding a u-shaped relationship between firm size and innovation, based on total factor productivity (TFP) data: small and large firms are highly innovative, but medium sized firms are not).

59. *See* Jan Bena & Kai Li, *Corporate Innovations and Mergers and Acquisitions*, 69 J. FIN. 1923, 1955 (2014) (studying 1762 mergers, from 1984 to 2006).

60. *Id.* at 1945.

61. *Id.* at 1936.

62. Synergies may add value, but the first finding is troubling. If mergers are more common in cases of a degree of technological overlap, mergers would be more likely to remove potential future R&D competition than product market competition. While this is good in one sense—short-term consumer welfare is enhanced by product market competition—it is worrisome in another: future innovative capacity is likely to be absorbed into larger and larger firms. Whether small companies aim from the outset to be acquired; or whether they simply fail to introduce meaningful product competition; their future innovative potential will be taken inside a large company. And so again the benefits of independence and autonomy will be lost.

63. One aspect of the Bena and Li study presents a contrast with conventional Schumpeterian market power explanations of mergers and so is worth noting. The authors find that "close rivalry in product markets has a negative impact on the likelihood of firms merging. As a result, the positive effect of technological overlap on the likelihood of a merger pair formation is reduced for firm pairs that also overlap in product markets." Bena & Li, *supra* note 59, at 1949. Note that one study, based on an economic model (and not empirical data), provides support for this empirical finding (even though it contravenes Schumpeterian wisdom. *See* Paolo Fulghieri & Merih Sevilir, *Mergers, Spinoffs, and Employee Incentives*, 24 REV. OF FIN. STUD. 2207, 2233 (2011). The authors argue that limiting product market competition reduces employee incentives due to lessened opportunities to pursue another job, providing one reason for firms to avoid mergers with other firms that compete in product markets:

synergies might give big companies a natural advantage when it comes to post-acquisition innovation.

The synergy trope shows up as an explanation for why large-company acquisitions have replaced some IPOs as a way for small companies to cash out (or "exit"). One research paper on this topic says:

> The recent decline in IPO activity can be explained by the small firms' increasing preference for being acquired rather than growing independently. . . . [A] firm's trade-off between being acquired and remaining independent strongly depends on the extent of the synergies arising from a potential merger, which are however difficult to assess ex-ante . . . . [W]e document that [Young Innovative Companies] facing the potential to develop larger synergies are the main [cause] responsible for the decline in IPOs. Compared to 15 years ago, the quarterly number of IPOs conducted by these firms has decreased by 20 [percent].[64]

Despite some counter-indications in the older literature, newer studies support the idea that R&D efficiency may increase after firms merge into a single entity.[65]

> [B]y reducing the number of firms in the product market, mergers limit employee ability to go from one firm to another with a negative effect on incentives. . . . When the negative effects of the merger on incentives are sufficiently large, firms are better off competing in the product market and competing for employee human capital rather than merging and eliminating competition. In other words, [in the model,] firms prefer not to merge and [instead choose to] bear competition in the product market to maintain stronger employee incentives.

Id. An omitted sentence in the block quote states another disadvantage of mergers: "Moreover, mergers create internal competition between the employees of the post-merger firm, with an additional negative effect on incentives to innovate." *Id.* While consistent with the terms of the model, the idea that internal teams of rivals face reduced incentives to innovate has been countered over the years. The (now fading) practice of "parallel R&D" groups was put in place to *stimulate* intra-firm competition, and at least some managers believed that this created conditions that favor innovation instead of undermining it. *See, e.g.*, Richard R. Nelson, *Uncertainty, Learning, and the Economics of Parallel Research and Development Efforts*, 43 REV. ECON. & STATISTICS 351 (1961).

64. Andrea Signori & Silvio Vismara, *M&A Synergies and Trends in IPOs*, 127 TECH. FORECASTING & SOC. CHANGE 141, 141 (2018).

65. For a summary of findings from this older literature, see MORTON I. KAMIEN & NANCY L. SCHWARTZ, MARKET STRUCTURE AND INNOVATION 103 (1982):

> The bulk of the empirical findings [as of 1982] indicate that inventive activity does not typically increase faster than firm size, except in the chemical industry. R&D activity, measured by either input or output intensity, appears to increase with firm size up to a point and then level

A. THE "TACIT DIMENSION" AND MARKETS FOR "DISEMBODIED TECHNOLOGIES"

Economists have acknowledged the existence of tacit knowledge, technical information that is difficult to write down or codify, since at least the 1960s. Michael Polanyi's famous 1966 volume *The Tacit Dimension* describes craft and technical skills that are difficult or even impossible to write down and hand off to another person.[66] For this type of knowledge, it is far more efficient to hire people than to try transferring the information in a disembodied form. It is either impossible or very difficult to transfer tacit knowledge in an arm's length market for disembodied assets. The best and sometimes only way to transfer tacit knowledge from Organization A to Organization B is for Organization B to somehow acquire, absorb, and retain the employment relationship with the employees from Organization A; in other words, B has to acquire A's people. The things, procedures, and written records of A's people are not good enough. If people themselves are not part of the deal, crucial tacit know-how will not survive the transfer from A to B. It will instead evaporate and be lost in the hands and minds of A's employees.

Professor Peter Lee has documented this fact well. He has written an article calling into question the supposed ascendancy of "dis-integrated" business models in the current era.[67] He observes that arm's-length transfers of disembodied products, technologies, and patent rights will be inferior to full-on corporate acquisitions as long as the tacit dimension is important.[68] With a full acquisition comes the right to assume the acquired firm's

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> off or decline, as is consistent with the evidence on the nature of the R&D process.

Id. Kamien and Schwartz also note that "market structure intermediate between monopoly and perfect competition [may be the ideal for innovation purposes." *Id.* at 104. The authors conclude, "[e]mpirical studies over the last fifteen years have consistently shown that, although there may sometimes be certain advantages of size in exploiting the fruits of R&D, it is more efficiently done in small or medium size firms than large ones." *Id.* at 66; *see also* FREDERIC M. SCHERER, INNOVATION AND GROWTH: SCHUMPETERIAN PERSPECTIVES 182 (1984) (noting, for all firms studied, R&D inputs (such as R&D employment) and outputs (patents) increase "less than proportionately" with size, where size is measured by firm sales); Zoltan J. Acs & David B. Audretsch. *Innovation in Large and Small Firms: An Empirical Analysis*, 78 AM. ECON. REV. 678 (1988) (presenting industry concentration measures, which estimate the degree of monopolization or oligopolistic dominance in an industry, are statistically associated with reduced innovation).

66. MICHAEL POLANYI, THE TACIT DIMENSION (Reissue Ed., 2009).

67. Peter Lee, *Innovation and the Firm: A New Synthesis*, 70 STAN. L. REV. 1431 (2018).

68. *See id.* at 1500 ("[P]atents do not disclose significant tacit knowledge that is valuable for practicing a technology and adapting it to commercial use. Indeed, it is precisely these knowledge deficiencies that contribute to vertical integration in patent-intensive industries.").

employment contracts; the deal includes people as well as the disembodied assets they have created. When the tacit skills of individual people are important or the future stream of creative work matters, acquisitions will be superior to patent transfers.

B. AREN'T FIRM MERGERS AND ACQUISITIONS (ALMOST) ALWAYS SUPERIOR TO PATENT SALES?

This logic raises an obvious objection. Precisely because independent thinking is good, Big Platform companies acquire the small fry instead of growing all desired capabilities in-house. These companies also value diversity and autonomy; when these positive virtues result in valuable innovations, Big Platform rewards those innovators by acquiring their companies. If this is true, then there is no need to maintain the small company as a going concern to encourage innovation.

This phenomenon of absorbing the most innovative companies presents its own problems. A successful Big Platform acquisition represents a fine reward for innovation, but startups still call that acquisition an "exit." The innovative team is absorbed into a big company and the small startup or emerging company is no longer independent. This makes acquisition a double-edged sword. It is a reward for *past* innovation, but a sizeable body of research suggests that it is a damper on *future* innovation. The team that develops a technology will cash out nicely, but the autonomy and independence that created the context for the original innovation will be gone. Despite heroic efforts to preserve the best of both worlds—namely by the massive acquiring company pledging to "keep hands off" and "preserve the special culture" of the acquired company—acquisition brings an inevitable change. If a large company could completely duplicate the culture of the startup, it would do so from the outset and develop the technology in-house. In the end, two stark facts usually stand out; the acquired company did what it did because it was plucky and independent, and after the acquisition it becomes part of a big company. When technology is acquired through acquisition of an entire company, autonomy and diversity both exit the scene and never fully return.[69]

69. *Cf.* Victor Luckerson, *How Google Perfected the Silicon Valley Acquisition*, TIME (Apr. 15, 2015), https://time.com/3815612/silicon-valley-acquisition/ [https://perma.cc/6DA9-25RB] ("Oftentimes [after an acquisition] founders are rolled up inside another group inside of the company. They can't make decisions as freely as when they were entrepreneurs. That affects people's willingness to stick around.") (quoting Justin Kan, venture capitalist at Y Combinator and cofounder of Twitch).

