

ARTICLE

INVENTORS, ENTREPRENEURS, AND INTELLECTUAL PROPERTY LAW

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I. INTRODUCTION

This Article asks whether intellectual property (IP) law should favor small innovative firms. I was motivated to analyze this question by three observations.

1. Small innovative firms make crucial contributions to technological progress and economic growth. Josh Lerner surveyed the literature on firm size and research & development (R&D) and concluded: “One of the relatively few empirical regularities . . . is the critical role . . . of entrants—typically de novo start-ups—in emerging industries.”¹ For example, small firms pioneered biotechnology and the Internet using technology “developed with federal funds at academic institutions and research laboratories.”² Robert M. Hunt and Leonard I. Nakamura found that before 1980, virtually all private R&D in the United States was performed by fewer than 200 very large, established manufacturing corporations.³ But since then, small and new firms have become an important source of R&D. In fact, the growth in the private R&D intensity of the U.S. economy after 1980 is entirely attributable to the growing R&D intensity of relatively small and new firms.⁴
2. American culture loves entrepreneurs. David Packard’s garage, the birthplace of Hewlett-Packard, has been honored as a historic landmark.⁵ Thomas Edison, Alexander Graham Bell, Henry Ford, Steve Jobs, and Bill Gates are featured in popular entertainment.⁶ Likewise, policymakers love

1. Joshua Lerner, *Small Businesses, Innovation, and Public Policy*, in *ARE SMALL FIRMS IMPORTANT? THEIR ROLE AND IMPACT* 159, 160 (Zoltan J. Acs ed., 1999).

2. *Id.*

3. Robert M. Hunt & Leonard I. Nakamura, *The Democratization of U.S. Research and Development after 1980*, at 8–9, fig.2 (Soc’y for Econ. Dynamics, Working Paper No. 121, 2006), available at <http://www.repec.org/sed2006/up.12143.1138646305.pdf>.

4. *Id.* at 9. Hunt & Nakamura also found that, prior to 1980, when new firms entered the market, they were less R&D intensive than established firms in the same industries. After 1980, new entrants were more R&D intensive than established firms in the same industry.

5. National Park Service, National Register of Historic Place Listings (May 11, 2007), <http://www.nps.gov/history/nr/listings/20070511.htm>. For a discussion of the “heroic inventor motif” in U.S. patent law, see Mark D. Janis, *Patent Abolitionism*, 17 *BERKELEY TECH. L.J.* 899, 910–22 (2002).

6. BIOGRAPHY—ALEXANDER GRAHAM BELL (A&E 2005); BIOGRAPHY—HENRY FORD: TIN LIZZY TYCOON (A&E 2006); EDISON: THE WIZARD OF LIGHT (Devine Entertainment 1998); PIRATES OF SILICON VALLEY (Haft Entertainment 1999); THE STORY OF ALEXANDER

entrepreneurs.⁷ Received wisdom holds that small business plays an especially important role in the American economy in terms of job creation, and that entrepreneurs are disproportionately responsible for revolutionary innovations.⁸ Perhaps because of this popular support and received wisdom, small business enjoys special treatment by regulators, tax authorities, and government contractors.⁹

3. Only a few IP law doctrines target small firms for specific benefits; a few other doctrines have a favorable differential impact on small firms.¹⁰ Two examples in the first category are: the Patent and

GRAHAM BELL (20th Century Fox 1939); see also Jane L. Levere, *Gates and Jobs, Together at Last*, N.Y. TIMES, July 11, 2004, § 3, at 2 (describing a musical featuring Bill Gates and Steve Jobs).

7. See Richard J. Pierce, Jr., *Small Is Not Beautiful: The Case Against Special Regulatory Treatment of Small Firms*, 50 ADMIN. L.R. 537, 543, 546 (1998) (stating that “[s]mall businesses are a much more potent special interest group than large businesses,” and discussing the “literally thousands” of statutes and regulations that have the effect of favoring small businesses); George L. Priest, *Small Business, Economic Growth, and the Huffman Conjecture*, 7 J. SMALL & EMERGING BUS. L. 1, 2 (2003) (“In the United States, largely for political and, perhaps, historical reasons, small business has attained a status of veneration as constituting the most basic foundation of growth in the economy.” (footnote omitted)).

8. See Priest, *supra* note 7, at 2.

9. See Pierce, *supra* note 7, at 540–43 (noting that the government subsidizes small business through (1) direct subsidies in the form of government loans; (2) indirect subsidies in the form of preferring small business in the tax system; and (3) indirect subsidies in the form of special treatment of small business); Priest, *supra* note 7, at 2 (“Congress has enacted special programs involving small business finance, simplified securities registration, special forms of tax treatment, and debt relief, among many others.”). Congress passed the Small Business Act in 1953, “whose function was to ‘aid, counsel, assist and protect, insofar as is possible, the interests of small business concerns.’” Small Business Administration: Overview & History, <http://www.sba.gov/aboutsba/history/index.html> (last visited Oct. 25, 2008).

10. There are many definitions of small businesses. Probably the most common are companies with fewer than 100 employees or companies with fewer than 500 employees. See, e.g., Ronald F. Wilson, *Federal Tax Policy: The Political Influence of American Small Business*, 37 S. TEX. L. REV. 15, 28 (1996). Small business has also been defined in terms of assets or sales. See Small Business Administration: What Is Small Business, <http://www.sba.gov/services/contractingopportunities/sizestandardstopics/size/index.html> (last visited Oct. 25, 2008).

The term entrepreneur also has multiple definitions. A common definition states that an entrepreneur is a “person who undertakes or controls a business or enterprise and bears the risk of profit or loss.” THE NEW SHORTER OXFORD ENGLISH DICTIONARY 831 (1993). In the context of a discussion of IP law, it often makes sense to adopt Baumol’s definition, which emphasizes innovation. William J. Baumol, *Entrepreneurial Enterprises, Large Established Firms and Other Components of the Free-Market Growth Machine*, 23 SMALL BUS. ECON. 9, 9 (2004) (defining entrepreneur as “the businessperson who recognizes the value of the invention, determines how to adapt it to the preferences of perspective users and whose tasks include bringing the invention to market and promoting its utilization”).

Trademark Office discount on patent application fees for small firms and other small entities,¹¹ and the copyright provision exempting small establishments using “home-style” music equipment from the public performance right of music copyright owners.¹² In the second category, the doctrine of reverse confusion in trademark law¹³ and the availability of inherent

11. The Patent Office reduces fees paid by small firms and other small entities. “Establishment of small entity status allows the payment of certain reduced patent fees pursuant to 35 U.S.C. 41(h)(1).” 37 C.F.R. § 1.27(b) (2007). Patent application, issue, and maintenance fees are generally cut in half for small entities (any individual, nonprofit corporation, or corporation that qualifies as a small business under the Small Business Act). 37 C.F.R. §§ 1.16, 1.18, 1.127 (2007). A list of fees is available at: United States Patent and Trademark Office FY 2009 Fee Schedule, <http://www.uspto.gov/web/offices/ac/qs/ope/fee2008october02.htm> (last visited Oct. 25, 2008). The fee reductions are about 1–10% of the attorney’s fees paid for preparation of a patent application. For example, a small firm might gain a fee savings of about \$750 and incur prosecution costs of about \$15,000.

12. The Copyright Act confers on music copyright owners the exclusive right to publicly perform their work. 17 U.S.C. § 106(4) (2006). The small business exemption is codified at 17 U.S.C. § 110(5) (2006). Retail stores, bars, restaurants, nightclubs, and others obtain performance licenses so they can lawfully play recorded copyrighted music in their establishments. In 1975, the Supreme Court confirmed a judicially created small business exemption in *Twentieth Century Music Corp. v. Aiken*, 422 U.S. 151, 162–64 (1975). The exemption survived major reform of the Copyright Act in 1976. The legislative history justified the exemption in terms of the difficulty of enforcing the performance right against numerous small businesses. Lydia Pallas Loren, *Paying the Piper*, 3 J. SMALL & EMERGING BUS. L. 231, 236–37 (1999); Peggy H. Luh, *Pay or Don’t Play: Background Music and the Small Business Exemption of Copyright Law*, 16 LOY. L.A. ENT. L.J. 711, 717–18 (1996). ASCAP, BMI, and SESAC, the organizations that administer most music performance licenses, frequently do not bother obtaining licenses from relatively small establishments because of the transaction costs. See Gene M. Grossman & Petros C. Mavroidis, *United States—Section 110(5) of the US Copyright Act, Recourse to Arbitration under Article 25 of the DSU: Would’ve or Should’ve? Impaired Benefits Due to Copyright Infringement*, 2 WORLD TRADE REV. 233, 237 (2003).

13. A trademark indicates the source of a product. Trademark law protects a trademark owner from a competitor who imitates a trademark in a way that confuses consumers about the source of the competitor’s product. *A&H Sportswear, Inc. v. Victoria’s Secret Stores, Inc.*, 237 F.3d 198, 210–11 (3d Cir. 2000). The typical trademark infringement case involves a claim of direct confusion in which a defendant (the “junior” or second user) exploits the goodwill of an established “senior” user by selling products with a trademark so similar to the established company’s trademark that consumers mistakenly believe the junior user’s products come from the senior user. *Id.* For example, a firm that uses Coca Cola on the label of its cola creates direct confusion. Reverse confusion, on the other hand, occurs when a junior user, usually a large company, creates a trademark that is similar to the senior (usually a small business) user’s trademark and generates consumer confusion at the expense of the senior user.

Reverse confusion claims are recognized under section 43(a) of the Lanham Act, regardless of whether a trademark is registered. *Id.* at 227–28; *Fisons Horticulture, Inc. v. Vigoro Indus., Inc.*, 30 F.3d 466, 475 (3d Cir. 1994). Before the 1988 amendment of the Lanham Act it was not clear whether reverse confusion was actionable under the federal trademark statute. 2 GILSON ON TRADEMARKS § 5.01(2)(a) (2008).

Reverse confusion is a relative newcomer to trademark law, and it is intended to protect “smaller senior users . . . against larger, more powerful companies who want to

distinctiveness for certain kinds of trade dress are both intended to benefit small firms.¹⁴ Also, in patent law, the United States maintains first-to-invent priority rules and a one-year grace period to benefit small inventors despite pressure to abolish the grace period and conform to the first-to-file priority rules followed in the rest of the world.¹⁵

In view of the first two observations, I am surprised how little attention IP law pays to small firms in general, and especially to small innovative firms. The most recent example of favoritism arose in 1998 when small business lobbied effectively for the Fairness in Music Licensing Act, the provision creating the performance right exemption.¹⁶ In 1992, the Supreme Court

use identical or confusingly similar trademarks.” *Fisons Horticulture, Inc.*, 30 F.3d at 475; see also *SK & F, Co. v. Premo Pharm. Labs., Inc.*, 625 F.2d 1055, 1067 (3d Cir. 1980) (declaring that public interest favored the adoption of reverse confusion); *Big O Tire Dealers, Inc. v. Goodyear Tire & Rubber Co.*, 561 F.2d 1365, 1372 (10th Cir. 1977) (extending Colorado’s “trademark infringement actions to include reverse confusion situations”).

In a leading case, Goodyear started selling its Big Foot brand tires after a small competitor named Big O had already started using that mark for its own product. *Big O Tire Dealers, Inc.*, 561 F.2d at 1367–68. Consumers were *not* deceived by Goodyear ads into thinking that Goodyear Big Foot tires came from Big O. They might have been confused into thinking that Big O tires came from Goodyear. Although the cause of action is now well established, it remains controversial because it is difficult to see any harm to consumers in many cases, and the doctrine opens the door to opportunistic suits.

14. A general trademark law principle requires that a mark must have the capacity to serve in the marketplace as an indicator of origin. *Two Pesos, Inc. v. Taco Cabana, Inc.*, 505 U.S. 763, 768–69 (1992). In trademark law jargon, the mark must be “distinctive.” Some marks are considered inherently distinctive and therefore eligible for trademark protection as soon as they are created. Other less distinctive marks cannot gain trademark protection until the owner establishes secondary meaning for the mark, usually by showing sufficient advertising and sales of the product in association with the mark. *Id.* at 768–69. The requirement of secondary meaning is applied without regard to the size of the trademark owner, but in effect, it works against small business because it is easier for big business to achieve the required level of advertising and sales. See *id.* at 775. In *Two Pesos*, the Supreme Court aided small business by relaxing the distinctiveness requirement for trade dress protection. See *id.* at 774–76.

