

PATENTING BY ENTREPRENEURS: AN EMPIRICAL STUDY

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INTRODUCTION

The classical theory of patents posits that society grants to inventors, in Thomas Jefferson's words, "the embarrassment of an exclusive patent," because doing so may provide socially beneficial economic incentives to create what would be otherwise lacking absent legal

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protection.¹ In particular, if there were not an exclusionary right protecting intellectual creations, again in Jefferson's words, "the moment [the creation] is divulged, it [would] force[] itself into the possession of every one," and the inventor would have no means to earn a suitable profit from the creation.² Moving one step backwards, without the potential for profit afforded by a patent right, inventors—at least those driven by the desire for financial gain—might not have a sufficient incentive to invent.

Beginning in the late 19th century, however, economists began to perceive other important uses for patents. For example, in 1896, the economist A.T. Hadley argued that the patent system "has established itself, not primarily as a stimulus for invention or disclosure," but as a driver of the investment of capital in the use and development of *pre-existing* inventions.³ In this view, patents provide substantial *ex post* incentives to commercialize inventions, rather than merely *ex ante* incentives to invent.⁴

In the late 20th century, several important empirical studies of primarily large companies revealed other widespread uses of patents, especially for so-called "strategic" reasons. First, many large firms have built large patent portfolios, furthering their strategic goal of cross-licensing with competitors to avoid mutually destructive patent litigation.⁵ When negotiating these cross-licenses, one standard practice in determining the value of each side's patent portfolio is simply to count up the total number of patents each side owns.⁶ Of course, this may engender a sort of arms-race mentality for patenting, with large firms acquiring more and more patents to maintain leverage at the negotiating table. Indeed, the so-called "flood" in patenting over the last few decades

1. Letter from Thomas Jefferson to Isaac M'Pherson (Aug. 13, 1813), in 6 THE WRITINGS OF THOMAS JEFFERSON: BEING HIS AUTOBIOGRAPHY, CORRESPONDENCE, REPORTS, MESSAGES, ADDRESSES, AND OTHER WRITINGS, OFFICIAL AND PRIVATE 175, 181 (H.A. Washington ed., Washington, D.C., Taylor & Maury 1854); cf. Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Innovation*, in THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS 609 (W.D. Nordhaus ed., 1962) (noting the disincentives to disclose novel information and knowledge in the absence of legal protection to prevent the use of such information and knowledge).

2. *Id.* at 180.

3. ARTHUR TWINNING HADLEY, *ECONOMICS* 134 (New York, G.P. Putnam's Sons 1896); see also ALBERT F. RAVENSHEAR, *THE INDUSTRIAL AND COMMERCIAL INFLUENCE OF THE ENGLISH PATENT SYSTEM* 52 (1908) ("[T]he final conclusion is that patents exercise a net influence in stimulating the growth of industry . . .").

4. See Mark A. Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129 (2004).

5. See *infra* Part I.C.

6. See Peter Tennent, IP Counsel, Int'l Bus. Machs. Corp., Theory and Practice of Patent Valuation, Berkeley Center for Law & Technology 7 (Feb. 6, 2009), available at <http://www.law.berkeley.edu/institutes/bclt/patent-valuation/schedule.htm>.

has been partially attributed to cross-licensing races.⁷ Second, patents have become valuable tools in defending against patent infringement suits.⁸ If a defendant accused of infringement can threaten suit against the plaintiff, the mutual threat can raise the stakes for both parties, making it more likely that suits settle, or never happen in the first place. Third, firms are engaging in “preemptive” patenting to prevent others from encroaching on their technological “space” with competing products.⁹ Even more recently, legal theorists have posited that patents can play an important role in “signaling” the value of a firm’s technology and inventiveness, both externally to the market and internally to managers. Several studies have reported these effects, especially among startup and early-stage companies seeking to use patents to attract financing and to improve their chances of being acquired or going public.¹⁰

Thus, since Jefferson’s time, our understanding of the use and effects of patents has become more varied and nuanced. Although a large body of empirical work has emerged documenting these alternative uses among large, publicly traded firms, there have been few studies of smaller, early-stage firms. Nonetheless, commentators and policymakers have come to radically differing conclusions. Some surmise that patents stand in the way of entrepreneurial activity.¹¹ Others suggest that strong patent protection is essential to the survival of young firms in competitive markets—especially in industries with large incumbents, which typically enjoy advantages in sales, marketing, and access to capital.¹² This latter notion has tended to dominate in the last several decades, partly spurring the expansion of patent rights since the creation in 1982 of the Court of Appeals for the Federal Circuit, which hears essentially

7. See Rick S. Nathan, *Valuation of Software Inventions: What Are They Worth in Economic Terms?*, SD35 ALI-ABA 145, 164 (1998) (“Today, software firms are filing patent applications in increasing numbers, as companies recognize the need to protect their intellectual assets and leverage cross-licensing opportunities.”); cf. Michael J. Meurer, *Business Method Patents and Patent Floods*, 8 WASH. U. J.L. & POL’Y 309, 327 (2002) (noting that cross-licensing arrangements may mitigate the negative effects of “patent floods”).

8. See *infra* Part I.E.

9. See *infra* Part I.G.

10. See *infra* Part I.D.

11. See, e.g., Brad Burnham, *Software Patents Are the Problem Not the Answer*, UNION SQUARE VENTURES (Feb. 19, 2010), <http://www.unionsquareventures.com/2010/02/software-patents-are-the-problem-not-the-answer.php>; Jason Mendelson, *76% of Venture Capitalists Believe that Software Patents are Important (NOT!)*, MENDELSON’S MUSINGS (May 6, 2010), <http://www.jasonmendelson.com/wp/archives/2010/05/76-of-venture-capitalists-believe-that-patents-are-important-not.php>.

12. See Roberto Mazzoleni & Richard R. Nelson, *The Benefits and Costs of Strong Patent Protection: A Contribution to the Current Debate*, 27 RES. POL’Y 273, 274 (1998) (“A significant share of the recent arguments in favor of strong patent protection focuses on the importance of patents for new entrants, or small firms . . . and stresses functions of patents that are often different from those presumed in the empirical studies [of large firms].”).

all appeals involving patent infringement claims.¹³ Moreover, discerning the drivers of patenting by entrepreneurs is especially topical given the importance of these firms to innovation and the overall economy. Because evidence suggests that startup and early-stage firms are more innovative per research and development (R&D) dollar than large firms, they may account for a disproportionately large share of U.S. productivity and employment growth in recent decades.¹⁴

Because of these important concerns, the Ewing Marion Kauffman Foundation—an organization that studies and promotes entrepreneurship in the United States—funded an effort at the University of California, Berkeley School of Law, to undertake the first comprehensive survey of the relationship between patenting and entrepreneurship in the United States. The authors, along with other investigators,¹⁵ administered the survey in 2008 to approximately 15,000 startup and early-stage companies in the biotechnology, medical device, information technology (IT) hardware, and software and Internet sectors. A portion of the survey examined why entrepreneurs, startups, and early-stage companies do (and do not) seek patents.

This Article reports and analyzes results from that survey, showing that several widespread beliefs about startup firm patenting practices are very likely wrong.¹⁶ In brief, like the surveys of large firms, our respondents that hold patents report that the main motivation for patenting is to prevent others from copying their products and services. This result holds—and is statistically valid—across a variety of company characteristics, including firm age, revenues, industry, and patent portfolio size. Because we find that many young technology companies are holding patents, our results offer evidence that is somewhat at odds with fre-

13. *See id.*

14. *See* Samuel Kortum & Josh Lerner, *Assessing the Contribution of Venture Capital to Innovation*, 31 *RAND J. ECON.* 674, 682 (2000); ZOLTAN J. ACS & DAVID B. AUDRETSCH, *INNOVATION AND SMALL FIRMS* 19–24 (1990); John Bound et al., *Who Does R&D and Who Patents?*, in *R & D, PATENTS, AND PRODUCTIVITY* 21, 38–39 & 51–52 (Zvi Griliches ed., 1984); *see also* JOSEPH A. SCHUMPETER, *THE THEORY OF ECONOMIC DEVELOPMENT: AN INQUIRY INTO PROFITS, CAPITAL, CREDIT, INTEREST, AND THE BUSINESS CYCLE* 74–94 (Redvers Opie trans., 1983) (pointing to the role that entrepreneurial innovation plays in driving competition).

15. These investigators include Professors Robert Merges and Pamela Samuelson, University of California, Berkeley School of Law, and Robert Barr, Executive Director of the Berkeley Center for Law & Technology.

16. In a separate article, we report a variety of results of the survey unrelated to the drivers of startup patenting, including the role of patenting in securing financing and driving innovation, the value of patents in appropriating profits from innovation, and the prevalence of inbound licensing of patents. *See* Stuart J.H. Graham, Robert P. Merges, Pam Samuelson & Ted Sichelman, *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 *BERKELEY TECH. L.J.* 1255 (2010) [hereinafter Graham et al., *High Technology Entrepreneurs*].

quently cited anecdotal reports that startups, especially in the software and Internet industries, generally do not use patents to protect against the erosion of their profits.¹⁷ We offer one important caveat, however. A substantial fraction of young firms are apparently opting out of the patent system altogether, and this observation is particularly true of companies in the software and Internet sectors.¹⁸ That said, our findings suggest that patent holding, and the strategic use of patents, is more widespread—even among young software and Internet companies—than commentators have previously reported.

Additionally, we find—consistent with anecdotal reports—that many startups rely heavily on patents as signals to the market to improve their chances of raising financing, being acquired, and going public. Our results greatly contrast with previous large-firm studies, however, which showed relatively little reliance on patents for these kinds of signaling. Indeed, our results show that as the patent-holding firms in our sample become older and larger, they tend to rely less on patents as signals. This finding is also important because it lends some empirical support—which had been lacking—for the alternative signaling theories of patents, especially for younger startups.¹⁹

Like large firms, our respondents that hold patents report engaging in strategic patenting to help defend against patent infringement suits and to increase negotiating power, possibly for cross-licensing with other firms. Recognizing that startups—and not just those in the biotechnology field—find the strategic use of patents important is a novel finding. Nonetheless, we show that these young technology companies are especially sensitive to the costs of acquiring and enforcing patents, which—at nearly \$40,000 per patent—are roughly double the reported average for all patentees.²⁰ Thus, even though startup firms are well aware of the strategic uses of patents, resource constraints may mean that fewer of them can engage in these strategies as compared with large incumbents. To the extent that strategic patenting is positively related to firm success and survival, we highlight this finding as a policy concern deserving of further study, especially in industries—like electronics—with large numbers of incumbents engaging in similar strategic patenting.

17. See *infra* Part II.B.1.

18. See Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1276–79.

19. See Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 641–42 (2002) (setting forth a theory of patents based on their “signaling value”); Paul J. Heald, *Transaction Costs and Patent Reform*, 23 SANTA CLARA COMPUTER & HIGH TECH. L.J. 447, 455 (2007) (“The information provided by the publication of all patents also indirectly helps in the difficult task of valuation and pricing by providing a central clearinghouse of information on innovation.”).

20. See *infra* note 293 and accompanying text.

Part I of this Article explores the variety of theories of entrepreneurs' patenting practices offered in the literature. Part II describes previous empirical studies, primarily of large firms, as well as the anecdotal accounts of the drivers of decisions to patent and to forgo patenting in entrepreneurial firms. Part III describes the design of the 2008 Berkeley Patent Survey, its sample set, and respondent characteristics. Part IV presents the major results related to the decision to patent (or not), with particular attention to how these results differ across company characteristics, such as industry, age, patent portfolio size, and revenue, among others. We conclude with some brief reflections on the policy implications of our findings.

I. THEORIES OF ENTREPRENEURIAL PATENTING

Scholars have investigated and proposed numerous theories for why inventors and their companies decide (or not) to file for patents on their inventions.²¹ In a previous article, we surveyed in detail the relatively scant literature on why entrepreneurs and startup companies file for and forgo patents.²² As background to the results presented here, we briefly review these theories of entrepreneurial patenting.²³

A. Earning Supernormal Profits

The usual explanation for why individuals and firms, of whatever size, file for patents is to sell their products and services at prices greater than their competitors or to cut production and similar costs in ways competitors will be precluded from replicating.²⁴ This explanation derives from the fundamental tenet of intellectual property theory—that without incentives beyond those offered by the free market, potential innovators will not innovate, because competitors and third parties would otherwise free ride off their innovations.²⁵ This explanation sup-

21. See Stuart J.H. Graham & Ted Sichelma, *Why Do Start-Ups Patent?*, 23 BERKELEY TECH. L.J. 1063, 1071–90 (2008) (surveying the dominant theories of patenting and forgoing patenting).

22. See *id.*

23. The remainder of this section is adapted from a portion of Graham & Sichelma, *supra* note 21, at 1071–90.

24. Supernormal profits may arise through either an increase in price or a decrease in the cost of producing the good or service. See generally WILLIAM M. LANDES & RICHARD A. POSNER, *THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW* 298 (2002); W.D. NORDHAUS, *INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE* (1969); JOHN W. SCHLICHER, *PATENT LAW: LEGAL AND ECONOMIC PRINCIPLES* § 2.15 (2007).

25. See Arrow, *supra* note 1, at 609. Alternatively, or in addition, an innovator might consider other legal options, such as trademark, copyright, and trade secret, or non-legal op-

ports the notion that, in some circumstances, the patenting inventor will be able to supply products at a price higher than the competitive market would otherwise bear, as long as other technology providers cannot supply non-infringing products that are perfect substitutes.²⁶ In contrast to established companies, startup and early-stage technology companies may be subject to a different cost-benefit scheme when deciding to file for a patent. First, unlike mature companies, startups will tend to have fewer revenue streams to protect or production costs to cut, which can make the benefit of a patent seem remote.²⁷ Second, because startups may be R&D specialists—doing less sales and marketing in their early life—they may invent a diverse set of potential and not yet marketable products in a short period of time. This tendency of startups to produce embryonic ideas may make the cost of patenting each invention high relative to the uncertainty of a market payoff, especially when compared with the patenting decisions of large firms insofar as they tend to spend more time improving existing products rather than inventing new ones.²⁸ Third, young companies usually have very limited IP budgets,²⁹ and although there has been a recent influx of contingent-fee attorneys who represent small- and medium-sized entities in patent litigation in return for a percentage of any damage or settlement award, post-dot-com,³⁰

tions, such as increased marketing expenditures, to increase its potential profits. *See, e.g.*, H. JACKSON KNIGHT, *PATENT STRATEGY FOR RESEARCHERS AND RESEARCH MANAGERS* 36–38 (2nd ed. 2001) (providing advice to company managers on the use of copyrights, trademarks, and trade secrets to protect innovations).

26. *See generally* Peter L. Swan, *Market Structure and Technological Progress: The Influence of Monopoly on Product Innovation*, 84 Q.J. ECON. 627, 628–29 (1970) (discussing the introduction of perfect and imperfect substitutes to a monopolist-controlled technology market).

27. *See* Ronald J. Mann, *Do Patents Facilitate Financing in the Software Industry?*, 83 TEX. L. REV. 961, 985 (2005) (“Because [small] firms do not yet have a product, they have no opportunity for revenues. Thus, the benefits they reap from excluding competitors are minimal at best.”).

28. *See, e.g.*, JESSICA LIVINGSTON, *FOUNDERS AT WORK: STORIES OF STARTUPS’ EARLY DAYS* 154 (2007).

29. *See* Mann, *supra* note 27, at 982–84 (describing how startup firms must allocate money between products and patents and often choose less effective forms of patent protection including provisional applications in order to save money for product development).

30. *See* Michelle Armond, Comment, *Introducing the Defense of Independent Invention to Motions for Preliminary Injunctions in Patent Infringement Lawsuits*, 91 CAL. L. REV. 117, 123–24 (2003); Emily Barker, *The One that Got Away?*, AM. LAW., Nov. 1995, at 16; David Rubenstein, *Contingency Patent Lawyer Fills Unique Niche: To Some He’s a Hero, to Others He’s No Better than an Extortionist*, CORP. LEGAL TIMES, Mar. 1994, at 3.

Additionally, when small firms sue large firms, Gwendolyn Ball and Jay Kesan have shown that they litigate their disputes to judgment more often than when they sue small- or medium-sized firms. *See* Gwendolyn G. Ball & Jay P. Kesan, *Transaction Costs and Trolls: Strategic Behavior by Individual Inventors, Small Firms, and Entrepreneurs in Patent Litigation* (Univ. of Ill. Law & Econ. Paper Series, Research Paper No. LE09-005, 2009), available at <http://ssrn.com/abstract=1337166>. Given the high costs of such cases, Ball and Kesan infer

there are few law firms willing to file patents on a long-term, fee-deferred basis or in return for equity.³¹ Thus, startups may face much greater barriers when filing patent applications on their inventions than their incumbent counterparts.

B. *Generating Licensing Revenues*

Not all inventors develop and commercialize their inventions. Another common rationale for patenting is to generate revenue in the form of licenses or royalties from authorized third parties and damage awards in patent litigation from unauthorized ones. The rationale behind efficient markets suggests that such licensing will be beneficial when a company can earn more by licensing its patented invention, or is otherwise incapable of fulfilling all of the market demand for its patented products and services. For instance, the company may not have the wherewithal to sell its products overseas, lacking sufficient production or distribution capabilities, and may find the value proposition superior under the licensing model.

While companies currently commercializing their patents may opt to pursue a licensing option, a paucity of know-how, resources,³² or interest to commercialize patents may be more common among startups and independents.³³ Notably, in contrast to some foreign regimes, the U.S. patent system has no “working” requirement—just as the owner of a piece of fertile farmland may plant crops himself, lease it out to a tenant, or leave it fallow.³⁴

A licensing option is also aided by the remedies available in patent law, particularly when the patentee has no intent to commercialize the invention. The threat of damages and, typically, injunctive relief, is a

that such results “could only be possible if there exists some mechanism—like contingency fee lawyers—which helps small parties overcome the high costs of litigation.” *Id.* at 20.

31. Based on the experience of one of the authors as a founder of a software startup and a practicing lawyer, although law firms regularly deferred fees and were paid in equity during the dot-com era, this is no longer the case.

32. One scholar postulates that small firms use patent disclosures as a form of marketing to attract licensing interest from larger firms. See Wolfgang Gick, *Little Firms and Big Patents: A Model of Small-Firm Patent Signaling*, 17 J. ECON. & MGMT. STRATEGY 913 (2008). Unfortunately, there has been no robust empirical study of how often potential users of a patented technology approach patentees for licenses based on reviewing patent disclosures.

33. There is a third form of licensing as well—cross-licensing—which we discuss in the next section. See *infra* Part I.C.

34. Compare, e.g., The Patents Act, No. 39 of 1970, India Code § 83(a) (1999) (setting forth a working requirement under Indian patent law), with *Dawson Chem. Co. v. Rohm & Haas Co.*, 448 U.S. 176, 215 (1980) (rejecting the argument that the failure to license would result in a loss of statutory rights and noting that such a position “runs contrary to the long-settled view [under U.S. law] that the essence of a patent grant is the right to exclude others from profiting by the patented invention”).

proverbial club useful in securing license fees and other payments from actual and potential infringers. Also, because of the high costs³⁵ and substantial uncertainty³⁶ of patent litigation, alleged infringers will often take a license even when they believe they would win in court.³⁷

Thus, there are ample incentives for companies to patent so as to generate license fees from third parties.³⁸ One kind of small firm licensor is the so-called “patent troll,” usually described as an entity that sells no products and performs no R&D, instead earning its profits through licensing or damages awarded in infringement suits.³⁹ On a pessimistic view, these sorts of licensors are akin to patent slumlords.⁴⁰ On another view, they are merely “non-practicing entities” (NPEs) that perform valuable R&D that is brokered and commercialized by others. Whatever one’s view, over the past ten years or so these entities have significantly increased their licensing and litigation activity, in what some observers contend is an abusive fashion.⁴¹ For those small companies whose

35. Litigating a patent case through trial costs on the order of \$3–6 million. *See* AM. INTELL. PROP. LAW ASS’N, REPORT OF THE ECONOMIC SURVEY 32 (2009) [hereinafter ECONOMIC SURVEY].

36. Arguably, uncertainty is especially high with lay juries deciding complex technological questions of fact. *See, e.g.*, Paul R. Michel, *Improving Patent Jury Trials*, in PLI’S FOURTH ANNUAL INSTITUTE FOR INTELLECTUAL PROPERTY LAW 1998, at 81 (PLI Patents, Copyrights, Trademarks & Literary Prop. Course Handbook Series No. 532, 1998) (“The very unpredictability of jury verdicts not only undermines opinion letters, but discourages license agreements and design-arounds, and multiplies litigation—with attendant costs in money, disruption and delay.”). A recent study found that about 30% of district court decisions in patent infringement cases are overturned for faulty interpretations of the patent claims by (typically lay) judges and that greater judicial experience with patent suits does not, on average, decrease a judge’s reversal rate. *See* David L. Schwartz, *Practice Makes Perfect?: An Empirical Study of Claim Construction Reversal Rates in Patent Cases*, 107 MICH. L. REV. 223, 249, 252–55 (2008).

37. Even if a patentee has the know-how or wherewithal to practice its patents, for the reasons mentioned above, it may be more profitable to license and enforce them. An empirical study by Joshua Gans, David Hsu, and Scott Stern finds that firms “with [intellectual property rights] are estimated to be 23 percentage points more likely than nonpatentholders to pursue a cooperative [i.e., licensing] strategy.” Joshua S. Gans et al., *When Does Start-Up Innovation Spur the Gale of Creative Destruction?*, 33 RAND J. ECON. 571, 572 (2002).

38. A growing literature examines the role of patents in facilitating technology transfer in the markets for technology, but these markets cannot exist without willing technology providers and an IP rights enforcement mechanism. *See* ASHISH ARORA, ANDREA FOSFURI & ALFONSO GAMBARDELLA, *MARKETS FOR TECHNOLOGY: THE ECONOMICS OF INNOVATION AND CORPORATE STRATEGY* (2001).

39. *See, e.g.*, Robert P. Merges, *Introductory Note to Brief of Amicus Curiae in eBay v. MercExchange*, 21 BERKELEY TECH. L.J. 997, 997 (2006) (noting “non-producing, non-research and development performing patent holders” are often referred to as “patent trolls”).

40. Charles Tait Graves, *The Law of Negative Knowledge: A Critique*, 15 TEX. INTELL. PROP. L.J. 387, 405 (2007); *see also* Peter Lattman, *Innovative Invention Company or Giant Patent Troll?*, WALL ST. J. L. BLOG, (Nov. 12, 2007, 9:04 AM), <http://blogs.wsj.com/law/2007/11/12/innovative-invention-company-or-giant-patent-troll/>.