1. For Radical Innovation, More Is Better and Small Is Big

A second major point regarding large firm acquisitions is that they reduce the chance for radical innovation. There are two reasons. First, they reduce the total number of separate firms in a given field. Second, they eliminate from the landscape precisely the sort of smaller firms that have been the source of paradigm-changing innovations throughout history. In these two ways, the loss of radical post-merger innovations is the major cost of large firm acquisitions, despite post-merger efficiencies.

In its simplest form, a corporate merger executes a form of legal arithmetic: 1 + 1 = 1. What starts with two separate firms ends with one. Whatever gains this brings in operations and in more efficient R&D, it entails a loss; an independent firm ceases to be. The consequences for future innovation are well understood in an aggregate sense but hard to pin down in any particular case. Future innovation is by its nature hard to predict, but students of long-term innovation patterns are fairly uniform in their assessment of the optimal number of firms—more is better. It is impossible to quantify what is lost when there are fewer separate firms to take part in the innovation sweepstakes, but on average throughout time, something is surely lost.

2. Small Is Big

The argument thus far establishes why *more* firms might make for more innovation in a given industry. The below arguments address another point—why *small* firms add to innovation in ways that make them superior to big ones.[70] All of them are variations on a single theme; smaller firms are more resourceful, nimble, focused, and productive, and hence more likely to come up with something new and different. As one study put it, summarizing

70. Definitions of "small" and "big" can of course vary, but in general small firms usually have fewer than 500 employees, and often fewer than 100, while large firms usually measure their workforces in the thousands. For a study of the very smallest firms and their ability to innovate, see Julian Baumann & Alexander S. Kritikos, *The Link Between R&D, Innovation and Productivity: Are Micro Firms Different?*, 45 RES. POL'Y 1263 (2016) (presenting data on German micro-firms, drawn from 10,000–15,000 firms in a total sample of firms in Germany, between 2005 and 2012). The authors find that most micro firms are young: "53% of the smallest firms were younger than 15 years." *Id.* at 1266. "[L]arger [small firms] have a lower R&D intensity than smaller ones: ceteris paribus, small firms invest 36% more in R&D per employee, firms with 0–4 FTE employees invest 90.4% more in R&D per employee than medium-sized firms." *Id.* at 1267. R&D intensity increases process and product innovations for all sized firms (which is to be expected). *Id.* at 1268. "Micro firms that do invest in innovation activities have 90% higher R&D expenditures per employee than medium-sized firms. Thus, firm size is negatively correlated with R&D intensity." *Id.* at 1271.

a large literature: "Empirical research on innovation and firm size confirms that despite large firms' apparent advantages in scale and access to complementary assets and capabilities . . . small firms are more efficient at innovation, particularly radical forms of innovation."[71]

Business people and scholars have named three different benefits to smallness for purposes of generating innovations: (1) magnified incentive effects; (2) better focus, meaning simpler and more direct decision processes within firms; and (3) the preference of those with an "entrepreneurial personality" for greater autonomy, which is better satisfied in small firms.

The first benefit hinges on the idea that small firms have more riding on their relatively few research projects. They therefore have less distraction and experience greater rewards when they succeed. Failure is more painful because the future of the company may be riding on a single research project. Success is also sweeter because the individual researchers often own a significant chunk of the entire small company.[72] Some theorists have described how big companies can leverage these features of small firms by entering into contracts that provide large rewards for project success. This is an example of the "high powered incentives" that economist Oliver Williamson delineated as an advantage of contractual exchange over integration or ownership.[73] Large firms are much more diffuse; individual projects pale in comparison to the overall scale of the firm. Additionally, individual effort is dwarfed by the totality of collective effort, so there is less direct reward for extraordinary effort. Large companies can access these

71. Todd R. Zenger & Sergio G. Lazzarini, *Compensating for Innovation: Do Small Firms Offer High-powered Incentives That Lure Talent and Motivate Effort?*, 25 MANAG. DECIS. ECON. 329, 329 (2004). As regards overall innovation efficiency, this conflicts with some of the studies cited in the preceding Section; that might be explained by the fact that many of the studies showing greater overall efficiency for post-merger firms were published after this article was. The conclusion regarding radical innovation, however, has not been superseded in the intervening years.

72. *Id.* at 342 ("[T]he results [of this study of 352 engineers in Silicon Valley and Route 128 in the Boston area] . . . provide consistent evidence that outcomes are linked directly to differences in contract attributes, which in turn are related to firm size. Firms with more aggressive reward systems appear more successful in motivating high effort and in luring and retaining top talent. Engineers with larger equity shares and a greater variable component to their pay work longer hours and are more likely to bring work home. Strong norms of peer monitoring may further escalate effort in small firms. By contrast, engineers with small equity shares, those employed in contracts with weak incentive intensity and weak peer performance pressure are less likely to work long hours and bring work home.").

73. This is an application of Oliver Williamson's transaction cost economics. *See generally* OLIVER E. WILLIAMSON, THE MECHANISMS OF GOVERNANCE (1996); Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L. J. 1477, 1483 (2005).

stronger incentives only indirectly—by contracting with small firms to supply research services or research-intensive inputs.[74]

A small team that puts all of its energy into a challenging project and is under the pressure of a specific contract requiring the team to deliver will on average work harder than a larger team embedded in a larger company. That idea is what fuels "high powered incentives" that accompany a contract specifying a discrete "deliverable." A researcher working in a research division of a large company cannot typically be strongly motivated. But a researcher or small team under pressure to deliver a specific result for a contractual reward can be expected to concentrate more and work harder. The downside of failure is greater in that the small firm might fail or experience a serious setback, and the upside of success is also greater if the contract is written so as to reward success robustly.

The second reason some researchers say small firms are superior is the relative lack of bureaucracy. One literature summary identifies "a loss of marginal control or [a] high level of bureaucratic control" as among the characteristics of large firms that cause R&D performance to decrease.[75] The perils of large bureaucracies are well understood but seem especially salient with respect to R&D activities, where freedom from bureaucratic oversight is especially important.[76] One pair of researchers noted that "it is not the size of firms per se, but rather the internal processes activated as firms evolve in size that affect innovation outcomes."[77] In planning for innovation, large firms typically gather more information as part of detailed analytical procedures. They "tend to make decisions in a more planned and more formal manner . . . than small firms."[78] This is partly due to organizational routines and styles

74. *See* Ashish Arora & Robert P. Merges, *Specialized Supply Firms, Property Rights and Firm Boundaries*, 13 INDUS. & CORP. CHANGE 451 (2004); *see generally* Bo Carlsson et al., *Knowledge creation, entrepreneurship, and economic growth: a historical review*, 18 INDUS. & CORP. CHANGE 1193, 1222, 1223 (2009) ("There are two main reasons why small firms have become more important in recent decades. One is that small firms simply do certain things (such as certain types of innovation) better than large firms. As a result, through division of labor between small and large firms, the efficiency of the economy is increased. The other reason is that small firms provide the entrepreneurship and variety required for macroeconomic growth and stability . . . .").

75. Negin Salimi & Jafar Rezaei, *Evaluating Firms' R&D Performance Using the Best Worst Method*, 66 EVAL. & PROG. PLAN. 147, 148 (2018).

76. *See, e.g.*, Clayton M. Christensen & Joseph L. Bower, *Customer Power, Strategic Investment and the Failure of Leading Firms*, 17 STRAT. MGT. J. 197 (1996) (asserting that innovation is negatively affected because allocation of resources is not autonomously decided but instead depends on what the biggest customers would likely want).

77. José Lejarraga & Ester Martinez-Ros, *Size, R&D Productivity and Decision Styles*, 42 SMALL BUS. ECON. 643, 644 (2014).

78. *Id.* at 646.

and partly due to increased monitoring; "as firms increase in size, managers become subject to closer monitoring by the firm's board of directors and shareholders, who expect decision making to be based on justifiable arguments." [79] Finally, with more layers of review and perhaps more competition over recognition and resources—in what is often called "company politics"—the personal agendas of corporate employees may come into play more often in large firms.[80]

Big firms recognize that their complex structures often fit poorly with the process of innovation. The spate of acquisitions by Big Platform companies and others attests to this; what the "bigs" cannot make, they buy. However, it is also borne out by the institution of "skunk works"—semi-secret or "unofficial" R&D projects within large companies that are conducted outside normal oversight and review procedures.[81] Indeed, complex oversight and approval seem like an anathema to successful R&D in whatever form. A study of 464 R&D joint ventures in the telecommunications industry found that "[c]ollaborative benefits [from these joint ventures] are diminished most by selection of governance that imposes excessive bureaucracy . . . ." [82] Whatever the industry, multi-stage decision procedures and more complex organizational landscapes seem to be the enemy of important innovation. Like many large companies before them, Big Platform companies are aware of these failings; acquisitions are one response to them. While those acquisitions may help address the "innovation deficiency" that often plagues big companies, these acquisitions come at the cost of extinguishing small innovators.

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79. *Id.* at 646–47.

80. *See* TOM BURNS & G.M. STALKER, THE MANAGEMENT OF INNOVATION 195 (1994). Quoting a research scientist brought into an industrial company to open an R&D lab: "What happens is that a plan devised in terms of changing the working organization [to include an R&D lab] fails to materialize because factors of status and politics play a determining role, and nobody realizes, or rather, admits, that these are real problems to be dealt with." *Id.* Describing R&D lab at one company: "[P]olitical conflicts do appear out of situations in which changing circumstances constitute a threat to existing parts of the working community. This happens when the new circumstances themselves are institutionalized." *Id.* at 199.