15. See 35 U.S.C. § 102(b) (2000). The small inventors’ lobby also obtained an exception to the requirement that patent applications must be published after eighteen months. The exception delays publication until issuance if the patent applicant does not apply for patents abroad. Small businesses are less likely to patent abroad and thus get more benefit from this exception. See Janis, *supra* note 5, at 919.

16. 17 U.S.C. § 110 (2006). Despite intense lobbying by the music industry, bar and restaurant owners successfully defended the exemption in 1998 when Congress fine-tuned the exemption and passed the Fairness in Music Licensing Act (FMLA). *Id.* The Copyright Act exempts all businesses that have less than 2,000 gross square feet excluding parking (the threshold is 3,750 square feet for food and drinking establishments). 17 U.S.C. § 110(5)(B)(i)–(ii) (2006). Furthermore, larger establishments are exempt if they use “home-style” audio performance equipment. 17 U.S.C. § 110(5) (2006).

The small business lobby succeeded in maintaining the exemption in 1998 despite its apparent violation of U.S. treaty obligations under TRIPs. In 2000, a WTO

made a ruling they believed favored small business in the *Two Pesos* trademark case, but just eight years later the Court changed direction in *Wal-Mart* and expressed skepticism about small business favoritism in trademark law.¹⁷ The patent priority rules and the grace period were placed in the statute in a different era when all businesses were small, but in recent years independent inventors have shown some lobbying muscle and so far preserved these provisions.¹⁸ Considering the political clout displayed by small business in other areas of the law,¹⁹ this seems like a meager payoff, especially considering that the

panel ruled that a portion of the exemption, § 110(5)(B), does violate the treaty. Grossman & Mavroidis, *supra* note 12, at 234–35. The United States accepted the finding and negotiated compensation with the European Union. After failing to reach an agreement, the parties moved to binding arbitration. The arbitrators awarded the European Union slightly more than \$1 million per year in compensation. *Id.* at 240. The European music rights owners are not pleased with this outcome and continue to press the United States to abolish the exemption.

17. *Two Pesos, Inc.*, 505 U.S. at 775–76. The Court stated: “[A]dding a secondary meaning requirement could have anticompetitive effects, creating particular burdens on the startup of small companies . . . [and] would present special difficulties for a business . . . that seeks to start a new product in a limited area and then expand into new markets.” *Id.* A few years later, the Supreme Court limited *Two Pesos* by insisting that secondary meaning must always be shown to gain trade dress protection over a product’s design. *Wal-Mart Stores, Inc. v. Samara Bros., Inc.*, 529 U.S. 205, 215–16 (2000). The Court in *Wal-Mart* was concerned about socially harmful trade dress litigation made possible by a low standard of distinctiveness. Commentators have criticized the *Wal-Mart* Court for abandoning the interests of small business. *See, e.g.*, Christina Platt Hillson, Note, *Trade Dress Protection: When a Dress is Just a Dress According to the Supreme Court in Wal-Mart Stores, Inc. v. Samara Brothers*, 53 BAYLOR L. REV. 461, 476 (2001) (“*Wal-Mart* will serve to make it more difficult to make a showing of distinctiveness in product configuration trade dress cases.”); Jeff Resnick, Comment, *Trade Dress Law: The Conflicts Between Product Design and Product Packaging*, 24 WHITTIER L. REV. 253, 288 (2002) (criticizing *Wal-Mart* for harming small business); *cf.* Gary Myers, *Statutory Interpretation, Property Rights, and Boundaries: The Nature and Limits of Protection in Trademark Dilution, Trade Dress, and Product Configuration Cases*, 23 COLUM.-VLA J.L. & ARTS 241, 254 (2000) (“The Supreme Court’s decision [in] *Samara* very likely reached the correct result, though it was probably unnecessary to establish such a bright-line rule.”).

18. The small business lobby has slowed harmonization of patent and copyright law with the laws of our major trading partners. *See* Mark A. Lemley & Colleen V. Chien, *Are the U.S. Patent Priority Rules Really Necessary?*, 54 HASTINGS L.J. 1299, 1304 (2003); Robert W. Pritchard, *The Future is Now—The Case for Patent Harmonization*, 20 N.C. J. INT’L L. & COM. REG. 291, 307, 309–10 (1995); Toshiko Takenaka, *The Best Patent Practice or Mere Compromise? A Review of the Current Draft of the Substantive Patent Law Treaty and a Proposal for a “First-To-Invent” Exception for Domestic Applicants*, 11 TEX. INTELL. PROP. L.J. 259, 348 (2003). *See generally* Donald W. Banner, *Patent Law Harmonization 1* U. BALT. INTELL. PROP. L.J. 9 (1992) (describing the history and probable future of patent law harmonization).

19. Mark Janis lists a number of instances where the small inventor has been concretely favored in proposed and enacted patent law. Janis, *supra* note 5, at 918 n.79. He does not make the comparison that I do to the success of small business in other areas of the law, and so I am not sure whether or not he would agree with my assessment.

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instances of trademark and copyright favoritism offer little advantage to high-tech firms.

I am not sure why small business concerns have not had more influence on IP law. Perhaps the sentiment prevailing in antitrust law spilled over into IP law. American antitrust law has reached a near consensus that small firms get no special treatment under a law designed to protect competition, not competitors.²⁰ In contrast, European competition law regulators are more likely to protect small business, and European patent policymakers openly fret about how to reform their patent law to promote small business.²¹

Regardless, my concern in this Article is mostly with the normative question: Should IP law favor small firms or give them any special attention? I will limit my discussion mainly to features of the law that are especially important to research intensive firms. My analysis distinguishes invention in small firms from innovation by small firms. I argue that IP law should do little to aid small firms as inventors, but possibly some favoritism toward small firms as innovators is appropriate. I lack the necessary empirical evidence to make a solid case for any sort of favoritism, but there are some good arguments for using IP law, not antitrust law, to protect small, high-tech firms from opportunistic and anticompetitive IP lawsuits. In contrast, I find little reason to put a thumb on the scale in favor of small firms when considering patent reform.

I assess favoritism in terms of traditional notions of economic efficiency. Thus, I will not consider arguments about distribution, localism, or democracy that might support intervention on behalf of small firms. None of these arguments seem especially strong in this context.

Efficiency arguments for special treatment are built from claims that market frictions have a differential effect on small innovative firms and that these frictions can be eased by designing proper IP policy. In other words, optimal policy can level the playing field. I will consider whether the playing field needs leveling because of technology market, capital market, and

20. See KEITH N. HYLTON, *ANTITRUST LAW: ECONOMIC THEORY & COMMON LAW EVOLUTION* 40–42 (2003) (“Important modern cases . . . have clearly placed the consumer welfare goal ahead of the atomism goal.”).

21. George Stephanov Georgiev, *Contagious Efficiency: The Growing Reliance on U.S.-Style Antitrust Settlements in EU Law*, 2007 UTAH L. REV. 971, 979–80 (noting the difference between European and American concern for small business within competition law).

labor market frictions, or because of strategic dangers created by anticompetitive use of IP.

One must be careful to recognize that large firms often enjoy advantages because of economies of scale and scope, and from the knowledge the firm has accumulated through previous R&D. These are not frictions that should be overcome. An argument for special attention to small firms only makes sense when they are “naturally” better at inventing or innovating and would dominate those activities but for the frictions. Economic histories of technology usually contend that from roughly 1880 to 1980, American R&D moved steadily away from independent inventors and small firms into big-firm R&D labs because of scale and scope effects and the importance of tacit knowledge.²²

A tentative case for favoritism must overcome the usual arguments against fine-tuning the law. Tailored laws tend to be more costly to write and administer, generate unforeseen harms, and exacerbate problems of rent-seeking. Some of the examples of favoritism mentioned above have performed poorly. Favoritism in trade dress law facilitates opportunistic and anticompetitive trademark lawsuits. The first-to-invent priority rule apparently does nothing to help small inventors, though it is costly and does benefit the patent bar.²³ Much of the small business lobbying on IP issues probably promotes the interests of the IP bar more effectively than the interests of entrepreneurs.

II. INVENTION, INNOVATION, AND ENTREPRENEURSHIP

Clear definitions are the first step toward a better understanding of the relationship between IP law, invention, and entrepreneurship. Economists often distinguish between

22. See Hunt & Nakamura, *supra* note 3, at 1, 19 (explaining that large economic participants dominated R&D until 1980 because there were barriers to entry such as large investment costs).

23. See Lemley & Chien, *supra* note 18, at 1332 (looking at the U.S. Patent and Trademark Office interference proceedings over the first-to-invent doctrine to decide whether small inventors are disproportionately benefited by the doctrine, and finding that although the evidence is apparently mixed, ultimately the doctrine does not particularly benefit small inventors (citing Gerald J. Mossinghoff, *The First-to-Invent System Has Provided No Advantage to Small Entities*, 87 J. PAT. & TRADEMARK OFF. SOC'Y 514 (2005) (generally finding same, but also finding that small entities were advantaged in certain circumstances)); Lerner, *supra* note 1, at 165–66 (arguing that interferences are complicated and expensive and the first-to-file rule is unlikely to benefit small inventors, and that the patent bar has been a powerful lobby working to preserve the current priority system); Bryan J. Massey, Comment, *Reasonable Royalties for 18-Month Patent Publication Infringement: An Unreasonable Remedy for Small Businesses*, 8 J. SMALL & EMERGING BUS. L. 87, 99–100 (2004) (arguing that provisional applications are relatively expensive and not that helpful to small businesses).

invention and innovation. Invention refers to a technical achievement, and innovation refers to development and commercialization of an invention.²⁴ Entrepreneur has three different meanings in economics. The broadest definition, which is often used in empirical work, is a nonfarm, self-employed worker.²⁵ More commonly, an entrepreneur is defined as a person responsible for finding a new business opportunity and establishing a new business to profit from that opportunity.²⁶ The narrower definition that I generally use in this Article modifies the common definition by requiring the new business to implement new technology.²⁷ Thus, an entrepreneur is an innovator; an entrepreneur starts a new business to commercialize an invention.

IP policy should be formulated in a way that recognizes invention and innovation are distinct; they are often done by different people in different organizations, separated by great time and distance.²⁸ Invention and innovation are sometimes entangled because innovation often uncovers new technical problems and suggests inventions that improve the technology that is the subject of the innovation. Entrepreneurs often engage in some inventive activity, but it is misleading to collapse the notion of inventor and innovator.²⁹ For example, Jobs and Wozniak at Apple, and Gates at Microsoft are great innovators,

24. For a careful discussion of the distinction between invention and innovation and a description of commercialization activities, see F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 707–09 (2001) (distinguishing between an invention and what happens “before it can be profitably exploited”).

25. See, e.g., Simon Parker, *Law and the Economics of Entrepreneurship*, 28 COMP. LAB. L. & POL’Y J. 695, 700–01 (2007).

26. See, e.g., M.B. Neace, *Entrepreneurs in Emerging Economies: Creating Trust, Social Capital, and Civil Society*, 565 ANNALS AM. ACAD. POL. & SOC. SCI. 148, 151 (1999).

27. See WILLIAM J. BAUMOL, *THE FREE-MARKET INNOVATION MACHINE: ANALYZING THE GROWTH MIRACLE OF CAPITALISM* 57 (2002) (defining entrepreneur as a “bold and imaginative deviator from established business patterns and practices, who constantly seeks the opportunity to introduce new products and new procedures, to invade new markets, and to create new organizational forms”).

28. Edmund Kitch documents the fact that significant time passed before many famous inventions were commercialized. See Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 271 (1977).

