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THE COMPETITIVE ADVANTAGE OF WEAK PATENTS

WILLIAM HUBBARD*

Abstract: Does U.S. patent law increase the competitiveness of U.S. firms in global markets? This Article argues that, contrary to the beliefs of many U.S. lawmakers, U.S. patent law currently undermines the ability of U.S. firms to compete in global markets because strong U.S. patent rights actually weaken an overlooked but critical determinant of U.S. competitiveness: rivalry among U.S. firms. Intense domestic rivalry drives firms to improve relentlessly, spawns related and supporting domestic industries, and encourages the domestic development of advanced factors of production—like specialized labor forces. U.S. patents restrict rivalry among foreign firms less because U.S. patents have little extraterritorial effect. Moreover, due to legal and economic differences between the United States and other countries, foreign patents do not equilibrate competitive conditions abroad. Consequently, for U.S. firms to benefit from the same competitive environment as foreign firms, U.S. patents should be weakened. Such changes, however, also threaten to reduce U.S. competitiveness because U.S. patents promote the development of new inventions that help U.S. firms compete in global markets. This Article thus exposes a deep tension in U.S. economic policy. Unfortunately, lawmakers have failed to recognize this tradeoff and, as a result, have adopted excessively strong patent protections that undermine U.S. competitiveness. This Article addresses this problem by proposing balanced reforms that will selectively weaken U.S. patent protection to increase U.S. competitive advantage.

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INTRODUCTION

Current U.S. patent law is based on a fundamental misconception regarding the effects of U.S. patents on U.S. competitiveness. The conventional view is that U.S. patents help firms in the United States to compete against foreign rivals because U.S. patents provide U.S. inventors with exclusive rights that promote the discovery of socially beneficial inventions. Nevertheless, conventionalists recognize that exclusive patent rights also inhibit competition regarding new inventions, and that competition provides many benefits for society. As a result, U.S. policymakers typically have tried to balance the incentive effect of U.S. patents against the competitive costs.¹ When considering U.S. competitiveness in global markets, however, conventionalists have failed to understand the impact of territoriality on U.S. patent law and U.S. competitiveness. This Article strives to correct these errors.

Certainly, U.S. patent law is closely related to competition in global markets. By providing inventors with exclusive rights to their discoveries, U.S. patents encourage innovation,² and companies in the United States frequently outcompete their international rivals by developing better products or cheaper manufacturing processes.³ Focusing on the incentive effect of U.S. patents, U.S. lawmakers have long argued that strong U.S. patents increase U.S. competitiveness.⁴ Many commenta-

¹ See, e.g., MICHELE BOLDRIN & DAVID K. LEVINE, *AGAINST INTELLECTUAL MONOPOLY* 6 (2008) (discussing the “need to strike a balance between providing sufficient incentive for creation and the freedom to make use of existing ideas”); Stuart J.H. Graham et al., *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 *BERKELEY TECH. L.J.* 1255, 1258–59 (2009).

² See U.S. CONST. art. I, § 8, cl. 8 (authorizing Congress to “promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries”); WILLIAM M. LANDES & RICHARD A. POSNER, *THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW* 294 (2003) (“The standard rationale of patent law is that it is an efficient method of enabling the benefits of research and development to be internalized, thus promoting innovation and technological progress.”). Not all new discoveries, however, are patentable inventions. *Bilski v. Kappos*, 130 S. Ct. 3218, 3225 (2010) (citing *Diamond v. Chakrabarty*, 443 U.S. 303, 309 (1980) (stating that laws of nature, physical phenomena, and abstract ideas cannot be patented)).

³ See MICHAEL E. PORTER, *THE COMPETITIVE ADVANTAGE OF NATIONS* 508 (1990) (recognizing that “productivity in American industry as a whole is still at or near the top compared to any nation”); see also *id.* at 70–76 (discussing the determinants of competitive advantage).

⁴ See, e.g., *Review of Findings of the President’s Commission on Industrial Competitiveness: Hearing Before the S. Comm. on Fin.*, 99th Cong. 11 (1985) (Senate Finance Committee Staff Memorandum) (recommending that, to enhance U.S. competitiveness, “greater protection . . . be given intellectual property”); 157 CONG. REC. S5411 (daily ed. Sept. 8, 2011) (statement of Sen. Orrin Hatch) (“Strengthening of our patent system will not only help lead us out of these tough economic times, but it will help us maintain our competitive

tors agree, asserting for instance that “[o]ne of the historical strengths of the U.S. science, engineering and technology enterprise has been the vigorous protection of [intellectual property] rights.”⁵ Indeed, some lawmakers apparently believe that U.S. patents predominately issue to U.S. inventors and that improvements to the U.S. patent system will therefore inure to the benefit of U.S. innovators, not foreign firms.⁶ Bolstered by these arguments, patent rights have grown more robust in the United States than in almost any other country.⁷