81. *Skunkworks*, WIKIPEDIA (last visited Dec. 21, 2019), https://en.wikipedia.org/wiki/Skunk_Works [https://perma.cc/Z6LJ-FYJS] ("The designation 'skunk works' or 'skunkworks' is widely used in business, engineering, and technical fields to describe a group within an organization given a high degree of autonomy and unhampered by bureaucracy, with the task of working on advanced or secret projects."). The name was first used at Lockheed Aeronautics; it was taken from the old L'il Abner comic strip; in that comic series, it was the name of a moonshine liquor still. *Id.*

82. Rachelle C. Sampson, *The Cost of Misaligned Governance in R&D Alliances*, 20 J.L. ECON. & ORG. 484, 485 (2004).

Unlike enhanced incentives and reduced bureaucracy, the final advantage of small firms relies less on their environment and more on the personalities of those who found and staff them. For many scholars, it is not firm size that shapes the entrepreneurial innovator; it is the entrepreneur who shapes the features of the small firm with his or her distinctive taste for autonomy and independence.

Some detailed research suggests that engineers and scientists who have a strong preference for autonomy and challenging projects tend to work at startups, while those impelled by security and risk avoidance more often work at large companies.[83] These differing motivations produce different outcomes; the autonomy valued by startup researchers creates the right sort of environment for radical innovation. As the title of one journal article says, "Being Independent is a Great Thing."[84]

Small firms admittedly have their own pressures. One is that the venture capital finance that makes startups possible brings external monitoring and accountability. Another is that although choosing one's career direction is exciting, it is also risky; going "all in" on a single project means little chance to deflect blame or soften the blow if it fails. Apparently, however, these negatives are outweighed for at least some people by the relative freedom from hierarchical oversight.[85] The simple act of choosing one's own course holds personal rewards.[86]

This self-selection also has ramifications for the larger economy. Because small firms are founded out of a desire for personal autonomy, they supply diverse and far-flung sources of fresh ideas. They ensure that many minds attack technological problems from many different, uncoordinated starting points. By decentralizing decision making, they make it more likely that a

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83. Henry Sauermann, *Fire in the Belly? Employee Motives and Innovative Performance in Startups Versus Established Firms* 14 (Nat'l Bureau of Econ. Research, Working Paper No. 23099, 2017), https://www.nber.org/papers/w23099 [https://perma.cc/6DL9-DDDX]. *But cf.* Thomas Lange, *Job Satisfaction and Self-Employment: Autonomy or Personality?*, 38 SMALL BUS. ECON. 165 (2012) (finding that, based on survey data, the extent of autonomy explains higher job satisfaction among self-employed men and women better than measures of various individual personality traits; a preference for autonomy, in this study, is not treated as a personality trait in and of itself).

84. Matthias Benz & Bruno Frey, *Being Independent is a Great Thing: Subjective Evaluations of Self-Employment and Hierarchy*, 75 ECONOMICA 362 (2008).

85. *See* Martin A. Carree & Ingrid Verheul, *What Makes Entrepreneurs Happy? Determinants of Satisfaction Among Founders*, 13 J. HAPPINESS STUD. 371 (2012).

86. *Cf.* Robert P. Merges, *Autonomy and Independence: The Normative Face of Transaction Costs*, 53 ARIZ. L. REV. 145 (2011) (arguing that even if multiple small firms add a modest increment to transaction costs in a given industry, the intrinsic value of autonomy might make it worthwhile to tolerate and encourage some small firms in that industry's structure).

small team "off the radar" of the established research paradigm will develop an unconventional or novel approach—the type of approach that can lead to a radical innovation.[87]

3. Innovating "Outsiders": A Complicating Factor?

According to the standard account, the typical source of "radical innovation" is an "outsider"—a person or firm from outside the industry that is disrupted or changed by the radical innovation. Social psychologists may provide the best explanation of why this is so through the concept of "cognitive distance." In this research, each person has a mental framework consisting of vocabulary, assumptions, and ways of looking at problems. Cognitive distance measures the distance between two persons' mental frameworks.[88] For purposes of innovation, closely aligned frameworks make for easy working relationships and productive incremental results. Nonetheless, it also produces a "groupthink" dynamic that does not lead to radical innovation.[89] In contrast, wildly divergent mental frameworks make it almost impossible for people to understand each other. Without a common ground, cooperative research is fruitless. Radical innovation comes not from excessive overlap or from the absence of overlap, but instead from a "just right" degree of overlap. When cognitive distance is too great, people "talk past each other" and collaboration is very difficult; but when this measure of distance is too small, people have nothing new to share with each other and their collaboration becomes sterile.[90]

As might be expected, cognitive distance between R&D personnel is reduced when a single organization amasses a large stock of R&D. This is good for incremental innovation because R&D efficiency increases; bigger is better for creating minor inventions. However, greater cognitive distance benefits more radical innovations; important new ideas very often come from

87. Each small firm also does its part to perpetuate the overall culture of small firms, the ethos and norms of this type of firm. By keeping this culture alive, even an unsuccessful small firm may sow the seeds of a future success. *See* Daniel W. Elfenbein et al., *The Small Firm Effect and the Entrepreneurial Spawning of Scientists and Engineers*., 56 MGMT. SCI. 659 (2010) (finding that researchers from small firms are more likely to subsequently be self-employed).

88. *See* Bart Nooteboom et al., *Optimal Cognitive Distance and Absorptive Capacity*, 36 RES. POL'Y 1016, 1016 (2007) (defining cognitive distance as "interpersonal difference between life experience and perceptual frameworks").

89. Though this is a consensus view, there are outliers. *See, e.g.*, Rajesh K. Chandy & Gerard J. Tellis, *The Incumbent's Curse? Incumbency, Size, and Radical Product Innovation*, 64 J. MARKET. 1 (2000) (presenting a historical study of sixty-four radical innovations in the consumer and office products markets that found that the traditional "outsider" innovation story was accurate until roughly 1945, but after that year large incumbents were responsible for a growing proportion of radical innovations in these industries).

90. *See* Nooteboom et al., *supra* note 88, at 1016.

the confluence of hitherto unrelated technical fields. For the most significant radical innovations, close cognitive proximity—as measured by single-firm accrued R&D stock—makes no difference, meaning that large size does not confer any advantages. As the authors of one study put it, "an increase in R&D-efforts will lead to more patents in the patent classes that the firm already masters" but not in new technologies due to "the high levels of uncertainty in explorative research."[91]

If outsiders are so important for radical innovations, the importance of preserving smaller companies within a given industry is harder to judge. If firms labeled as outsiders would be acquisition targets for Big Platform and other large companies, policies that preserve small outsiders are still important. Special solicitude for small firms also makes sense if there are only a few large firms in an industry and the cognitive distance between them is small—as happened with the three largest U.S. auto companies before the entry of overseas car companies in the 1980s.[92]

However, if outside firms are *infrequent* candidates for large firm acquisitions, the growth of big companies by merger poses less of a threat to the prospects for radical innovation. Precisely because they are "outsiders," these firms are not on the "radar screens" of the big companies. Perhaps there will always be such outsiders, no matter how many "inside" firms are vacuumed up in large firm acquisitions. Perhaps the history of radical innovation teaches us not to worry so much. Additionally, if the large firms in an industry have employees with the right "cognitive distance" from the employees of other large firms, maybe radical innovation can result from combinations of large firms working together—even in the absence of small firms. The research on cognitive distance relates to the cognitive styles of people inside different organizations; it is not directly related to firm size in any way.

Despite these potential concerns, the available evidence indicates that preserving cognitive distance requires protecting against excessive merger activity to cultivate an industrial ecosystem that includes small firms. The research cited earlier on R&D productivity and cognitive distance is based on pairs of firms involved in collaborative R&D.[93] If a firm can find a partner for collaborative R&D, it could presumably acquire that firm just as easily. This means that the research partners in this and similar studies are not

91. *Id.* at 1027.

92. *See* DAVID HALBERSTAM, THE RECKONING (1986) (providing a historical overview of the auto industry in the United States and Japan).

93. Nooteboom et al., *supra* note 88, at 1021 (presenting data on research "alliances" between pairs of firms).

unknown to each other. Having firms of different sizes may also make it more likely that a variety of cognitive distances are present between employees of different firms. The research cited earlier[94] explained that the personalities and preferences of small firm entrepreneurs differ systematically from those of large firm research employees. This alone makes it more likely that some of these small firms will "see things differently" and that a more optimal degree of cognitive distance will therefore open up between them and the employees of large firms. Small firms are likely to be beneficial due to the reasons explored in the earlier sections, as well as the possibility that they will have the "just right" degree of cognitive distance from large firms to make radical innovation more likely.