29. Entrepreneurs who launch successful innovative firms are usually not technical experts, let alone outstanding inventors; instead, they tend to be generalists. See Edward P. Lazear, *Balanced Skills and Entrepreneurship*, 94 AMER. ECON. REV. 208, 208 (2004) (finding that entrepreneurs are “jacks-of-all-trades”); Edward P. Lazear, *Entrepreneurship* 4 (Nat’l Bureau of Econ. Research, Working Paper No. 9109, 2002), available at <http://www.nber.org/papers/w9109> (showing data that Stanford MBAs who became entrepreneurs took a more diverse set of classes in business school and had more varied job experience).

but perhaps not great inventors. Bell and Edison, on the other hand, were both great inventors and innovators.

Inventors, especially independent inventors, are often credited with the leading role in innovation and economic growth;³⁰ they are certainly important, but their importance is probably overstated. William J. Baumol emphasizes that historians have documented tremendous inventive activity in ancient Rome and in medieval China, but failure to commercialize those inventions meant they made no significant contribution to economic growth in those economies.³¹ Economic growth is fueled by innovation rather than invention, and modern capitalism has succeeded because it fosters innovation.³² Some innovation is accomplished by entrepreneurs, but most is accomplished by large firms.³³

Many people argue that small innovators are more productive than their larger counterparts and, therefore, good policy should promote small research intensive firms. There is evidence to support the predicate that small-firm R&D is more productive,³⁴ but, on the whole, the evidence is not so clear.³⁵ It is hard to perform clean comparisons because small firms and big firms are likely to settle into different niches. For example, Paul Almeida finds small semiconductor firms get relatively more important patents in less crowded fields and large firms get relatively more important patents in crowded fields of technology.³⁶ Also, much of the literature combines inventive and

30. For a lone inventor discussion see, for example, Catherine L. Fisk, *Removing the 'Fuel of Interest' from the 'Fire of Genius': Law and the Employee-Inventor, 1830-1930*, 65 U. CHI. L. REV. 1127, 1139-42 (1998) and Janis, *supra* note 5, at 910-22.

31. BAUMOL, *supra* note 27, at 266-67.

32. *Id.*

33. See Baumol, *supra* note 10, at 10 (“[Seventy] percent of R&D expenditure in the U.S. is carried out by private business, and most of this is provided by larger firms.”).

34. See Zoltan J. Acs & David B. Audretsch, *Innovation in Large and Small Firms: An Empirical Analysis*, 78 AM. ECON. REV. 678, 687 (1988) (“[T]he greater extent to which an industry is composed of large firms, the greater will be the innovative activity, but . . . increased innovative activity will tend to emanate more from the small firms than from the large firms.”); John Bound et al., *Who Does R & D and Who Patents?*, in R & D, PATENTS, AND PRODUCTIVITY 21, 51 (Zvi Griliches ed., 1984) (finding “a higher output of patents per R & D dollar for smaller firms”); Charles P. Himmelberg & Bruce C. Petersen, *R & D and Internal Finance: A Panel Study of Small Firms in High-Tech Industries*, 76 REV. ECON. & STAT. 38, 49 (1994) (finding that small firms account for a statistically significant percent of technological innovations in the year and industries analyzed).

35. See Pierce, *supra* note 7, at 551-52 (observing that numerous studies regarding innovation and small business are inconclusive); cf. Jonathan M. Barnett, *Private Protection of Patentable Goods*, 25 CARDOZO L. REV. 1251, 1288-89 (discussing evidence showing small firms are more innovative and concluding they probably are, though the evidence is mixed).

36. Paul Almeida, *Semiconductor Startups and the Exploration of New*

innovative activity, so we do not have a clear picture of relative productivity in the separate activities.

I have already mentioned that on theoretical grounds large firms should be more productive at invention because of economies of scale and scope and their stock of tacit research knowledge.³⁷ They should be more productive at innovation for similar reasons and because of the complementary assets they control. Other theories point in the opposite direction and suggest small inventors and innovators are likely to be more productive.³⁸ One argument suggests entrepreneurs have much stronger incentives (perhaps including stronger nonpecuniary rewards) than employees in large firms.³⁹ Inventors at small firms are likely to receive a larger share of the profits from their inventions than do the R&D employees of large firms.⁴⁰ As long as the independent inventor or small firm can realize comparable profits (which is not necessarily true), then this means the rewards for success will be greater for small inventors. Greater rewards mean greater effort, all else being equal, and thus possibly resulting in better quality innovations or a greater likelihood of success.

Second, large, incumbent firms might be slow to develop innovations that threaten to “cannibalize” existing markets. Industry entrants and outsiders are not concerned about displacing existing product lines and thus have stronger incentives to develop technologies that replace older technologies. The theoretical literature that has developed this point is inconclusive, though, because in some cases incumbent firms will

Technological Territory, in ARE SMALL FIRMS IMPORTANT? THEIR ROLE AND IMPACT, *supra* note 1, at 39, 41–42.

37. See F.M. Scherer, *Economies of Scale and Industrial Concentration*, in INDUSTRIAL CONCENTRATION: THE NEW LEARNING 16, 48 (Harvey J. Goldschmid, H. Michael Mann & J. Fred Weston eds., 1974) (describing the controversial view that large, monopolistic firms are best at innovation). Large firms enjoy economies of scale created by the need for specialized staff and equipment. Further, they can diversify their pool of research projects and diminish the effect of risks that could ruin a small company. On the other hand, large organizations may be sluggish and risk averse. “Whether large firms are in fact superior or inferior innovators depends upon how these various characteristics balance out, and that is basically an empirical question.” *Id.*

38. See *supra* note 34 and accompanying text.

39. See David G. Blanchflower & Andrew J. Oswald, *What Makes an Entrepreneur?*, 16 J. LAB. ECON. 26, 46–47, 51 (1998) (illustrating through statistical data that entrepreneurs are happier and enjoy greater utility than regular workers).

40. Cf. Scherer, *supra* note 37, at 48 (“Large organizations are not always renowned for their speed in recognizing good ideas, and this sluggishness may drive the most ambitious creative individuals into smaller firms, where their proposals have a better chance of receiving personal consideration by the top decision-maker.”).

innovate first to “preempt” innovation by potential entrants.⁴¹ Either way, the existence of potential entrants spurs innovation.⁴²

Third, even if the quality of innovations from small inventors is no different than the quality of large-company innovations on average, there might be an important advantage to having diverse sorts of innovators with different experience or technical knowledge. Breakthrough innovations are sometimes realized as combinations of previously known techniques.⁴³ In these cases, the probability of a breakthrough will increase with the diversity of potential innovators. Often, historical accident plays an important role in the origins of this diverse technical knowledge so that even a large, multiproduct firm cannot necessarily count on having experience with all the technologies needed to make a breakthrough. Theoretical models have shown that such “innovative complementarities” can dramatically increase the rate of innovation,⁴⁴ much as biodiversity can increase the rate of biological evolution. Michael Gort and Steven Klepper find that industries are often most innovative when many firms enter the industry.⁴⁵ In these cases, small inventors might add a critical element of technological diversity to the pool of potential innovators attacking a problem. This might then lead to breakthroughs.

Economists have long recognized that many small, innovative firms face challenges commercializing their technology. Entrepreneurship is costly and risky.⁴⁶ The failure

41. Barnett, *supra* note 35, at 1292 (explaining preemptive patenting and publication as occurring when “a monopolist [elects] to develop the drastic innovation prior to any challenger, patent it or publish it (so as to prevent its being patented by competitors), and then suppress or postpone the innovation’s market introduction”).

42. See Almeida, *supra* note 36, at 40 (noting conventional explanation that large firms are less productive in R&D because inflexibility discourages radical innovation); see also Barnett, *supra* note 35, at 1290–98 (presenting three theoretical arguments that large firms are less innovative because: (1) large firms are loathe to replace current products with new products; (2) managers in large firms are more cautious; and (3) large firms are sluggish because of bureaucratic routines).

43. See CLAYTON M. CHRISTENSEN, *THE INNOVATOR’S DILEMMA: WHEN NEW TECHNOLOGIES CAUSE GREAT FIRMS TO FAIL* 45 (1997) (contending that new entrants who launched disruptive technologies usually included “frustrated engineers from established firms”).

44. James Bessen & Eric Maskin, *Sequential Innovation, Patents, and Imitation* 5 (MIT Dep’t of Econ., Working Paper No. 00–01, 2006), available at www.sss.ias.edu/publications/papers/econpaper25.pdf.

45. Michael Gort & Steven Klepper, *Time Paths in the Diffusion of Product Innovations*, 92 *ECON. J.* 630, 651 (1982).

46. Rajshree Agarwal & Michael Gort, *Firm and Product Life Cycles and Firm Survival*, 92 *AM. ECON. REV.* 184, 189 (2002) (computing the likelihood of firm survival in terms of “hazard rates” and concluding that small firm size has a “positive relation to

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rate of innovations given technical success is high, and the cost of innovation typically far exceeds the cost of invention. High-tech entrepreneurs are often hobbled by capital market constraints,⁴⁷ strategic threats from incumbent firms, and limited access to assets that are complementary to new technology like a marketing infrastructure. Despite these frictions, which I will discuss in detail below, the supply of entrepreneurs in the American economy is abundant, and one goal of IP policy should be to guide these entrepreneurs into productive, innovative activities.⁴⁸

The value of policy interventions that help high-tech entrepreneurs may be greater today than it would have been in the last century. Hunt & Nakamura present evidence that the introduction of the personal computer spurred innovation by small American firms after 1980. They contend that computerization reduces the fixed marketing costs invested by firms *after* they innovate.⁴⁹ Scale economies associated with marketing are one of the main factors disadvantaging small, innovative firms. Computers and the Internet cut marketing costs and improved the ability of small firms to compete. This in turn improved their return to R&D.

III. A FRAMEWORK FOR ASSESSING POLICY EFFECTS ON LARGE AND SMALL FIRMS

Policy assessment of small business favoritism starts by noting who is disfavored. My interest is with policies that arguably favor (or disfavor) small firms at the expense of big firms that they potentially compete against. Thus, I am not interested in the Fairness in Music Licensing Act, which favors small firm music users at the expense of music composition copyright owners.⁵⁰ Instead, I am interested, for example, in trade secret policy that affects employee mobility and the ease of starting a high-tech firm and in patent priority rules that influence the probability that a small firm will win a patent race. Policies that expand or contract IP laws can have a differential

hazard rates”).

47. David S. Evans & Linda S. Leighton, *Some Empirical Aspects of Entrepreneurship*, 79 AM. ECON. REV. 519, 520 (1989) (analyzing the process of selection into self-employment and finding evidence supporting the notion that entrepreneurs face liquidity constraints).

48. See BAUMOL, *supra* note 27, at 59–62 (characterizing entrepreneurship as an input that can be guided into innovation or into rent-seeking depending on the law and other institutional factors).

49. Hunt & Nakamura, *supra* note 3, at 4, 14.

50. See *supra* note 16 and accompanying text.

impact on big and small firms and, therefore, can be thought to favor one or the other. Scholars have asked whether strong copyright protection, especially in the digital world, encourages vertical integration in entertainment industries.⁵¹ Meanwhile, scholars often suggest the opposite is true about patent law. Many have argued that strong patent rights have fostered vertical disintegration of R&D, especially in the pharmaceutical industry.⁵² But in the software industry, small businesses, especially in Europe, have lobbied against stronger software patents.⁵³

Recent discussions of patent reform emphasize the disparate interests of the pharmaceutical and biotechnology industries on one side, and the information and communication technology industries on the other. Some of the discussion also notes tension between small inventors and big information and communications technology firms.⁵⁴ How should legal scholars assess patent and other IP policy that has a differential effect on different industries or different types of firms?

A useful, but incomplete, method calls for analysis of the total effect of policy change on inventive or innovative output, or both. A particular change that helps one group of firms may hurt

51. See Bradford L. Smith & Susan O. Mann, *Innovation and Intellectual Property Protection in the Software Industry: An Emerging Role for Patents?*, 71 U. CHI. L. REV. 241, 246 (2004) (noting that in 1964, dissenting in the National Commission on New Technological Uses of Copyrighted Works, Commissioner Hersey expressed concern that extending copyright protection to software would entrench a small number of dominant firms).