41. *See, e.g.*, Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991, 2009 (2007) (arguing that awarding “patent trolls” injunctive remedies

primary business is selling products or services, patent litigation and licensing can be difficult to undertake because of the substantial resources and time required to mount a lawsuit.⁴² Conversely, although the empirical data are limited, relatively cash-poor startups may be less likely to be subject to infringement suits from NPEs.⁴³

C. *Developing an Arsenal for Cross-Licensing*

Using another military metaphor—which, incidentally, is used frequently among IP practitioners⁴⁴—patentees that hold a well-stocked arsenal of patents are often in a strong bargaining position. The genesis of Microsoft’s march into the top three in total yearly U.S. patent grants is telling.⁴⁵ As a knowledgeable IP lawyer recounts:

[I]n 1993 Microsoft only held 24 patents and was struggling with IBM over software licensing. When the two companies could not come to terms, IBM wielded a portfolio of over 1,000 patents as a strong-arm tactic to get Microsoft to the table. Analysts said Microsoft eventually had to ante up an estimated \$20–30 million in patent licensing fees. In the wake of this, Bill Gates told financial analysts “Our goal is to have enough patents to be able to take and exchange intellectual property with other companies.” As of October 2000, Microsoft held 1,391 patents.⁴⁶

distorts the economic purpose of the patent system); John M. Golden, Commentary, “*Patent Trolls*” and *Patent Remedies*, 85 TEX. L. REV. 2111 (2007) (criticizing Lemley and Shapiro’s theoretical model, empirical data, and policy recommendations); Mark A. Lemley & Carl Shapiro, Reply, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 2163 (2007) (critiquing Golden’s response); Steven Levy, *Changes in Patents May Be Pending*, NEWSWEEK, Mar. 12, 2007, at 19; Joe Nocera, *Tired of Trolls, a Feisty Chief Fights Back*, N.Y. TIMES, Sept. 16, 2006, at C1; Tracey Steiner & Stephen Guth, *Beware Patent Trolls*, MGMT. Q., Sept. 22, 2005, at 38.

42. As noted earlier, contingent-fee attorneys can substitute for a patentee’s own litigation war chest, but presumably many small companies focused on product development and sales are either not particularly interested in mounting contingent-fee lawsuits or simply do not have access to contingent-fee attorneys.

43. Cf. Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1317–18 (finding that a relatively low percentage of startups license-in patents solely to avoid a lawsuit).

44. For instance, one of the authors recently heard a well-known patent broker refer to himself as an “arms dealer.” Statement by Northern California Patent Broker to Ted Sichelman, in Berkeley, Cal. (Feb. 6, 2009).

45. See U.S. PATENT & TRADEMARK OFFICE, *PATENTING BY ORGANIZATIONS 2009*, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/topo_09.pdf.

46. ANTHONY L. MIELE, *PATENT STRATEGY: THE MANAGER’S GUIDE TO PROFITING FROM PATENT PORTFOLIOS 40* (2001) (recounting the 1993 IBM-Microsoft licensing negotiations).

As of August 2010, Microsoft has been granted 15,836 patents,⁴⁷ has acquired many others, and has sealed numerous cross-licensing deals⁴⁸—arguably realizing Bill Gates’s ambition “to take and exchange intellectual property with other companies.”⁴⁹

Yet, Microsoft’s weak position vis-à-vis IBM in 1993 likely typifies most startup companies’ inability to negotiate with more established rivals. Insofar as startups may lack the capital to acquire patent arsenals, they will be disadvantaged relative to larger incumbents in cross-licensing deals.⁵⁰ An incumbent’s ability to gain access on very favorable terms through a cross-license to the startup’s innovative technology—which the incumbent may be able to market and sell more effectively than the startup—will build upon the already strong incentives for the incumbent to grow its patent portfolio to maintain low cross-licensing costs with other incumbents.⁵¹ Collectively, these strategies may create or exacerbate patent thickets—erecting barriers to entry and possibly favoring entrenched incumbents.⁵²

47. This number resulted from a search for “Microsoft” as assignee on the U.S. Patent & Trademark Office’s website. See *Patent Full-Text Databases*, U.S. PAT. & TRADEMARK OFF., <http://www.uspto.gov/patft/index.html> (last visited Aug. 30, 2010).

48. *Cross-licensing Deals—Google Search*, GOOGLE, <http://www.google.com/search?source=ig&hl=en&rlz=&=&q=cross-licensing+deals&btnG=Google+Search> (search of term “cross-licensing deals” on Google resulting in a high number of “Microsoft” hits) (last visited Aug. 3, 2010).

49. See generally Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1, 31–43 (2005) (discussing the benefits of aggregating patents into large portfolios).

50. Indirect support for this assertion is Bronwyn Hall’s finding that the average economic value of a patent held by publicly traded entrants in complex product industries was higher than incumbents for a sample of electrical and mechanical firms. See Bronwyn H. Hall, *Exploring the Patent Explosion* (Nat’l Bureau of Econ. Research, Working Paper No. 10605, 2004), available at <http://www.nber.org/papers/w10605>. This finding suggests that incumbents in complex product industries—which are exactly those known to file large numbers of patents for cross-licensing purposes—are digging deeper into the technological well, so to speak, to file for patents.

51. Most of the companies that are the top patent holders in the United States are large incumbents that are highly active in cross-licensing deals. See Graham & Sichelman, *supra* note 21, at 1066 & n.11; David J. Teece, *Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, 15 RES. POL’Y 285 (1986) (discussing the benefits of complementary assets, such as marketing power, in appropriating value from innovation). In this regard, Jean Lanjouw and Mark Schankerman show that patents held by small firms are more likely to be litigated than ones by large firms, consistent with the notion that small firms are not engaging in out-licensing to the same extent as large firms. See Jean O. Lanjouw & Mark Schankerman, *Protecting Intellectual Property Rights: Are Small Firms Handicapped?*, 37 J.L. & ECON. 45 (2004).

52. See generally Carl Shapiro, *Patent System Reform: Economic Analysis and Critique*, 19 BERKELEY TECH. L.J. 1017 (2004).

D. Securing Investment and Financing

Implementing a patented technology may yield greater revenues or lower expenses in the provision of products and services. Another means for startups to generate cash is to raise capital through borrowing or fundraising, and patents can play an important role here as well.⁵³ First, scholars have shown that intensive patenting by acquisition targets is associated with increases in purchase prices.⁵⁴ Other research indicates that similar effects increase IPO share prices.⁵⁵ Second, researchers have found that intensive patenting by venture-backed companies in the software and biotechnology sectors is associated with greater total investment, total number of financing rounds, and firm longevity, though it remains unresolved whether increased patenting causes, or is merely correlated with, these events.⁵⁶ Third, patents can function as valuable

53. See Jesper Lindgaard Christensen, *The IPR System, Venture Capital and Capital Markets—Contributions and Distortions of Small Firm Innovation?* (Druid Working Paper No. 08-03, 2008), available at <http://www.business.aau.dk/wp/08-03.pdf> (reviewing much of the relevant literature on the topic).

54. See David Hsu & Rosemarie Ziedonis, *Patents as Quality Signals for Entrepreneurial Ventures* (Apr. 2007) (unpublished manuscript) (on file with Mack Ctr. for Technological Innovation working paper series), available at http://elsa.berkeley.edu/~bhhall/e222spring07_files/HsuZiedonis07_PatentSignaling_abstables.pdf (finding that a doubling in the patent stock of venture-backed semiconductor companies leads to a 24% premium in market valuation); see also Andreas Panagopoulos & In-Uck Park, *Patent Protection, Takeovers, and Startup Innovation: A Dynamic Approach* (Ctr. for Mkt. and Pub. Org. Working Paper No. 08/201, 2008), available at http://www.epip.eu/conferences/epip03/papers/Panagopoulos_ip-aug08v2-sw.pdf (providing an economic model wherein “positive but not excessive IP protection” leads to increased acquisitions of startup firms by incumbents, thereby increasing overall innovation).

55. Iain M. Cockburn & Megan J. MacGarvie, *Patents, Thickets, and the Financing of Early-Stage Firms: Evidence from the Software Industry* (Nat’l Bureau of Econ. Research, Working Paper No. W13644, 2007), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1037168; see also Hsu & Ziedonis, *supra* note 54, at 2 (finding that semiconductor “[startups] with larger numbers of patent applications are more likely to exit successfully through an initial public offering (IPO)”).

56. See Ronald J. Mann & Thomas W. Sager, *Patents, Venture Capital, and Software Start-ups* (Univ. of Tex. Sch. of Law, Law & Econ. Research Paper No. 057, 2006), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=802806 (finding a significant correlation between patenting activity and total financing as well as the number of rounds of financing, but acknowledging that they could not determine whether increased patenting caused increased financing); Carolin Haeussler et al., *To Be Financed or Not—The Role of Patents for Venture Capital Financing* (CEPR Discussion Paper No. DP7115, 2009), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1393725 (finding that the rate of patenting among German and British biotechnology firms is correlated with the timing of venture capital investment); Paul H. Jensen et al., *Innovation, Technological Conditions and New Firm Survival* (Melbourne Inst. Working Paper No. 16/06, 2006), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=946827 (finding among Australian startup firms that increased patenting is correlated with firm survival rates); David B. Audretsch et al., *Financial Signalling by Innovative Nascent Entrepreneurs* (CEPR Discussion Paper No. DP7165, 2009), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1345692 (finding that patenting increases the likelihood of external financing);

hard assets, either in securing loans or by increasing a company's valuation upon liquidation.⁵⁷

One reason why patents may be important in garnering investment and financing is that they can signal a company's ability to earn super-normal profits or to reduce production costs. Yet, some startup executives, especially those in software companies, contend that patents provide no particular benefit other than a merely "optical" one for potential investors.⁵⁸ These views suggest that although patents may have no intrinsic value for the company that owns them, they can provide an extrinsic value to outsiders estimating the company's worth.

There are several ways of explaining this apparent paradox. One possible explanation is that investors, banks, lawyers, and other outsiders conducting due diligence on startups have only a limited amount of time and resources to assess the value of the startup. Although the patents may be of no particular value for the given startup under consideration, because patents can increase profitability for many other companies, the outsiders nonetheless attribute some value to the patents. On a more sanguine view, the patents may serve as a proxy for internal firm resources that are otherwise difficult to quantify or may signal to outsiders that the company is engaging in the sorts of practices that successful companies generally conduct. For example, the wherewithal a company has to file for patents could signal to investors that it has the "discipline and technical expertise" to "codify [otherwise] tacit knowledge," which acts as a form of insurance against a "brain drain" of the company's valuable know-how if key engineers were to leave.⁵⁹ Yet another explanation is that managers, unlike investors, are incorrect in their poor value assessments, not comprehending the high actual value of patents to their

Cockburn & MacGarvie, *supra* note 55, at 41 (finding that "patents significantly affect the likelihood of obtaining funding for early-stage firms"); *see also* Mazzoleni & Nelson, *supra* note 12, at 276 ("The collection of small and medium sized firms in the American biotechnology industry is, of course, a striking example of enterprises that would not have come into existence without the prospect of a patent, and which depend on patent protection to make their profits, and to attract capital, through one or another of these strategies."); *cf.* Kortum & Lerner, *supra* note 14 (examining patenting by venture-backed firms and postulating a strong causal relationship between venture capital funding and the rate of patenting).

57. *See* Xuan-Thao Nguyen & Jeffrey A. Maine, *Acquiring Innovation*, 57 AM. U. L. REV. 775, 786 (2008) [hereinafter Nguyen & Maine, *Acquiring Innovation*] (noting the potentially high value of a strong intellectual property portfolio for financially distressed companies); Xuan-Thao Nguyen, *Intellectual Property Financing: Security Interests in Domain Names and Web Contents*, 8 TEX. WESLEYAN L. REV. 489, 489 (2002) ("[M]any companies use intellectual property for security purposes in commercial financing schemes.").

58. *See* Mann, *supra* note 27, at 995 n.172.

59. *Id.* at 992; *see generally* Dan L. Burk, *The Role of Patent Law in Knowledge Codification*, 23 BERKELEY TECH. L.J. 1009 (2008); Long, *supra* note 19.

companies.⁶⁰ Still another possibility is that patents, even if not valuable to the startup, might be extremely valuable in the hands of a third party, such as an incumbent acquirer. If this is so, the patent may offer residual value to investors, even if the startup fails to execute its business model.⁶¹ If a startup's patents can be used effectively by others to sell products, demand royalties, or file infringement suits, they may have value quite independent from their utility to the startup per se. So, even if a startup's patents may offer little to the company in terms of its strategy for earning profits, they may nevertheless be valuable assets on the balance sheet, particularly in the eyes of investors and lenders.⁶²

E. *"The Best Defense is a Good Offense": Patents as Shields*

It is a cliché of war, boxing, and football strategists that "the best defense is a good offense."⁶³ In the experience of one of the authors as a practicing IP litigator, this cliché is also well-worn in the patent arena.⁶⁴ An alleged infringer that can assert one of its own patents against a plaintiff as a counterclaim can benefit in several ways. First, the plaintiff will usually become exposed to the threat of an injunction on the sale of its potentially infringing products.⁶⁵ If the revenue associated with the plaintiff's potentially infringing products is comparable to the revenue associated with the defendant's, the shrinking of the possible transfer payment may drive the case to a quick settlement, even if the defendant

60. Such an explanation raises the question of why the entrepreneur would not recognize the inherent value in the asset, or why the investor would demand that the entrepreneur make such an investment in patents when the entrepreneur, who is arguably in the best position to recognize where investments would yield their highest returns, believes that patents are not that best use. An answer to this puzzle could lie in a principal-agent problem in which the entrepreneur engages in investments to maximize both her pecuniary and non-pecuniary gains, while the investor is only interested in the former. *See generally* PAUL GOMPERS & JOSH LERNER, *THE VENTURE CAPITAL CYCLE* (2004) (discussing how venture capital investors face a principal-agent problem in funding startups).

61. *See* Nguyen & Maine, *Acquiring Innovation*, *supra* note 57, at 786.

62. *Cf.* Wesley M. Cohen, Richard R. Nelson, & John P. Walsh, *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)* 24 (Nat'l Bureau of Econ. Research., Working Paper No. 7552, 2000), available at <http://www.nber.org/papers/w7552> (finding that a firm's motive for filing patents "to enhance the reputation of the firm or its employees," which the authors interpreted as useful for securing financing and joint ventures, was significantly negatively correlated with firm size).

63. *See, e.g.*, Anthony H. Cordesman, *The Best Defense Is a Good Offense*, N.Y. TIMES, Dec. 27, 2004, at A17.

64. *See, e.g.*, Rand Bateman, *The Best Defense Is a Good Offense—Even in Patents*, IP THOUGHTS (Jan. 29, 2008, 9:38 AM), <http://iphoughts.com/2008/01/29/the-best-defense-is-a-good-offense--even-in-patents.aspx>.

65. *See* DONALD S. CHISUM, *CHISUM ON PATENTS* § 20.04 (2008).

asserts a weak patent.⁶⁶ Second, the counterclaim will usually level the playing field for the accused infringer. For example, legal contentions that the plaintiff might make to strengthen its claim of infringement (for example, on the proper standard of obviousness) will usually redound to the benefit of the accused infringer as well. Additionally, the accused infringer that asserts its own patents will typically be able to use any of the plaintiff's defenses in its own defensive case. Third, counterclaiming increases the plaintiff's costs. Altogether, using a "defensive" strategy of asserting an infringement counterclaim can substantially decrease the defendant's risks and costs of litigation, providing it greater leverage in bargaining towards a settlement. Because of these benefits, startups may seek patents to erect a "defensive shield."

While small firms face resource constraints in acquiring patents, they may be disproportionately benefited from beginning to build a defensive patent stance. From one perspective, small firms have even more of an incentive than large firms to acquire patents to prevent litigation. Because large firms are often repeat players, they are more often engaged in cross-licensing of patents and other market activities—such as participation on standards-setting committees—that offer advantages in settling disputes in the absence of litigation.⁶⁷ Smaller firms, especially startups, are by and large industry outsiders without these means of coordination.⁶⁸ Indeed, there is empirical evidence showing that the size of a small firm's patent portfolio is a significant determinant of its ability to avoid litigation.⁶⁹

F. Patent Bullying

Even for large firms holding stockpiles of patents, competitors sometimes engage in prolonged patent "wars."⁷⁰ One example is the recently settled worldwide litigation between the two wireless companies, Broadcom and Qualcomm.⁷¹ If competitors assert strong patents that are

66. See Jean Lanjouw & Josh Lerner, *The Enforcement of Intellectual Property Rights: A Survey of the Empirical Literature*, 49/50 ANNALES D'ECONOMIE ET DE STATISTIQUE 223 (1998).

67. See Lanjouw & Schankerman, *supra* note 51, at 47–48; Timothy Simcoe, Stuart Graham & Maryann Feldman, *Competing on Standards? Entrepreneurship, Intellectual Property and Platform Technologies*, 18 J. ECON. MANAGERIAL STRATEGY 775 (2009) (finding that in the standard-setting context, small firms tend to litigate more over essential intellectual property than their larger counterparts).

68. See Lanjouw & Schankerman, *supra* note 51, at 57.

69. See *id.* at 47–48, 57–58.

70. FRED WARSHOFSKY, *THE PATENT WARS* 69–88 (1994) (documenting the hard-fought patent litigation between Polaroid and Kodak over instant photography).

71. See Jonathan Sidener, *Qualcomm Says Competitors Conspiring in Patent Dispute*, SAN DIEGO UNION-TRIB., Mar. 21, 2008, at C1. Qualcomm and Broadcom recently settled most of this litigation. See Brooke Crothers, *Qualcomm, Broadcom Reach \$891 Million*

likely to stand up at trial, and the parties are battling to maintain supra-competitive prices, presumably the patent system effectively fulfils its aim of providing appropriate *ex post* incentives to encourage *ex ante* invention. However, when the patents are weak, in the sense that the patentee is unlikely to prevail, the patent system may not function optimally because of the uncertainty and high costs involved in patent litigation.⁷²

Thus, it may be that incumbents can strategically exploit weak patents to prevent competition from potential entrants. The story of Vonage is illustrative. Vonage, founded in 2000,⁷³ was one of the first of a new wave of telecom startups to provide voice services over the Internet through traditional telephone handsets.⁷⁴ After wide-scale initial marketing, Vonage secured two million subscriber lines by 2006, many of which had been switched from the incumbent telecom carriers, including Verizon, AT&T, and Sprint.⁷⁵ These incumbents responded by asserting patent infringement claims against Vonage.⁷⁶ Despite a belief among industry observers that the carriers' patents were invalid or not infringed,⁷⁷ Vonage ultimately settled the cases for roughly \$200 million,⁷⁸ about a quarter of its annual revenues.⁷⁹ Since settling the lawsuits, Vonage's marketing expenditures have lessened and its subscriber growth has slowed, causing in part a nearly 90% decline in the company's value.⁸⁰

Settlement, NANOTECH: THE CIRCUITS BLOG CNET NEWS (Apr. 26, 2009, 7:18 PM), http://news.cnet.com/8301-13924_3-10227815-64.html.

72. In certain foreign jurisdictions, like the United Kingdom, fee-shifting and other procedural rules may constrain litigation costs, making the effect of weak patents much less severe. See Morag Macdonald, *IP, IT and Telecoms: Beware of the Troll*, LAWYER, Sept. 26, 2005, at 26, available at 2005 WLNR 15209913 (describing common litigation policies that lessen the sting of weak patents in Europe, such as fee-shifting and bars to contingent-fee arrangements).

73. See *Profile for Vonage Holdings*, YAHOO! FINANCE, <http://finance.yahoo.com/q/pr?s=VG> (last visited Aug. 15, 2008).

74. See Lev Grossman, *On the Internet, Talk Is Cheap*, TIME, Apr. 15, 2002, at 77.

75. See Chris Williams, *Vonage: Patent Smackdown Won't Bring Shutters Down*, REGISTER (Feb. 26, 2007), http://www.theregister.co.uk/2007/02/26/vonage_defends_against_verizon. One of the authors performed legal work for Vonage in the AT&T case. All of the information provided on Vonage herein is publicly available.

76. See *id.*

77. See Mike Masnick, *AT&T Joins the Party of Jealous Telcos: Sues Vonage for Patent Infringement*, TECHDIRT (Oct. 22, 2007, 1:03 AM), <http://techdirt.com/articles/20071019/184443.shtml>.

78. See Nathan Eddy, *Vonage, AT&T Agree on Patent Lawsuit Settlement*, CRN.COM Dec. 26, 2007, <http://www.crn.com/networking/205203144>.

79. See, *Income Statement for Vonage Holdings Corporation*, YAHOO! FINANCE, <http://finance.yahoo.com/q/qs?s=VG&annual> (last visited Apr. 15, 2008) (Dec. 31, 2007 data).

80. See David Shabelman, *Some Hope for Vonage*, THEDEAL.COM, (Nov. 9, 2007), available at Lexis-Nexis, News-All file; see also Seth Wallis-Jones, *Growth Slows but Vonage Trims Losses on Path to Profits*, GLOBAL INSIGHT, Feb. 14, 2008; *Vonage Holdings Corp.*, YAHOO! FINANCE, <http://finance.yahoo.com/q?s=VG> (last visited Feb. 6, 2010).

Although there are other reasons for Vonage's decline, the sapping of significant revenues early in its technology and product trajectory drained resources from its research, development, and marketing—each of which is important for long-term success.⁸¹

G. "Blocking" and "Preemptive" Patenting

A company seeking to avoid a situation like that faced by Vonage may seek patents to preempt competitors from gaining patent protection over the company's own inventions.⁸² Since invention in and of itself does not count as prior art if it is "abandoned, suppressed, or concealed,"⁸³ another later-patenting inventor is permitted under law to prevent the earlier inventor from using the invention (by claiming infringement against the earlier inventor who maintained the invention as a secret).⁸⁴ While open publication of an invention provides a means of preempting later patenting by others, this option tends to undercut the inventor's option value in the invention and thus is not commonly used.⁸⁵

Inventors also may seek so-called "blocking" patents that have the unique feature of preventing a competitor company from realizing the full value of its *own patents*.⁸⁶ This strategy is built upon the reality that patents do not provide an affirmative right to "use, sell, and

81. See Paul H. Jensen, Elizabeth M. Webster & Hielke Buddelmeyer, *Innovation, Technological Conditions and New Firm Survival*, 84 *ECON. REC.* 434 (2008); Andrew Beckerman-Rodau, *The Supreme Court Engages in Judicial Activism in Interpreting the Patent Law in eBay, Inc. v. MercExchange, L.L.C.*, 10 *TUL. J. TECH. & INTELL. PROP.* 165, 172 (2007).