C. MERGERS AND INDUSTRY STRUCTURE: SUMMARY

This Section makes the case that a variegated industry structure, one that includes a number of smaller firms, gives the best chance for important future innovations. As one study summarized it:

> [T]he results show that larger firms enjoy greater advantages for incremental innovation performance . . . but not for radical innovation performance on which large firm size has a negative non-significant effect . . . . Large firms rarely introduce radical innovation performance; rather they tend to solidify their market positions with relatively incremental innovations . . . .[95]

Both these themes—increased overall innovation and decreased radical innovation—are apparent from a large-scale study of post-merger R&D in European companies. Economist Joel Stiebale studied 941 European mergers between 1978 and 2008 using data on the nationality of inventors listed on patent applications. The results show that after many mergers, inventive activity increases in the country where the acquiring company is located but decreases in the country that is home to the acquired, or target, company.[96] The study recognizes that after a merger, consolidation of patent activities in the headquarters of the acquiring company is to be expected, and that therefore more patent applications will originate from the home country of the acquiring company after the merger. To adjust for this, Stiebale tests national-level inventiveness by the domiciles of listed inventors on those patent applications, rather than by the applications originating in the

94. *See* notes 83–85 and accompanying text.

95. Beatriz Forés & César Camisón, *Does Incremental and Radical Innovation Performance Depend on Different Types of Knowledge Accumulation Capabilities and Organizational Size?*, 69 J. BUS. RES. 831, 836 (2016) (references omitted) (summarizing literature).

96. Joel Stiebale, *Cross-border M&As and Innovative Activity of Acquiring and Target Firms*, 99 J. INT'L ECON. 1 (2016).

acquiring and target home countries. The patent department and thus filing country may change after an acquisition, but the inventors usually stay put. Stiebale finds that R&D productivity of the acquired company drops, as measured by the number of patent applications filed by its inventors in the post-merger period.

The larger the patent portfolio of the acquiring company (which Stiebale calls the "knowledge stock"), the greater the drop in inventiveness in the country where the target firm is located.[97] The data show that innovative activities become more concentrated in the home country of the acquiring firm—a sign of the increased efficiency that accompanies R&D-oriented acquisitions.[98] From an overall efficiency standpoint, there is a good and defensible reason for this result; it shows that "innovation activities are not relocated from targets to acquirers per se" but to whatever part of the firm is "more efficient in innovation."[99] Nevertheless, another finding of this study stands out: there is a loss of innovative vigor on the part of the target firm after these mergers. Efficiency is gained, but what could be paradigm-stretching creativity is lost.

Admittedly, this study documents a drop in inventiveness only for the trans-national, intra-European mergers studied. It is possible that these results pertain to European mergers in some peculiar way. Aside from this, however, the study sounds a cautionary note. While the overall *volume* of innovation increases in the expected way after a merger, this comes at the expense of the innovative output of the acquired firm. While the gains in efficiency may outweigh the loss of a highly innovative independent firm, the theory and experience reviewed earlier tell us to be wary of the long-term effects. Multiple, rivalrous sources of innovation are still a good thing; one might even view them as a good in and of themselves. Losing many autonomous firms to the merger trend may generate serious costs in the long run.

One historical study published in 1969, aptly entitled *The Sources of Innovation*,[100] takes a long-term perspective regarding industry structure and reflects many of the arguments presented here. In this study, as with more recent literature, small firms are often the heroes of innovation stories. As in 1969 and the times when the innovations studied were being developed,

97. *Id.* at 11.

98. *Id.*

99. Stiebale, *supra* note 96, at 11.

100. JOHN JEWKES ET AL., THE SOURCES OF INVENTION 211–12 (2d ed. 1969) (summarizing the invention and development of fifty-six important innovations, including the ball point pen, catalytic cracking of petroleum, new polymers such as polypropylene, the transistor, etc.).

there is an important place for small firms in a healthy R&D-rich industrial ecosystem. That was true before the Big Platform companies, and it remains true now as well.

IV. SUGGESTED REFORMS TO ASSIST THE PATENT MARKET

This Article has established that patent markets can serve an important purpose in an era when "bigness" is reasserting itself as an economic imperative. Although this Article therefore comes to defend patent markets rather than condemn them, they are no panacea. They have limits and create inefficiencies, which makes them far from perfect as a solution to the potential problems of the Big Platform era. This Part identifies one important problem before offering constructive suggestions.

A. RELATIONSHIP TO LITIGATION: DO PATENT MARKETS "FEED THE TROLLS"?

The greatest inefficiency of the patent market is that it is tethered to the thoroughly inefficient business of patent litigation. Reasonable parties on both sides of a patent transaction would ideally predict potential court outcomes, bargain accordingly, and stay away from court; this happens in roughly half of these transactions.[101] The other half, unfortunately, lead to some stage of the litigation process. The result is that the patent market seems intimately bound to the fraught phenomenon of patent litigation.

B. POLICIES TO SUPPORT THE SECONDARY PATENT MARKET

Changes in both antitrust law and the rules regarding patent rights would assist in strengthening patent markets. This can in turn mitigate the effects of Big Platform companies.

1. Antitrust Law

Antitrust law plays an indirect role in promoting patent markets. The chief contribution it can make is to recognize the importance of small,

101. Until recently we might have guessed that as many as 90% of patent-related transactions were conducted without recourse to formal enforcement of some sort. But the dismal fact that the number is closer to 50% has now been established. *See* Mark A. Lemley et al., *The Patent Enforcement Iceberg*, 97 TEX. L. REV. 801, 803 (2019). For general treatments of the costs and benefits of litigation, see Louis Kaplow, *Private Versus Social Costs in Bringing Suit*, 15 J. LEGAL STUD. 371, 371 (1986); Peter S. Menell, *A Note on Private Versus Social Incentives to Sue in a Costly Legal System*, 12 J. LEGAL STUD. 41, 41 (1983); Steven Shavell, *The Fundamental Divergence Between the Private and the Social Motive to Use the Legal System*, 26 J. LEGAL STUD. 575, 577–79 (1997).

independent firms in the innovative ecosystem of technology-intensive industries. This will apply mostly when antitrust authorities are asked to review a sale of patents by a small firm to a larger firm, such as a platform company. Patent acquisitions are routinely reviewed for compliance with antitrust law;[102] they are suspect because they combine the resources of two firms in a "horizontal" (competitor-to-competitor) arrangement. [103] In reviewing such an arrangement, antitrust agencies and courts should consider both the short-term effect on consumers and the long-term benefits of the survival of small firms. There may be cases where a large firm acquires some added short-term market power due to the purchase of patents. While this is not to be ignored, it must be weighed against the benefits of small firm survival—which may be dependent on the sale of patents. The prospect of future innovation potential needs to be part of the regulatory calculus.

In general, antitrust review centers on the relationship between patent holdings and market power. In merger analysis, for example, antitrust authorities in the past have sought to ameliorate the effects of enhanced post-merger market power by requiring the newly merged company to license patents to a third party. [104] The aim in such cases is to create

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102. Intellectual Ventures I LLC v. Capital One Fin. Corp., 280 F. Supp. 3d 691, 697 (D. Md. 2017); Kobe, Inc. v. Dempsey Pump Co., 198 F.2d 416, 423–25 (10th Cir.), *cert. denied*, 344 U.S. 837 (1952) (acquiring a portfolio of patents to "corner the hydraulic pump business for oil wells" constituted illegal monopolization); United States v. Westinghouse Elec. Corp., 648 F.2d 642, 647 (9th Cir. 1981) ("[A] patent holder may run afoul of the antitrust laws . . . by expanding] that monopoly by . . . accumulation."); SCM Corp. v. Xerox Corp., 645 F.2d 1195, 1205 (2d Cir. 1981) ("Surely, a § 2 violation will have occurred where, for example, the dominant competitor in a market acquires a patent covering a substantial share of the same market that he knows when added to his existing share will afford him monopoly power.").

103. Hurricane Shooters, LLC v. Emi Yoshi, Inc., No. 8:10-cv-762-T-30AEP, 2010 WL 4983673, *2–3 (M.D. Fla. 2010). In denying a patentee's motion to dismiss the accused infringer's antitrust counterclaim, the court said this about patent acquisitions:

> Count II alleges that Plaintiff acquired title to a competitor's patent (McNaughton Inc.) in order to restrain commerce in the relevant market, by requiring other competitors, like Defendant, to take a license from Plaintiff at an exorbitant royalty. Defendant also alleges that Plaintiff has acquired more than 10 patents covering [the market for the patented product] . . . in order to obtain licenses from competitors at exorbitant rates. At this stage, this is sufficient to state a claim. Defendant has alleged that McNaughton Inc. conspired or combined to restrain competition . . . . [I]t is not a violation of the antitrust laws to acquire patents from others. [But if] it is determined, at a later stage, that these allegations were lacking in merit, the Court will not hesitate to award sanctions.

Id.