52. Supporters of big pharmaceutical firms sometimes complained about gene patents that lacked utility and should not have been granted. Supporters of biotech startups usually took the opposite position. Big firms resorted to self help by undertaking what has been called the “strategy of the commons.” They funded public disclosure of human gene sequences to forestall patenting by universities and small firms. Robert P. Merges, *A New Dynamism in the Public Domain*, 71 U. CHI. L. REV. 183, 188–90 (2004). “According to one estimate, [Merck] spent several million dollars to preempt the threat that patents would stall research projects that depended on gene sequence data.” *Id.* at 188. Ten major pharmaceuticals formed the SNP Consortium, “intent on preempting the emerging anti-commons problem.” *Id.* at 190.

53. Alfonso Gambardella, Paola Giuri & Alessandra Luzzi, *The Market for Patents in Europe*, 36 RES. POLY 1163, 1165–68 (2007) (discussing negative impact on small software firms where strong patents disincentivize licensing, withholding complementary assets necessary for innovation).

54. The clash between big firms and small inventors was evident in the previous decade, as demonstrated by the debate over then-pending legislation, which would have forced publication of pending patent applications eighteen months after the filing, rather than retaining secrecy until patent issuance. See generally John F. Duffy et al., *Early Patent Publication: A Boon or Bane? A Discussion on the Legal and Economic Effects of Publishing Patent Applications After 18 Months of Filing*, 16 CARDOZO ARTS & ENT. L.J. 601, 604 (1998) (“[T]he early publication proposal is interesting because it exposes a growing fault line in the patent community between large corporations, which generally support the proposal, and small inventors, who tend to oppose it.” (footnote omitted)).

another. In theory, one can determine whether the expected total dollar value of R&D goes up or down in response to the policy change. Even if such a calculation cannot be done with any precision, thinking about how the calculation should be performed is useful.

Three ingredients are required for this recipe. The first is easy to obtain: the fraction of total R&D spending by each of the two groups. The second is a measure of the productivity of R&D spending by each group. And the third is an estimate of how much the policy change increases or decreases R&D spending by each group. With these values in hand, the analyst multiplies the three numbers together for each group, adds the products, and considers the final sum.

To be more concrete, we could evaluate the total effect on R&D of expansion of the set of software inventions that are patentable subject matter. The first step would be to measure total software R&D and the amounts done by large and small firms. We would find that large firms do most software R&D. But the interests of small firms could still matter quite a bit if they are significantly more productive in the sense that they generate more invention or innovation per R&D dollar, or in the sense that they generate higher quality output. There is much controversy about whether software patent expansion was good or bad for R&D incentives, especially for small firms. An interesting possibility is that greater patentability increased R&D spending by small firms and reduced it by big firms. A critic of the expansion would want to emphasize the large fraction of R&D spent by large firms, as well as the negative effect of the reform on the incentives of large firms.⁵⁵ A defender would emphasize

55. Large firms hold many more patents and are more likely to maintain them. Kimberly A. Moore, *Worthless Patents* 22–23 (George Mason U. Sch. of Law Working Paper Series, Paper No. 27, 2005), available at <http://www.law.bepress.com/cgi/viewcontent.cgi?article=1025&context=gmulwps>. Large firms own approximately 71% of patents. See John R. Allison & Mark A. Lemley, *Who's Patenting What? An Empirical Exploration of Patent Prosecution*, 53 VAND. L. REV. 2099, 2128 (2000) (reviewing sample of 1,000 patents issued during 1996–1998 and finding that 70.7% of the patents were issued to large entities and 29.3% to small entities, of which 17.5% were individuals, 1.1% were nonprofits, and 10.7% were small businesses). But see Scott Erickson, *Patent Law and New Product Development: Does Priority Claim Basis Make a Difference?*, 36 AM. BUS. L.J. 327, 336–37 (1999) (“The [U.S. Patent & Trademark Office] tracks only statistics on the number of individual inventors, not on small entities, *per se*. However, an examination of more than 1,300 inventors listed in the May 27, 1997 *Official Gazette of the USPTO* showed a full 50 percent of domestic patentees came from entities with one thousand employees or less, or from the nonprofit sector.” (citation omitted)).

Likewise, the value of large firm innovation is great. See BAUMOL, *supra* note 27, at 30–34 (implying routinized corporate innovation probably has greater social value than entrepreneurial innovation, but both are certainly important); see also

the greater productivity of small firms (if it can be proven) and the positive effect of expansion on their R&D incentives.⁵⁶

The econometric evidence is not rich enough to perform this sort of calculation with much precision, but perhaps that day is not too far off. Here is some of what we know.

While computerization spurred small innovative firms, the appearance of software patents may have slowed them down. James Bessen and Robert M. Hunt found that the number of software patents grew dramatically as subject matter restrictions on software patenting fell away.⁵⁷ “Critics of the increased patentability of software have argued that these legal changes will stifle innovation and competition by holding up the development of technology that builds on patented prior art and swamping inventors in patent infringement suits.”⁵⁸ Firms in the software industry acquired relatively few patents, however; instead, most were obtained by firms in electronics and computer industries known for stockpiling large arsenals of patents to use as bargaining chips.⁵⁹ Moreover, the firms that acquired relatively more software patents tended to actually reduce their level of R&D spending relative to sales.⁶⁰

Bronwyn H. Hall and Megan MacGarvie obtained mixed results on the value of software patents.⁶¹ They analyzed the stock market response to important court decisions concerning software patents and did a cross-sectional analysis of the relationship between firms’ stock market value and their holdings of software patents. They found the extension of patentability to software was initially negative for software

CHRISTENSEN, *supra* note 43, at xv (“[R]arely have even the most radically difficult sustaining technologies precipitated the failure of leading firms.”); *id.* at 13 (determining case study of the disk drive industry showed that “[t]he established firms were the leading innovators not just in developing risky, complex, and expensive component technologies . . . but in *literally every other one of the sustaining innovations in the industry’s history*”); *id.* at 97 (finding little evidence that bad management or the “not invented here” syndrome explained why established firms failed to adopt disruptive technologies).

56. When this method is applied across industries, it is important to adjust for differences in the social value of innovations across industries as well as differences in the productivity of R&D investment.

57. James Bessen & Robert M. Hunt, *An Empirical Look at Software Patents*, 16 J. ECON. & MGMT. STRATEGY 157, 181 (2007).

58. Iain M. Cockburn & Megan J. MacGarvie, *Entry, Exit and Patenting in the Software Industry 1* (Nat’l Bureau of Econ. Research, Working Paper No. 12563, 2006), available at <http://www.nber.org/papers/w12563>.

59. Bessen & Hunt, *supra* note 57, at 162.

60. *Id.* at 163, 168.

61. Bronwyn H. Hall & Megan MacGarvie, *The Private Value of Software Patents* 30–32 (Nat’l Bureau of Econ. Research, Working Paper No. 12195, 2006).

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firms, especially for those producing application software or services.⁶² They also found that software patents are positively and significantly associated with Tobin's Q and that the market's valuation of software patents increased following changes in the U.S. Patent Office's treatment of software patents in 1995.⁶³

Iain M. Cockburn and MacGarvie assessed the effect of software patents on entry and exit of firms from software markets. They found that patents have a mixture of effects on entry. After controlling for firm and market characteristics, including market fixed effects, they found firms are less likely to enter product classes in which there are more software patents, more potential licensors, or more ambiguous property rights.⁶⁴ They found that the "stifling" effects of software patents increased following changes in the patentability of software, and that these stifling effects were greatest for small, young firms.⁶⁵ However, all else equal, firms that hold software patents related to the market are more likely to enter these markets, suggesting that the decision to invest in IP depends on the contours of the patent landscape in specific markets.

The picture that emerges from this empirical research is not clear. I read it to suggest that expanding the patentability of software inventions decreased innovation by large firms, while the effect on small firms is not clear. Furthermore, the relative importance of small firm software innovation is unknown. Assuming one can make a convincing case that relaxing software patent subject matter restrictions actually increased R&D output, there are still other relevant policy considerations (that apply to other sorts of small firm IP favoritism as well).

First, the social cost to consumers of more patents must be evaluated. Second, patents may protect the crown jewel held by a high-tech startup, but they also increase the rents dissipated in opportunistic and anticompetitive IP lawsuits. A significant number of small inventors have manipulated the patent system to extract undeserved patent royalties from genuine innovators. The patent term was adjusted in the mid-1990s to discourage the practice of submarine patenting, whereby patent applicants delay their patent application until potential defendants are locked into the patented technology.⁶⁶ Publication of patent

62. *Id.* at 25.

63. *Id.* at 28.

64. Cockburn & MacGarvie, *supra* note 58, at 31–32.

65. *Id.* at 2–3, 14, 20–21.

66. See Robert J. Girouard, *U.S. Trade Policy and the Japanese Patent System* 7 n.16 (Berkeley Roundtable on the Int'l Econ. Working Paper Series, Paper No. 89, 1996)

applications was also justified in part as a means of reducing the threat from submarine patents. More recently, the Federal Circuit fashioned the doctrine of prosecution laches to discourage abusive patent prosecution practices.⁶⁷ Nevertheless, the decline of the public notice function of patents and the expansion of patentable subject matter to include business methods and software have contributed to the success of “patent trolls”—parties who obtain patent royalties based on weak or frivolous infringement claims.⁶⁸

Third, a variety of tax,⁶⁹ contract, and grant policies can be used to promote entrepreneurship.⁷⁰ One government innovation program that some economists see as very successful is the Advanced Technology Program (ATP) of the National Institute of Standards and Technology, which provides subsidies to firms to develop promising new technologies.⁷¹ The private sector has recently shown some interest in using prizes (or patent buyouts) to stimulate R&D, and some policymakers are calling for their use to stimulate certain kinds of pharmaceutical research.⁷²

The Small Business Administration (SBA) oversees two programs that subsidize R&D by small firms. These programs

(describing submarine patents as “applications that remain hidden from the public until they are approved by PTO, sometimes decades after they are introduced,” the “most notorious” of which was the application for the patent on the basic microprocessor).

67. *Symbol Techs., Inc. v. Lemelson Med.*, 277 F.3d 1361, 1365–66 (Fed. Cir. 2002) (holding that, *inter alia*, the defense of laches in patent prosecution cases was neither limited to interference actions nor abrogated by passage of the 1952 Patent Act).

68. *See InternetAd Sys., LLC v. Opodo Ltd.*, 481 F. Supp. 2d 596, 601 (N.D. Tex. 2007) (describing a “patent troll” as a company that “enforces patent rights against accused infringers in an attempt to collect licensing fees, but does not manufacture products or supply services based on the patents in question” (citation omitted)).

69. Feld described at least two ways the federal tax system favors small businesses: the corporate tax is progressive and businesses can write off the cost of equipment up to a relatively low total dollar limit. ALAN FELD, TAX POLICY AND CORPORATE CONCENTRATION 30–31, 49 (1982); *see also* Eric Toder, *Does the Federal Income Tax Favor Small Business?*, 2007 NAT’L TAX ASS’N ANN. CONF. ON TAX’N, available at <http://www.urban.org/url.cfm?ID=411606>. Economists have estimated that it costs \$5 billion annually to subsidize small business. *See* Wilson, *supra* note 10, at 68. On the other hand, when considering legislation that affects small business exclusively, there is some evidence that the amount spent is insignificant. *Id.*

70. The federal income tax subsidizes entrepreneurship by individuals because of the deductibility of business losses. *See* Leandra Lederman, *The Entrepreneurship Effect: An Accidental Externality in the Federal Income Tax*, 65 OHIO ST. L.J. 1401, 1411 (2004); Julie Berry Cullen & Roger H. Gordon, *Taxes and Entrepreneurial Activity: Theory and Evidence for the U.S.* 1 (Nat’l Bureau of Econ. Research, Working Paper No. 9015, 2002), available at <http://www.nber.org/papers/w9015> (noting the incentive to open up a business to avoid taxes).

71. 15 C.F.R. § 295.1 (2008).