82. See Mark A. Lemley, *Reconceiving Patents in the Age of Venture Capital*, 4 *J. SMALL & EMERGING BUS. L.* 137, 144 (2000) (describing such a strategy); Joachim Henkel & Florian Jell, *Alternative Motives to File for Patents: Profiting from Pendency and Publication* (Apr. 8, 2009)(working paper), available at <http://ssrn.com/abstract=1271242>; see also Gideon Parchomovsky, *Publish or Perish*, 98 *MICH. L. REV.* 926 (2000); Rebecca S. Eisenberg, *The Promise and Perils of Strategic Publication to Create Prior Art: A Response to Professor Parchomovsky*, 98 *MICH. L. REV.* 2358 (2000).

83. 35 U.S.C. § 102(g)(2) (2000).

84. Note that there is a narrow exception in certain situations of "prior use" involving business methods. See 35 U.S.C. § 273(b)(1) (2000) (limiting the "prior use" exemption to business methods reduced to practice at least one year before the effective filing date of the patent and commercially used before the effective filing date of the patent).

85. See Robert P. Merges, *A New Dynamism in the Public Domain*, 71 *U. CHI. L. REV.* 183, 194–96 (2004). Additionally, patents sometimes enjoy benefits as "prior art" not available to publications, because patent examiners tend to search patent databases more extensively than publication databases. See Bhaven Sampat, *Examining Patent Examination: An Analysis of Examiner and Applicant Generated Prior Art* 9–11, available at <http://www.stiy.com/MeasuringInnovation/Sampat.pdf> (finding that examiners' prior art citations overwhelmingly arise from issued patents, with only 12% from non-patent prior art).

86. STEPHEN C. GLAZIER, *PATENT STRATEGIES FOR BUSINESS* 34 (2008) (describing this "picket fence" strategy).

manufacture.”⁸⁷ Instead, patents are “negative” rights that endow their owners with a right to exclude infringers from “using, selling, and manufacturing.”⁸⁸ In this way, Company X may file for patents on improvements to Company Y’s patented products, even if those improvements technically fall within the scope of Company Y’s patents.⁸⁹ In that circumstance, Company Y’s and Company X’s patents will “block” one another, thus preventing each company from using, making, and selling the improvements.⁹⁰ Because this strategy requires technical and legal sophistication, small entrepreneurial startups may use it less commonly than larger companies. Nevertheless, where patenting is more common, such as in the biotechnology and semiconductor sectors, experienced board members or attorneys may counsel startup executives to follow a “blocking” patent strategy.⁹¹

H. *Patents as Foils*

Because both technology and market environments can be fraught with uncertainty, companies may pursue patenting strategies to confuse, or even mislead, competitors, market analysts, or journalists that might be reading patents and applications to predict the emergence of new products or services. For example, the publication of Apple Inc.’s applications and patents are routinely reported upon by media outlets intent to predict the arrival of new products.⁹² Companies can use the equivalent of an information strategy to mislead competitors as to the technological direction the company is taking, and its planned forthcoming products and services, by planting a false and misleading trail of patent disclosures. One study of patenting by large companies completed in the 1990s

87. 35 U.S.C. § 271 (2000); see Robert P. Merges, *One Hundred Years of Solitude: Intellectual Property Law, 1900–2000*, 88 CALIF. L. REV. 2187, 2222 (2000).

88. See 35 U.S.C. § 271; see also Giles S. Rich, *The Relation Between Patent Practices and the Anti-Monopoly Laws*, 24 J. PAT. OFF. SOC’Y 159, 167–71 (1942); Katherine J. Strandburg et al., *Law and the Science of Networks: An Overview and an Application to the “Patent Explosion,”* 21 BERKELEY TECH. L.J. 1293, 1323 (2006) (“[T]he legal effect of a patent is to provide the patentee a right to exclude others . . .”).

89. See Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 860–62 (1990) (describing blocking patents).

90. See *id.*

91. See, e.g., Rajiv P. Patel, Fenwick & West L.L.P., *A Patent Portfolio Development Strategy for Start-Up Companies* (Nov. 1, 2002), http://www.fenwick.com/docstore/Publications/IP/IP_Articles/Patent_Portfolio_Dev.pdf.

92. See, e.g., Alex Brooks, *Apple Awarded Multi-Touch Patent*, WORLD OF APPLE (Jan. 26, 2009), <http://news.worldofapple.com/archives/2009/01/26/apple-awarded-multi-touch-patent/>; Tim Stevens, *Apple Patent Application Reveals New Display Housing, Mythical Tablet Nowhere to be Found*, ENGADGET (Feb. 3, 2009), <http://www.engadget.com/2009/02/03/apple-patent-application-reveals-new-display-housing-mythical-t/>.

showed that this strategy was not uncommon.⁹³ Because startups are more financially constrained than their larger counterparts, however, it stands to reason that pursuit of such a strategy—which would require intensive patenting—would be less common.

I. Patents as Substitutes for Nondisclosure Agreements

While it may seem antithetical to the disclosure role of patenting, another purpose of seeking patents is to maintain secrecy before the patent is published. Because a patent can often prevent copying by third parties, a patent may effectively serve as a non-negotiable form of nondisclosure agreement (NDA), usually protected by broad injunctive relief. NDAs are agreement used by employers to restrict the disclosure or use of confidential information by employees or third parties.⁹⁴ It is not uncommon for technology companies to require new hires, especially technical employees like engineers, to sign as part of the employment agreement a nondisclosure provision that prevents the hire from disclosing or using knowledge gained during employment not in the public domain.⁹⁵ Companies collaborating in a research joint venture also commonly use NDAs to prevent the employees of the partner firm from disclosing learned information and know-how.⁹⁶ Moreover, inventors often seek NDAs from third parties during licensing, commercialization, or investment negotiations.⁹⁷

While NDAs are useful, patents may offer a stronger “fix” to the problem of employee information disclosure. First, although NDAs can provide for injunctive relief, the protections are generally limited to preventing information disclosure and often do not extend—unlike patenting—to the manufacture and sale of a product incorporating the information.⁹⁸ Second, proving that there has been a breach of the NDA contract is often difficult.⁹⁹ Third, commercial partners may refuse to

93. See British Technology Group, IPR Market Benchmark Study (1999) (prepared by Business Planning & Research International) (on file with author) [hereinafter BTG Study] (finding that about 20% of the respondents engaged in such a strategy).

94. See Michael L. Rustad, *The Negligent Enablement of Trade Secret Misappropriation*, 22 SANTA CLARA COMPUTER & HIGH TECH. L.J. 455, 507 (2006).

95. See *id.*

96. See *id.*

97. See *id.*

98. See, e.g., RESTATEMENT (THIRD) OF UNFAIR COMPETITION § 44 cmt. d (1995) (“When the trade secret is narrow in scope and closely related to publicly available information, the injunction should be carefully restricted to the contours of the trade secret in order to avoid encroachment on the public domain.”); Robert Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L.J. 1477, 1498 (2005) [hereinafter Merges, *A Transactional View*].

99. See, e.g., M. Scott McDonald, Symposium, *Noncompete Contracts: Understanding the Cost of Unpredictability*, 10 TEX. WESLEYAN L. REV. 137, 149–50 (2003); cf. Greenberg v.

sign the NDA contract.¹⁰⁰ A patent offers a solution to these downsides of contract since it (i) binds the world, not just the parties to an agreement; (ii) prevents the use, sale, or manufacture of any product embodying the confidential information; (iii) treats as irrelevant the question of whether the information was stolen; and (iv) typically provides the strong coercion of injunctive remedies.¹⁰¹ Because patents are advantaged in these ways, and because entrepreneurs may lack negotiating power relative to larger firms, startups may have more incentives to use patents in this manner, especially in their relationships with larger companies. However, once again, financial and resource constraints may make pursuing strategic patenting of this type difficult.¹⁰²

J. “Image is Everything” Patenting

Human psychology and behavior offer a final reason for seeking patents. Inventors may file for patents to validate the value and importance of their ideas: the Patent Office, with its expert technical examiners, may offer credibility by certifying that the idea met the government’s utility, novelty, and nonobviousness standards. According to a popular book for independent inventors, *Patent It Yourself*, “[s]ome inventors file for and obtain patents mainly for vanity, or the prestige a patent brings.”¹⁰³

Croydon Plastics Co., 378 F. Supp. 806, 814 (E.D. Pa. 1974) (“Plaintiffs in trade secret cases . . . are confronted with an extraordinarily difficult task. Misappropriation and misuse can rarely be proved by convincing direct evidence. . . . Against this often delicate construct of circumstantial evidence there frequently must be balanced defendants and defendants’ witnesses who directly deny everything.”).

100. See, e.g., Merges, *A Transactional View*, *supra* note 98, at 1498.

101. Although a patent’s rights do not inhere prior to publication, if a third party uses the pre-publication information in making, selling, or offering to sell a product, it is likely to continue that use beyond the date of publication, which can provide a basis for an infringement claim. See 35 U.S.C. § 154(d)(1) (2000). So, in effect, a patent can substitute for a pre-publication NDA.

102. Indeed, there is a strong argument that the boundaries created by patents play a large part in enabling the existence of small firms by fostering the presence of inter-firm boundaries. See Ashish Arora & Robert P. Merges, *Specialized Supply Firms, Property Rights and Firm Boundaries*, 13 *INDUS. & CORP. CHANGE* 451, 470–71 (2004); Oren Bar-Gill & Gideon Parchomovsky, *Law and the Boundaries of Technology-Intensive Firms*, 157 *U. PA. L. REV.* 1649 (2009); Dan L. Burk & Brett H. McDonnell, *The Goldilocks Hypothesis: Balancing Intellectual Property Rights at the Boundary of the Firm*, 2007 *U. ILL. L. REV.* 575, 613 (2007) (“[R]obust provision of intellectual property rights can encourage interfirm transactions.”).

103. DAVID PRESSMAN, *PATENT IT YOURSELF* 8 (2006). Interestingly, in a recent study examining the relationship between the patenting activity of engineers and those aspects of their jobs most important to them, “intellectual challenge” was much more strongly correlated to patenting rates than other factors, most notably economic rewards. Henry Sauermann & Wesley M. Cohen, Duke Univ., Fuqua Sch. of Bus., “I Don’t Work for Money”: The Motives of Scientists and Engineers, Address at the Berkeley Center for Law & Technology March

Whatever view engineers and scientists may have of the past quality of patents issued by the U.S. Patent Office,¹⁰⁴ among the general public, a patent can lend importance to an invention. Companies routinely place “patent pending” tags in their product advertisements (strangely, even if the patent has been granted).¹⁰⁵ While the usefulness of applying the “patent pending” moniker in marketing has apparently escaped rigorous empirical study, at least one commentator has suggested the words have value,¹⁰⁶ and many examples of their use exist.¹⁰⁷

Apart from direct marketing image, patenting may provide startups with another even-more important type of image: a signal to investors and analysts of the quality of the technical capabilities of the firm. Economic research by Bronwyn Hall, Adam Jaffe, and Manuel Trajtenberg has shown that patents, and particularly highly cited patents, are positively related to the market value of large publicly-traded companies, even after taking account of other factors such as tangible assets and R&D spending.¹⁰⁸ Moreover, other scholars have hypothesized that patenting acts as a signal of quality to investors among small technology companies.¹⁰⁹ While neither of these studies determinatively shows that signaling plays a role in patenting, the findings are suggestive of a role for technology image. Accordingly, it may be that this sort of recognition

2008 Entrepreneurship Symposium 8 (Mar. 7, 2008), <http://www.law.berkeley.edu/files/sauer mann.pdf>.

104. See Michael Orey, *The Patent Epidemic: It's Wasting Companies' Money and Slowing the Development of New Products*, BUSINESSWEEK ONLINE (Jan. 9, 2006), http://www.businessweek.com/magazine/content/06_02/b3966086.htm (last visited Aug. 12, 2010) (suggesting that “[o]ver the past two decades, critics say, the hurdle for passing the obviousness test has been steadily lowered, and the U.S. is now awash in a sea of junk patents.”).

105. It is possible that the “patent pending” signal provides benefits beyond mere reputation or vanity – to the extent that such a signal fosters fear, uncertainty, and doubt over what monopoly rights may erupt in the technology space, competitors may be less inclined to invest in innovating in the area. Peter Menell suggested to one of the authors that perhaps the “patent-pending” phrase is more effective than a mere “patented” tagline, because the former portrays a product so “cutting edge” that not even enough time has passed for the patent to issue.

106. See, e.g., ROBERT C. DORR & CHRISTOPHER H. MUNCH, *PROTECTING TRADE SECRETS, PATENTS, COPYRIGHTS, AND TRADEMARKS* 216 (1995) (“[T]he words patent pending may have substantial psychological or marketing value.”).

107. See, e.g., Bosch Sec. Sys., Inc., *Constant Light Technology (Patent Pending) for LED Infrared Security Lighting*, 1 (Aug. 2010), <http://www.boschsecurity.us/NR/rdonlyres/3886110E-9392-4B8D-B40B-00B99004D5E0/9428/ConstantLightWhitePaper.pdf>; *Learn How to Get the Patent Pending Instant Buzz Now*, http://www.squidoo.com/Levi_Holman (last visited Sept. 10, 2010); *Scorpion EXO-400 Sting Full Face Street Motorcycle Helmets*, <http://www.extremesupply.com/scorpionhelmets/scorpionexo400sting.htm> (last visited Sept. 10, 2010).

108. Bronwyn H. Hall, Adam Jaffe & Manuel Trajtenberg, *Market Value and Patent Citations*, 36 RAND J. ECON. 16, 31–32 (2005).

109. See Hsu & Ziedonis, *supra* note 54, at 1–2.

is a non-trivial driver of patenting for startup companies looking to improve the image of their products or capabilities.

K. *Reasons for Not Patenting*

During the last three decades, the number of patent applications filed at the U.S. Patent Office has grown substantially.¹¹⁰ While scholarly research has pointed to varied reasons for this growth,¹¹¹ the associated change in the amount of technological innovation over the same period—both patented and unpatented—is even more speculative. Unfortunately, we cannot know with certainty the quantity or value of unpatented inventions. We can, however, analyze the reasons that may lead inventors, and startup companies, to forgo patent protection on their inventions that are valuable or otherwise objectively patentable.

1. Technology is Perceived as Unpatentable

Some inventors may regard their inventions as unpatentable, because they believe the inventions are either outside the scope of the patent law's subject matter allowance or otherwise obvious in view of the prior art.¹¹² However, since the scope of patentable subject matter has been quite broad, it is likely that some inventors have been wrong in their beliefs, mistakenly choosing to forgo a patent application.¹¹³ Examples of subject matter that some novices may have mistakenly believed to be unpatentable, but for which patents have issued, include many business methods, such as schemes to avoid paying taxes,¹¹⁴ and so-called "mental steps" patents, such as a physician's determination of whether an amount

110. See JAMES BESSEN & MICHAEL J. MEURER, *PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK* 63 (2008).

111. See, e.g., Hall, *supra* note 50, at 2–4 (demonstrating that a significant change occurred in the rate of patenting shortly after the creation of the Federal Circuit); Samuel Kortum & Josh Lerner, *Stronger Protection or Technological Revolution: What is Behind the Recent Surge in Patenting?* (Nat'l Bureau of Econ. Research, Working Paper No. 6204, 1997), available at <http://www.nber.org/papers/w6204> (suggesting that the rise in patenting during the 1990s was primarily due to increased innovation, and not the pro-patent regime created by legal changes).

112. See, e.g., Kenneth M. Bush, *Advising Clients: How to Recognize and Protect Intellectual Property*, 62 ALA. LAW. 380, 380 (2001) (claiming that from large companies down to individual inventors, potential clients often do not understand what is protectable as intellectual property).

113. A related reason for inventors not filing is that they think their inventions should not be patentable on policy grounds. See Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1314. While these inventors think their inventions would be patentable, they do not file because they believe their inventions should not be patentable. See *id.*

114. See generally William A. Drennan, *The Patented Loophole: How Should Congress Respond to this Judicial Invention?*, 59 FLA. L. REV. 229 (2007).

of a naturally occurring chemical in the body indicates illness.¹¹⁵ Although the Supreme Court's recent opinion in *Bilski v. Kappos*¹¹⁶ casts doubt on the continuing viability of "pure" business method patents—that is, those that are wholly abstract in nature¹¹⁷—the scope of patentable subject matter remains fairly expansive.¹¹⁸

While those inexperienced in prosecuting patents may see the previous patenting of discrete ideas as a bar to patenting, the more experienced inventors (and their attorneys) realize that discrete inventions may be recombined to create patentable disclosures. Ideas that are seemingly obvious, even to lay observers, have passed muster in the Patent Office.¹¹⁹ Amazon.com's "one-click" patent is a favorite example: it claims in essential part "a single-action ordering component . . . in response to performance of only a single action."¹²⁰ So, while novelty and nonobviousness are certainly bars to patenting, the inexperienced may not hold accurate perceptions of their effects. Thus, the least experienced—e.g., first-time inventors and entrepreneurs—may be more likely to underestimate the broad scope of patentability and, as a result, wrongly fail to file a patent.

2. The High Costs of Patenting and Patent Litigation

The law of demand indicates that as prices rise, we will see less demand, suggesting that higher "prices" for patenting (the fees charged by the USPTO and attorneys) will deter inventors from "demanding" these

115. See *Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc.*, 548 U.S. 124, 127–35 (2006) (Breyer, J., dissenting). In his dissent, Justice Breyer stated that the Court's dismissal of the case was improvidently granted and reasoned that the claim-at-issue merely "instructs the user to (1) obtain test results and (2) think about them." *Id.* at 136.

116. *Bilski v. Kappos*, 130 S. Ct. 3218 (2010).

117. See *id.* at 3229–3231.

118. See Ted Sichelman, *Guest Post on Bilski: Why Bilski Benefits Startup Companies*, PATENTLY-O (June 29, 2010, 8:19 AM), <http://www.patentlyo.com/patent/2010/06/guest-post-why-bilski-benefits-startup-companies.html>.

119. See, e.g., FTC, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY 8–19 (2003) (citing patent and economic scholars that criticize the lenient nature of the nonobviousness requirement), available at <http://www.ftc.gov/os/2003/10/innovationrpt.pdf>; ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT 25–26 (2004); NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., A PATENT SYSTEM FOR THE 21ST CENTURY (Stephen A. Merrill et al. eds., 2004); Robert P. Merges, Symposium, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKELEY TECH. L.J. 577, 598 (1999) (noting that standards at the USPTO would be raised if the requirements were tightened).

120. U.S. Patent No. 5,960,411 col.10 l.51 (filed Sept. 12, 1997); see generally Stephen Dirksen et al., *Who's Afraid of Amazon.com v. Barnesandnoble.com?*, 2001 DUKE L. & TECH. REV. 3 (2001).

services (thus bringing fewer patent applications into the process).¹²¹ Opportunity costs tend to exacerbate these direct pecuniary costs: company executives and engineers must spend time in the prosecution of patents instead of attending to their key managerial, design, and innovative functions.¹²² Moreover, the value of a company's patent may be negligible unless it can credibly threaten patent enforcement actions.¹²³ It may be—if cash constraints are the major driver—that competitors are more likely to infringe the patents of resource-poor startups, on the theory that these companies are less able to enforce their rights.¹²⁴ To the extent that entrepreneurs are more likely to face cash constraints, it stands to reason that, even if the startup files an infringement suit, the case may be settled for less at the margin: without the credible threat of maintaining a patent suit which, on average, can cost each party over \$5 million,¹²⁵ settlement amounts can be expected to decline. Accordingly, to the extent that entrepreneurs are resource constrained, and patent enforcement is contingent on expending resources (both financial and managerial), startups likely face lower incentives to apply for patents on their inventions.¹²⁶

3. Perceptions that Patents Provide Weak Protection: “Design Arouds”

It has been said that patents can be a “gigantic waste of time and money.”¹²⁷ Some innovators—particularly in some technology fields—believe that patents can be easily “designed around,” a notion that can lead companies to regard patenting as a worthless activity.¹²⁸ This view maintains that if the claims of the patent are sufficiently narrow, a third

121. See Christensen, *supra* note 53, at 10.

122. See, e.g., Mann, *supra* note 27, at 982–83.

123. This credible threat includes the ability to detect infringement in the first instance, which may be very costly itself, especially for patents on internal processes that are not discernable from commercial products. See, e.g., Rebecca S. Eisenberg, *Patenting the Human Genome*, 39 EMORY L.J. 721, 739 (1990).

124. Conversely, it may be that a small firm faces larger incentives to enforce its patents, since the company's value may be proportionately more bound to their upstream technological “crown jewels” as compared to their larger counterparts operating in the downstream product markets. See Simcoe et al, *supra* note 67, at 20.

125. See ECONOMIC SURVEY, *supra* note 35, at 32.

126. As we noted earlier, some entrepreneurs may compensate for inadequate resources by using contingent-fee attorneys. See *supra* notes 30–31 and accompanying text. But contingency arrangements are unlikely to be available in all situations in which a third party infringes a valid and enforceable patent.

127. Bruce Byfield, *End Software Patents Project Comes Out Swinging*, LINUX.COM (Feb. 29, 2008), <http://www.linux.com/feature/128110> (quoting Brad Feld, founder and chair of Mobius Venture Capital).

128. For instance, one software startup company CFO asserts that “[t]here are a lot of ways to work around [software] patents.” Mann, *supra* note 27, at 978 n.95.

party can escape infringement by making simple changes to the underlying invention while achieving the same functionality.

There is some evidence to suggest, however, that it can be difficult to design around patents, regardless of the underlying technology. First, although the disclosure in a patent must provide a written description sufficient to enable the claims that are drafted,¹²⁹ in recent years the Federal Circuit has applied the enablement and written description doctrines fairly loosely, particularly outside the biotechnology and pharmaceutical fields.¹³⁰ This trend has allowed patentees to broadly claim their inventions, often outside the embodiments disclosed in the patent specification. Second, some courts have construed claims more broadly than their language indicates.¹³¹ Finally, there is no requirement per se that claims be literally infringed—the doctrine of equivalents provides that if the product in question is “insubstantially different” from that claimed or performs “substantially the same function in substantially the same way to achieve substantially the same result” as that claimed, there is nevertheless an infringement.¹³² Although the doctrine of equivalents has been reduced in stature in recent years, the incidence of patentee wins under such a theory is not negligible.¹³³ Given these realities, it may be wise to view any suggestion that patents can be easily avoided with skepticism. Nonetheless, again, an uninformed startup—especially one lacking knowledgeable counsel—may choose to forgo filing an application based on a mistaken view that its claims would be too narrow to provide substantial benefits in the face of aggressive and deep-pocketed competitors.