104. *See In re* Ciba-Geigy Ltd., et al., 123 F.T.C. 842 (1997) (noting a consent decree requiring divestiture of lines of business and/or licensing of patents to third parties in the

competition if the new firm would have excessive market power in the absence of such a license. A good example of this is a Federal Trade Commission (FTC)-managed consent decree from 1995.[105] The two largest producers of polypropylene technology had proposed a joint venture (JV)[106] aimed at broad cooperation in the polyolefin (plastics) industry. The FTC ordered that the parties divest the JV of all plants, patents, and related assets pertaining to polypropylene; this was to prevent the JV from dominating that part of the industry.[107]

In antitrust analysis of patent acquisitions, authorities look at the effects of patent purchases on product markets. The emphasis is on whether the patents give the acquiring firm some extra degree of market power over rivals in these "downstream" markets (markets for products derived from or drawing upon the patented technology).[108] A typical antitrust review of this type came in *ABS Global, Inc. v. Inguran dba Sexing Technologies, LLC*,[109] where antitrust plaintiff ABS Global argued that patent acquisitions by defendant Sexing Technologies (ST) violated § 2 of the Sherman Act.[110] According to

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fields of gene therapy, pet medicines, and corn herbicides). The consent decree requires that the merged firm license a specific competitor—one judged to be in the best position to promote competition:

> [The parties, i.e., the merged firm] shall (i) grant a non-exclusive license to [third party Rhone Poulenc Rofer, Inc.] to make, use and sell [Herpes simplex virus-thymidine kinase ("HSV-tk") gene therapy products, for the treatment of cancer], under [the merged firm's] HSV-tk Patent Rights . . . or (ii) grant a nonexclusive license to make, use and sell HSV-tk Licensed Products under [the merged firm's] HSV-tk Patent Rights to an HSV-tk Licensee that receives the prior approval of the Commission and in a manner that receives the prior approval of the Commission, in perpetuity and in good faith, at no minimum price. In consideration for the HSV-tk License, each [party] may request from the HSV-tk Licensee compensation in the form of royalties and/or an equivalent cross-license.

Id.

105. *In re* Montedison S.P.A., et al., 119 F.T.C. 676 (1995).

106. According to the consent decree, the parties "collectively account for over 80% of completed and projected additions to capacity pursuant to [polypropylene] technology licenses since 1990. Other technologies are not a significant competitive constraint." *Id.* at 681.

107. *Id.*

108. *See* Fiona M. Scott Morton & Carl Shapiro, *Strategic Patent Acquisitions*, 79 ANT. L.J. 463, 463 (2014) ("Our analysis has much in common with merger analysis: we study how a strategic patent acquisition changes economic incentives and trace through the likely economic effects of those changed incentives.").

109. ABS Global, Inc. v. Inguran L.L.C., No. 14-CV-503-WMC, 2016 WL 3963246 (W.D. Wis. July 21, 2016).

110. 15 U.S.C. § 2 ("Every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade

ABS Global, these acquisitions were part of an effort to monopolize the market for sex-sorted bull semen used for artificial insemination in the cattle industry. ST's strategic patent acquisitions began after expiration of ST's foundational patent, the "Johnson patent":

> Since the Johnson Patent expired in 2006, ST has purchased, acquired or licensed several U.S. patents related to sexed semen processing. Principally, ST acquired control of XY, Inc., in 2007. At the time, ST was one of several U.S. licensees using [three of the important] XY . . . [patents] . . . . ST is now XY's sole current licensee for its patented sexed semen process in the United States for bull studs. Since 2007, XY has also been a wholly-owned subsidiary of ST. In 2008, ST also purchased several pending patent applications related to sexed semen processing from Monsanto Company. . . . Those applications matured into 24 U.S. patents, including [two] that [were asserted against the defendant/antitrust counterclaimant] . . . here. Finally, ST obtained an exclusive license for nonhuman applications to a portfolio of U.S. patents relating to sexed semen processing from Cytonome, Inc., covering an additional 46 U.S. patents related to sexed semen.[111]

Antitrust defendant had thus acquired a collective portfolio of seventy-three patents covering the technology at issue in the case. Both parties moved for summary judgment on the antitrust issue, but the court declined to grant either motion. In explaining why, the court gave some useful instruction in the whys and wherefores of antitrust claims based on patent acquisitions:

> Any [Sherman Act] § 2 claim based on the acquisition of patents presents an "obvious tension between the patent laws and antitrust laws. One body of law creates and protects monopoly while the other seeks to proscribe it." *United States v. Westinghouse Elec. Corp.*, 648 F.2d 642, 646 (9th Cir. 1981). Indeed, acquiring and asserting valid patents is absolutely protected by the patent laws "in the absence of monopoly but, because of their tendency to foreclose

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or commerce among the several States, or with foreign nations, shall be deemed guilty of a felony . . . ."). The same antitrust offenses punishable as felonies under criminal law can be the subject of private civil suits, due to Section 4 of the Clayton Act, codified at 15 U.S.C. § 15:

> [A]ny person who shall be injured in his business or property by reason of anything forbidden in the antitrust laws may sue therefor in [a] district court of the United States . . . without respect to the amount in controversy, and shall recover threefold the damages by him sustained, and the cost of suit, including a reasonable attorney's fee.

15 U.S.C. § 15.

111. *ABS Global*, 2016 WL 3963246, at *3.

> competitors from access to markets or customers or some other inherently anticompetitive tendency, they are unlawful under § 2 if done by a monopolist [.]" *City of Mishawaka, Indiana* [*v. Am. Elec. Power Co.*, 616 F.2d 976, 986 (7th Cir. 1980)] . . . at 986 (quoting *Sargent-Welch Sci. Co. v. Vernon Corp.*, 567 F.2d 701, 711–12 (7th Cir. 1977)).
>
> Here, ABS has shown enough to suggest that ST's acquisition of patents may qualify as unlawful under the Sherman Act. See *SCM Corp. v. Xerox Corp.*, 645 F.2d 1195, 1205 (2d Cir. 1981) ("Surely, a § 2 violation will have occurred where, for example, the dominant competitor in a market acquires a patent covering a substantial share of the same market that he knows when added to his existing share will afford him monopoly power."); *L.G. Balfour v. F.T.C.*, 442 F.2d 1, 15 (7th Cir. 1971) (disagreeing with the petitioners that the cases they cited "[stood] for the proposition that the accumulation of patents . . . may never constitute a violation of the antitrust laws").[112]

The key factor in allowing the antitrust case to proceed, as the *ABS* court said, was the defendant's "relatively recent, aggressive patent acquisitions" that led to the patent litigation against the antitrust counterclaimant ABS.[113] This raised the possibility that ABS would be liable under the antitrust laws, provided that factual proof at trial showed that their patent acquisitions "reflect ST's intent to maintain monopoly power through anticompetitive means."[114]

The ABS case was premised on § 2 of the Sherman Act, but other challenges to patent acquisitions are brought under the Clayton Act's § 7 prohibition on acquiring "assets" where "the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly."[115]

While not all antitrust challenges succeed,[116] the threat of scrutiny and the possibility of treble damages for successful antitrust plaintiffs may decrease

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112. *Id.* at *18.

113. *Id.*

114. *Id.* at *19.

115. 15 U.S.C. § 18. Patents are a type of asset, so patent acquisitions are included in this provision. *See* SCM Corp. v. Xerox Corp., 645 F.2d 1195, 1210 (2d Cir. 1981) ("Since a patent is a form of property . . . and thus an asset, there seems little reason to exempt patent acquisitions from scrutiny under [Section 7]."); Crucible, Inc. v. Stora Kopparbergs Bergslags AB, 701 F. Supp. 1157, 1162 (W.D. Pa. 1988) ("A patent, as a form of property, is an asset and not exempt from scrutiny under Section 7."); Dole Valve Co. v. Perfection Bar Equip., Inc., 311 F. Supp. 459, 463 (N.D. Ill. 1970) ("Of course, a patent may be 'any part of the assets of another [person]' within the meaning of Section 7.").

116. *See* Eastman Kodak Co. v. Goodyear Tire & Rubber Co., 114 F.3d 1547 (Fed. Cir. 1997), *abrogated on other grounds by* Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448 (Fed. Cir.

the incidence of acquisitions or on their value. An acquiring firm that cannot use a patent against a rival will pay less for that patent. This does not support a complete rejection of all antitrust enforcement actions based on acquired patents. The health of the selling firm and its future innovative prospects should instead be part of the process for assessing the overall competitive situation that follows in the wake of the acquisition.

Admittedly, this policy may seem counter-intuitive; it permits the Big Platforms and other large companies to possibly acquire some degree of market power in the name of preserving speculative long-term benefits.[117] Patent acquisitions today, which can have an immediate impact on pricing and consumer welfare, are balanced against the maintenance of an ecosystem that includes some smaller potential innovators.[118] Theory, history, and

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1998) (holding that a competitor failed to show the threatened market injury from the defendant's acquisition of an allegedly key patent required to support its Section 7 claim); *see also* Intellectual Ventures I LLC v. Capital One Fin. Corp., 280 F. Supp. 3d 691, 703 (D. Md. 2017) (noting the extreme difficulty of determining the relevant market in a case where the "product" is a large bundle of related patents).