72. Michael Kremer, *Patent Buyouts: A Mechanism for Encouraging Innovation*, 113 Q.J. ECON., 1137, 1163 (1998).

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support the complementary goals of encouraging R&D within small firms and encouraging transfer of R&D from nonprofit laboratories to small firms. The Small Business Innovation Research Program (SBIR) sets aside “a specific percentage of federal R&D funds for small business SBIR funds the critical startup and development stages and it encourages the commercialization of the technology, product, or service”⁷³ The Small Business Technology Transfer Program (STTR) provides federal funds to support the transfer of technology from nonprofit research organizations to small businesses.⁷⁴ The SBIR and STTR programs are open to any for-profit company that is American-owned and independently operated. The principal researcher must be employed by the company, and the company size is limited to 500 employees.⁷⁵ IP favoritism must be justified through comparison to these alternatives.⁷⁶

IV. FRICTIONS THAT ESPECIALLY HARM ENTREPRENEURS

The case for favoritism should be strongest when there is a market failure that hurts small firms more than big firms. I consider problems in technology, financial, and labor markets, and also the threat of anticompetitive behavior by incumbent IP owners.

A. *Technology Markets*

Scholars and business people frequently comment on problems that afflict the markets for technology and IP licenses. These markets often function poorly because the quality of technology and IP varies enormously and is hard to assess. These problems are aggravated by uncertain law, especially in the case of patent law, where uncertainty exists about the boundaries of the property right. They are further aggravated by the difficulty of writing complete contracts and monitoring the performance of the parties.

73. SBA, Description of the Small Business Innovation Research Program (SBIR), <http://www.sba.gov/SBIR/indexsbir-sttr.html> (last visited Oct. 25, 2008).

74. *See id.*

75. *Id.*

76. No doubt, these alternatives come with various offsetting social costs. Procurement programs tend to reflect the idiosyncratic needs of government agencies, especially the military, rather than the needs of society at large. Direct subsidy programs, such as the ATP, might have difficulty “picking the winners” because government agencies might lack knowledge about the technology that private firms have. Tax credits reward low-quality R&D (and, to some extent, other activities relabeled “R&D”) as well as high-quality R&D. In addition, tax credits are of limited value to cash-strapped small inventors.

Independent inventors benefit from policies that make these markets work better because they will be able to sell their patents and technology more easily. Entrepreneurs get a reciprocal benefit when they enter technology markets as buyers.⁷⁷ Of course, big firms also benefit from better technology markets, but it might be that small firms benefit more because big firms are more likely to integrate invention and innovation, and thus be less dependent on technology markets.

Improving the performance of technology markets is a daunting challenge. The informational problems are great and solutions are few. The leading policy recommendation is quite simply to make patents and copyrights easy to evaluate and enforce by making patent and copyright law clear.⁷⁸ These goals are hard to argue with. My only noteworthy comment is that small firms often push these goals more vigorously than others because of the greater relative benefits they perceive from more efficient technology markets.

The main controversy relating to technology markets is whether market incentives are important in promoting the commercialization of university inventions.⁷⁹ University inventions are often quite basic and distant from the marketplace. Jerry G. Thursby and Marie C. Thursby find that “only 12% [were] ‘ready for practical use.’”⁸⁰ Because these inventions require substantial additional technical development, they may be particularly well suited for licensing to firms with experience and resources for commercial development.⁸¹

Many commentators have credited the Bayh–Dole Act with encouraging university patenting and improving technology transfer from universities to the private sector.⁸² The Act

77. See *infra* Part IV.C (providing some evidence that entrepreneurs often develop technology that they have obtained outside of their firm).

78. 153 CONG. REC. S15,899 (daily ed. Dec. 18, 2007) (statement of Sen. Hatch) (“The courts have struggled valiantly to interpret the law in ways that make sense in light of change[,] but that piecemeal process has left many areas unclear and some areas of the law out of balance. So action by the Congress is needed, and needed urgently.”).

79. See KEITH EUGENE MASKUS, *INTELLECTUAL PROPERTY RIGHTS IN THE GLOBAL ECONOMY 202* (2000) (arguing that such incentives encourage university inventors to “focus on inventions with marketable applications”).

80. Jerry G. Thursby & Marie C. Thursby, *Enhanced University Licensing and the Bayh–Dole Act*, 301 *SCIENCE* 1052, 1052 (2003).

81. See *id.* (stating licensing may be needed when further development is required); see also Joshua A. Newberg & Richard L. Dunn, *Keeping Secrets in the Campus Lab: Law, Values and Rules of Engagement for Industry–University R&D Partnerships*, 39 *AM. BUS. L.J.* 187, 201 (2002) (“Technology licensing is the most common and straightforward type of industry–university research collaboration.”).

82. As Joshua A. Newberg and Richard L. Dunn state:

Another widespread form of industry–university collaboration is the spin-off

encourages universities to patent inventions made using federal funds and to license those inventions for commercial development.⁸³ There are also many skeptics who contend that the increase in university patenting since Bayh–Dole would have occurred with or without the Act.⁸⁴ Interestingly, proponents make the case that “[t]he act was introduced to stimulate entrepreneurship, increase the nation’s productivity and to compete more successfully with countries whose economies were healthier at that time, such as Japan.”⁸⁵ The original version of the statute limited patent licenses to small firms, but this favoritism was eliminated after a couple of years when licensing restrictions were removed.

The Bayh–Dole Act and the Stevenson–Wydler Act⁸⁶ (which applies to technology transfers from the government) address idiosyncratic problems that arise because the inventors are in the government or not-for-profit sector. Reforms that address systemic problems with technology markets are difficult to fashion. I will return to this issue in Part V in my discussion of patent reform.

B. *Financial Markets*

Capital market imperfections are the most nettlesome problem facing potential entrepreneurs.⁸⁷ They have trouble

company Some institutions have adopted policies to encourage faculty members to establish spin-off companies based on their research efforts. Professors at Carnegie–Mellon University, for example, are allowed to retain their university offices and make limited use of university facilities during the start-up phase of their spin-off companies. Other universities encourage spin-offs by agreeing to defer licensing royalties or to accept equity in lieu of royalties.

Newberg & Dunn, *supra* note 81, at 204–05 (footnotes omitted).

83. Patent and Trademark Amendments (Bayh–Dole Act) of 1980, Pub. L. No. 96-517, 94 Stat. 3015 (1980).

84. See, e.g., Thursby & Thursby, *supra* note 80, at 1052.

85. Jerome P. Kassirer, *Financial Conflict of Interest: An Unresolved Ethical Frontier*, 27 AM. J.L. & MED. 149, 150–51 (2001); see also Kenneth Sutherland Dueker, *Biobusiness on Campus: Commercialization of University-Developed Biomedical Technologies*, 52 FOOD & DRUG L.J. 453, 461 (1997) (acknowledging the Bayh–Dole Act was a response to the decline in industry); William L. Geary, Jr., *Protecting the Patent Rights of Small Businesses—Does the Bayh–Dole Act Live up to Its Promise?*, 20 AIPLA Q.J. 10, 17–18 (1992) (noting that Congress enacted the Bayh–Dole Act “to establish uniformity in the vesting of patent rights in inventions resulting from Federally-funded research, and to encourage commercialization of the funded inventions”).

86. Stevenson–Wydler Technology Innovation Act of 1980, Pub. L. No. 96-480, 94 Stat. 2311 (1980) (codified as amended at 15 U.S.C. §§ 3701–3717 (2006)).

87. See David G. Blanchflower & Andrew J. Oswald, *What Makes an Entrepreneur?*, 16 J. LAB. ECON. 26, 33 (1998) (noting capital constraints are a primary impediment to self-employment); Luís M. B. Cabral & José Mata, *On the Evolution of the Firm Size Distribution: Facts and Theory*, 93 AMER. ECON. REV. 1075, 1075 (2003) (evidencing that

raising capital from traditional sources because of “uncertainty, asymmetric information, the nature of firm assets, and the conditions in the relevant financial and product markets.”⁸⁸ Venture capitalists mitigate the harm caused by these frictions by relying on greater expertise, gathering more information, and monitoring more closely than traditional financiers.⁸⁹ Venture capital is the most important source of “external equity financing raised by privately held technology-intensive businesses from private-sector sources.”⁹⁰ But other nontraditional sources of funds are also important, including angel investors⁹¹ and government grants and loans.⁹²

Embittered entrepreneurs sometimes call them vulture capitalists,⁹³ but the evidence indicates that American venture capital and other institutions for funding high-tech startups are remarkably effective.⁹⁴ Between 20–35% of venture capitalist-backed firms are taken public.⁹⁵ A Samuel Kortum and Josh Lerner study, analyzing twenty U.S. manufacturing industries over three decades, finds that “venture capital is associated with a significant increase in patenting.”⁹⁶ They argue that the

financing constraints affect investment decisions and slow the growth rate of small firms); Robert Cressy, *Are Business Startups Debt-Rationed?*, 106 *ECON. J.* 1253, 1255 (1996) (noting entrepreneurial survival is a function of capital); David S. Evans & Boyan Jovanovic, *An Estimated Model of Entrepreneurial Choice Under Liquidity Constraints*, 97 *J. POL. ECON.* 808, 810 (1989) (examining entrepreneurial choice when liquidity is constrained).

88. PAUL A. GOMPERS & JOSH LERNER, *THE VENTURE CAPITAL CYCLE* 127 (1999).

89. *Id.* at 130.

90. *Id.* at 11.

91. See John L. Orcutt, *Improving the Efficiency of the Angel Finance Market: A Proposal to Expand the Intermediary Role of Finders in the Private Capital Raising Setting*, 37 *ARIZ. ST. L.J.* 861, 872 (2005) (“Angel investors are the primary source of funding for a rapid-growth start-up’s early-stage financings.”).

92. The SBA provides billions of dollars in capital to businesses. “SBA’s current business loan portfolio of roughly 219,000 loans worth more than \$45 billion makes it the largest single financial backer of U.S. businesses in the nation.” Small Business Administration, *Overview & History*, <http://www.sba.gov/aboutsba/history/index.html> (last visited Oct. 25, 2008).

93. See GOMPERS & LERNER, *supra* note 88, at 1–2 (countering the distorted perception that venture capitalists add no value and disrupt startups when they exit).

94. The remarkable concentration of venture capital funds in Silicon Valley helps entrepreneurs in that community quickly spread the word about vulture-like behavior. The reputational cost could be high, and probably deters much opportunism by vulture capitalists. See Ronald J. Gilson, *Engineering a Venture Capital Market: Lessons from the American Experience*, 55 *STAN. L. REV.* 1067, 1087 (2003) (explaining how geographic concentration facilitates information transfer of entrepreneurial performance).

95. GOMPERS & LERNER, *supra* note 88, at 6.

96. Samuel Kortum & Josh Lerner, *Assessing the Contribution of Venture Capital to Innovation*, 31 *RAND J. ECON.* 674, 674 (2000). Kortum & Lerner find that “a dollar of venture capital appears to be about three times more potent in stimulating patenting than a dollar of traditional corporate R&D.” *Id.* at 675.

increase in patents is not because startup companies rush to get patents to impress venture capitalists, or because the startups divert potential trade secrets into the patent system.⁹⁷ They observe:

Venture-backed firms' patents are more frequently cited by other patents and are more aggressively litigated: venture backing does not appear to lead to lower-quality patents. Furthermore, the venture-backed firms are more frequent litigators of trade secrets, which suggests that they are not simply patenting more in lieu of relying on trade secret protection.⁹⁸

The message of the Kortum & Lerner study is that venture capitalists select good entrepreneurs and help them succeed with both cash and managerial talent. The message is *not* that venture capitalists like patents. The study uses citations-weighted patent counts as a proxy for the quality of the inventive output of the firms.⁹⁹

Well, what do venture capitalists think about patents and other forms of IP?

Patents, trade secrets, and copyrights (in the case of software) offer rights to exclude that create incentives that encourage invention and innovation. The incentive effect of IP is felt differently by small and big firms. Small firms are probably less effective at enforcing their IP rights. At the same time, they are more dependent on IP rights to capture profit from their inventions and innovations.

In the biotechnology sector, strong patents are usually essential for venture capital funding¹⁰⁰ simply because only a patent-based business model makes sense for most firms in this sector—big or small. This sector is risky and filled with young, small firms. “[M]ost biotechnology firms start out as venture-capital-financed ‘spin-outs’ from a university or research institute”¹⁰¹ Biotechnology firms and venture capitalists see more profit in stronger patents and favor court decisions that push patentability upstream toward the academic science end of the invention process.