129. See 35 U.S.C. § 112 (2000).

130. See, e.g., BESSEN & MEURER, *supra* note 110, at 65–67; Julie E. Cohen & Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 CALIF. L. REV. 1, 24 (2001). The Federal Circuit implemented a relatively heightened disclosure requirement for biotechnology products in *Eli Lilly & Co. v. Barr Laboratories, Inc.*, 251 F.3d 955, 963 (Fed. Cir. 2001), but arguably has not applied it consistently. See Ajeet P. Pai, Note, *The Low Written Description Bar for Software Inventions*, 94 VA. L. REV. 457, 471–78 (2008).

131. See generally Michael Risch, *The Failure of Public Notice in Patent Prosecution*, 21 HARV. J.L. & TECH. 179, 210–12 (2007).

132. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 731 (2002) (“Unimportant and insubstantial substitutes for certain elements could defeat the patent, and its value to inventors could be destroyed by simple acts of copying.”); see also *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 608 (1950) (“‘To temper unsparing logic and prevent an infringer from stealing the benefit of the invention’ a patentee may invoke this doctrine to proceed against the producer of a device ‘if it performs substantially the same function in substantially the same way to obtain the same result.’”) (quoting *Royal Typewriter Co. v. Remington Rand, Inc.*, 168 F.2d 691, 692 (2d Cir. 1948) and *Sanitary Refrigerator Co. v. Winters*, 280 U.S. 30, 42 (1929)).

133. Inst. for Intellectual Prop. & Info. Law, Univ. of Houston Law Ctr., *U.S. Patent Litigation Statistics Project*, PATSTATS.ORG., <http://www.patstats.org> [hereinafter PatStats] (last visited Mar. 7, 2009) (showing seventy patentee wins on the doctrine of equivalents in district courts from 2000 to 2007).

4. Fear of Disclosing Valuable Trade Secrets

The “patent and secret as substitutes” view suggests that an inventor must either keep his invention as a trade secret or disclose it, either during the application process or, at the latest, when the patent issues.¹³⁴ Obviously, if an invention can be easily copied or reverse engineered, and is accessible to competitors,¹³⁵ then a patentee cannot expect to appropriate much value from trade secret protection.¹³⁶ However, if the patentee can keep the invention secret, and unobserved, it may be valuable to forgo patenting in order to avoid disclosure. Moreover, despite the seemingly binary choice between trade secrecy and patenting, in practice a patentee is often able to patent an invention while keeping its “secret sauce” as a trade secret.¹³⁷ In part because patent law disclosure requirements tend to be weak, the stark contrast that some scholars present between these two options—the so-called secret-patent divide—is generally much fuzzier in practice.¹³⁸

5. Other Forms of Protection

The last major reason why startup companies may not patent is that they may believe other forms of legal or non-legal protection are adequate, or even superior, given their business strategies. It may be that a patenting strategy is merely redundant given other forms of legal protection over innovations, including copyright, trademark, or contractual

134. See LANDES & POSNER, *supra* note 24, at 294–95; Dan L. Burk, *Misappropriation of Trade Secrets in Biotechnology Licensing*, 4 ALB. L.J. SCI. & TECH. 121, 130 (1994) (“For those inventions that are patentable subject matter, concurrent patent protection and trade secret protection are incompatible because the disclosure required by the patent destroys trade secrecy.”); see also *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 484–85 (1974) (implicitly assuming that an inventor must make a choice between trade secrecy and disclosure by patenting).

135. An internal manufacturing process, for instance, might be easy to copy, but may not have to see the light of day, and thus be protected from prying eyes.

136. Importantly, trade secret protection does not prevent a third party from copying or reverse engineering a product that it has legally obtained. UNIF. TRADE SECRETS ACT §§ 1–3 (1985).

137. For instance, both patents and trade secrets were used by Pilkington Glass to protect codified and tacit elements of the firm’s “float glass” invention, a radical improvement in creating smooth glass. See *United States v. Pilkington, PLC*, No. CV 94-345, 1994 WL 750645 (D. Ariz. Dec. 22, 1994). Moreover, applicants may enjoy trade secrecy while a patent application is pending, providing the applicant both priority advantages and the protection of trade secrecy before publication. See Stuart J.H. Graham & Deepak Somaya, *Vermeers and Rembrandts in the Same Attic: Complementarity Between Copyright and Trademark Leveraging Strategies in Software* (Ga. Inst. of Tech. TI:GER Working Paper, 2006), available at http://papers.ssrn.com/abstract_id=887484.

138. See Graham & Somaya, *supra* note 137.

protections.¹³⁹ Accordingly, patents may coexist (and not overlap) with these other legal forms of protection, providing at best supplementary rights which do not offer sufficiently improved protection.¹⁴⁰

Patenting may also fail to serve as a sufficient complement to non-legal strategic advantages. A company may enjoy “first-mover” advantages or possess complementary assets, such as production or marketing capabilities, that effectively prevent competition in the market for commercial embodiments of the invention.¹⁴¹ If these non-legal advantages are strong enough, or if product life cycles are short enough, patenting may be unnecessary or effectively redundant.

II. THE (PAUCITY OF) PRE-EXISTING DATA ON PATENTING BY ENTREPRENEURS

Despite the substantial theoretical literature on why entities decide to patent or not, there is relatively meager empirical evidence about patenting by startup companies, particularly in the United States. This Part begins by briefly reviewing several studies conducted in the 1970s, 80s, and 90s in the United States and Europe of large, mainly publicly traded companies. Then, it explores the handful of empirical studies, some based primarily on anecdote, of patenting by entrepreneurs. Finally, it summarizes the important results of these studies.¹⁴²

A. Surveying Large Company Patenting

One line of studies has surveyed large, mostly publicly traded companies.¹⁴³ Although large, established companies clearly differ in many

139. See, e.g., Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1279–96 (discussing that patenting ranks behind copyright and trademark among software entrepreneurs for securing competitive advantage from their technology innovations).

140. See Graham & Somaya, *supra* note 137.

141. See Teece, *supra* note 51. First-mover advantages are particularly relevant in fast-moving industries, such as software and the Internet. See Arti Rai, *Addressing the Patent Gold Rush: The Role of Deference to PTO Patent Denials*, 2 WASH. U. J.L. & POL'Y 199, 212 (2000) (suggesting that the short business cycle for Internet technologies lends import even to short-lived first-mover advantages).

142. A portion of this Part is adapted from Graham & Sichelman, *supra* note 21, at 1088–90.

143. See, e.g., C.T. TAYLOR & Z.A. SILBERSTON, *THE ECONOMIC IMPACT OF THE PATENT SYSTEM: A STUDY OF THE BRITISH EXPERIENCE* (1973); Richard C. Levin, Alvin K. Klevorick, Richard R. Nelson & Sidney G. Winter, *Appropriating the Returns from Industrial Research and Development*, 3 BROOKINGS PAPERS ON ECON. ACTIVITY 783 (1987); Edwin Mansfield, Mark Schwartz, & Samuel Wagner, *Imitation Costs and Patents: An Empirical Study*, 91 ECON. J. 907 (1981); Edwin Mansfield, *Patents and Innovation: An Empirical Study*, 32 MGMT. SCI. 173 (1986) [hereinafter, Mansfield, *Patents and Innovation*]; Cohen et al., *supra* note 62.

regards from new companies, these studies are instructive not only because they provide initial insights into the reasons why startups do and do not patent, but also because their findings inform the majority of scholars' views on the topic. In a series of studies in the 1970s and early 1980s, Edwin Mansfield and others reported a statistically significant correlation between firm size and the percentage of inventions that were patented, inferring that out-of-pocket costs are more substantial disincentives to relatively smaller firms.¹⁴⁴ However, in this early period, they reported that firms of all sizes found patenting of relatively limited importance to the profit potential of their innovations, although their studies did not include startups, and they noted that if "very small firms" were included, "the results might be different."¹⁴⁵ In a late-1980s study by researchers at Yale University of 650 publicly traded companies, respondents reported that preventing product duplication was a substantially more important reason to file patents than securing royalty income.¹⁴⁶ Additionally, the Yale study found that the major factor limiting the effectiveness of product patents was the ability of competitors to invent around claims, followed (in descending order of importance) by the lack of patentability of inventions, the difficulty of enforcing a patent, the disclosure of too much information, the likelihood of invalidation of the patent if challenged, the rapid rate of technological change, the existence of cross-licensing agreements with potential infringers, and the possibility of compulsory licensing of the patent.¹⁴⁷

An important study organized at Carnegie Mellon University by Wes Cohen, Richard Nelson, and John Walsh in the mid-1990s found that for generally large U.S. companies, the main driver of patenting was preventing imitation, followed by preempting competitors, preventing lawsuits, improving negotiating leverage, enhancing reputation, securing licensing income, and tracking internal performance.¹⁴⁸ Smaller firms were more likely to report patenting to enhance reputation than larger firms.¹⁴⁹ Cohen, Nelson, and Walsh also examined reasons not to patent, determining that the ease of inventing around a potential patent was the primary rationale for forgoing patenting, followed (in descending order of importance) by a belief that the invention was not novel, a reluctance to disclose the information, the cost of applying for the patent, and the

144. Mansfield, *Patents and Innovation*, *supra* note 143, at 177.

145. *Id.* at 175.

146. Levin et al., *supra* note 143, at 794 tbl.1.

147. *See id.* at tbl.6. The compulsory licensing requirement—specifically, when the patent is not commercialized within a fixed period of time, usually three years after issuance—is applicable only in certain foreign countries. *See* PATENTS THROUGHOUT THE WORLD §§ 1:19–20 (2008).

148. *See* Cohen et al., *supra* note 62, at 47 fig.7, 48 fig.8.

149. *Id.* at 18, 24.

cost of enforcing the patent.¹⁵⁰ In addition, they found that smaller firms were more likely to forgo patenting than larger firms because of the costs of filing and enforcement.¹⁵¹

A survey of large European companies in the early 1990s also found that preventing imitation was the most important reason for patenting, followed (in descending order of importance) by improving bargaining leverage in negotiations, preempting patenting by others, securing licensing revenues, protecting international market expansion, and signaling internal employee performance.¹⁵² Another study of primarily large German firms found that the largest ones were more apt to engage in strategic patenting—that is, patenting for reasons other than preventing copying or maintaining supernormal profits—than smaller firms.¹⁵³ Smaller firms, on the other hand, were more likely than larger ones to use patents for reputational purposes, such as improving their company and technological image.¹⁵⁴

Despite their valuable findings, these studies failed to investigate and explain why *startups* patent.¹⁵⁵ Moreover, significant shifts have occurred in industry and innovation dynamics since these surveys were completed, including the rise of the software and biotechnology industries, which have grown on the heels of important legal decisions in the early 1980s.¹⁵⁶ Finally, there have been major changes in the patent law

150. *Id.* at 14–15 & fig.5.

151. *See id.* at 15–16.

152. A. ARUNDEL ET AL., PACE REPORT: INNOVATION STRATEGIES OF EUROPE'S LARGEST INDUSTRIAL FIRMS: RESULTS OF THE PACE SURVEY FOR INFORMATION SOURCES, PUBLIC RESEARCH, PROTECTION OF INNOVATIONS, AND GOVERNMENT PROGRAMMES 13 (1995) (on file with authors).

153. Knut Blind et al., *Motives to Patent: Empirical Evidence from Germany*, 35 RES. POL'Y 655, 660 (2006).

154. *Id.* at 664–65.

155. The Mansfield study focused on “firms with about \$25 million or more in sales, not very small ones.” Mansfield, *Patents and Innovation*, *supra* note 143, at 174. The Yale study used a ranking of companies with R&D expenses greater than 1% of sales or \$35 million in 1981. Levin et al., *supra* note 143, at 819. Similarly, the Carnegie Mellon study surveyed eligible labs in the Directory of American Research and Technology as well as other publicly traded firms, oversampling Fortune 500 companies. Cohen et al., *supra* note 62, at 4. Additionally, the published results of the Cohen study were limited to firms “with at least \$5,000,000 in sales or business units of at least 20 people.” *Id.* at 5. The Blind study included a “high share of very large, actively patenting companies.” Blind et al., *supra* note 153, at 660.

156. *See, e.g.*, *Diamond v. Diehr*, 450 U.S. 175 (1981) (holding that the execution of a process, controlled by running a computer program, is patentable); *Diamond v. Chakrabarty*, 447 U.S. 303 (1980) (holding that genetically modified microorganisms are patentable). The software industry is especially different today from the early 1980s or 1990s. *See, e.g.*, Stuart J.H. Graham & David C. Mowery, *Intellectual Property Protection in the U.S. Software Industry*, in *PATENTS IN THE KNOWLEDGE-BASED ECONOMY* 219–227 (Wesley Cohen & Steven Merrill eds., 2003).

landscape, including the emergence of so-called “patent trolls,”¹⁵⁷ shifting case law from the Federal Circuit and the Supreme Court,¹⁵⁸ and a significant upward trend in overall patenting and in the hazards of litigation.¹⁵⁹ In sum, although these surveys may provide instructive background on what the patenting behavior of new, embryonic firms looks (or *looked*) like, they are certainly far from conclusive.

B. Few Targeted Studies on Entrepreneurial Patenting

1. Some Scattered Anecdotes

Perhaps the most prevalent form of data on entrepreneurial patenting to date has come from anecdotes available in scattered magazines, newspapers, blogs, congressional hearing reports, and—less commonly—law reviews. In an influential article, Ronald Mann summarizes a series of sixty interviews with firm managers, venture capitalists, angel investors, and attorneys concerning the role of patents in private, venture-backed software firms.¹⁶⁰ From these interviews, Mann draws several conclusions. First, he finds that patenting does not significantly benefit the ability of these firms, especially those at very early stages, to earn super-normal profits, because the firms typically have not commercialized their patents.¹⁶¹ Buttressing this result is the finding that these young firms cannot afford to enforce their patents.¹⁶² Mann also recounts that interviewees believed that software patents—especially “product” patents—are easy to “design around” with non-infringing technology and are subject to rapid obsolescence, further diminishing their value.¹⁶³ On the other hand, Mann notes that a number of his later-stage interviewees file for patents to “barter” in cross-licensing agreements and to generate (often significant) revenue from one-way licensing.¹⁶⁴ Second, Mann concludes that patents substantially distract these firms “from the central task of designing and deploying a product.”¹⁶⁵ Third, he finds that patents

157. See sources cited *supra* note 41.

158. See, e.g., Rebecca S. Eisenberg, Commentary, *The Supreme Court and the Federal Circuit: Visitation and Custody of Patent Law*, 106 MICH. L. REV. FIRST IMPRESSIONS 28 (2007); Harold C. Wegner, Commentary, *Making Sense of KSR and Other Patent Cases*, 106 MICH. L. REV. FIRST IMPRESSIONS 39 (2007).

159. James Bessen & Michael J. Meurer, *The Patent Litigation Explosion* (Boston Univ. Sch. of Law Working Paper No. 05-18, 2005), available at <http://ssrn.com/abstract=831685> (arguing that the threat of litigation rises for companies that spend more on R&D, file more patents, and are publicly traded).

160. See Mann, *supra* note 27.

161. See *id.* at 978–79.

162. See *id.* at 981.

163. See *id.* at 978–79, 988.

164. *Id.* at 985–86, 990.

165. *Id.* at 962, 983.

can play important “signaling” roles in later-stage fundraising and exit events, such as IPOs or acquisitions, or even in bankruptcy.¹⁶⁶ Fourth, he finds little to no evidence that patent thickets—large groups of third-party patents that potentially block innovators from performing research, development, and commercialization—have hindered the innovation of young software firms.¹⁶⁷ Although Mann’s study filled an important gap in the literature, because of the small size of his non-random sample, the results may not accurately represent the population of venture-backed software companies. Indeed, as we explain in Part III, our data cast serious doubt on a few of his findings.

In a similar study in Denmark, Lee Davis interviewed 34 very small firms (averaging about 20 employees) in the telecommunications, software, and biotechnology industries to determine their patenting behavior and strategy.¹⁶⁸ Davis found that many software companies did not patent, because their managers felt their inventions “did not fulfil [sic] the criteria of patentability.”¹⁶⁹ Additionally, relative to other industries, software firms found the process of patenting to be a distraction from core R&D activities.¹⁷⁰ Managers of biotechnology firms, on the other hand, reported high rates of patenting and noted the importance of patents to investors.¹⁷¹ Furthermore, Davis found that biotechnology firms engaged in sophisticated strategies, such as filing for patents to create preemptive fences around existing technologies and to block competitors from improving their products.¹⁷² For telecommunications firms, respondents reported higher rates of patenting for product than process inventions, because of the relative ease of reverse engineering product inventions by competitors.¹⁷³ Although these findings are valuable, like Mann’s interviews, the small number of respondents makes interpretation problematic. Moreover, the restricted (at best) availability of software patents in Europe causes Davis’ results to be of less assistance in understanding patenting by U.S. software entrepreneurs.

166. *See id.* at 993–96, 998. However, Mann perceives no “information benefits” from patents to pre-revenue startup companies. *See id.* at 998.

167. *See id.* at 1002–09.

168. *See* Lee Davis, *How Do Small, High-Tech Firms Manage the Patenting Process?* (DRUID Summer Conference on Knowledge, Innovation and Competitiveness, Working Paper No. 164, 2006), available at <http://www2.druid.dk/conferences/viewabstract.php?id=164&cf=8>. For a more general discussion of studies on patenting by entrepreneurial firms in Europe, see ZHANAR SAKIEVA, *THE USE OF INTELLECTUAL PROPERTY BY SMALL- AND MIDDLE-SIZED ENTERPRISES* (2009).

169. Davis, *supra* note 168, at 11.

170. *See id.* at 14.

171. *See id.* at 12.

172. *See id.*

173. *See id.*

2. Assessments of Archival Data

Other studies have mined publicly available archival data to elucidate the role of patenting in the evolution of small companies. Josh Lerner examined the patenting behavior of young biotechnology firms and found an inverse relationship between companies' decisions to patent and increasing patent litigation costs.¹⁷⁴ In particular, he found that firms with relatively little litigation experience and low paid-in capital—factors that he used as proxies for the increased burden of potential litigation costs on the firm—avoided patenting in more competitive technological fields.¹⁷⁵ Additionally, he showed that firms sensitive to litigation costs tend to avoid technological fields dominated by less cost-sensitive firms.¹⁷⁶ Thus, based on Lerner's results, it appears that less battle-worn, less well-capitalized firms tend to channel their patenting activity to relatively untapped technological areas.

A number of studies have examined the relationship between entrepreneurs' patenting and financing. David Hsu and Rosemarie Ziedonis used existing data to demonstrate that, for early-stage semiconductor companies, holding patents is associated with higher valuations by investors.¹⁷⁷ In a complementary study, Iain Cockburn and Megan MacGarvie found that the growth in software patenting has prolonged the funding cycle for some companies, and determined that companies' IPOs may be delayed in technologies characterized by dense patenting.¹⁷⁸ Similarly, Ronald Mann and Tom Sager showed that increased patenting by a given software company is significantly correlated with total investment, the number of financing rounds, and firm longevity.¹⁷⁹ Several other studies have yielded similar results.¹⁸⁰

In sum, while these studies are illustrative of small-firm patenting, they do not systematically address the drivers of patenting by startups.¹⁸¹

174. Josh Lerner, *Patenting in the Shadow of Competitors*, 38 J.L. & ECON. 463 *passim* (1995).

175. *See id.* at 465, 478 (using patenting by large rival firms as a measure of technological competitiveness); *see also* Iain M. Cockburn & Megan J. MacGarvie, *Entry, Exit, and Patenting in the Software Industry* (Nat'l Bureau of Econ. Research, Working Paper No. 12563, 2006), available at <http://www.nber.org/papers/w12563> (finding software firms less likely to enter product markets characterized by large numbers of patents); Paul Almeida & Bruce Kogut, *The Exploration of Technological Diversity and the Geographic Localization of Innovation*, 9 SMALL BUS. ECON. 21, 21–22, 27–28 (1997) (finding that small semiconductor firms tend to produce innovations in “smaller, less crowded fields” of technology).

176. *See* Lerner, *supra* note 174, at 465, 483–84.

177. *See* Hsu & Ziedonis, *supra* note 54.

178. *See* Cockburn & MacGarvie, *supra* note 55.

179. Mann & Sager, *supra* note 56.

180. *See* sources cited *supra* note 56.

181. Moreover, because these studies relied upon archival data, they are at best a proxy for firm strategy and behavior.

Unfortunately, other than data on issued patents and pending applications available from the U.S. Patent and Trademark Office, there has been no comprehensive data available on the dynamics of U.S. firm patenting, licensing, and litigation among startup companies. However, as we discuss next, a few studies have examined select aspects of small firm patenting, especially in Europe.

3. Surveying Small Firm Patenting

Giorgio Sirilli surveyed inventors in Italy in the 1980s, mainly focusing on their personal backgrounds and invention processes.¹⁸² However, in the course of this work, he asked why inventors' firms filed for patents. Sirilli found that for firms of twenty or fewer employees (representing about 110 inventor respondents), 59.3% filed their patents for "protection against competition," 29.2% for "profits from sale or licence concessions," and 11.5% for "marketing promotion."¹⁸³ For firms with 21–500 employees (representing about 120 inventor respondents), the figures were 70.5%, 16.4%, and 13.1%, respectively.¹⁸⁴ For firms with over 500 employees (representing about 100 inventor respondents), the numbers were 80.4%, 15.7%, and 3.9%, respectively.¹⁸⁵ Sirilli interprets "protection against competition" as smaller firms' ability to obtain a "monopoly over the technology which could be exploited by others," indicating that while these firms use patents as a mechanism for maintaining supernormal profits, they are somewhat less concerned with doing so than larger ones.¹⁸⁶ It is interesting to note in these results that, at least in Italy in the 1980s, patenting by small- and medium-sized companies tended to be more focused on "marketing promotion"—a reputational basis—than their larger counterparts.

In the late 1990s, William Kingston undertook a survey of patent-holding European small- and medium-sized enterprises ("SMEs") to assess their ability to enforce their patents.¹⁸⁷ He identified over 4,000 SMEs holding at least one patent issued from 1994–1997, of which nearly 600 completed questionnaires.¹⁸⁸ While the survey focused on

182. See Giorgio Sirilli, *Patents and Inventors: An Empirical Study*, 16 RES. POL'Y 157, 158 (1987).

183. *Id.* at 165.

184. *Id.*

185. *Id.*

186. *Id.* at 166.

187. See WILLIAM KINGSTON, OFFICE FOR OFFICIAL PUBL'NS OF THE EUR. COMMUNITIES, ENFORCING SMALL FIRMS' PATENT RIGHTS (2000), ftp://ftp.cordis.europa.eu/pub/innovation-policy/studies/studies_enforcing_firms_patent_rights.pdf.