117. Which is why the literature on antitrust and patent acquisitions leans heavily toward the view that acquisitions present mostly problems, and not opportunities, with respect to product market and R&D competition. *See, e.g.*, Alan Devlin, *Antitrust Limits on Targeted Patent Aggregation*, 67 FLA. L. REV. 775, 776 (2015) ("[A]ntitrust law can viably limit certain abuses of the patent system by PAEs. Section 2 of the Sherman Act proscribes monopolization and Section 7 of the Clayton Act prohibits asset acquisitions that may substantially lessen competition or tend to create a monopoly. These provisions have sufficient teeth theoretically to catch the most egregious forms of hold-up founded on ex post patent aggregation and assertion. This Article explains how PAE activity can reduce social welfare and how PAEs' targeted patent aggregation and assertion may violate competition rules."); *see also* Eric Young, *A Bridge over the Patent Trolls: Using Antitrust Laws to Rein in Patent Aggregators*, 68 HASTINGS L.J. 203, 224 (2016) (warning of potential antitrust liability where a patent aggregator has acquired 100% or some other hefty market share of a certain technology standard, through its acquisition of industry standard patents). *But see* Intellectual Ventures I LLC v. Capital One Fin. Corp., 280 F. Supp. 3d 691 (D. Md. 2017) (finding a failed attempt to plead antitrust liability on the part of patent aggregator Intellectual Ventures for asserting in litigation patents acquired from disparate sources and bundled into single licensing program).

118. The key is to understand the effect the acquisition will have on future innovation potential in the relevant industry. *Cf.* Erik Hovenkamp & Herbert Hovenkamp, *Buying Monopoly: Antitrust Limits on Damages for Externally Acquired Patents*, 25 TEX. INTELL. PROP. L.J. 39, 40 (2017) ("We propose that infringement damages for an externally acquired patent be denied if the acquisition served materially to expand or perpetuate the plaintiff's dominant position in the relevant technology market. By weakening enforcement, this limits the patent holder's ability to use such acquisitions to anticompetitive ends. We do not suggest that a dominant patent holder should be prohibited from securing external patent rights in the relevant technology market, but simply that its acquisition be limited to a nonexclusive license. This will permit the acquirer to practice the patent and keep its own technology up to date, but will not enable it to restrict third party access. This is as valuable to patent policy

empirical evidence nevertheless all support this policy. Big Platforms are by their nature very powerful in the short term; acquisition of some extra degree of market power through patent purchases will not change this much. Meanwhile, preserving some small firms could turn out to be enormously important for innovation in the long term. This raises the question of precisely how future innovation potential should factor in.

a) Towards a Consideration of Potential Future Innovation

Patent acquisitions have triggered antitrust scrutiny in several cases. Liability for an antitrust violation has been imposed when a firm with a strong market presence acquires patents that add to its anticompetitive economic power.[119] This Article proposes that antitrust regulators add a new dimension to their investigation of these acquisitions: the competitive survival of the *selling firm*.

There are two ways the survival of the seller might be incorporated into this analysis. First, it might be considered a potential *future* "disruptive firm," a concept named in the authoritative Department of Justice (DOJ) and FTC Horizontal Merger Guidelines ("Merger Guidelines")[120] as relevant in merger regulation. Alternatively, the contribution of the seller's patents to the buying firm's market power might be discounted or partially offset where patent sales are an important element of the selling firm's continuing viability.

i) Preserving a Future Disruptor

The Merger Guidelines say that disruptive firms can make a valuable contribution to the competitive landscape:

> The Agencies [DOJ and FTC] consider whether a merger may lessen competition by eliminating a "maverick" firm, i.e., a firm that plays a disruptive role in the market to the benefit of customers. For example, if one of the merging firms has a strong

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as it is to antitrust, for it will tend to increase innovation by discouraging systematic monopoly in technology markets."). My proposal is inconsistent with the Hovenkamps' proposal to limit patent damages when patents are acquired—so long as one properly understands their test, whether the acquisition "served materially to expand or perpetuate the plaintiff's dominant position in the relevant technology market." An acquisition may contribute some market power in the short run while helping prevent the expansion or perpetuation of monopoly power in the long run.

119. *See, e.g.*, Kobe, Inc. v. Dempsey Pump Co., 198 F.2d 416, 423–25 (10th Cir.), *cert. denied*, 344 U.S. 837 (1952) (holding that acquiring a portfolio of patents to "corner the hydraulic pump business for oil wells" constituted illegal monopolization).

120. U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, HORIZONTAL MERGER GUIDELINES (2010), https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf [https://perma.cc/9CDP-SRRX] [hereinafter *Merger Guidelines*].

> incumbency position and the other merging firm threatens to disrupt market conditions with a new technology or business model, their merger can involve the loss of actual or potential competition. Likewise, one of the merging firms may have the incentive to take the lead in price cutting or other competitive conduct or to resist increases in industry prices. . . .[121]

In conventional merger analysis, "mavericks" or disruptors are preserved by refusing to approve the merger of a maverick and another firm if the merger would significantly increase market concentration.[122] Because they are especially important for preserving competition, a disruptor might not be allowed to merge, even if a non-disruptive firm with the same market share would be.[123]

In an antitrust review where "the competitive significance of one of the merging firms is declining," the Merger Guidelines count this as a factor favoring the merger. Several antitrust cases invoke the strongest form of this principle, the "failing firm defense." A dominant acquiring company can argue that a merger does no harm because the acquired firm is failing anyway. By this line of thinking, competitive conditions after the two firms combine cannot be any worse because the failing firm is leaving the market either way. In such a case, as the Merger Guidelines state, "the projected market share and significance of the exiting firm is zero."[124]

In its current form, the failing firm defense is quite narrow.[125] Invoking it requires that the acquiring firm show significant business losses on the part of the acquired firm, with no immediate prospects that it can turn things around. Antitrust authorities know that if this defense is too readily accepted, it could serve as a cover for a large number of anticompetitive mergers; the ability to assume away the market share of one the merging firms is a

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121. *Id.* at § 2.1.5.

122. For details on how market shares and industry concentrations are calculated, see *id.* at § 5.3 (describing, among other things, use of the standard Herfindahl-Hirschman Index (HHI) to calculate market concentration).

123. *See, e.g.*, United States v. H & R Block, 833 F. Supp. 2d 36, 79–80 (D.D.C. 2011) (analyzing whether the acquisition target was a "maverick" competitor in the market and finding that it was based on its role as a firm that "constrains prices"); *see generally* Jonathan B. Baker, *Mavericks, Mergers, and Exclusion: Proving Coordinated Competitive Effects Under the Antitrust Laws*, 77 N.Y.U. L. REV. 135 (2002); Courtney D. Lang, *The Maverick Theory: Creating Turbulence for Mergers*, 59 ST. LOUIS U. L.J. 257 (2014).

124. *Merger Guidelines*, *supra* note 120, at 32.

125. United States v. Greater Buffalo Press, Inc., 402 U.S. 549, 555 (1971) (finding that failing firm defense is "narrow in scope"); *cf.* Int'l Shoe Co. v. FTC, 280 U.S. 291, 303 (1930) (holding that a company's acquisition of a competitor does not violate Section 7 of the Clayton Act where the target's resources are "so depleted and the prospect of rehabilitation so remote that it faced the grave probability of a business failure").

considerable plus in merger analysis. They prevent abuse of the defense by requiring stringent proof of imminent failure.

When a small firm sells patents to a dominant company, particularly a platform company, courts should permit a new variant of the failing firm defense called the "declining significance" defense. In a winner-takes-all market, all who compete with the winning platform are by definition of declining significance. This is not the fault of these firms, but rather an unavoidable feature of platform markets. The idea this Article is championing here would apply when antitrust reviewers are looking over a purchase of small firm patents by a large platform firm. Antitrust authorities in these cases should discount or even factor out the market share contribution of a small firm's patents. This makes it more likely that the patent acquisition will be approved, even if it enhances the market power of the large platform firm acquiring the patents. Whatever consumer harm might stem from such an enhancement is offset by the survival of the small firm into the future. If survival requires selling patents, these patent sales should be looked at favorably. A small increase in market power today is less disastrous than complete elimination of a possible innovator for tomorrow.

Where the firm selling the patents is relatively small but historically and potentially innovative, the survival of the selling firm ought to be considered. Where the acquiring firm appears to be gaining some degree of market power, an offsetting consideration would therefore enter the picture—the contribution the sale makes to the survival of the relatively small firm selling the patents. This is not a factor in the current analysis, which instead emphasizes the prospects for innovation by the acquiring firm and its downstream product competitors, which is likely appropriate in most cases.[126] If, for example, a patent portfolio permits an acquiring firm to raise costs for its rivals in important product markets, this may in theory detract from the rivals' investments in future research. By diverting some of the rivals' profits from their internal operations (such as R&D) to the acquiring firm (via patent infringement liability or licensing in the shadow of it), the firm

126. *See* Richard J. Gilbert & Steven C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 63 ANTITRUST L.J. 569, 570 (1995) ("A reduction in innovation may delay improvements in production processes that would lower the production costs of each of the merging firms, or it may reduce the magnitude of such improvements. In addition, a reduction in innovation may reduce the likelihood of discovery or delay the introduction by each firm of new or improved products. The loss of production improvements would result in higher costs, and possibly higher prices, even in markets where only one of the merging firms is a participant. Similarly, the loss of new or improved products would deny consumers the benefits of these improvements in every market where the firm is a supplier, including markets where only one of the firms is a participant.").

acquiring the patents may impact future R&D in the industry. This much is conventional and usually correct; the process simply needs to remember the seller of the patent as well. Patent sales might be an important part of a firm's survival strategy, and to survive is to preserve the potential to fight for future innovations on some future day.