97. *Id.*

98. *Id.*

99. *See id.* at 690–91 (using previous patents cited as a measure of quality).

100. *See* John M. Golden, *Biotechnology, Technology Policy, and Patentability: Natural Products and Invention in the American System*, 50 EMORY L.J. 101, 122–23 (2001) (explaining how patents provide biotechnology startups one of their only assets in the form of IP).

101. *Id.* at 139.

Despite folk stories during the dotcom heyday suggesting otherwise, Silicon Valley venture capitalists are not eager to fund every startup with a thick portfolio of patents. Many of them favor patent reform and some have even called for the abolition of software patents.¹⁰² Others contend that patents play the same role in information and communication technology (ICT) that they play in biotechnology.¹⁰³ The academic research gives a mixed message, but there is some strong evidence that patents are much less important for a successful startup in ICT than in biotechnology. I will discuss this research in Part V.

C. High-Skilled Labor Markets

Many small innovative firms invent, develop, and commercialize new technology from within. Others look outside for inventions and key research personnel. The role of the Bayh-Dole Act and the Stevenson-Wydler Act in promoting the transfer of patents and technology to innovators has been much discussed.¹⁰⁴ A more subtle legal influence on small innovative firms was identified by Ronald J. Gilson and Alan Hyde. They make an interesting case for restricting the reach of trade secret law and covenants not to compete in cases that often pit a high-tech startup against the firm that previously employed key members of the startup.¹⁰⁵ Both argue that California law is relatively more generous to startups than Massachusetts law, and that this difference spurred more rapid growth of the high-tech economy in Silicon Valley compared to Route 128 around Boston.¹⁰⁶

Specifically, Gilson & Hyde argue that strong trade secret law and enforceable restrictions on labor mobility harm innovative firms because they undercut technological spillovers

102. See, e.g., *Abolish Software Patents? Not So Simple*, Posting of Rob Hof to BUS. WK.: The TechBeat, http://www.businessweek.com/the_thread/techbeat/archives/2006/04/abolish_softwar.html (Apr. 14, 2006) (quoting a venture capitalist who equates patents to the nuclear arms race).

103. Smith & Mann, *supra* note 51, at 258, 262 (noting that critics of patent protection for software argue that patent prosecution costs mean patents would harm small firms, and arguing that software patents help small firms get venture capital funding).

104. See, e.g., James Stuart, *The Academic-Industrial Complex: A Warning to Universities*, 75 U. COLO. L. REV. 1011, 1039–40 (2004).

105. See ALAN HYDE, *WORKING IN SILICON VALLEY: ECONOMIC AND LEGAL ANALYSIS OF A HIGH-VELOCITY LABOR MARKET* 32–33, 67–68 (2003); Ronald J. Gilson, *The Legal Infrastructure of High-Technology Industrial Districts: Silicon Valley, Route 128, and Covenants Not to Compete*, 74 N.Y.U. L. REV. 575, 593 (1999).

106. HYDE, *supra* note 105, at 33; Gilson, *supra* note 105, at 578.

that occur when employees move.¹⁰⁷ If the harm from loss of spillovers exceeds the direct incentive effect¹⁰⁸ from strong protection of a firm's own research, then welfare is improved by weakening both trade secret law and permissible restrictions on employee mobility. Firms face a collective action problem and would find it difficult to voluntarily implement a low protection regime.¹⁰⁹ This intuitive argument has been formalized in a model by Andrea Fosfuria and Thomas Rønde.¹¹⁰

The Gilson & Hyde theory was motivated by case studies, but economists have contributed evidence supporting the assumptions that technological spillovers are important to innovation and are strengthened by geographic proximity. For example, patent citations are more likely between patents issued to inventors living in the same location.¹¹¹ Iain Cockburn and coauthors use patent-based evidence and find that social capital facilitates knowledge spillovers.¹¹² Their finding complements

107. HYDE, *supra* note 105, at 31; Gilson, *supra* note 105, at 578; *see also* Almeida, *supra* note 36, at 43–45 (suggesting that small semiconductor firms overcome resource limits by sharing knowledge with other researchers in the same geographic area, and that some of this sharing is informal and often connected to social relationships, while in other cases the sharing follows from labor mobility).

108. Trebilcock argues in favor of covenants not to compete because they protect human capital investment by restricting the movement of workers. *See, e.g.*, MICHAEL J. TREBILCOCK, *THE COMMON LAW OF RESTRAINT OF TRADE: A LEGAL AND ECONOMIC ANALYSIS* 129–31 (1986); *see also* Gillian Lester, *Restrictive Covenants, Employee Training, and the Limits of Transaction-Cost Analysis*, 76 *IND. L.J.* 49, 53 (2001).

In contrast, Paolo Fulghieri and Merih Sevilir develop a model in which human capital investment is critical for innovation. They show firms benefit from competition because competition creates opportunities for employees to depart with human capital that would be valuable in a competing firm. The credible threat of departure forces firms to share the profit from innovation with employees. The prospect of sharing the fruits of innovation motivates employees to acquire skills to innovate. *See* Paolo Fulghieri & Merih Sevilir, *Innovation Incentives in Entrepreneurial Firms* 27 (EFA 2004 Maastricht Meetings, Working Paper No. 4160, 2004), *available at* <http://www.ssrn.com/abstract=558586>. They report that empirical evidence shows that innovative firms tend to operate in competitive industries. *Id.* at 2.

109. *See* HYDE, *supra* note 105, at 50 (“[C]ontracts and labor market intermediaries characteristic of Silicon Valley’s high-velocity labor market exist in order to realize the endogenous economic growth that comes from the production and diffusion of information. Its contract and careers provide maximum incentives for employee production of information; maximum diffusion of that information; and maximum absorptive capacity in firms.”).

110. Andrea Fosfuria & Thomas Rønde, *High-Tech Clusters, Technology Spillovers, and Trade Secret Laws*, 22 *INT’L J. INDUS. ORG.* 45, 47 (2004); *see also* Eric A. Posner, Alexander Triantis & George G. Triantis, *Investing in Human Capital: The Efficiency of Covenants Not to Compete* 4 (Univ. of Va. Law Sch. John M. Olin Program in Law & Econ. Working Paper Series, Paper No. 11, 2004).

111. HYDE, *supra* note 105, at 58–59.

112. Ajay K. Agrawal, Iain M. Cockburn & John McHale, *Gone But Not Forgotten: Labor Flows, Knowledge Spillovers, and Enduring Social Capital* 13–20 (Nat’l Bureau of Econ. Research, Working Paper No. 9950, 2003), *available at* <http://www.nber.org/>

sociological research finding that immigrant communities in the Silicon Valley foster entrepreneurship and innovation.¹¹³

Robert M. Hunt and coauthors study the dramatic variation in inventive productivity (measured by patents per capita) across U.S. cities.¹¹⁴ After controlling for the factors usually cited by economists, such as industry mix, historical concentrations of technology, and city size, they find other labor markets factors are also significant.¹¹⁵ Not surprisingly, the education of workers is significant; in fact, it proves to be the most important determinant of inventive productivity.¹¹⁶ But the density of the labor market is at least as important in explaining inventive productivity as city size. Finally, cities with smaller average firm size are more productive at innovation.¹¹⁷

Hunt suggests dense labor markets filled with highly educated workers and many firms are more efficient at innovation because workers and firms are more selective in their matching, which leads to greater productivity.¹¹⁸ The critical question left unanswered by this research is the role of covenants not to compete and trade secret law in explaining regional variation in R&D productivity. Gilson & Hyde disagree about the amount of variation across states in the substance of their trade secret laws, but agree that there is significant variation across states with regard to the enforceability of covenants not to compete.¹¹⁹ At one extreme, California refuses to enforce such agreements.¹²⁰ Massachusetts and most other states will enforce them if they are reasonable—the factors that determine reasonableness vary across states.¹²¹ More research is needed to link substantive variations in the law across states and over time to measures of local spillovers, and also to analyze the nature of

papers/w9950.

113. VIVEK WADHWA ET AL., EDUCATION, ENTREPRENEURSHIP AND IMMIGRATION: AMERICA'S NEW IMMIGRANT ENTREPRENEURS, PART II, at 2–3, 13–14 (2007), available at <http://www.ssrn.com/abstract=991327>.

114. Gerald A. Carlino, Satyajit Chatterjee & Robert M. Hunt, *Urban Density and the Rate of Invention*, 61 J. URBAN ECON. 389, 390 (2007).

115. *Id.* at 394–95.

116. *Id.* at 402.

117. *Id.* at 401.

118. Robert Hunt, *Matching Externalities and Inventive Productivity* 8–9 (Fed. Reserve Bank of Phila. Working Paper No. 07-7, 2007), available at <http://www.philadelphiafed.org/research-and-data/publications/working-papers/2007/wp07-7.pdf>.

119. See HYDE, *supra* note 105, at 30–37; Gilson, *supra* note 105, at 597–98, 602–03.

120. See HYDE, *supra* note 105, at 64–65 (stating that California law “flatly prohibits covenants not to compete, and gives no independent weight to negotiated trade secrets agreements that reserve to the employer more than its rights under statute”).

121. See Gilson, *supra* note 105, at 603–05.

these sorts of lawsuits to learn if they could possibly play the negative role that Gilson & Hyde asserted they did in Massachusetts.¹²²

D. Anticompetitive Use of IP

Perhaps some tailoring of IP law is desirable as a way to minimize anticompetitive lawsuits. IP law has advantages over antitrust in terms of addressing anticompetitive behavior. IP law sets ground rules for competition. It can be structured to level the playing field in markets in which small firms face big competitors. Antitrust law should play a secondary role because it can only be used after the fact to punish anticompetitive behavior. It is relatively cumbersome and creates serious rent-seeking problems. IP law mitigates anticompetitive conduct through the misuse defense and fee-shifting to defendants in exceptional cases. These doctrines *cannot* generate the rent-seeking costs associated with treble damage antitrust suits because there are no damages available to motivate frivolous charges of anticompetitive conduct.¹²³

Anticompetitive IP lawsuits may succeed because the small firm defendant lacks the information to prove noninfringement or invalidity. Other defendants may settle to avoid litigation costs even though they are confident the plaintiff would lose the lawsuit. In addition to gaining a favorable settlement, a dominant firm may use weak IP rights to deter small competitors from using its IP because of the threat of suit.¹²⁴

Lerner develops empirical evidence showing the threat of patent litigation has a significant effect on firms' research agendas, especially small firms.¹²⁵ He and Jean O. Lanjouw also find that preliminary injunctions in patent lawsuits appear to be used by incumbents to impose a financial burden on smaller rivals.¹²⁶ They note the anticompetitive effect from the "particular

122. We will also explore laws regulating the portability of health insurance, looking for effects on employee mobility and personnel costs faced by high-tech startups. If we find interesting variations across states or over time we will try to capture these variations in data and fold them into our projects on the geography of innovation.

123. Further discussion of these issues is found in Michael J. Meurer, *Vertical Restraints and Intellectual Property Law: Beyond Antitrust*, 87 MINN. L. REV. 1871, 1875–76 (2003).

124. Michael J. Meurer, *Controlling Opportunistic and Anti-Competitive Intellectual Property Litigation*, 44 B.C. L. REV. 509, 521 (2003).

125. Lerner, *supra* note 1, at 165.

126. Jean O. Lanjouw & Josh Lerner, *Tilting the Table? The Use of Preliminary Injunctions*, 44 J.L. & ECON. 573, 575–76, 595 (2001) (reporting empirical evidence that the financial strength of the plaintiff is significantly correlated with the use of preliminary injunctions in patent cases).

difficulty of raising external funds to finance litigation.”¹²⁷ And they conclude preliminary injunctions in patent lawsuits were a threat to innovative industries “driven by smaller, more vulnerable, venture-capital-based firms” during the time period studied.¹²⁸

There are plenty of anecdotes and opinions suggesting strategic trade secret and trademark litigation also discourage entry by startups. Patent lawsuits get most of the publicity, but trade secret lawsuits are also common, expensive, and a threat to solvency and venture capital funding.¹²⁹ Kramer observes:

The trade secret lawsuit can be a devastating competitive weapon, particularly against start-up or marginally financed smaller businesses. . . . If a preliminary injunction—even of limited scope—issues, it places the defendant business at a serious competitive disadvantage. Even though the scope of the injunction may be relatively benign, the existence of such a court order may discourage customers, lenders, and investors from doing business with the defendant.