188. See *id.* at 8. SMEs are similar to "small entities" in the United States, which generally have fewer than 500 employees. See 37 C.F.R. § 1.27(a) (2009); 13 C.F.R. § 121.802

enforcement of issued patents, some of his findings suggest smaller firms' reasons for patenting. Kingston found that the cost of litigation had a "very big" effect on decisions to invest in invention for 13% of the respondents and a "significant" effect for 36% of them.¹⁸⁹ He also noted that in telephone and personal interviews, employees at small firms reported suffering from noticeable levels of distraction in undergoing the patenting process.¹⁹⁰

Also in the late 1990s, a U.S. Small Business Administration (SBA) report surveyed nearly 200 small firms in the automation, biotechnology, materials, subassemblies, testing and measurement, and telecommunications industries, of which about twenty-five percent were less than ten years old.¹⁹¹ Although the survey did not ask respondents why they patented, it did ask them to address possible limitations of patent protection.¹⁹² The most important reason given was that enforcement costs were too high, followed (in descending order of importance) by the ease of inventing around the patent, the expense of acquiring a patent, and the rapid pace of technological change making patents obsolete.¹⁹³

More recently, several researchers surveyed European inventors listed on more than 9,000 European Patent Office patents in the "PatVal" study.¹⁹⁴ Although the study did not examine why inventors and their firms filed for patents, it did ask how issued patents were ultimately used. For small firms of less than 100 employees (representing about 1,200 respondents), 56% used the patents "internally," i.e., to prevent copying and to maintain supernormal profits; 15% out-licensed the patents to others for commercialization; 6.9% used the patents both

(2009). In Europe, however, "small entities" are limited to 250 or fewer employees. See KINGSTON, *supra* note 187, at 17.

189. See KINGSTON, *supra* note 187, at 9.

190. See *id.* at 40–41. As an extension to this survey work, Kingston and Kevin Scally later investigated characteristics of small firm patenting from 1994 to 2003 by examining Patent Office databases in a variety of countries, including the United States, OECD countries, Israel and Taiwan. See WILLIAM KINGSTON & KEVIN SCALLY, PATENTS AND THE MEASUREMENT OF INTERNATIONAL COMPETITIVENESS: NEW DATA ON THE USE OF PATENTS BY UNIVERSITIES, SMALL FIRMS AND INDIVIDUAL INVENTORS 3–11, 93 (2006). While this study focused on total patent counts, citations, and other characteristics of issued small firm patents, it did not investigate why firms decide to file for patents (or not). Cf. Fernand Amesse et al., *The Individual Inventor and the Role of Entrepreneurship*, 20 RES. POL'Y 251 (1991) (surveying individual inventors but not addressing why inventors file for patents).

191. JOSEPH J. CORDES ET AL., U.S. SMALL BUS. ADMIN., A SURVEY OF HIGH TECHNOLOGY FIRMS, 10, 13 (1999), www.sba.gov/advo/research/rs189tot.pdf.

192. See *id.* at 55–59.

193. See *id.* at 58.

194. ALFONSO GAMBARDILLA ET AL., EUR. COMM'N, STUDY ON EVALUATING THE KNOWLEDGE ECONOMY – WHAT ARE PATENTS ACTUALLY WORTH? THE VALUE OF PATENTS FOR TODAY'S ECONOMY AND SOCIETY 24 (2005), http://ec.europa.eu/internal_market/indprop/docs/patent/studies/patentstudy-report_en.pdf.

internally and for out-licensing; 3.9% cross-licensed them; 9.6% used them to strategically block competitors; and 8.8% put them to no use.¹⁹⁵ Compared with medium-sized and large firms, small firms showed much higher rates of out-licensing and cross-licensing, but much lower rates of non-use and blocking competitors.¹⁹⁶

Unlike the large firm studies and anecdotal accounts, these studies begin to address the drivers of patenting by entrepreneurs. Nonetheless, they are subject to significant limitations. First, the Sirilli and SBA studies included very small numbers of respondents (about 200–250) across a variety of industries.¹⁹⁷ Although larger than the sample sizes used in Mann's and Davis' interviews of startup firms, the industry breadth may be too wide and the number of respondents too small to guarantee generalizable results. Second, while the recent PatVal study of European firms included about 1,200 small firm respondents, the sample was composed solely of inventors to whom patents had been issued.¹⁹⁸ By excluding firms with no patents and collecting answers solely from scientists and engineers—employees who may not be driving the patenting process—this study may be biased. Third, although all of these studies focused on small firms, the samples were not limited to young firms, instead including firms of all ages. Fourth, two of the studies were limited to firms based in Europe, where incentives to patent likely differ from those in the United States. Thus, these studies—like the large-firm surveys and anecdotal literature—provide valuable background to the questions at hand, but not definitive findings.

C. Summarizing the Results

Although a systematic study of the drivers of patenting by entrepreneurs has been lacking, we summarize previous relevant studies in Table 1. This table provides a summary of not only the studies described earlier, but also several others, focusing on those surveys that examined in any way the reasons for companies to patent. The target sample and year of the study is listed in the heading column (with a parenthetical to indicate whether the data relate to product or process inventions, when applicable). Each reason assessed in a given study is ranked according to its overall importance to patenting as stated by the respondents.¹⁹⁹

195. See *id.* at 43, 104 tbl.A.2.

196. See *id.* at 43 tbl.3.13.

197. CORDES ET AL., *supra* note 191, at 10; see Sirilli, *supra* note 182, at 158.

198. GAMBARDILLA ET AL., *supra* note 194, at 24, 104 tbl.A.2.

199. Many of the studies used different response scales and types. In order to compare responses across the studies, we have ordered the responses for each study according to numerical rankings.

Categories marked “N/A” indicate that the option was not offered to the respondents in the corresponding survey.²⁰⁰

TABLE 1
SUMMARY OF STUDIES EXAMINING MOTIVES TO PATENT

	OECD Study of Very Large Cos. (2003) ²⁰¹	Study of Mainly Large German Cos. (2002) ²⁰²	Study of German Cos. (1997) ²⁰³	Study of UK and Japanese Cos. (1994) ²⁰⁴	Carnegie Mellon Study of U.S. Cos. (1994) ²⁰⁵	Study of French Cos. (1993) ²⁰⁶	Study of Large European Cos. (1993) ²⁰⁷	Study of Swiss Cos. (Products) (1988) ²⁰⁸
Prevent Copying	N/A	1	1	1	1	1	1	1
Preemptive Patenting ²⁰⁹	3	2, 4	2, 3	2	2, 3	2	3	5
Negotiating/Cross-Licensing/Firm Reputation/Litigation Defense	1, 2	7, 9	4	3	4	2	2	3
Signaling: Technical & Product Image	N/A	3	6	N/A	5	N/A	N/A	N/A
Signaling: Employee Performance	4	8	5	N/A	7	6	6	6
Signaling: Financing/Capital	6	6, 10	N/A	N/A	N/A	N/A	N/A	N/A
Secure License Fees	5	11	7	4	6	4	4	1
Entry into Foreign Markets	N/A	5	N/A	N/A	N/A	5	5	4

As Table 1 indicates, the top reason for patenting across all studies was to prevent copying. Although copying is not required for a patent infringement claim, this rationale may be broadly understood as reflecting

200. A few minor categories on some of the surveys have been omitted. When overall scores were identical, the numerical ranking shown in the table is the same.

201. Specifically, the OECD study asked about changes in the significance of these factors in the last ten years. *See* Blind, *supra* note 153, at 659.

202. *See id.* at 662–63.

203. *See id.* at 659 (citing WISSENSVERBREITUNG UND DIFFUSIONSDYNAMIK IM SPANNUNGSFELD ZWISCHEN INNOVIERENDEN UND IMITIERENDEN UNTERNEHMEN (H.J. Schalk et al., eds., 1999)).

204. *See* Robert H. Pitkethly, *Intellectual Property Strategy in Japanese and UK Companies: Patent Licensing Decisions and Learning Opportunities*, 30 RES. POL’Y 425, 432 (2001).

205. *See* Cohen et al., *supra* note 62, at 4, 47 fig.7, 48 fig.8 (noting that the available data in their working paper are restricted to larger companies in their sample).

206. *See* EMMANUEL DUGUET & ISABELLE KABLA, APPROPRIATION STRATEGY AND THE MOTIVATIONS TO USE THE PATENT SYSTEM IN FRANCE 28, tbl.6 (Working Paper G9717, 1997), available at http://www.insee.fr/en/themes/document.asp?reg_id=0&id=260.

207. *See* ARUNDEL, *supra* note 152.

208. *See* Najib Harabi, *Appropriability of Technical Innovations: An Empirical Analysis*, 24 RES. POL’Y 981, 990 (1995).

209. Some studies divide preemptive patenting in “offensive” and “defensive” variants, depending on whether the preemption is used to “block” other firms from practicing their technologies or to merely prevent other firms from encroaching upon the patentee’s own endeavors. *See* Blind, *supra* note 153, at 659. We report both categories together for those studies.

the classical reason of maintaining supracompetitive prices by preventing competitors from selling the same or a substitute product.²¹⁰ The next most common reasons—with the exception of the results of the 2003 study of German companies—were acquiring patents for cross-licensing and for other defensive reasons as well as preemptive patenting to maintain freedom to operate and to block competitors from improving their products. Signaling and entry into foreign markets followed, with securing licensing fees coming last or near-to-last in almost all of the surveys.

In Table 2, we summarize findings of reasons not to patent, including studies that examined why patents might be of limited effectiveness, as the two topics tend to overlap. Again, when a category is marked “N/A,” that option was not offered to the respondents in the corresponding survey.

TABLE 2
SUMMARY OF STUDIES ON REASONS NOT TO PATENT

	U.S. SBA Study of Small Cos. (1998) ²¹¹	Study of Swiss Cos. (Products) (1995) ²¹²	Carnegie Mellon Study of (Mainly) Large U.S. Cos. (1994) ²¹³	Study of French Cos. (1993) ²¹⁴	Yale Study of Large Companies (Products) (1987) ²¹⁵
Ease of Inventing Around Patent	2	1	1	1	1
Reluctant to Disclose Information Required for Patenting	N/A	2	3	2	4
Not Patentable (general)	N/A	3	N/A	N/A	2
Not Patentable (invalid for novelty, obviousness, or other reasons)	1	6	5	3	3
Difficulty and Costs of Enforcing Patent	3		4	3	
Difficulty and Costs of Acquiring Patent	6	6, 10	N/A	N/A	N/A
Technological Change Too Rapid for Patent to Be Effective	4	5	N/A	N/A	6
Entry into Foreign Markets	N/A	5	N/A	N/A	N/A
Did Not Want to Become Subject to Legal Restrictions on Licensing (e.g., compulsory licensing)	N/A	7	N/A	N/A	8
Already Cooperating with Competitors (e.g., through joint ventures or cross-licenses)	N/A	8	N/A	N/A	7

As Table 2 indicates, the most common reason for not filing a patent application is the ease of inventing around the patent’s claims, except for the study that focused on small firms, which placed the costs and

210. Alternatively, supracompetitive profits may arise by preventing competitors from lowering their costs of production or distribution of a given product. *See supra* Part I.A.

211. *See* CORDES, *supra* note 191, at 55–58.

212. *See* Harabi, *supra* note 208, at 988. Harabi’s study examined why patents might be of limited effectiveness. *See id.*

213. *See* Cohen et al., *supra* note 62, at 45 fig.5.

214. *See* DUGUET & KABLA, *supra* note 206, at 28 tbl.7.

215. *See* Levin et al., *supra* note 143, at 803 tbl.5. Levin’s study examined why patents might be of limited effectiveness. *See id.*

difficulty of enforcing the patent as the primary obstacle to filing.²¹⁶ The next reasons (in descending order of importance) were the reluctance to disclose the information required for patenting and the perceived lack of patentability of the invention, with the remaining reasons seeming to follow no particular pattern.

III. THE DESIGN, RESPONSE RATES, AND RESPONDENT CHARACTERISTICS OF THE 2008 BERKELEY PATENT SURVEY

A. *The Sample and Survey Design*

Prompted by the lack of adequate data and the changing patent environment, the authors and other investigators developed and administered the first targeted survey in the United States of startup and early-stage companies' interactions with the patent system. Formally titled the "The 2008 Berkeley Patent Survey: Entrepreneurial Companies and the Patent System," it includes a variety of questions centered on how patenting, patent licensing, and patent litigation relate to company innovation, capital formation, business strategies, competition, and alternative forms of intellectual property protection.²¹⁷

The survey was administered by mail, e-mail/Internet, and telephone from June 2008 through December 2008 to top managers at over 15,000 U.S. "entrepreneurial companies"—i.e., firms that were founded in the United States during the last ten years²¹⁸—in the biotechnology, medical device, software and Internet, and hardware (including computer, semiconductor, and telecommunications equipment) sectors.²¹⁹ Our sample frame was drawn from two prominent databases—Dun & Bradstreet

216. See Enno Masurel, *Patenting Behaviour by SMEs*, 2 INT. J. ENTREPRENEURSHIP & INNOVATION MGMT. 574, 574 (2002) (reporting that Dutch small- and medium-sized enterprises found patenting costs "too high").

217. For a description of the survey's genesis, including the rigorous process used to develop and test the survey, see Graham & Sichelman, *supra* note 21, at 1091–96. A portion of this section is adapted from that article. See *id.*

218. Our research team understood that there are varying conceptions of the "entrepreneur" and "entrepreneurial firm." See Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1266–67. After much consideration, we decided to follow Daniel Spulber's view of entrepreneurs as those persons central to the formation of new firms, thereby focusing on the young company as the unit of analysis. See *id.* (citing DANIEL F. SPULBER, *THE THEORY OF THE FIRM: MICROECONOMICS WITH ENDOGENOUS ENTREPRENEURS, FIRMS, MARKETS, AND ORGANIZATIONS* 156–57 (2009)).

219. Our analysis of companies that received venture funding during the last ten years shows that over 75% are classified into the primary industries "information" (61%) and "health" (15%). VENTUREXPERT (THOMSON), <http://vx.thomsonib.com/NASApp/VxComponent/VXMain.jsp> (last visited Nov. 12, 2010). For the hardware industry, we only sampled venture-backed firms. Because of the large number of software firms founded during the period of interest, we randomly selected 25% of those firms to include in our sample.

(D&B) and VentureXpert (VX) (Thomson)—using both the Standard Industry Classification (SIC) and North American Industry Classification System (NAICS) to identify companies in relevant industries. The survey spanned about thirty questions, including several on motivations to patent²²⁰ and to forgo patenting.²²¹ Additionally, we inquired about each respondent company's background, revenues, number of employees, innovation focus, and patent ownership and use.

Based upon our interviews and a review of the literature, we hypothesized before collecting our data that “securing investment” would rank highly on the list, along with “preventing others from copying.” For later-stage startups, we predicted that “improving chances/quality of liquidity” and “obtaining licensing revenues” would play a greater role than for early-stage companies. We also stated that we would be

220. The 2008 Berkeley Patent Survey: Entrepreneurial Companies and the Patent System (on file with authors). The question regarding motivations to patent read as follows:

Q: How important or unimportant have the following been to your company in seeking patent protection in the United States:

	Very Important	Moderately Important	Slightly Important	Not at all Important
Preventing others from copying our products or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improving our chances of securing investment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obtaining licensing revenues	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improving chances/quality of liquidity (e.g., acquisition/IPO)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preventing patent infringement actions against us	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improving negotiating position with other companies (for example, cross-licensing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhancing company's reputation/product image	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

221. *Id.* The questions on forgoing patenting read as follows:

Q1: Thinking about the last major *technology* innovation that your company *did not patent*, which if any of the following influenced your company's decision *not to patent*? (Please check ALL that apply)

a. Did not want to disclose information	<input type="checkbox"/>
b. Cost of getting the patent, including attorneys' fees	<input type="checkbox"/>
c. Competitors could have easily invented around the patent	<input type="checkbox"/>
d. Believed that trade secret was adequate protection	<input type="checkbox"/>
e. Cost of enforcing the patent, including actions in court	<input type="checkbox"/>
f. Did not believe the technology was patentable	<input type="checkbox"/>
g. No need for legal protection	<input type="checkbox"/>

Q2: Which of these was the most important reason not to patent?

“somewhat surprised” if many startups were filing for patents to improve their position in negotiations, such as cross-licensing deals.²²²

B. Response Rates and Respondent Characteristics

1. Survey Response Rates

Overall, our response rate for firms actually residing at the address provided from our data sources is 9.8%—specifically, 8.3% for Dun & Bradstreet firms and 12.4% for VentureXpert firms.²²³ Additionally, when we conducted our phone campaign—calling about 13% of our initial non-respondents—many phone lines had been disconnected and numerous addressees (to whom we had mailed the initial survey) had moved. Taking these factors into account, our effective response rate increases to 12.3%—specifically, 10.7% for D&B firms and 16.6% for VX firms. Within industries, our effective response rate for D&B biotechnology and medical device firms was 23.7% (105 responses total); for VX biotechnology and medical device firms, 24.2% (139 responses); for D&B software and Internet firms, 8.9% (535 responses); and for VX software, Internet, and hardware firms, 15.6% (242 responses).

Although these response rates are low, rates of this magnitude are fairly common for surveys of small firms.²²⁴ Indeed, given that the majority of respondents were CEOs and CTOs, whose time is in high demand in the startup environment, we believe that our response rates would likely have been difficult to increase. Of course, any low response rate raises the potential for bias and skew, which we discuss in the next section.

2. Characteristics of Respondents

Using data from Dun & Bradstreet, Thomson’s VentureXpert, and the U.S. Patent Office, we were able to compare several different variables of our respondent and non-respondent samples. We tested the mean statistics on attributes such as age, size, geographic location, and patents held—and, when available, annual revenue and features of the company’s venture funding. Generally, the differences in these variables are not statistically significant at conventional levels. Some notable exceptions are geography (in general, our respondents

222. Graham & Sichelman, *supra* note 21, at 1096.

223. For additional discussion of response rates, see Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1271–1272.

224. See CORDES ET AL., *supra* note 191, at 10–11 (reporting response rates of 3.8% to 31% on small firm surveys).

exhibit a “western” bias, with relatively more of our respondent companies coming from the West Coast than the non-respondents), and firm size for medical device firms, which tend to be smaller on average in employee count than non-respondents. However, this difference is primarily driven by large outliers; at the median, our respondent medical device firms have the same number of employees as our non-respondents (five).²²⁵ There are also differences in the levels of patenting and firm revenues—notably in the software sector, which suggest that higher-revenue, higher-patenting firms were more likely to answer our survey—although not at statistically significant levels.²²⁶ Despite these exceptions, our overall findings of little to no significant difference in age, size, and patenting suggest that our respondent companies are not different from the entire random sample of companies, at least in terms of these important characteristic attributes.²²⁷

It is important to recognize, too, that any bias in our sample is likely present—and in many instances to a greater degree—in previous surveys. First, no previous study tested characteristics of their respondent sample against their non-respondent sample. For

225. When we compare the number of employees reported by D&B in their 2008 data, medical device respondents in the D&B sample had an average of fourteen employees versus thirty-eight employees among the non-respondents (significant at the 90% confidence interval).

226. Issued patents were determined by examining and comparing data supplied from U.S. Patent & Trademark Office databases current through July 22, 2008. *See Weekly Bibliographic Information for Patent Grants and Published Patent Applications*, U.S. PAT. & TRADEMARK OFF., http://www.uspto.gov/products/catalog/patent_services/patdata.jsp (last visited November 12, 2010). We also examined the number of published patent applications starting in the year 2001 using the same data. *See id.*

In a study by Mann and Sager of venture-backed software and biotechnology companies that received their first rounds of funding in 1996–1998, using Patent Office assignment data, they found that as of the end of 2004, biotechnology firms held an average of 5.5 patents. Mann & Sager, *supra* note 56, at 197. Using Patent Office data, our figures show 4.4 patents for respondent VentureXpert biotechnology firms and 3.8 patents for non-respondent VentureXpert firms of comparable age. Given the average firm age for our sample is about 5.5 years, which is about a year less than Mann and Sager’s average firm age, these numbers accord quite well. Mann and Sager also found that software firms held an average of 0.7 patents. *See id.* at 197. Using Patent Office data, our figures showed 0.5 patents for respondent VentureXpert computer software, computer services, and Internet firms and 0.7 patents for comparable non-respondent VentureXpert firms.

As we note elsewhere, in general, the number of patents and applications reported to be held by respondent firms greatly exceeds the number of average patents and applications as evidenced by the USPTO databases. *See* Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1275. These differences appear to stem primarily from respondents not recording assignments on the USPTO databases. *See id.* at 1274–76.

227. For further discussion of non-respondent bias testing, *see* Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1272–74; Stuart Graham & Ted Sichelman, Patents and Innovating Startups: Analysis of the 2008 Berkeley Patent Survey (Nov. 24, 2009) (unpublished manuscript), available at <http://papers.ssrn.com/abstract=1512726>.

example, the frequently cited Carnegie Mellon and Yale Surveys—although they had response rates of about 50%—disclosed no analysis comparing company size, revenues, market capitalization, patenting rates, or other important characteristics of respondents with non-respondents. Second, many prior surveys—especially those undertaken in Europe—drew their samples *only* from firms with at least one patent, completely ignoring firms that had either never applied for patents or whose applications had been rejected. Conversely, our survey captured non-patenting innovators: For example, a large percentage of our D&B software and Internet firm respondents, 76%, reported holding no patents whatsoever.

Finally, as another test for bias, we used a variety of statistical methods to compare the results of the responses we received from our mailings and e-mails (approximately 1,200) versus those responding to our telephone re-sampling (approximately 130).²²⁸ In this regard, in the first phase of contacting sample firms, we only used mail and e-mail; thus, the firms contacted later by phone can be viewed as a “non-respondent” sample set.²²⁹ Moreover, unlike our mail and e-mail respondents, most of the telephone-based respondents received (and, to a large degree, required) incentive payment in the form of gift certificates in order to motivate their responses.²³⁰ Thus, our comparison set of telephone respondents very likely does not comprise “responsible, good citizens that take surveys”²³¹—reflecting instead a group that, despite repeated requests, did not initially respond to our survey. Importantly, based on our testing to date, we have found no statistically significant differences between the responses of these two groups—including comparisons just of software firms, which had the lowest response rates. Given these findings, we believe that we have by and large insulated ourselves from the charge that differences in background characteristics reported above are problematic. In any event, by segmenting our responses by patenting rates and total revenue, we are able to discern and generally compensate for several

228. See Graham & Sichelman, *supra* note 227.

229. We contacted the original respondents by email and mail from June to August 2008. Telephoning the non-respondents began in September 2008. As mentioned earlier, we attempted to contact about 13% of these non-respondents by telephone.

230. After testing, we determined that a large share of the telephoned sample needed to be motivated by a guaranteed prize—in this case, a \$25–50 gift certificate for Amazon.com—to take the survey.