b) Patent Markets and the Future Competitive Landscape

Even while largely emphasizing the negative welfare effects of patent acquisitions, the most sophisticated antitrust analysts also recognize potential complexities. They see the possibility of positive effects. Fiona M. Scott Morton and Carl Shapiro, for example, note that:

> [P]atent acquisitions by [Patent Assertion Entities], a central element of their monetization strategy, often discourage innovation and harm consumers. However, the analysis in this . . . article is rather general. We have not distinguished here between different types of patent portfolios, sellers, or buyers. When a given transaction is evaluated in practice, these particulars will rightly receive close attention. . . . As usual when patents are involved, we need to look at upstream technology markets (the markets where these patents are licensed) and at downstream product markets (the markets for products using the patented technology). Ultimately, we are interested in the impact of strategic patent acquisitions on downstream product prices, variety, and innovation.[127]

Although there are hints that the analysis proposed in this Section might fit within contemporary antitrust guidelines, they unfortunately are only hints. Consider the 2017 FTC/DOJ Licensing Guidelines ("Licensing Guidelines"). These Licensing Guidelines on their face apply only to the analysis of IP licensing, and even then, only to determine whether a licensing term is anticompetitive. They are not aimed at the problem of patent sales and are instead generally geared to the traditional concern of antitrust law—enhancing consumer welfare. In the context of patent licensing, this typically takes the form of protecting against the use of patent agreements to reduce competition in a market. The Licensing Guidelines protect two different types of markets: product markets and R&D (or "innovation") markets:

> [A] licensing arrangement could include restraints that adversely affect competition in goods markets by dividing the markets among firms that would have competed using different technologies. An arrangement that effectively merges the activities of two actual or potential competitors in research and development

127. Fiona M. Scott Morton & Carl Shapiro, *Strategic Patent Acquisitions*, 79 ANT. L.J. 463, 484, 486 (2014) (footnote omitted).

> in the relevant field might harm competition for development of new goods and services.[128]

Nevertheless, the Licensing Guidelines do shed some light on the way antitrust authorities look at future R&D potential as a factor in antitrust analysis. Section 3.2.3 of the Licensing Guidelines contains this discussion of R&D (or "innovation") markets:

> A research and development market consists of the assets comprising research and development related to the identification of a commercializable product, or directed to particular new or improved goods or processes, and the close substitutes for that research and development. When research and development is directed to particular new or improved goods or processes, the close substitutes may include research and development efforts, technologies, and goods that *significantly constrain the exercise of market power with respect to the relevant research and development*, for example by limiting the ability and incentive of a hypothetical monopolist to reduce the pace of research and development. The Agencies will delineate a research and development market *only when the capabilities to engage in the relevant research and development can be associated with specialized assets or characteristics* of specific firms.[129]

The highlighted phrases indicate the potential to include future R&D capacity in antitrust analysis, but they also illustrate the problems with such an approach. It may be impossible to say whether a small research-oriented company "significantly constrain[s]" market power in a given area of research; proof at this level may be asking for too much. The future R&D potential of a company may consequently be deemed too speculative to consider; as this Article argues, that would be a mistake. On the other hand, the requirement that R&D capabilities be associated with "specialized assets or characteristics" of specific firms seems consistent with the argument in this Article. One "characteristic" of a small firm that seems relevant is a track record of consistent creativity and innovation. If this "characteristic" counts as a positive in the analysis of R&D markets, the fact that the small firm so characterized will survive longer if it can sell patents may well be relevant. Consider, too, the helpful ideas in the following passage, also from the Licensing Guidelines:

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128. U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, ANTITRUST GUIDELINES FOR THE LICENSING OF INTELLECTUAL PROPERTY § 3.1 (2017), https://www.justice.gov/atr/IPguidelines/download [https://perma.cc/NP55-2XFV] (footnotes omitted) [hereinafter *Antitrust Licensing Guidelines*].

129. *Id.* at § 3.2.3 (emphasis added) (footnote omitted).

> In assessing the competitive significance of current and potential participants in a research and development market, the Agencies *will take into account all relevant evidence*. When market share data are available and accurately reflect the competitive significance of market participants, the Agencies will include market share data in this assessment. The Agencies also will seek *evidence of buyers' and market participants' assessments of the competitive significance of research and development market participants*.[130]

This passage serves a different purpose than the one this Article discusses, but some of the listed factors are relevant. These Licensing Guidelines analyze when a restrictive licensing arrangement might have significant anticompetitive effects. Third-party company research capabilities may bear on whether a restrictive license agreement between two parties is anticompetitive. Viable third-party-research capacity might constrain the market power of the parties to the license. Nevertheless, the spirit of the analysis is helpful. If "all relevant evidence" of the "significance of [R&D] market participants" is important for the licensing analysis, it should also be employed when a company sells patents. This Article has established why the future innovative capacity of a patent-selling firm is part of this "relevant evidence." It has also argued that the *continued presence* of a participant in the R&D market is of chief importance, and that its survival ensures the possibility of future "competitive significance." Essentially, the Licensing Guidelines show that the continued viability of a patent-selling firm should factor into the antitrust analysis of patent acquisitions.

2. Smoothing the Patent Market

Adjusting antitrust law can only have so much effect; there are at least two other policy changes that would facilitate patent markets. The first is a slight amendment in the patent recording statute which would make patent transfers a little more transparent. The second is a modification to the rules regarding administrative patent validity proceedings, which would allow an assignee to continue to defend a patent after an assignment rather than requiring a more expensive re-start of the proceeding.

a) Recording of Patent Assignments, Licenses, and Other Interests

With respect to market-making, one of the most helpful features of the patent system is the patent assignment registry.[131] This searchable database

130. *Antitrust Licensing Guidelines*, s*upra* note 128, at § 3.2.3 (emphasis added).

131. *Patent Assignment Search*, U.S. PAT. & TRADEMARK OFF. (last visited Dec. 21, 2019), https://assignment.uspto.gov/patent/index.html#/patent/search [https://perma.cc/LMP7-YUW9] (last visited Dec. 21, 2019).

allows patent-related transactions to be recorded and memorialized. When parties to a transaction use it, the database permits any member of the public to identify the current owner of a patent. Its most important function beyond this is as a registry that allows business people to record all manner of patent-related transactions—such as patent licenses or use of a patent as collateral for a loan.

The wording of the patent recordation statute, 35 U.S.C. § 261, provides a strong incentive to record ownership transfers. It says that "an assignment, grant or conveyance" shall be void, as against a later transferee, *unless it is recorded* in the Patent Office.[132] Patent recordation therefore protects an assignee against later transfers of the same patent. Although there are scenarios where an assignee can defeat a later assignment even without recordation,[133] recording is the safest and easiest way to protect an ownership interest in a patent.

By convention, people involved with the patent system also often record other patent-related transactions; the Patent Office will accept records of any patent-related transfer for recordation.[134] Thus licenses, mortgages, security interests, etc., are often recorded.[135] While this is advantageous, the incentive to record these interests is not as great as the incentive to record an actual assignment. Recording these other interests, as opposed to ownership transfers, does not automatically cut off the rights of subsequent transferees.[136] So licenses, mortgages, etc., are treated differently from assignments.[137] One possible improvement would be to broaden the

132. 35 U.S.C. § 261.

133. *See, e.g.*, Stanford Univ. v. Roche Molecular Sys., Inc., 583 F.3d 832, 843 (2009) (holding that "without notice" under § 261 can include constructive or inquiry notice, in addition to actual notice).

134. The Patent Office notes that it "does not verify the validity of the information [submitted for recordation]. Recordation is a ministerial function—the USPTO neither makes a determination of the legality of the transaction nor the right of the submitting party to take the action." *Id.*

135. *See* MPEP (9th ed. Rev. 3, Jan. 2018) § 313 ("In addition to documents that constitute a transfer or change of title, other documents relating to interests in patents or applications will generally be recorded. Typical of these documents which are accepted for recording are license agreements and agreements which convey a security interest. Such documents are recorded in the public interest in order to give third parties notification of equitable interests or other matters relevant to the ownership of a patent or application.").

136. *See, e.g.*, *In re* Cybernetic Servs., Inc., 252 F.3d 1039, 1052 (9th Cir. 2001) (arguing that § 261 concerns itself with only ownership rights, as opposed to lesser rights such as liens or licenses).