Crushing and intrusive discovery may be the next order of business for the aggressive trade secrets plaintiff. . . . The trade secret claim, regardless of its ultimate merit, can force the defendant business to yield sensitive business information to an aggressive and hated competitor and hobble the defendant business by distracting its employees and straining its financial resources.¹³⁰

Even trademark lawsuits have been used to harass small innovative firms.¹³¹ In *Ferraris Medical, Inc. v. Azimuth Corp.*, the court shifted fees to the prevailing small firm defendant because the plaintiff’s trade dress litigation was motivated by the

127. *Id.* at 574.

128. *Id.* at 575.

129. Elizabeth Smith, Comment, *Eliminating Predatory Litigation in the Context of Baseless Trade Secret Claims: The Need for a More Aggressive Counterattack*, 23 SANTA CLARA L. REV. 1095, 1099–1104, 1107–08 (1983) (noting the high costs of trade secret litigation resulting from expert testimony, discovery, preliminary injunctions, and possible loss of venture capital, as well as the harm from bad publicity and the difficulty in winning summary judgments because of the inherently factual nature of the questions involved).

130. Jeffrey W. Kramer, *How Misuse of the UTSA Can Be Countered*, L.A. LAW., Nov. 2002, at 17, 18.

131. In a trademark case involving a large firm defendant, *Wal-Mart v. Samara Brothers*, Justice Scalia observed: “Competition is deterred, however, not merely by successful lawsuit but by the plausible threat of successful suit, and given the unlikelihood of inherently source-identifying design, the game of allowing suit based upon alleged inherent distinctiveness seems to us not worth the candle.” *Wal-Mart Stores, Inc. v. Samara Bros., Inc.*, 529 U.S. 205, 214 (2000).

desire to impose litigation costs and discourage competition.¹³² The product in question was a harness designed to mount equipment on the heads of surgical patients. The defendant Azimuth copied Ferraris's unpatented design, and Ferraris responded with a frivolous trade dress infringement theory and other frivolous trademark and copyright infringement theories.¹³³

Judges have some discretion to tailor the law to protect small firms from anticompetitive conduct. The defendant's status as a small firm is a factor that can be weighed in making decisions about fee shifting and preliminary injunctions.¹³⁴ It is also relevant to the antitrust style analysis that applies to a misuse defense based on predatory litigation.¹³⁵

V. THE EFFECT OF PATENT REFORMS ON SMALL FIRMS

In response to complaints from the information and communications industries, Congress has debated patent reform in recent years; the House recently passed a reform bill, and the Senate may soon vote on reform.¹³⁶ The Supreme Court has shown significant interest in patent law recently as well, and has pushed the law in new directions in several important cases.¹³⁷

Certain critics of reform worry that many proposed reforms will harm small innovative firms. They argue that patents are crucial to small firms, that breakthrough innovations originate with these firms, and that many of these innovations will be lost if the patent system is *weakened* by reform. If the argument so far is correct, then it is possible to argue that the harm caused by patent reform to small innovative firms outweighs the benefit that patent reform brings to others.

In my book *Patent Failure* with Jim Bessen, we make the case that the patent system performs poorly when it fails to provide the public with notice of property boundaries that are the

132. See *Ferraris Med., Inc. v. Azimuth Corp.*, No. CIV. 99-66-M, 2002 WL 1728225, at *3 (D.N.H., July 24, 2002).

133. *Id.* at *1-2.

134. Meurer, *supra* note 124, at 526-28, 535-38.

135. *Id.* at 543-44.

136. TED FRANK, AM. ENTER. INST. FOR PUB. POL'Y RES. LIAB. OUTLOOK, THERE IS A ROLE FOR CONGRESS IN PATENT LITIGATION REFORM 1 (2008), available at http://www.aei.org/publications/pubID.27550/pub_detail.asp.

137. See *Quanta Computer, Inc. v. LG Elecs., Inc.*, 128 S. Ct. 2109, 2117 (2008) (holding the doctrine of patent exhaustion applies to method patents); *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740 (2007) (reducing the threshold for a showing of obviousness in a patent claim); *MedImmune, Inc. v. Genentech, Inc.*, 127 S. Ct. 764, 776 (2007) (making suits over patent validity easier).

hallmark of a properly functioning system of property rights.¹³⁸ We provide a variety of empirical evidence that patents work as property when they provide good notice, and not otherwise.¹³⁹ We show that the performance of the American patent system has deteriorated in recent years because of misguided court decisions that have weakened the notice function of patents.¹⁴⁰

Concern about notice suggests certain reforms that reduce search costs and make patent property rights more predictable, more transparent, and more closely connected to the invention actually possessed by the inventor. Possibly, some of these reforms could limit patent scope or raise the cost of obtaining patents. An optimal policy must find the right balance between exclusionary rights and good notice. Let's consider how important patents are to small firms (and their financiers) and whether reform will harm them.

Many opponents of patent reform seem to overestimate the importance of patents to small innovative firms. The evidence shows that the average value of a patent to a small publicly traded firm (less than 500 employees) is much less than the value of a patent to a large publicly traded firm.¹⁴¹ Carlos J. Serrano estimated that small patentees realize only a 14% gain from the sale of a patent.¹⁴² In part, this is because frictions cause technology markets to perform poorly, as I discussed in Part IV.A. Survey data reveals that 39% of European patent owners who attempted to license their patents could not find a customer.¹⁴³ And when patent owners find licensees they generally fail to capture much of the value of their inventions. Richard E. Caves, Harold Crookell, and J. Peter Killing found that, on average, licensors only receive about 40% of the value of the rents earned on their technologies.¹⁴⁴

Small inventors suffer from fuzzy patent boundaries because they realize less value from licensing or selling their patents. Naturally, licensees will not pay more on royalties than they

138. JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK 8–9 (2008).

139. *Id.* at 11–16.

140. *Id.* at 227–30.

141. *Id.* at 109.

142. Carlos J. Serrano, The Market for Intellectual Property: Evidence from the Transfer of Patents 29–30 (June 2006) (unpublished manuscript, on file with the Houston Law Review), available at http://www.chass.utoronto.ca/~serrano/eco2404/transfers_kelowna.pdf.

143. See Gambardella et al., *supra* note 53, at 1176–78.

144. Richard E. Caves, Harold Crookell & J. Peter Killing, *The Imperfect Market for Technology Licenses*, 45 OXFORD BULL. ECON. & STATS. 249, 258 (1983).

expect to gain in profits from access to a patent. Litigation risk attributable to weak patent notice reduces these profits. If, for example, a manufacturer expects profit erosion because of the risk of an infringement assertion by some other patent owner, then the manufacturer will revise downward the royalties it will pay the first patent owner. This means that although small inventors might not be exposed directly to the same magnitude of inadvertent infringement litigation risk, this risk reduces their incentives *indirectly*. A similar argument applies to small inventors who choose to bring their technology to market themselves—once they invest in substantial complementary production and distribution assets, they are at risk for significant litigation costs attributable to inadvertent infringement of others' patents.

Improved notice offers a second benefit to patent owners who want to sell or license their patents: the negotiation process is less costly, and the risk of bargaining breakdown is reduced. There is some limited evidence that suggests patents can facilitate licensing transactions when they have clear boundaries, but not otherwise. First, patent licenses are more common in interfirm alliances in the chemical and pharmaceutical industries.¹⁴⁵ These are industries with patents that have the clearest boundaries, and maybe that clarity encourages more licensing. Another study found that startups have more success in the technology market if they rate patent protection as relatively "effective."¹⁴⁶

Patent rents are a critical source of R&D funding for small biotechnology firms and some other types of small innovative firms.¹⁴⁷ But the role of patents in promoting innovation by small firms may have been overstated, and the metaphor of the entrepreneur David armed with a patent sling to fight off an incumbent Goliath has been applied too broadly. Bessen & Meurer found that the *average* small publicly traded firm more or

145. See Bharat N. Anand & Tarun Khanna, *The Structure of Licensing Contracts*, 48 J. INDUS. ECON. 103, 112–13 (2000).

146. Joshua S. Gans, David H. Hsu & Scott Stern, *When Does Start-up Innovation Spur the Gale of Creative Destruction?*, 33 RAND J. ECON. 571, 583 (2002) (observing that startups are more likely to market their products in environments where patents effectively protect IP rights and mitigate the threat of disclosure).

147. See Frederick M. Abbott, *The WTO Medicines Decision: World Pharmaceutical Trade and the Protection of Public Health*, 99 AM. J. INT'L L. 317, 324 (2005); Alan O. Sykes, *TRIPS, Pharmaceuticals, Developing Countries, and the Doha "Solution,"* 3 CHI. J. INT'L L. 47, 60 (2002).

less breaks even when the costs and benefits it derives from the patent system are added up.¹⁴⁸

Many socially important startups operate in nascent technologies and usually do not compete directly with large incumbents. Clayton Christensen writes, “Perhaps the most powerful protection that small entrant firms enjoy as they build the emerging markets for disruptive technologies is that they are doing something that it simply does not make sense for the established leaders to do.”¹⁴⁹ When startups do face incumbents they might be on the wrong end of a patent lawsuit.

Iain Cockburn and Megan MacGarvie examine the impact of patents on early stage software firms.¹⁵⁰ They uncover evidence that startup software companies suffer a delay in initial venture capital funding compared to comparable firms if they operate in a market characterized by denser patent thickets.¹⁵¹ The relationship between patents and the probability of IPO or acquisition is less clear, but they find “some evidence that firms without patents are less likely to go public if they operate in a market characterized by patent thickets.”¹⁵²

The surprising bottom line that concludes this grim story about the small role of patents in securing financing for most small firms is that most startups do not rely on patents. Cockburn & MacGarvie found in most segments of the software market, 80–95% of the incumbent firms have *no* patents related to that segment.¹⁵³ Ronald J. Mann and Thomas W. Sager found that just 24% of venture-backed software startups had any patents at all within five years of receiving financing.¹⁵⁴ The figure was significantly higher (56%) for biotech startups, showing that patents are quite important in that industry but not so important to gain venture capital funding in the software industry.¹⁵⁵

148. See BESSEN & MEURER, *supra* note 138, at 143–44 (noting that patent profits in excess of litigation expenses are offset by the relatively larger losses small firms suffer in litigation and lower overall profits).

149. CHRISTENSEN, *supra* note 43, at 210.

150. Iain M. Cockburn & Megan MacGarvie, *Patents, Thickets and the Financing of Early-Stage Firms: Evidence from the Software Industry* 5 (Nat'l Bureau of Econ. Research, Working Paper No. 13644, 2008), available at <http://www.nber.org/papers/w13644> (defining “patent thickets” and hypothesizing about their impacts on market entrants).

151. *Id.* at 41.

152. *Id.* at 1.

153. Cockburn & MacGarvie, *supra* note 58, at 50 fig.3.

154. Ronald J. Mann & Thomas W. Sager, *Patents, Venture Capital, and Software Start-Ups*, 36 RES. POL'Y 193, 197 (2007).

155. *Id.* Mann & Sager reported that when they used a model that controlled for firm

The patenting proclivity of startups persists through the IPO stage. Bessen & Meurer measured “the percentage of firms [in various industries] that had filed one or more successful patent applications by the time the firm was first listed in Compustat, a database of publicly listed firms.”¹⁵⁶ The sample contained “5,163 firms that were first publicly listed from 1979–1999.”¹⁵⁷ “For R&D-performing firms, 50[%] obtained patents,” with the highest share being 67% in the instruments industry.¹⁵⁸ The shares were below 50% in certain “high-tech areas, such as software, engineering services, or communications.”¹⁵⁹ “Note also that the share of newly public firms with patents did not increase substantially” between 1995 and 1999 when compared to the entire range of years from 1979 through 1999.¹⁶⁰ “Despite the great increase in patenting in recent years, only 37 percent of the firms newly listed between 1995 and 1999 had any patent applications at the time they went public.”¹⁶¹ 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.¹⁶² Second, they are more likely to face liquidity constraints that influence enforcement activity.¹⁶³

duration, they found “little significance to having a patent before first financing.” *Id.* at 206.