231. Statement by James Pooley, Partner, Morrison & Foerster, to the authors (Feb. 26, 2009) (remarking that the sample may comprise only those “responsible, good citizens that take surveys”).

potential sources of bias. We have done so below and comment on these effects in our analysis.²³²

IV. MAJOR RESULTS REGARDING MOTIVATIONS AND HINDRANCES TO PATENTING

In this section, we describe the major findings of our study regarding startups' motivations to patent their inventions as well as the reasons they decide to forgo patenting.

A. Preventing Copying is the Primary Driver of Patenting

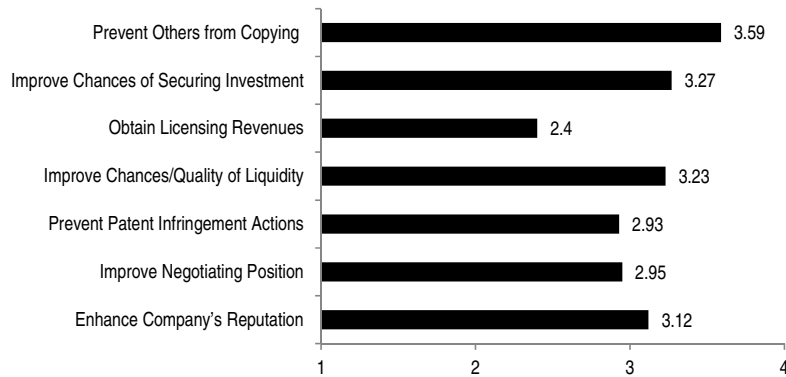
Respondents reported that preventing others from copying their products and services was their primary reason to seek patent protection.²³³ (See Fig. 1.) This motivation remained paramount for cohorts segmented by a variety of characteristics, including dataset (i.e., Dun & Bradstreet and VentureXpert), industry, age, patenting intensity, and total revenues.²³⁴ (See Figs. 2–4.) Thus, we believe that this finding is extremely robust in our data.

232. This discussion assumes, of course, that differences are largely captured by observable characteristics like employees, revenues, and geographical location. There may be unobservable characteristics that drive the use of patenting; our testing cannot account for this possibility.

233. The mean for this response was statistically different from the next most important (securing investment) at a 99% confidence level. When we report confidence levels herein, we describe differences as either at a 90%, 95%, or 99% level, but an actual confidence level may be higher than the reported value.

234. Although high-revenue firms listed preventing copying as the top reason for patenting, those firms rated this reason as less important than low-revenue firms (at 99% confidence level). Because firms with greater revenues have more to lose from copying, this result might seem paradoxical. Yet, examined in view of high-revenue firms' other responses, it becomes sensible; namely, high-revenue firms find patenting less, or of about equal, importance as low-revenue firms for nearly all other listed reasons for patenting. See *infra* Figure 1. One possible explanation for this result is that the high-revenue firms have more complementary assets, such as developed sales and marketing channels, which reduce their reliance on patenting, than firms with less or no revenue. See Teece, *supra* note 51.

FIGURE 1
REASONS FOR SEEKING PATENT PROTECTION.²³⁵ HOW IMPORTANT OR UNIMPORTANT HAVE THE FOLLOWING BEEN TO YOUR COMPANY IN SEEKING PATENT PROTECTION IN THE UNITED STATES?



(1=Not At All Important, 2=Slightly Important, 3=Moderately Important, 4=Very Important)

This result is notable because some previous commentators had opined that the high costs of patenting and enforcing patents generally precluded startups from using patents to prevent copying and competition.²³⁶ Yet, in line with these commentators, our respondents also indicated that the primary barriers to patenting (on their last major unpatented invention) were precisely the high costs of filing and enforcement.²³⁷ This raises a potential dilemma: if startups are highly sensitive to the costs of patenting and enforcement—which can run to millions of dollars—then how can preventing copying and competition be the primary driver of startup patenting?

235. Because this question was limited to respondents that had previously filed at least one patent application, it foreclosed many respondents from answering, so the total respondent size is 559 firms. The standard error of the mean for each response is as follows: prevent others from copying (0.03); improve chances of securing investment (0.04); obtain licensing revenues (0.05); improve chances/quality of liquidity event (0.04); prevent patent infringement actions against us (0.05); improve negotiating position (0.04); and enhance company's reputation (0.04).

236. See Mann, *supra* note 27, at 981 (finding that the benefits of patenting to earning supernormal profits are weak for startup software firms, especially for ones at very early stages); cf. Michael J. Meurer, *Inventors, Entrepreneurs, and Intellectual Property Law*, 45 Hous. L. Rev. 1201, 1233 (2008) ("Relative to large firms, small firms face two problems enforcing their IP rights. First, they incur a higher ratio of fixed enforcement cost to variable enforcement cost. Second, they are more likely to face liquidity constraints that influence enforcement activity.").

237. See *infra* Part IV.E. Indeed, on average, startups appear to pay roughly double the average for a granted patent. See Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1311 (reporting that respondent startup firms spend over \$38,000 per issued patent).

Wesley Cohen, who administered the Carnegie Mellon survey of primarily large firms in the 1990s, remarked that our result regarding “preventing copying” possibly reflected “socially desirable response bias.”²³⁸ Specifically, he raised the issue that respondents may have subjectively believed that the primary policy justification for patents is to prevent copying and simply answered accordingly in their firm-specific responses.²³⁹ Although such a bias might be reflected in our results, there are several reasons to believe that our finding represents actual firm behavior.

First, each decision to file for a patent (or not) involves unique cost-benefit trade-offs. Specifically, while startup firms may be cost-sensitive in general, which prevents filing for patents on many innovations, there is another set of innovations for which the benefits of filing, particularly those stemming from preventing copying, outweigh the costs of filing and expected enforcement costs. The benefits of patenting related to preventing competition will generally vary depending on (1) the expected level of consumer demand for (or cost-savings attributable to) the innovation; (2) the ease of reverse-engineering and copying the innovation; (3) the nature and degree of competition (and potential copying) in the marketplace; (4) the risk profiles of the innovator and its competitors; and (5) the relative amounts of capital the innovator and potential infringers have available to enforce a patent or defend against a claim of patent infringement. Because of the varying nature of these calculations with respect to each specific innovation, it is not inconsistent for our firms to answer that preventing competition—which depends at least to some extent on enforcement—is the primary reason for patenting, while cost is the primary reason for forgoing patenting.

In this regard, firms that answered the “motivations to patent” question necessarily had filed for at least one patent and application, while firms that had never filed for a patent answered the “motivation not to patent” question. When the respondents for this latter question are segmented by patenting propensity, the importance of cost drops substantially for firms with greater patenting intensity—so much so that cost is no longer the primary reason for forgoing patenting. (See Fig. 5 below.) Thus, there may be one class of firms for which the costs of filing and enforcement are simply too high to justify patenting their innovations, and another class for

238. Statement by Wesley Cohen, Professor, Duke Univ. Sch. of Law, to the authors (July 22, 2009). See generally Catherine E. Ross & John Mirowsky, *Socially-Desirable Response and Acquiescence in a Cross-Cultural Survey of Mental Health*, 25 J. HEALTH & SOC. BEHAV. 189 (1984) (noting the incidence of socially desirable response bias). Further support for such a view is lent by our positioning the “preventing copying” choice as first in the applicable survey question.

239. Statement by Wesley Cohen, *supra* note 238.

which the cost-benefit ratio is quite different, presumably justifying patenting primarily to prevent copying and competition.

Second, because patents last twenty years from the date of filing, startup firms need not immediately file an infringement suit in order for a patent to play a primary role in preventing copying. Rather, the only immediate cost to patenting is the cost of filing, which often stretches over several years. Only upon the success of the patented product or process and detected infringement by others—which typically occurs years after filing—will the patentee want to undertake more costly enforcement activities. By that point, the startup may be generating significant revenue and profits, allowing it to fund litigation more easily, or it may have been acquired by a larger, cash-rich firm. For instance, nearly 10% of our respondents had already undergone an acquisition. In this sense, by filing for a patent, startup firms are buying an option to enforce. Importantly, the purchase price of the option is much less expensive than its exercise price. Thus, when reporting that patents are used primarily to prevent competition, managers may be taking into account the long-term interests of their firms.

Third, although litigating to trial is costly, a patentee can often gain significant leverage merely by sending threat letters or putting an accused infringer through the initial stages of litigation. Indeed, a recent study by Gwendolyn Ball and Jay Kesan found that over 50% of patent infringement suits are filed by small firms—namely, those with revenues of less than \$10 million per year.²⁴⁰ Ball and Kesan thus reject the conventional wisdom that small firms are not able to enforce their patents in court.²⁴¹ So, while the cost of litigating a patent infringement through to trial (roughly \$3–6 million) may generally seem too high for most startups to absorb, effective patent enforcement may occur well short of such expenditures.²⁴² In fact, only about 5% of patent actions ever reach trial.²⁴³

Fourth, in qualitative interviews with respondents, managers report “preventing copying” as an important consideration when choosing to patent. For example, this factor strongly motivated the CEO of a respondent software firm to file for patents. She created a piece of software and filed a patent prior to founding her startup in 2003 to market the software. Ultimately, the patent became important to her company’s survival and success. She related:

240. Ball & Kesan, *supra* note 30, at 13, 33 & tbl.4.

241. *See id.* at 17.

242. *See supra* note 35 and accompanying text.

243. Jay P. Kesan & Gwendolyn G. Ball, *How Are Patent Cases Resolved? An Empirical Examination of the Adjudication and Settlement of Patent Disputes*, 84 WASH. U. L. REV. 237, 254, 273 (2006).

A large public company copied the code of our product and tried to sell it on the market [] Without my patent, I wouldn't have been able to stop it. . . . [Ultimately], our company settled on the courthouse steps—literally—and we got our expenses covered, picked up a bit of money, and also established a license agreement [with the large company] to license it and pay us royalties.²⁴⁴

In sum, there are several reasons to believe our results are not infected with socially desirable response bias. On this basis, our findings suggest that startup firms are similar to large firms, in that preventing copying is their dominant reason for patenting.²⁴⁵

B. *Securing Financing and Improving Valuation are Important Drivers*

Our respondents reported that financing and improving valuation upon exit—such as an acquisition or IPO²⁴⁶—played a moderately to very important role in their decision to file for patents.²⁴⁷ (See Fig. 1.) These results stand in stark contrast to surveys of non-startup companies, in which respondents ranked patenting for securing capital as relatively unimportant.²⁴⁸ Indeed, our finding is consistent with reports in the Carnegie Mellon study that smaller firms tended to rank the importance of patenting to improve firm reputation higher than larger firms.²⁴⁹ Our finding is also consistent with the studies by social scientists concluding that patenting plays a positive role in valuation during fundraising and upon exit.²⁵⁰

Like preventing copying, this result is robust across a variety of firm characteristics, including age, patenting intensity, revenues, type of financing, and industry. As might be expected, there is a stronger tendency by the VentureXpert companies—which are primarily funded by venture capital firms—to rate improving the chances of securing investment and liquidity events as more important compared with the Dun & Bradstreet

244. Telephone interview with Anonymous Company Executive (Apr. 2009). Interestingly, the CEO related that copyright was not an effective means for her company to enforce its intellectual property rights against the accused infringer, because of problems surrounding proof of copying. *See id.* (In accordance with our human subjects protocol for the survey, we agreed not to disclose the identities of our interviewees without their express permission. For further description of post-survey interviews, see Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1277–78.)

245. *See supra* Part II.C (summarizing results of large-firm surveys).

246. Another important—though, less desirable—exit event that respondents may have taken into account in responding is bankruptcy. *See* Nguyen & Maine, *Acquiring Innovation*, *supra* note 57.

247. There were no statistically significant differences between the rankings of securing investment and improving the liquidity event, but they differ from the next reason—enhancing company reputation—at a 95% confidence level.

248. *See supra* Part II.C.

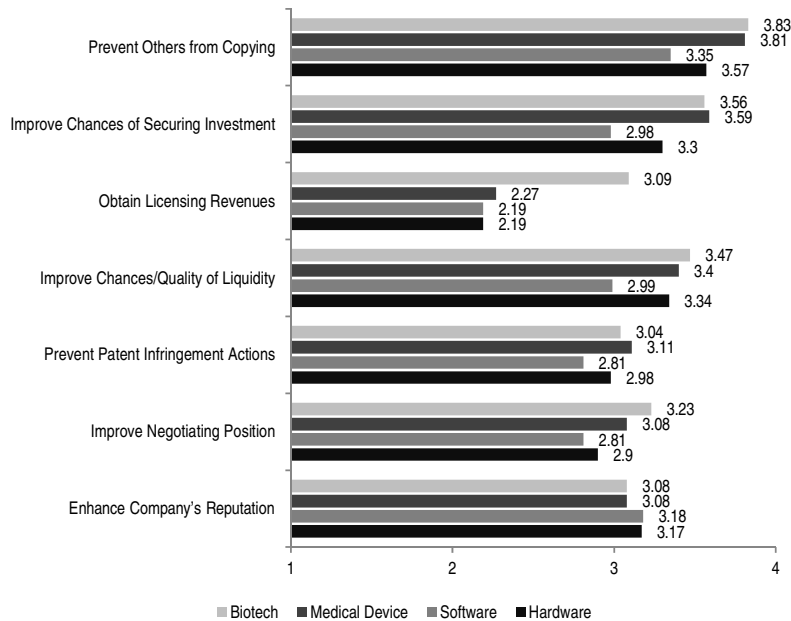
249. *See supra* note 149 and accompanying text.

250. *See supra* notes 177–178 and accompanying text.

companies—which are not generally venture-backed. However, the overall order of the reasons listed is the same for each sample set as the aggregate presented in Figure 1.

When respondent firms are segmented by industry, this set of financing reasons remain the second-most important driver of patenting behind preventing copying, but important differences arise. (See Fig. 2.)

FIGURE 2
REASONS TO PATENT WITHIN INDUSTRIES.²⁵¹ HOW IMPORTANT OR UNIMPORTANT HAVE THE FOLLOWING BEEN TO YOUR COMPANY IN SEEKING PATENT PROTECTION IN THE UNITED STATES?



(1=Not At All Important, 2=Slightly Important, 3=Moderately Important, 4=Very Important)

Biotechnology and medical device firms list preventing copying as nearly “very important” overall, while (venture-backed) hardware firms,

251. The standard error of the mean for each response is as follows (biotech, medical device, software, hardware): prevent others from copying (0.05, 0.05, 0.06, 0.09); improve chances of securing investment (0.08, 0.08, 0.07, 0.09); obtain licensing revenues (0.10, 0.11, 0.08, 0.11); improve chances/quality of liquidity event (0.08, 0.09, 0.07, 0.09); prevent patent infringement actions against us (0.10, 0.09, 0.07, 0.11); improve negotiating position (0.08, 0.09, 0.07, 0.11); and enhance company's reputation (0.08, 0.09, 0.07, 0.09).

and particularly software firms,²⁵² place less emphasis on this reason (though still rating it between “moderately” and “very” important).²⁵³ Similarly, biotechnology and medical device firms report patenting to secure investment and to improve the chances and quality of a liquidity event as more important than (venture-backed) hardware firms do and much more important than software firms do.²⁵⁴

These results are understandable for several reasons. First, in another survey question, biotechnology and medical device firms rated patents as one of the top mechanisms for capturing competitive advantage from their innovations, while software and Internet companies rated it least important.²⁵⁵ Arguably, much of the competitive advantage afforded by patents derives from preventing competitors, or potential licensees, from freely using the patented innovation. In this regard, even though patent-holding software and Internet firms rated preventing copying as the primary reason for filing, they ranked almost all of the reasons for patenting as comparatively less important than respondents in other industries. (See Fig. 2.) Second, respondents informed us that investors perceived the importance of patenting to be substantially more important to their investment decisions for biotechnology and medical device firms than software and Internet firms.²⁵⁶ For example, the VentureXpert biotechnology respondents reported that 97% of venture capital firms indicated that patents were important to their decision to invest, while only 59% of VentureXpert software and Internet firms reported the same.²⁵⁷ Similar trends held for other types of investors: angel investors (78% for biotechnology and 36% for software), “other companies” as investors, i.e., corporate venture capital (90% and 51%, respectively), and investment banks (81% and 40%, respectively).²⁵⁸

These inter-industry differences are generally consistent with previous studies. For example, the Carnegie Mellon study found that patenting was a much more important means of securing competitive advantage to the pharmaceutical and medical equipment industries than

252. Our hardware companies are all drawn from the VentureXpert database, while the samples of biotechnology, medical device, and software firms come from both the Dun & Bradstreet and VentureXpert lists.

253. Biotechnology and medical device firms showed statistically significant differences in their mean responses for the importance of preventing copying from hardware and software firms at a 99% confidence level.

254. Biotechnology and medical device firms showed statistically significant differences from hardware and software firms at a 99% confidence level.

255. See Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1291–92.

256. See *id.* at 1308.

257. *Id.*

258. *Id.*

to the electronic component and semiconductor industries.²⁵⁹ However, our findings appear to contradict Ronald Mann's anecdotal reports that patenting to maintain supracompetitive pricing is not a viable strategy for venture-backed startup software firms.²⁶⁰ Specifically, as noted earlier, the software firms in our sample reported that "preventing copying"—which may directly relate to maintaining supracompetitive profits—was "moderately" to "very" important. Moreover, while it is possible that this difference is explained by our software respondents patenting at rates slightly higher than non-respondents, when we account for total company patenting the result does not change qualitatively.²⁶¹ (See Fig. 4 below.)

To be sure, even though startup firms appear to file patents predominately to prevent competition, responses to other survey questions show wide variability among industries in how well patents actually serve this function. For example, while biotechnology firms report that patents are the primary means of "capturing competitive advantage" from their innovations, software and Internet companies rank patents dead last.²⁶² Similarly, in another set of survey questions, respondents told us that patents play moderately to very important roles in providing incentives to innovate to biotechnology firms but only slightly to moderately important roles for software firms.²⁶³ Thus, our results are not diametrically opposed to Mann's finding on the usefulness of patents in preventing copying for software startups, and instead provide a more nuanced picture of the use of patents in this industry. Moreover, our findings validate with a randomly-sampled survey Mann's anecdotal observation that startup software firms can use patents to assist in raising financing.²⁶⁴

The inter-industry differences we find in the rated importance of patents as a means to prevent copying raise a thorny question. Specifically, are the differences reflected in the importance of patenting for securing investment and financing mainly driven by (1) the industry-specific utility of patents in preventing competition, or (2) differences in patents' usefulness in acting as signals for other important capabilities within firms, such as a firm's ability to codify its engineers' knowledge? While these questions are best answered in a multivariate context with sophisticated regression analysis, the descriptive statistics here offer some preliminary answers. Because biotechnology and medical device firms rate patenting of top importance in appropriating value from their innovations—and

259. See Cohen et al., *supra* note 62, at 32 tbl.1.

260. See *supra* note 162 and accompanying text.

261. See *supra* Part III.B.2.

262. Graham et al., *High Technology Entrepreneurs*, *supra* note 16, at 1291–92.

263. See *id.* at 1286.

264. See *supra* note 166 and accompanying text.

similarly provide relatively high scores for preventing copying as a reason for filing—this finding may be evidence that the classical reason of patenting to prevent competition is a major driver of third-party investment decisions.²⁶⁵ On the other hand, since software firms rate patenting as the least effective of various means for appropriating value—and similarly provide much lower scores for preventing copying as a reason for filing—this finding may support the view that investor sentiment is primarily driven by patents’ signaling qualities.²⁶⁶ In this regard, that “enhancing firm reputation” was the only reason rated more highly by software firms than biotechnology and medical device companies (see Fig. 2) arguably supports a signaling thesis.

C. Startup Firms, Like Incumbents, Engage in Strategic Patenting

As we noted above, in an earlier article, we stated that we would be “somewhat surprised” if many startups were filing for patents for strategic reasons, such as defending against patent infringement suits or improving their position negotiations, such as cross-licensing deals.²⁶⁷ We assumed that startup firms, at least outside of the biotechnology industry, were relatively immune to litigation threats and were primarily concerned with licensing out their patents to other firms, as opposed to inbound- or cross-licensing activity. Yet, consistent with the results of the large-firm surveys, our respondent patenting firms rated these strategic reasons as “moderately important” in their decision to file for patents.²⁶⁸ (See Fig. 1.) This result is a novel and important finding.

Importantly, the smaller firms in our startup sample (as measured by total revenues) found patenting for strategic reasons nearly as important as the larger firms.²⁶⁹ (See Fig. 3.)

265. See generally Rebecca S. Eisenberg, *Patents, Product Exclusivity, and Information Dissemination: How Law Directs Biopharmaceutical Research and Development*, 72 *FORDHAM L. REV.* 477, 479 (2003) (discussing how the uses of patents vary across industries and noting that “while, in some contexts, it may be misleading to say patents confer monopoly power, in pharmaceuticals that statement is pretty accurate”).

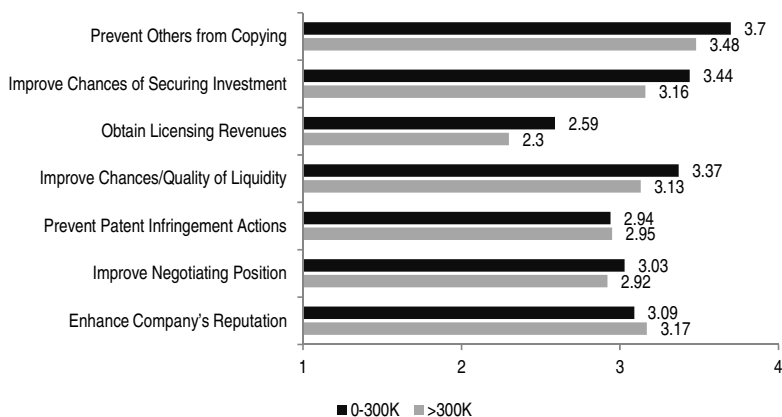
266. Cf. Burk, *supra* note 59, at 1018 (suggesting that “the presence of the patent system may tip the scales toward codified rather than tacit transmission” in the software industry, “where the availability of patents is relatively recent compared to the accumulated tacit knowledge in the field”).

267. Graham & Sichelman, *supra* note 21, at 1096; see *supra* Part III.A.

268. While the means of both of these motivations are significantly different at the 99% confidence level from that of “enhancing reputation,” there are no statistically significant differences between the two reasons. Taking the less important reason of this group—“preventing patent actions against us”—there was a statistically significant difference at the 99% confidence level when compared with the next most important reason—licensing.

269. See *supra* Part II.C.

FIGURE 3
REASONS TO PATENT BY FIRM REVENUE.²⁷⁰ HOW IMPORTANT OR UNIMPORTANT HAVE THE FOLLOWING BEEN TO YOUR COMPANY IN SEEKING PATENT PROTECTION IN THE UNITED STATES?