137. There is authority to support the idea that a license follows along with a patent after the patent has been assigned, regardless of whether the license is recorded in the Patent Office. *See, e.g.*, Innovus Prime, L.L.C. v. Panasonic Corp., No. C-12-00660-RMW, 2013 WL

recordation statute and provide stronger incentives to record all patent-related transactions. This can be accomplished simply by changing the wording of the recording statute to "the transfer of any interest relating to a patent shall be void as against any subsequent transferee for a valuable consideration, without notice . . . ." This would place all patent interests on the same footing as assignments or other conveyances, which in turn would create strong incentives to record all patent-related transactions in the recordation database.

b) Facilitating Transfers When Patents are Being Challenged in the Patent Office

The America Invents Act of 2011 created a way to challenge patent validity without paying for expensive federal litigation;[138] a competitor or interested party can test validity in an administrative case at the Patent Office.[139] The most popular form of challenge is an Inter Partes Review

3354390 (N.D. Cal. 2013) (granting accused infringer summary judgment that plaintiff as a fourth generation assignee of the patent had to honor a covenant not to sue that was granted to the accused infringer by the original patentee, and that the subsequent assignments of the patent did not operate to nullify the covenant not to sue, even if the later assignees were not aware of the covenant) ("Assignment transfers assignor's contract rights . . . . This occurs whether or not an assignee had notice."); Keystone Type Foundry v. Fastpress Co., 272 F. 242, 245 (2d Cir. 1921); *see also* L.L. Brown Paper Co. v. Hydroiloid, Inc., 118 F.2d 674, 677 (2d Cir. 1941) ("The assignee of a patent taking title subsequent to the granting of a license under patent receives no more than the former owner's interest, including the usual rights of a patent owner diminished by the licensee's right to use the patented process within scope of its license."); Jones v. Berger, 58 F. 1006, 1007 (C.C.D. Md. 1893) (citing WILLIAM C. ROBINSON, THE LAW OF PATENTS FOR USEFUL INVENTIONS § 817 (1890)); Sanofi, S.A. v. Med-Tech Veterinarian Prods., 565 F. Supp. 931, 940–41 (D.N.J. 1983) ("Because the purchaser [of patented products] is under an obligation to inquire of the seller as to the existence of any outstanding licenses, the purchaser cannot claim that his expectations have been frustrated if he fails to make the necessary inquiry."); Andrew C. Michaels, *Patent Transfer and the Bundle of Rights*, 83 BROOK. L. REV. 933, 937–38 (2018) ("The courts have ruled that even a "bona fide purchaser" of a patent takes the patent subject to prior "licenses, of which he must inform himself as best he can at his own risk" The intuition seems to be that the purchaser of a patent should recognize the possibility that licenses on the patent might exist, and should take steps to investigate whether they in fact do exist. In other words, the purchaser is on "inquiry notice" with regard to the potential existence of license agreements affecting the patents to be transferred. Of course, a true bona fide purchaser patent assignee may have some claim sounding in tort or contract against a patent seller who is less than forthright about the extent to which the patent has been licensed, particularly where the license or its terms are not public knowledge.") (citing *Innovus Prime*, 2013 WL 3354390, at *15).

138. *See* ROBERT P. MERGES & JOHN F. DUFFY, PATENT LAW AND POLICY: CASES AND MATERIALS 931–47 (7th ed. 2017).

139. For an explanation of why administrative challenges are appealing to challengers, see Joseph Farrell & Robert P. Merges, *Incentives to Challenge and Defend Patents: Why Litigation*

(IPR). While most patents in IPR proceedings are also being litigated in court,[140] it has become common to use an IPR (or the threat of one) in all sorts of patent-related negotiations—including negotiations over the sale or license of a patent or patent portfolio.[141]

The problem arises when a patent changes hands while under challenge in an IPR. Current rules do not create a smooth transition between owners; they do not allow for a new owner to step into the shoes of the old one. In fact, there is no provision at all for the replacement of a party to an IPR in the middle of a proceeding.[142] The old owner could settle its case with the patent challenger and be released, but then the new owner and challenger might have to start over or at least duplicate some of the costs that the old owner had already sunk into the IPR.[143]

The obvious solution is to implement a simple party-substitution procedure. This new procedure would allow a new owner to step into the shoes of the old, provided that they are willing to be bound by stipulations

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Won't Reliably Fix Patent Office Errors and Why Administrative Patent Review Might Help, 19 BERKELEY TECH. L.J. 943 (2004).

140. Saurabh Vishnubhakat et al., *Strategic Decision Making in Dual PTAB and District Court Proceedings*, 31 BERKELEY TECH. L.J. 45 (2016) (finding that 70% of instituted IPRs are brought by parties also involved in district court litigation and showing that IPRs are working as an effective substitute for district court litigation to invalidate patents).

141. *See* Jake Berdine & Matt Rosenberg, *Creating Leverage: A Practitioner's Guide to Inter Partes Review and Its Effects on Intellectual Property License Negotiations*, 44 AIPLA Q.J. 1, 2 (2016).

142. *See* Librestream Techs., Inc.., v. Wireless Remote Sys. L.L.C., No. IPR2014-00369, 2014 WL 5080112 (P.T.A.B. Oct. 20, 2014) (October 10, 2014) ("We advised [attorney for the old patent owner] that withdrawal may occur only as permitted under our rules. Our rules require our authorization prior to seeking withdrawal. *See* 37 C.F.R. § 42.10(e). Further, until withdrawal is granted, Mr. Moreland and any other attorneys designated as counsel for Patent Owner under 37 C.F.R. § 42.8(b)(3), are attorneys of record for Patent Owner. Current counsel will remain of record until new lead and backup counsel are identified by an appropriate power of attorney. *See* 37 CFR § 42.10(b). Whether or not the patents at issue have been assigned to a new party is not of record. Regardless, counsel and Patent Owner are advised that the AIA does not provide for the "replacement" of a party. Changes to Implement Inter Partes Review Proceedings, Post-Grant Review Proceedings, and Transitional Program for Covered Business Methods, 77 Fed. Reg. 48680, 48707 (Aug. 14, 2012).").

143. *See* Christina Schwarz & Raymond Mandra, *US Patents: Beware Assigning Patents in IPR Proceedings*, MANAGING INTELL. PROP. (Dec. 11, 2014), http://www.managingip.com/Article/3409566/US-patents-Beware-assigning-patents-in-IPR-proceedings.html [https://perma.cc/PHA8-5F88] ("Until the Board provides further clarity, prospective patent assignees should proceed cautiously when considering assignment of patents involved in IPR proceedings. At a minimum, it should be assumed the assignor will remain the named patent owner in the IPR and thus a potential assignee should seek an agreement that provides control of the IPR proceeding and cooperation by the former patent owner. It may also be advisable to seek guidance from the Board prior to finalizing any transfer of patent rights.").

and findings made while the proceeding was under the direction of the old owner. This would facilitate efficient challenges—a primary aim of the IPR process—in the increasingly likely scenario where the challenged patent is sold mid-stream. It would be very useful, for example, where a challenged patent is one of many that is part of a portfolio being sold. This simple procedural fix would ensure that one or a handful of patents under IPR challenge do not threaten the sale of a substantial patent portfolio.

V. CONCLUSION

Whether all innovation in the future will emanate from a handful of massively integrated firms is hard to predict. Even a supporter of growth by acquisition and of today's entrepreneurial exits via the "acqui-hire" will normally acknowledge the benefits of small, independent outsiders. Big may be better in many minds, but it's not uniformly thought of as permanently Best.

This is important because it is wise to be wary of the thought which has so often crept into consciousness during a major technological realignment—that *this time is different*, that *this time we have it figured out*. It is inevitable that this thought will pop up, yet essential that it be resisted.

At least a few defenders of today's Big Platform companies will claim that the care and feeding of small, independent outsider firms is no longer essential because they have become obsolete. This is certain because people have repeatedly claimed this before, despite always being proven incorrect. To take one example of many that could be selected, consider this:

> As organized invention and discovery gain momentum the revolutionist will have no chance . . . . He will have to compete with more and more [people] who have at their disposal splendidly equipped laboratories, time, and money, and who may work for three or four years before producing a noteworthy result . . . . Possibly Edison may be the last of the great heroes of invention.[144]

That was written in 1930. Meanwhile, despite this belief, outsider Philo Farnsworth was inventing the television;[145] Scotch tape was being invented; the frozen food process was being perfected, etc.[146]

144. WALDEMAR KAEMPFFERT, INVENTION AND SOCIETY 30 (1930).

145. *See* U.S. Patent No. 2,087,633 (filed Apr. 26, 1933) (issued July 20, 1937).

146. *See* Mary Bellis, *Twentieth Century Timeline: Technology, Science and Inventions*, THOUGHTCO. (Sept. 4, 2019), https://www.thoughtco.com/20th-century-timeline-1992486 [https://perma.cc/4JP6-U33D].

The reason people make this mistake over and over is that each glittery, new innovation system that comes to prominence really is impressive. The organized industrial research labs of the 1930s looked like nothing the world had seen before. They even produced excellent results for many years for companies such as General Electric and DuPont. As successful as they were, however, they were simply the Latest Word in the long march of new ideas. The mistake some people made and continue to make is to think that they were the Last Word. That Word has not been written yet, and with luck it may never be.

For now, the glittery success of Big Platform companies and their companions of the moment appears to be sweeping all before them in a great conquest of digital-era innovation. Nevertheless, it would be very wise for society to place a few side bets and hedge against the future. It makes sense to keep the avenues open for something new and different—something from out of left field. If the patent market can help in that respect, then it behooves society to keep that market open. The fact that it is associated at times with litigation and attempts at rent seeking ought not to exert too much influence. If the patent market provides a profitable outlet and allows some small companies to remain independent, it may prove quite useful in the long run. The phrase "history teaches" has a tired ring to it, but it might be accurate in this case. Multiple rivalrous and independent sources of innovation have always been a good thing. It seems safe to bet that they still are and will be in the future, too.