156. BESSEN & MEURER, *supra* note 138, at 175.

By “successful” patent application, we mean that it resulted in a patent grant by the end of 2002. This sample includes all newly listed firms; that is, it includes some firms that are not start-ups, such as spin-offs. If we restrict the analysis to newly public firms with fewer than five hundred employees, the percentages are very similar. The sample of firms is restricted to those that are matched to the United States PTO list of patent assignees and those for whom there is no match.

Id. at 174 n.14.

157. *Id.* at 176.

158. *Id.* at 175–76.

159. *Id.*

160. *Id.* at 176.

161. *Id.* “In the business services/software industry, the share was 22 percent from 1995 through 1999 despite a major expansion in software patenting during the late 1990s.” *Id.* at 176 n.16.

162. For a general discussion of the fixed and variable costs of regulatory compliance and the effect of these costs on small business, see C. Steven Bradford, *Does Size Matter? An Economic Analysis of Small Business Exemptions from Regulation*, 8 J. SMALL & EMERGING BUS. L. 1, 5–7 (2004) (noting that the fixed and variable costs of regulatory compliance efforts per unit of size decrease when the size of the transaction increases); James L. Huffman, *The Impact of Regulation on Small and Emerging Businesses*, 4 J. SMALL & EMERGING BUS. L. 307, 308–09 (2000) (observing that regulation has disadvantaged small and emerging businesses) and Priest, *supra* note 7, at 3 (discussing Dean Huffman’s hypothesis that regulatory compliance costs disproportionately impact small businesses).

163. Patent prosecution costs also create disparities between small and large firms in

Successful enforcement requires monitoring for infringement. Large firms have a natural advantage in monitoring because they have more employees and are likely to have more contacts with competitors and chances to monitor for infringement that are incidental to other activities. Also, a large firm with a large collection of patents can spread shared monitoring costs over subsets of related patents. Large firms with in-house IP lawyers have an advantage over smaller firms in terms of management of litigation and negotiation of licensing. Finally, big firms are more likely to have a reputation for being tough litigators, which increases deterrence and settlement licenses; conversely, small firms are more likely to have weak reputations because liquidity constraints may impair their ability to finance litigation. There are many stories of small patent holders frustrated by their inability to profit from their patents.¹⁶⁴

Large firms depend less on IP to profit from R&D than small firms. Large firms profit from the sale of complementary products, from lead time, from contracts, and from technological protection.¹⁶⁵ These sources of profit are open to smaller firms, but they tend to get relatively more profit from IP.¹⁶⁶ Firms bringing a new technology to an established market are often eclipsed by incumbent firms who imitate the entrant following a strategy known as the “fast second.”¹⁶⁷

terms of patenting. See MARY ELLEN MOGEE, SMALL BUS. ADMIN., FOREIGN PATENTING BEHAVIOR OF SMALL AND LARGE FIRMS: AN UPDATE 3–4 (2003) (describing an earlier study that compared a matched set of small and big business patents and found that small businesses obtain fewer patents abroad because of the high cost of obtaining the patents, and stating that small businesses obtain fewer foreign patents after controlling for the technology field).

164. See, e.g., DORON S. BEN-ATAR, TRADE SECRETS: INTELLECTUAL PIRACY AND THE ORIGINS OF AMERICAN INDUSTRIAL POWER, at xiii–xv (2004) (observing that Eli Whitney brought scores of patent infringement suits to protect his cotton gin invention and complained that he did not earn enough from the invention to cover his litigation costs).

165. Rajshree Agarwal & Michael Gort, *First-Mover Advantage and the Speed of Competitive Entry, 1887–1986*, 44 J.L. & ECON. 161, 173 (2001) (describing the first-mover advantage and the benefits of lead time); Barnett, *supra* note 35, at 1251–52 (discussing methods other than patents for capturing profit from inventions); James Bessen & Michael J. Meurer, *Lessons for Patent Policy from Empirical Research on Patent Litigation*, 9 LEWIS & CLARK L. REV. 1, 6 (2005) (noting that firms may consider “lead time advantage, learning, complementary products, and secrecy” stronger incentives for R&D than patents).

166. Barnett, *supra* note 35, at 1255 (describing hardships for potential entrants, and stating that “patent protection may be required in order to facilitate entry into technology-dependent markets dominated by one or a handful of firms”).

167. For a discussion of the fast second strategy, see CONSTANTINOS C. MARKIDES & PAUL A. GEROSKI, FAST SECOND—HOW SMART COMPANIES BYPASS RADICAL INNOVATION TO ENTER AND DOMINATE NEW MARKETS 121 (2005) (noting that entrants following the “fast-second” strategy can influence the “dominant design” through mass marketing); DAVID C. MOWERY & NATHAN ROSENBERG, TECHNOLOGY AND THE PURSUIT OF ECONOMIC

The high rate of patent lawsuit filing by small firms and independent inventors suggests they value patents more highly than large firms. The patents of large firms are litigated about one-third of the amount the patents of small firms are litigated.¹⁶⁸ Small business advocates claim this shows that small business patents are more valuable.¹⁶⁹ But there are other explanations. As mentioned above, big business might be more effective in deterring infringement and, therefore, not need to file suit as often. Or perhaps the label “small business” is too coarse. Possibly, there are genuinely innovative entrepreneurs who fight hard to enforce their IP rights, and there are also opportunistic “trolls” who bring weak or frivolous patent suits to collect nuisance settlement payments.¹⁷⁰

A study commissioned by the European Union recommends that patent owners should be compelled to purchase insurance covering the cost of enforcing their patents.¹⁷¹ The suggestion was motivated by the observation that casualty insurers in the United States and Europe offer almost no insurance to either potential plaintiffs or defendants covering patent infringement litigation.¹⁷² This observation is surprising because casualty insurers have a long history of insuring potential tort defendants. In addition, there are robust markets for insurance against trade secret misappropriation and copyright infringement lawsuits.¹⁷³

GROWTH 214–15 (1989), David C. Mowery, *Innovation, Market Structure, and Government Policy in the American Semiconductor Electronics Industry: A Survey*, 12 RES. POL'Y 183, 189–90 (1983) and David J. Teece, *Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing, and Public Policy*, 15 RES. POL'Y 285, 285–86 (1986).

168. John R. Allison et al., *Valuable Patents*, 92 GEO. L.J. 435, 466 (2004).

169. Small firms have certain advantages in patent litigation that offset the disadvantages mentioned above. They have less reason to fear retaliation in the form of a patent counterclaim because they operate in fewer lines of business than larger firms.

170. The highest rate of litigation per patent occurs when patent ownership is transferred before the lawsuit. Allison et al., *supra* note 168, at 465. This might reflect patent purchases by “licensing shops” who either are extracting full value from underenforced, strong patents, or are extracting nuisance payments from weak patents. Unlike typical small businesses, licensing shops and trolls have low litigation costs because they have no business to disrupt and they are often owned by the attorneys who bring the suits. Licensing shops and trolls also benefit from favoritism that juries show toward independent inventors. See Kimberly A. Moore, *Populism and Patents*, 82 N.Y.U. L. REV. 69, 107 (2007) (documenting jury preferences for domestic individuals with patents).

171. CJA CONSULTANTS LTD., PATENT LITIGATION INSURANCE: A STUDY FOR THE EUROPEAN COMMISSION ON POSSIBLE INSURANCE SCHEMES AGAINST PATENT LITIGATION RISKS 49 (2003) (“Without a compulsory scheme the premiums would be high, the take-up low and most tellingly, insurers would not wish to be involved.”).

172. *Id.* at 8.

173. See, e.g., Anna Lee, Note, *Insuring Cyberspace: Why Traditional Insurance Policies are Not Enough*, 3 VAND. J. ENT. L. & PRAC. 84, 88–89 (2001) (observing that

Certain European policymakers believe that small innovative firms are especially harmed by the absence of enforcement insurance. They reason that small firms are less likely to patent because they foresee that they will not be able to afford to enforce their patents.¹⁷⁴ They conclude that fostering the patent insurance market will also foster R&D by small firms.¹⁷⁵ These policymakers favor compulsory insurance as a strategy for eliminating an adverse selection problem—insurance companies recognize that those most eager to purchase enforcement insurance are those who are about to assert a patent.¹⁷⁶

I am skeptical that the compulsory insurance plan makes sense—certainly not in the United States, where notice problems make effective underwriting incredibly difficult. The United States is also different because the success of venture capital funding means that enforcement insurance is essentially provided by the financiers. Recall that Kortum & Lerner find high rates of patent and trade secret litigation by venture capital-backed startups.¹⁷⁷ Other creative schemes for financing litigation are also developing in the United States.

Let me recap the effect of notice-based patent reform on small firms. It is possible that reforms could increase the cost of getting a patent and possibly narrow patent scope and value. It seems very unlikely that this will cause much harm to small innovative firms except perhaps those in biotechnology and a few other sectors. The reason is simply that patents are not the crown jewels many entrepreneurs might wish. Most startups do not rely on patents for funding. Patents are not a great source of value to the average small firm because small firms have trouble

large Internet service providers such as America Online, CompuServe, and Prodigy may have already obtained insurance against liability for copyright infringement and other risks).

174. Small firms without insurance may face liquidity constraints. Big firms can spread the fixed cost of monitoring for infringement over a larger number of patents, and develop reputational advantages from participating in multiple lawsuits, or settle more easily. See Jean O. Lanjouw & Mark Schankerman, *Protecting Intellectual Property Rights: Are Small Firms Handicapped?*, 47 J.L. & ECON. 45, 57 (2004) (describing the extrajudicial resources available to large firms in resolving patent disputes).

175. See *id.* at 45–46 (noting that the likelihood of costly litigation in order to enforce patents may prevent “small firms from conducting [R&D] effectively”).

176. See CJA CONSULTANTS LTD., *supra* note 171, at 51 (noting that “new patents only should be covered [in a voluntary or opt-out insurance scheme] because of the risk of bad cases dominating if existing patents are allowed to apply”).

177. Kortum & Lerner, *supra* note 96, at 675.

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enforcing, selling, and licensing their patents. If notice-based reform is successful, it easily could be a benefit rather than a cost to small firms because it will increase the value of their patents in technology markets and reduce the probability that they will fall victim to a socially unwarranted patent lawsuit if they successfully commercialize their technology.

VI. CONCLUSION

Many policymakers and scholars believe small firms are especially important to American technological progress. Evidence on this point is not well developed, but they may be right. Assuming the claim is correct, I ask whether IP law should be tailored in some way to favor small innovative firms.

I start with a presumption against tailoring because of rent-seeking, administrative, and other social costs. This presumption can be overcome if there is some market friction that impedes invention or innovation and that has a disproportionate effect on small firms. Frictions in financial markets and technology markets both might have a disproportionate effect on small inventors and innovators. American law and culture apparently have done a good job smoothing financial market frictions and encouraging robust venture capital and angel financing of high-tech startups. This success has not depended on any tailoring of IP law. Effective financial and technology markets often depend on secure IP rights, but not tailored rights. Perhaps small firms have a special interest in strong and cheap IP rights because they are more reliant on them than large firms are. The empirical evidence does not support this view of the patent system.

Frictions in the market for skilled labor and frictions created by anticompetitive IP lawsuits may warrant some IP tailoring to aid small innovators. I am not aware of small firms in their capacity as inventors facing any problems caused by labor market frictions of anticompetitive suits. But there are strong theoretical concerns supported by some evidence that small firms in their capacity as innovators must worry about these two frictions. Tailoring could benefit small firms by according employee mobility more deference in trade secret and employment cases featuring a small firm defendant. And generally, district court judges in IP lawsuits should use fee-shifting to sanction plaintiffs who bring anticompetitive suits and otherwise manage lawsuits in ways that minimize the risk of socially harmful exclusion.