(1=Not At All Important, 2=Slightly Important, 3=Moderately Important, 4=Very Important)

Specifically, Figure 3 displays patent-holding firms divided into top and bottom revenue earners (at the sample median of \$300,000 per year). As evident in the average responses, defensive patenting was of exactly the same importance for high- and low-revenue firms, while patenting to improve negotiating position was only slightly more important for high-revenue firms.²⁷¹ Of course, the kinds of negotiations for firms of different sizes may vary widely—for instance, larger firms may be more apt to bargain over cross-licenses and smaller firms may be more likely to negotiate one-way licenses. Nevertheless, our evidence tends to undercut the argument that strategic patenting is merely the province of the largest firms. We do find, however, that firms with larger patent portfolios were more likely to engage in strategic patenting, which may be an endogenous effect: firms may amass larger patent portfolios because they see value in a cross-licensing strategy, or they may learn about the value of cross-licensing only after acquiring a relatively large portfolio. (See Fig. 4 below.)

270. The standard error of the mean for each response is as follows (low revenue, high revenue): prevent others from copying (0.04, 0.05); improve chances of securing investment (0.05, 0.06); obtain licensing revenues (0.07, 0.07); improve chances/quality of liquidity event (0.05, 0.06); prevent patent infringement actions against us (0.06, 0.06); improve negotiating position (0.06, 0.06); and enhance company's reputation (0.05, 0.05).

271. The differences between high- and low-revenue firms for improving negotiating position were not statistically significant.

Of course, not only firm size may have an effect on strategic patenting; industry differences may also play an important role.²⁷² Focusing on specific industries shows that biotechnology, medical device, and hardware firms rated strategic patenting as more important than software and Internet firms did. (See Fig. 2 above.) These results are consistent with Davis's finding that European biotechnology firms tend to engage in strategic patenting more than other types of firms.²⁷³ Yet, interestingly, biotechnology firms rated improving negotiating position more highly than medical device firms did (see Fig. 2 above),²⁷⁴ while there was no statistically significant difference in their ratings for defensive patenting. This result may be attributable to the relative importance of licensing in the biotechnology industry, a topic to which we turn next.

D. Obtaining Licensing Revenue is the Least Important Reason for Patenting

A number of commentators have opined that licensing intellectual property is important for firms that lack substantial complementary assets, such as production and marketing capabilities.²⁷⁵ Because startups typically do not hold such complementary assets—and, hence, do not have the same internal resources to commercialize their inventions as do large firms—one would expect earning licensing revenues would play a more important role in startups' patenting decisions. Indeed, according to a recent study by Ashish Arora and Marco Ceccagnoli, effective patenting is more likely to encourage licensing by firms that possess fewer complementary assets.²⁷⁶

Nonetheless, our respondents reported that the importance of securing licensing revenue was significantly lower than the other reasons, falling between “slightly important” and “moderately important.” While this finding might seem to conflict with the PatVal study of European patentees, which showed that small firms were much more likely to patent to secure licensing revenue than large ones,²⁷⁷ when we segment our respondent firms by total revenue, high-revenue entrepreneurial firms report that licensing is significantly less important to patenting when compared with low-revenue firms, suggesting that the smallest of the

272. See BRONWYN HALL & ROSEMARIE ZIEDONIS, *THE PATENT PARADOX REVISITED: AN EMPIRICAL STUDY OF PATENTING IN THE U.S. SEMICONDUCTOR INDUSTRY, 1979–1995*, 32 *RAND J. ECON.* 101, 105 (2001).

273. See *supra* note 172 and accompanying text.

274. This difference was statistically significant at a 90% confidence level.

275. See, e.g., Teece, *supra* note 51, at 285–86; Ashish Arora & Marco Ceccagnoli, *Patent Protection, Complementary Assets, and Firms' Incentives for Technology Licensing*, 52 *MGMT. SCI.* 293, 293 (2006).

276. See Arora & Ceccagnoli, *supra* note 275, at 293.

277. See GAMBARDELLA ET AL., *supra* note 194, at 39.

small are more likely to rate this reason highly.²⁷⁸ (See Fig. 3 above.) We also find that although licensing is not as important for our respondents relative to other reasons to patent, when we compare our responses with those from the large firm surveys (an approach admittedly fraught with problems), it appears that this driver of patenting is more important for smaller firms than larger ones.²⁷⁹ Moreover, a non-trivial number of our respondents generate all or nearly all of their revenue from licensing. Thus, while our finding that generating licensing revenue is the least important driver of patenting is somewhat unexpected, our results are not inconsistent with studies showing that licensing takes on more prominence for firms lacking complementary assets.

We also find significant inter-industry differences regarding the utility of patents for licensing. Specifically, biotechnology firms place much greater emphasis on patenting to obtain licensing revenue than all other firms, including medical device, (venture-backed) hardware, and software and Internet firms (with these latter segments all roughly clustered together in their rankings).²⁸⁰ (See Fig. 2 above.) These differences may stem from the difficulties startup biotechnology firms face in commercializing their inventions. Indeed, it is well-documented that unlike many startups in other industries, biotechnology startups typically form alliances with incumbents to clear costly regulatory hurdles and bring their innovations to market, thus suggesting that patenting and licensing may generally play a different role in the peculiar industrial organization characteristic of the biotechnology and pharmaceutical sectors.²⁸¹

Interestingly, firms that had filed larger numbers of patent applications did not rate obtaining licensing revenue as any more important a driver for filing than firms with smaller portfolios. (See Fig. 4.)

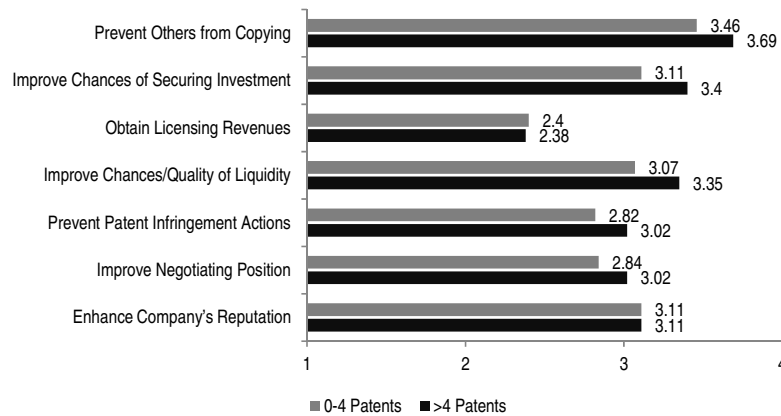
278. This difference was statistically significant at a 99% confidence level.

279. See, e.g., Cohen et al., *supra* note 62, at 47 fig.7.

280. Biotechnology firms showed statistically significant differences from medical device, hardware, and software firms at a 99% confidence level.

281. See Riitta Katila et al., *Swimming with Sharks: Technology Ventures, Defense Mechanisms and Corporate Relationships*, 53 MGMT. SCI. 295 (2008); Luis Diestre & Nandini Rajagopalan, Are All “Sharks” Dangerous? New Biotechnology Ventures and Partner Selection in R&D Alliances (June 2008) (working paper) (on file with authors). Although medical device firms usually must undergo regulatory approval to market their products, because these firms often rely in large part upon the proven safety of older—but “substantially equivalent”—devices to pass regulatory muster, as well as for other reasons, their costs are generally not as great as those for firms undergoing approval for new biotechnology products. See 21 U.S.C. § 360e(b)(1)(B) (2007) (providing exemptions from pre-market approval for Class III medical devices that are “substantially equivalent” to pre-existing devices); H.R. REP. NO. 101-808, at 14 (1990), reprinted in 1990 U.S.C.C.A.N. 6305, 6307 (noting that 80% of new Class III devices were introduced to the market through the § 510(k) exemption process); Jennifer A. Henderson & John J. Smith, *Realizing the Potential for Biomarkers in Imaging: Background and Legal Basis*, 60 FOOD & DRUG L.J. 511, 516 (2005) (remarking that the costs of regulatory approval are lower for medical devices than biotechnology products).

FIGURE 4
 REASONS TO PATENT BY NUMBER OF FILED PATENTS AND APPLICATIONS.²⁸² HOW IMPORTANT OR UNIMPORTANT HAVE THE FOLLOWING BEEN TO YOUR COMPANY IN SEEKING PATENT PROTECTION IN THE UNITED STATES?



(1=Not At All Important, 2=Slightly Important, 3=Moderately Important, 4=Very Important)

Yet, there were notable differences between the groups regarding other motivations to patent. In particular, for the top patent filers, preventing copying is a somewhat more important reason to patent than for firms with low patenting rates.²⁸³ Nonetheless, even the bottom half found preventing copying somewhere between “moderately” and “very” important. There is a more noticeable difference in terms of signaling. For firms with fewer numbers of patents filed, using patents to improve their chances of securing investment or a liquidity event are substantially lower than for firms filing a greater number of patents.²⁸⁴ Again, however, even for the lower division, these forms of patenting remained nearly “moderately” important. Another noticeable difference arises in the use of patents to improve negotiating position, such as in cross-licensing. Although we showed earlier that startup firms engage in strategic patenting in ways

282. The sample is divided into cohorts at the median number of patents and applications reported to have been filed by respondent firms after founding (i.e., not including patents or applications filed by founders later acquired by the firm). The standard error of the mean for each response is as follows (low patenting, high patenting): prevent others from copying (0.05, 0.04); improve chances of securing investment (0.06, 0.05); obtain licensing revenues (0.07, 0.06); improve chances/quality of liquidity event (0.06, 0.05); prevent patent infringement actions against us (0.06, 0.06); improve negotiating position (0.06, 0.05); and enhance company's reputation (0.05, 0.05).

283. This difference was statistically significant at the 99% confidence level.

284. These differences were also statistically significant at the 99% confidence level.

not unlike large firms, as we mentioned, firms filing more patents are more likely to use patents for strategic reasons.²⁸⁵

Notably, other than for licensing, none of the responses is less than “moderately” important for firms with below-the-median levels of patent filing. As such, we believe that some of our most salient findings in this Article regarding the use of patents by startups—namely, the importance of patents to prevent copying, the use of patents to secure capital and improve exits, and the strategic use of patents for enhancing negotiating position—remain robust to criticisms that our responses may not be capturing those companies that are less interested in patents. Indeed, as we discuss in the next section, many of our respondent firms had never filed for a patent.

E. *Cost Is the Major Hindrance to Startup Patenting*

A sizable percentage of respondents held no patents or applications whatsoever. For the Dun & Bradstreet firms, nearly 60% had never filed for a patent—of software firms, roughly 75% had never filed, though that same percentage of biotechnology firms *had* filed. For the venture-backed, VentureXpert firms, only 18% had not filed—with 32% of software firms and 4% of biotechnology firms holding no patents or applications. Some of these non-filers—such as many of the small software service and “consulting” shops in our respondent sample—might simply not innovate, at least in ways that are potentially patentable (although even non-patenting firms generally reported that innovation was important to their business strategies).²⁸⁶ On the other hand, firms that regularly patent may decide to forgo filing for some of their innovations. As we discussed earlier, because hindrances to startup patenting had not previously been thoroughly investigated with empirical data, we inquired of our sample firms why they decided not to patent their most recent major technology innovation.

Figure 5 shows the results from nearly 1,000 respondents.²⁸⁷ By asking the respondent to report on its most recent major technology innovation, we intended to secure a sample of discrete decisions about whether to patent potentially patentable innovations. By far, the top reason to forgo patenting on this sample of major innovations was the cost of obtaining

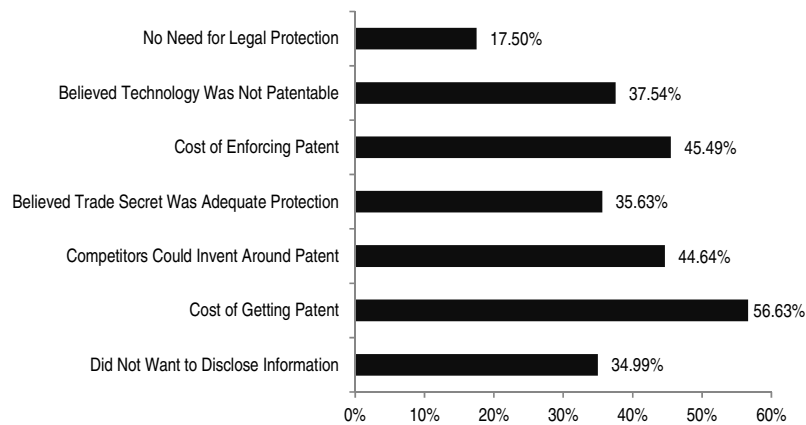
285. Strategic reasons—namely, improving negotiating and preventing suits—showed differences at a 95% confidence level.

286. *But cf. supra* Part I.K.1 (noting that many small firms may mistakenly believe their inventions are unpatentable).

287. This question could be answered by respondents regardless of whether they had filed for a patent. Because respondents could check one or more of these selections, the percentages for each reason do not add up to 100%.

the patent, closely followed by the cost of enforcing the patent.²⁸⁸ These results are similar to those found in the Small Business Administration survey conducted in 1998 of small firms, which listed the same reasons as the most important for forgoing patenting.²⁸⁹ Additionally, these motivations accord with the finding reported in the Carnegie Mellon study that the smaller firms in their (generally large-firm) sample showed a significantly greater sensitivity to the costs of filing and enforcing patents.²⁹⁰

FIGURE 5
REASONS FOR FORGOING PATENT PROTECTION.²⁹¹
FOR THAT SAME UNPATENTED INNOVATION, WHICH IF ANY OF THE
FOLLOWING INFLUENCED YOUR COMPANY'S DECISION NOT TO PATENT?



As noted earlier, while the ease of inventing around was a prominent reason reported by large companies to forgo patenting in previous surveys, the difficulties and costs of acquiring and enforcing patents tended not to be.²⁹² Given our earlier findings documenting the relative importance of patenting in startups, not only for maintaining supracompetitive

288. The difference between the reported percentage for the costs of acquiring and the costs of enforcing the patent was statistically significant at a 99% confidence level. The costs of enforcing the patent and the ease of inventing around the patent did not show statistically significant differences from one another, but they were statistically significantly different from the next reported reason to a 99% confidence level.

289. See CORDES ET AL., *supra* note 191, at 55–58.

290. See Cohen et al., *supra* note 62, at 15–16.

291. The standard error of the mean for each response is as follows: did not want to disclose information (1.51%); cost of getting patent (1.57%); competitors could invent around patent (1.57%); believed trade secret protection was adequate (1.51%); cost of enforcing patent (1.57%); believed technology was not patentable (1.53%); no need for legal protection (1.20%).

292. See *supra* Part II.C.

profits but also for strategic reasons (especially for increasing bargaining power), the barriers created for entrepreneurs by the high costs of patent prosecution and enforcement arguably present a serious public policy concern. Moreover, high costs are no chimera for these startup firms: another of our survey questions revealed that the average out-of-pocket cost for a respondent firm to acquire its most recent patent was over \$38,000. This figure is substantially higher than the averages for patent prosecution reported in the literature, which vary from a low of \$10,000 to a high of \$30,000.²⁹³

To be certain, not all firms were equally sensitive to the cost of filing or enforcement. For instance, the Dun & Bradstreet respondents were much more likely to list cost as the primary disincentive to patenting than the venture-backed VentureXpert respondents. (See Fig. 7 below.) Indeed, as a group, while the VentureXpert firms listed filing costs (including attorneys' fees) as the main reason for not patenting, the costs of enforcement trailed behind the ability of others to design around the patent. These differences may be attributable to the greater capitalization of venture-backed firms. When firms are segmented by annual revenue, statistically significant differences appear between the highest and lowest quartile in the cost of acquiring a patent as well as the top-half and bottom-half in the cost of enforcing a patent. Older firms were much less sensitive to the cost of acquiring and enforcing patents than younger firms.²⁹⁴ (See Fig. 9 below.) In addition, respondents that reported that patents were fairly effective at allowing them to appropriate value from their innovations—such as biotechnology and medical device firms—were less likely to be sensitive to filing and enforcement costs than firms stating otherwise²⁹⁵—such as those in the software and Internet industry.²⁹⁶ (See Fig. 6 below.)

293. See Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 Nw. U. L. REV. 1495, 1498–99 (2001) (estimating the cost of prosecuting a patent to issuance as between \$10,000 and \$30,000); see also ECONOMIC SURVEY, *supra* note 35, at 27 (reporting average attorneys' fees for prosecuting an original patent application, filing one amendment, and issuing an allowed application as between \$10,000 and \$20,000, depending on the complexity of the technology).

294. These differences were statistically significant at 99% and 95% confidence levels, respectively.

295. It also accords with recent work showing that software litigation may be more costly than other technological fields, because of the abstract nature of software patent claims. See BESSEN & MEURER, *supra* note 110, at 164; Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction?*, 157 U. PA. L. REV. 1743, 1760 (2009) (“By contrast, we have a much harder time defining machines in words, and a still harder time writing words that clearly delineate the scope of software inventions.”). Another likely factor explaining these differences is that software firms tended to be smaller than other firms in our sample.

296. These differences were statistically significant at a 99% confidence level. As would be expected, companies with fewer patents were noticeably more sensitive to the cost of get-

Yet, the greater cost-sensitivity of our small-company respondents as compared with those in the large-firm surveys may not be merely a result of more binding capital constraints. As we stated above, our respondents reported significantly higher patent prosecution costs than those for more established firms. In unstructured interviews we conducted with a sample of respondents, one executive at a venture-backed semiconductor firm stated that startups often pay significantly more than incumbents, because startups (1) tend to file for patents on inventions that are more important to the company's core business model than those filed by established firms; (2) usually use outside, instead of in-house, counsel for patent prosecution; and (3) often have difficulty monitoring outside counsel to limit overall costs.²⁹⁷ Indeed, a non-trivial percentage of respondents—about 10%—listed cost as the only barrier to filing for a patent.²⁹⁸ Additionally, when asked to indicate the “most important” reason for not filing, more than one-third of the respondents selected either the cost of acquiring or enforcing the patent.²⁹⁹ Finally, as a converse argument, a relatively low percentage of firms—about 18%—reported no need for legal protection as a reason for not filing, thus suggesting that startups are interested in obtaining the protections that patents can afford.³⁰⁰ As Kingston's study of European firms revealed, these high costs might not merely prevent startups from appropriating the value of their

ting and enforcing a patent. These differences were statistically significant at the 99% and 95% confidence levels, respectively.

297. Telephone Interview with Anonymous Semiconductor Company Executive (Feb. 20, 2009).

298. Despite the high costs of patenting and enforcement acting as a deterrent to filing for patents—for the companies that did patent, especially for software companies—respondents did not report that the patenting process was terribly disruptive to their overall innovation process. In a separate survey question, firms in all industries, including software, reported that patenting was only a little more than “slightly disruptive” on average to their technology teams. Importantly, these results appear to contradict Mann's anecdotal finding that patents substantially distract startup software firms “from the central task of designing and deploying a product.” Mann, *supra* note 27, at 962, 983.

299. Specifically, respondents identified the following as the most important reasons for not patenting their last innovation: cost of acquiring the patent (26.00%); did not believe technology was patentable (20.92%); did not want to disclose information (15.84%); ease of inventing around the patent (12.41%); cost of enforcing the patent (10.52%); no need for legal protection (7.33%); and believed that trade secret protection was adequate (6.97%).

300. Software firms found “no need for legal protection” more often than other firms, but somewhat surprisingly, biotechnology and medical device firms report this motivation more often than venture-backed hardware firms. *See infra* Figure 6. The difference between software and other firms was statistically significant at the 99% confidence level, and the difference between hardware and medical firms was statistically significant at the 90% confidence level. These findings could partly reflect that these healthcare-related firms are already cooperating with potential competitors through licensing or joint venture agreements, obviating the direct need for patent protection in certain instances. *See infra* note 320 and accompanying text.

innovations via patents, but could deter R&D in the first instance—preventing us from knowing with certainty what innovations society did *not* realize.³⁰¹ Thus, we strongly believe that the significant barrier presented by the high costs of prosecuting and enforcing patents by startups warrants further analysis and, potentially, remedial policy action.

F. *The Perceived Narrow Scope of Patents
and High Patenting Thresholds*

Another set of reasons to forgo patenting related to our respondents' perceptions about the effectiveness of the patent system. First, nearly 45% of respondents stated that the ability of competitors to design around a potential patent influenced their decision to forgo patenting. Second, nearly 38% of respondents reported not filing because they believed the innovation was not patentable. (See Fig. 5 above.) Both findings were somewhat surprising in view of recent criticism that (1) the courts too often uphold patent claims of overly broad scope,³⁰² and (2) the U.S. Patent Office too frequently grants patents of questionable inventiveness.³⁰³

There are at least two possible explanations for these findings. One, the criticism of the courts and the Patent Office could simply reflect attribution bias that results from wrongly inferring that the relatively small number of “bad patents” that issue and are later upheld in litigation represent the universe of issued patents. On this score, only about 70% of all original patent applications—either directly or through a continuation or divisional application—ultimately mature into a patent.³⁰⁴ Thus, there is at least one non-trivial barrier that prevents every application from becoming an issued patent—the patent examination process. Additionally, concerns about overbreadth in patent scope have mainly been made

301. See KINGSTON, *supra* note 187, at 9 (finding that the cost of litigation had a “very big” effect on the decisions of small firms to invest in invention for 13% of respondents and a “significant” effect for 36%).

302. See BESSEN & MEURER, *supra* note 110, at 66–68 (describing biotechnology and software patent claims that greatly exceeded the scope of the disclosed inventions); Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1499–1500 (2001) (explaining how the U.S. Patent & Trademark Office is unable to adequately examine each patent and grants many broad patents as a result).

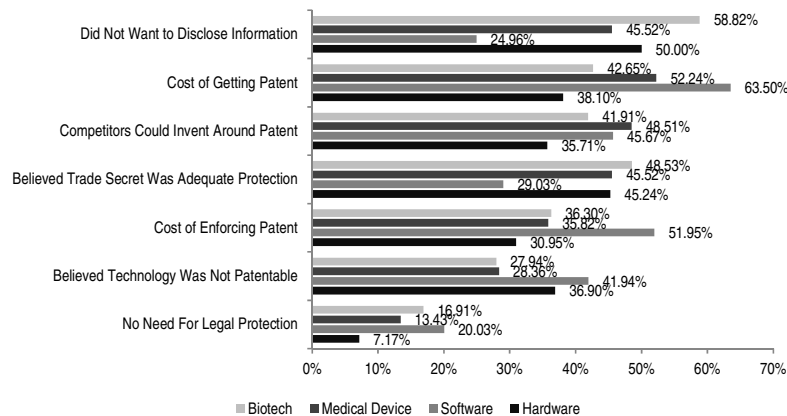
303. See Jay P. Kesan & Andres A. Gallo, *Why “Bad” Patents Survive in the Market and How Should We Change?—The Private and Social Costs of Patents*, 55 EMORY L.J. 61, 63 & n.2 (2006) (collecting recent articles criticizing the Patent Office for issuing “so-called ‘bad’ or improvidently granted patents”); *supra* notes 119–122 and accompanying text.

304. Mark A. Lemley & Bhaven Sampat, *Is the Patent Office a Rubber Stamp?*, 58 EMORY L.J. 181, 187, 193 (2008) (reporting a “grant rate” range for a one-month sample of applications to be roughly 73%).

in the context of software and communications patents.³⁰⁵ Indeed, the Federal Circuit recently heard arguments en banc to weaken disclosure standards that mainly apply to biotechnology patents.³⁰⁶ Thus, concerns from startups about high patentability thresholds and narrow scope may reflect accurate perceptions of the system in practice.

On the other hand, it could be the case that startups are relatively unsophisticated and misperceive the ease of garnering a patent, particularly one with claims of broad scope. In this regard, when responses are segmented by industry, although medical device firms were the most likely to list the ease of designing around the patent as a reason for not patenting, it is software, not biotechnology, firms that follow. (See Fig. 6 below.)

FIGURE 6
REASONS FOR FORGOING PATENT PROTECTION BY INDUSTRY.³⁰⁷
FOR THAT SAME UNPATENTED INNOVATION, WHICH IF ANY OF THE
FOLLOWING INFLUENCED YOUR COMPANY'S DECISION NOT TO PATENT?



305. See, e.g., BESSEN & MEURER, *supra* note 110, at 21–24; Brian Kahin, *The Software Patent Crisis*, TECH. REV. (Apr. 1, 1990), at 53, 58 (noting the problem of overbroad software patents), available at <http://kahin.people.si.umich.edu/softwarepatentcrisis.htm>.

306. See *ARIAD Pharms., Inc. v. Eli Lilly & Co.*, No. 2008-1248, 2009 WL 2573004 (Fed. Cir. Aug. 21, 2009) (granting en banc review on whether there is “a written description requirement separate from an enablement requirement”).

307. The standard error of the mean for each response is as follows (biotech, medical device, software, hardware): did not want to disclose information (4.24%, 5.49%, 4.30%, 1.78%); cost of getting patent (4.26%, 5.33%, 4.31%, 1.99%); competitors could invent around patent (4.25%, 5.26%, 4.32%, 2.05%); believed trade secret protection was adequate (4.30%, 5.46%, 4.30%, 1.87%); cost of enforcing patent (4.13%, 5.07%, 4.14%, 2.06%); believed technology was not patentable (3.86%, 5.3%, 3.89%, 2.03%); no need for legal protection (3.23%, 2.83%, 2.94%, 1.65%).

Based on the practice experience of one of the authors, a non-trivial share of the high percentage of software firms (about 45%) that have concerns over patent breadth may simply be mistaken about how difficult it is to garner patent claims of expansive scope. Supporting this contention is our finding that the youngest firms, which are arguably less experienced with the Patent Office, are comparatively more likely to forgo filing because of the perceived ability of others to design around a patent.³⁰⁸ The same contention of ignorance arguably holds true for the large percentage (42%) of software firms that believed their innovations were not patentable.³⁰⁹ It is possible, too, that among software engineers, a positive response to the “not patentable” option could refer to philosophic beliefs about what *should be* patentable and not objective beliefs about what *is in fact* patentable.

However, there are several arguments against these contentions. First, the finding that younger firms were more concerned about patent scope could simply reflect more “incremental”—as opposed to “disruptive”—innovation by older firms.³¹⁰ Specifically, incremental innovation is harder to invent around, since doing so would require replicating other product components associated with the incremental innovation.³¹¹ Second, software patent applications, especially those in the “business method” area, have had relatively high rejection rates since at least 2006.³¹² This result is also consistent with Davis’s finding that Danish software firms reported avoiding patenting, because they did not feel their inventions were patentable.³¹³ Third, there were no significant differences in the perceived ability to invent around a patent or the patentability of the innovation-at-hand when segmenting respondent firms by the size of their patent portfolio. This result suggests that companies with less experience in patenting share similar views with more experienced firms about patenting

308. This difference was statistically significant at a 90% confidence level.

309. Biotechnology and medical device firms significantly differed from hardware and software firms at the 99% confidence level.

310. See generally JOE TIDD ET AL., *MANAGING INNOVATION: INTEGRATING TECHNOLOGICAL, MARKET AND ORGANIZATIONAL CHANGE* §§ 1.3, 1.6 (2001) (discussing both incremental and disruptive innovations).

311. We thank Colleen Chien for this suggestion.

312. See Lemley & Sampat, *supra* note 304, at 196–97 (finding lower grant rates in the Computer Architecture, Software & Information Security technology “art units” than other art units); Dennis Crouch, *Evidence Based Prosecution V: Business Method Rejections*, PATENTLY-O (Oct. 22, 2006), http://www.patentlyo.com/patent/2006/10/evidence_based_2.html (showing final rejection rates of over 50% for business method patents compared against 25% for the general population). Recently, however, it appears that grant rates in the business method art unit are increasing. See Dennis Crouch, *The Business Method Art Units*, PATENTLY-O (July 18, 2010), <http://www.patentlyo.com/patent/2010/07/business-method-patents.html>.

313. See Davis, *supra* note 168, at 11.

thresholds and patent strength. In sum, just what share of startups are knowledgeable or ignorant about patentability standards and claim scope—and, related, how much of the criticism of the patent system is hyperbole—cannot be determined from our data and is deserving of further study.

G. *Unwillingness to Disclose Trade Secrets*

The last set of reasons to forgo patenting revolves around the reluctance of firms to disclose their (trade) secrets. As shown in Figure 2, respondents listed not wanting to disclose information as a reason for not patenting about 35% of the time. In this regard, if a firm makes reasonable efforts to prevent the disclosure of confidential information that provides it a commercial advantage, the firm is typically protected by trade secret law—so long as the company is aware of this protection and the process for securing it.³¹⁴ We note that a nearly identical percentage of firms (36%) indicated that a reason not to file was the adequacy of trade secrecy law.³¹⁵ Moreover, that relatively few firms stated that they did not need any legal protection for their innovations indicates that trade secrecy law may play an important role beyond the non-legal protection measures firms can take to ensure secrecy.

The relative frequency of these reasons tends to track the large firm surveys, though the desire to prevent disclosure appears to be generally more of a deterrent to patenting for large firms than for our respondents. Part of this difference reflects our survey's heavy focus on software and Internet firms, for which reluctance to disclose played a less significant deterrent role compared with other industries.³¹⁶ This result may reflect the historically weak disclosure requirements at the U.S. Patent Office for software patents—particularly the ability of applicants to retain source code and other important know-how from patent applications.³¹⁷ Or there may be other technology- or labor-market characteristics at work that relate to information flow in the software and Internet space, including the notoriously short product life cycles in software, in which the disclosure from marketing a product may come prior to the usual 18-month patent application publication requirement.³¹⁸

314. See UNIF. TRADE SECRETS ACT §§ 1–2 (1985).

315. The responses for these reasons were not statistically significantly different from one another, but they were from the next reason—no need for legal protection—at a 99% confidence level.

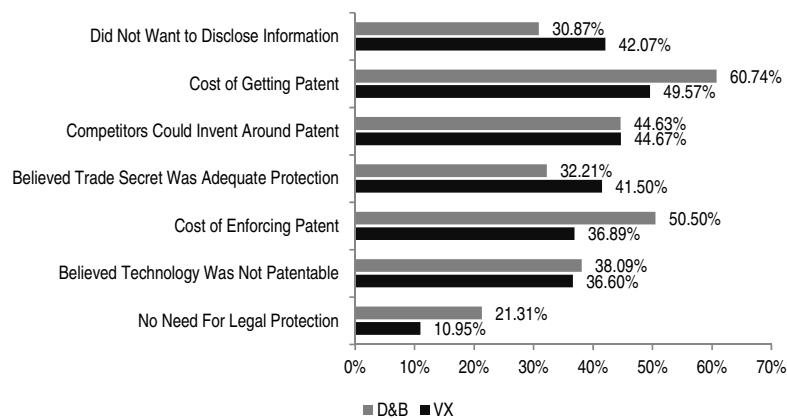
316. These differences were statistically significant at a 99% confidence level.

317. See Gregory J. Maier, *Software Protection – Integrating Patent, Copyright and Trade Secret Law*, 69 J. PAT. & TRADEMARK OFF. SOC'Y 151, 163–65 (1987) (noting that patent law does not require the disclosure of software code and that “there is sometimes motivation . . . to obtain broad patent protection and yet retain significant trade secret protection”).

318. See 35 U.S.C. § 122(b)(1)(A) (2000).

Do other company characteristics, apart from industry, play an important role in the reluctance to disclose information? For instance, when the respondent firms are segmented by data source, the VentureXpert venture-backed firms were more reluctant to disclose information than the Dun & Bradstreet firms, which are generally smaller and not venture-backed. (See Fig. 7.)

FIGURE 7
REASONS FOR FORGOING PATENT PROTECTION BY DATA SOURCE.³¹⁹
FOR THAT SAME UNPATENTED INNOVATION, WHICH IF ANY OF THE
FOLLOWING INFLUENCED YOUR COMPANY'S DECISION NOT TO PATENT?



Indeed, at first blush, that smaller, non-venture-backed firms are less motivated by a desire to avoid disclosure of their information in patents than larger ones is puzzling. One would expect that smaller firms have more to fear from larger competitors using their otherwise proprietary information. On the other hand, as industry-segmented results show, most of the reported difference stems from the biotechnology firms, which disproportionately leave process inventions unpatented. (See Fig. 6 above.) Thus, these differences may reflect the underlying dynamics of the types of technologies smaller, non-venture-backed firms choose to leave unpatented. Additionally, given that very small biotechnology firms are known to enter into joint ventures and other cooperative relationships with larger firms,³²⁰ it could simply

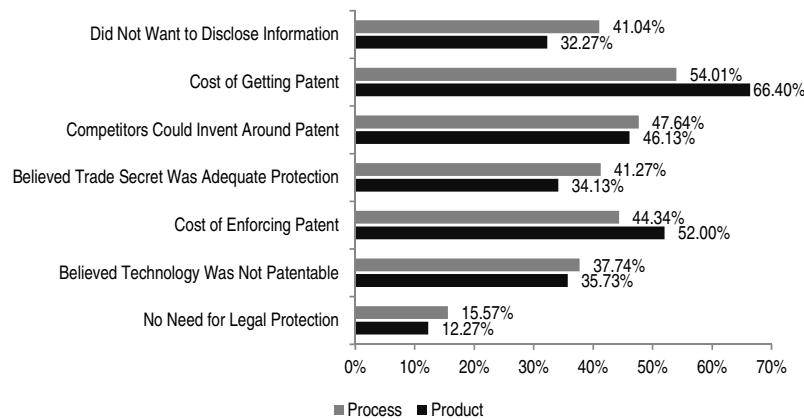
319. The standard error of the mean for each response is as follows (Dun & Bradstreet, VentureXpert): did not want to disclose information (1.89%, 2.49%); cost of getting patent (2.00%, 2.53%); competitors could invent around patent (2.04%, 2.52%); believed trade secret protection was adequate (1.91%, 2.49%); cost of enforcing patent (2.05%, 2.44%); believed technology was not patentable (1.99%, 2.45%); no need for legal protection (1.68%, 1.64%).

320. See Gregory B. Abbott, *Pharmaceutical and Biotechnology Licensing and Joint Ventures*, 514 PLI/PAT. 37, 54–57 (1998).

be the case that the information these firms would disclose in a patent is already known by potential competitors. Moreover, the Dun & Bradstreet firms saw less of a need for legal protection than the VentureXpert firms, which could also partially explain the findings on the reluctance of the latter firms to disclose.³²¹ In sum, while more sophisticated statistical analysis is necessary to disentangle the role of firm size, venture funding, and technology in the willingness to disclose, it appears that other factors are influencing the reported variations.

Whether the innovation is a product or process raises other interesting differences regarding the disclosure of proprietary information. We segmented our data by whether the respondent indicated that the last invention for which they chose to forgo patent protection was a product or a process (or whether that question was not applicable). (See Fig. 8.)

FIGURE 8
REASONS TO FORGO PATENTING BY INVENTION TYPE.³²²
FOR THE SAME UNPATENTED INNOVATION, WHICH IF ANY OF THE
FOLLOWING INFLUENCED YOUR COMPANY'S DECISION NOT TO PATENT?



321. Dun & Bradstreet and VentureXpert firms showed statistically significant differences from one another in not wanting to disclose information, the costs of acquiring patents, the belief that trade secret protection was adequate, the costs of enforcing the patent, and the belief that there was no need for legal protection. Each was significantly different at a 99% or greater confidence level.

322. The standard error of the mean for each response is as follows (process, product): did not want to disclose information (2.32%, 2.38%); cost of getting patent (2.35%, 2.39%); competitors could invent around patent (2.35%, 2.53%); believed trade secret protection was adequate (2.31%, 2.40%); cost of enforcing patent (2.34%, 2.53%); believed technology was not patentable (2.28%, 2.43%); no need for legal protection (1.70%, 1.65%).

As expected, trade secrecy was viewed as a more adequate form of protection than patenting for process and, to a lesser degree, product innovations.³²³ This result likely stems from the characteristic that processes, especially internal ones, are generally easier to keep secret than products.³²⁴ For similar reasons, respondents were less concerned with fear of disclosure for processes than products in patent applications.³²⁵ These findings are generally consistent with those of the Yale study, in which large firms reported that they were less willing to disclose process innovations.³²⁶

Unlike our results, the Yale study also found that firms with process innovations were less willing to patent than product innovators because of difficulties of enforcement.³²⁷ However, the Yale study was conducted three decades ago and focused on large, publicly traded firms, which were likely less sensitive to enforcement costs than startups. In our 2008 study, biotechnology firms—which are generally larger and better capitalized than our average respondent—were more likely to report that their last unpatented innovation was a process than other types of firms. If biotechnology firms, with access to spare capital, are more capable of enforcing their patents in court, and legal regimes have changed over time, it is understandable that a lower percentage of process innovators reported concerns about enforcement in deciding to forgo patenting. However, all else being equal, one would expect that process patents are more difficult to litigate, because of problems in proving infringement.³²⁸

Although older firms are generally larger than younger ones, the oldest of our respondent firms were more willing to disclose information in a patent than the youngest firms, a finding that seemingly runs contrary to our findings on firm size.³²⁹ (See Fig. 9.)

323. This difference was statistically significant at the 95% confidence level.

324. See Andrew Beckerman-Rodau, *The Choice Between Patent Protection and Trade Secret Protection: A Legal and Business Decision*, 84 J. PAT. & TRADEMARK OFF. SOC'Y 371, 396 (2002); Teece, *supra* note 51, at 290.

325. This difference was statistically significant at the 95% confidence level.

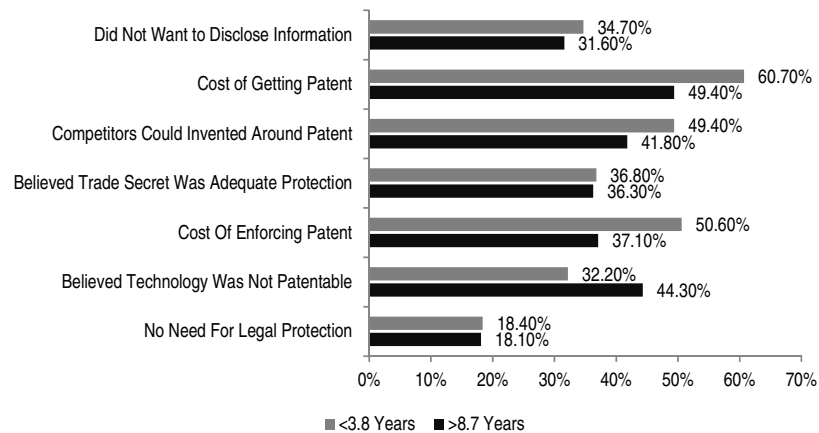
326. See Levin et al., *supra* note 143, at 806, t.6.

327. See *id.*

328. See Eisenberg, *supra* note 123, at 739.

329. This difference was statistically significant at a 90% confidence level. The likelihood of having last not patented a product versus a process invention was virtually the same in both the youngest and oldest companies, at 50% each. The younger quartile was, however, more likely to be populated by biotechnology startups (17.7% vs. 13.4%), which may account for some of the observed difference.

FIGURE 9
 REASONS TO FORGO PATENTING BY FIRM AGE.³³⁰
 FOR THAT SAME UNPATENTED INNOVATION, WHICH IF ANY OF THE
 FOLLOWING INFLUENCED YOUR COMPANY'S DECISION NOT TO PATENT?



One might surmise that older firms are more likely to patent incremental—as opposed to revolutionary—inventions, which arguably would lead to less of a concern with disclosure.³³¹

Finally, firms with comparatively *more* patent filings were more likely not to patent because of a reluctance to disclose information from their last major innovation in a patent.³³² Similarly, these same firms were more likely to forgo filing a patent for that last innovation because they believed trade secret protection was adequate.³³³ Although these results might appear counterintuitive, it may be the case that firms with more patents are more likely to patent a greater share of their innovations; thus, we have no way of knowing with certainty how long ago the “most recent” unpatented innovation was generated in the company. A company patenting 90% of its major innovations may make the non-patenting decision relatively rarely. Accordingly, when these firms

330. The standard error of the mean for each response is as follows (<3.8 years, >8.7 years): did not want to disclose information (3.09%, 3.03%); cost of getting patent (3.17%, 3.25%); competitors could invent around patent (3.24%, 3.21%); believed trade secret protection was adequate (3.13%, 3.13%); cost of enforcing patent (3.24%, 3.15%); believed technology was not patentable (3.03%, 3.23%); no need for legal protection (2.51%, 2.51%).

331. One might also hypothesize that older firms have a greater ability to withstand competition, but if that were so, then arguably these firms would have reported using patents less to prevent copying than younger firms, which we did not find.

332. This difference was statistically significant at the 90% confidence level.

333. This difference was statistically significant at the 99% confidence level.

affirmatively decide not to patent, fear of disclosing sensitive information may be more salient a reason than for firms that patent a smaller share of their innovations. Additionally, this difference may be driven by the technological profiles of the innovations at these firms, which in turn influence what the firms choose to patent, and not to patent.

CONCLUSION

Until the study presented here, the collective understanding of the drivers of patenting by entrepreneurial firms was primarily a variety of constructs built from scattered anecdotes and patent law theory, with a few lesser known empirical studies of limited sample sizes contributing on the fringes. In many cases, commentators and policymakers simply relied upon studies of large firms to infer the characteristics of startups. Despite these methodologically flawed approaches, policymakers have used these constructs to fashion applicable laws, generally strengthening patent rights over the last few decades.

The 2008 Berkeley Patent Survey—the first of its kind to target a large sample of small, startup firms in a variety of technology-intensive industries—casts doubt on many facets of these constructs. Most importantly, we find that startups—like large firms—are primarily motivated to file for patents to prevent copying by competitors, presumably in order to earn supernormal profits. This finding holds across industries, firm ages, patent portfolio size, and a variety of other important characteristics. Additionally, licensing intellectual property to other firms for ultimate commercialization is not viewed by most entrepreneurial firms as comparatively important to patenting. Thus, anecdotal reports that startup firms do not use patents in the traditional sense to exclude competitors should be reconsidered in light of our findings. Nonetheless, we do find important inter-industry differences, with biotechnology and medical device firms rating the exclusionary nature of patents as significantly more important relative to software firms. As such, policies that strengthened patent rights in the software industry may have had unintended negative consequences not only, as reported, for incumbents but also for startups, and we plan to explore this concern in later work.

Second, consistent with the anecdotal accounts and the previously limited empirical data, we find that entrepreneurial firms rely heavily on patenting to raise financing, to improve their chances and the quality of acquisition or going public, and to enhance their overall company and product image—all of which may support what is often termed a “signaling” theory of patents. This affirmation of the anecdotal literature is important, because the use of patents for financing is much less

pronounced in large firms. As such, we provide robust data showing that recent, alternative theories of patents as “signals” may have more force than previously believed.

Third, we make the novel finding that entrepreneurial firms of all ages, sizes, and technologies appear to engage in the so-called “strategic” use of patents just like large, incumbent firms. These strategies include using patents for defensive reasons, such as to prevent patent infringement suits, and to enhance bargaining power, such as in one-way or cross-licensing negotiations. Earlier reports had implicitly assumed that these sorts of strategic uses would not be important to startup firms—at least outside of the biotechnology industry—because these companies were not prone to the same kinds of offensive litigation and licensing threats as larger, incumbent firms. Even the youngest respondent firms in our survey declared these reasons salient.

Despite the diverse drivers of patenting by entrepreneurs, we found that startup firms are more price-sensitive than large firms to the costs of acquiring and enforcing patents. By far, the dominant factors deterring the patenting of entrepreneurial innovation are these costs. Given the strong motivations of startups to patent to secure financing and for strategic uses vis-à-vis incumbents, these high costs raise serious policy concerns. In particular, cost asymmetries between startups and incumbents could very well result in the misallocation of capital and an overall dampening of innovation by new firms. Because startup firms appear to innovate at greater rates per R&D dollar than large firms, these significant cost barriers could have substantial, unrealized effects in the innovation economy. As such, we recommend further research into the extent of the problem, as well as more analysis of potential solutions³³⁴ to normalize effective barriers to patenting.

In sum, by gathering and reporting targeted responses from numerous startups—not only in the aggregate but also segmented by a variety of firm characteristics—the 2008 Berkeley Patent Survey is able to provide new insights into the drivers of patenting by entrepreneurs. For an important class of economic agents, we can now provide empirically

334. Suggested approaches have included providing tax credits for patent-related expenses for small firms, see Paul R. Michel & Henry R. Nothhaft, Op-Ed, *Inventing Our Way Out of Joblessness*, N.Y. TIMES, Aug. 5, 2010, at A23, available at <http://www.nytimes.com/2010/08/06/opinion/06nothhaft.html> (recommending a proposal suggested by Ted Sichelmann whereby “a tax credit of up to \$19,000” would be provided to small businesses “for every patent they receive”), and significantly raising the patent filing fees for large entities, perhaps on a graduated basis, or the installation of a registration system, whereby inventors simply register specifications of their inventions, along with proposed claims, but no substantive review is undertaken until suit is brought or it is requested by a third party. See Mann, *supra* note 27, at 1021–22. Such a system could potentially serve important signaling and strategic goals without imposing large filing costs on patentees. See *id.*

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grounded answers to the questions: What are the determinants of patenting by startup technology companies? And, why don't these companies patent their technologies?