edge both domestically and abroad.”); 157 CONG. REC. S5433 (daily ed. Sept. 8, 2011) (statement of Sen. Mark Kirk) (stating that legislation that “strengthen[s] our patent system . . . [will] bolster our global competitiveness [sic]”); 157 CONG. REC. E1206 (daily ed. June 24, 2011) (statement of Rep. Chris Van Hollen) (indicating that “stronger patents . . . enhance our nation’s economic competitiveness”); 153 CONG. REC. 23706 (2007) (arguing that legislation resulting in weaker patent protection “is a severe threat to American innovation, American jobs and American competitiveness”); 148 CONG. REC. 18139 (2002) (claiming that a proposed bill “promotes America’s economic competitiveness by strengthening protections for intellectual property”); 143 CONG. REC. 4359 (1997) (“[W]e have had the strongest patent protection of any country of the world, and that is what has ensured the American people for these last 200 years the ability to have a higher standard of living than other countries of the world, because we were able to out-compete them.”); 132 CONG. REC. 18753 (1986) (“Our competitiveness is closely tied to innovations which are promoted and protected by strong laws on patents, copyrights and trademarks.”); 131 CONG. REC. 21739 (1985) (stating that “strengthening intellectual property rights was cited as a major prescription for ensuring America’s continued prosperity and economic competitiveness”); *see also* COUNCIL OF ECON. ADVISERS, ECONOMIC REPORT OF THE PRESIDENT 229 (2006) (discussing a bill proposed in 2005 that “would strengthen intellectual property protection”).

⁵ COUNCIL ON COMPETITIVENESS, *COMPETITIVENESS INDEX: WHERE AMERICA STANDS* 77, 81 (2007); *see also* BOLDRIN & LEVINE, *supra* note 1, at 46 (noting that industries have successfully lobbied the U.S. government to strengthen intellectual property rights during time periods marked by “slow productivity growth”); James J. Anton et al., *Policy Implications of Weak Patent Rights*, in 6 *INNOVATION POLICY AND THE ECONOMY* 1 (Adam B. Jaffe et al. eds., 2006) (describing potential problems stemming from weak patent rights).

⁶ *See* Press Release, Senator Patrick Leahy, Comment of Senator Leahy on the Senate Motion to Proceed to the America Invents Act (Aug. 2, 2011), <http://www.leahy.senate.gov/press/comment-of-senator-leahy-on-the-senate-motion-to-proceed-to-the-america-invents-act> (arguing that reforms to U.S. patent laws would “give American inventors and innovators the 21st century patent system they need to compete”); *see also* Joseph Allen, Reexamination: Boone or Bane?, Panel Remarks at the Seventh Annual Judicial Conference of the United States Court of Customs and Patent Appeals (Apr. 11, 1980), in 88 F.R.D. 369, 415 (1980) (“We feel very strongly that, by improving the patent system, we’re helping not only the Patent Bar and the Office, but also American inventors and innovative companies become more successful in increasingly difficult competition.”).

⁷ *See* BOLDRIN & LEVINE, *supra* note 1, at 46 (noting that “business practices and financial securities” are patentable in the United States but not in “most of the rest of the world”); LANDES & POSNER, *supra* note 2, at 2 (indicating that, during the 1970s, 1980s, and even the 1990s, people believed that the United States was losing competitive ground to other nations, particularly Japan, and that emphasis on technological innovation was necessary to prevent further decline); *see also* Amy Kapczynski, *Harmonization and Its Discon-*

Nevertheless, the incentive effect of U.S. patent law often provides U.S. innovators with little advantage over foreign rivals because inventors worldwide can obtain U.S. patents.⁸ Indeed, because only U.S. patents can be asserted in the United States and because the U.S. economy is the largest market in the world, foreign inventors are obtaining U.S. patents in record numbers.⁹ In recent years, the U.S. Patent and Trademark Office (“U.S. Patent Office”) has issued more U.S. patents to foreign inventors than to U.S. inventors.¹⁰

In contrast to the similar incentive effects of U.S. patents on U.S. and foreign firms, the harms to competition stemming from U.S. patents fall disproportionately on firms in the United States. U.S. patents have little effect on competition in foreign markets due to limits on the extraterritorial effect of U.S. law.¹¹ Some traditional patent policymakers have recognized that U.S. patents therefore can limit the technological tools available to firms within the United States while leaving foreign rivals relatively unconstrained. As a result, U.S. lawmakers have

tents: A Case Study of the TRIPS Implementation in India's Pharmaceutical Sector, 97 CALIF. L. REV. 1571, 1588–1616 (2009) (describing differences between Indian patent law and U.S. patent law and demonstrating that patent protections in India are weaker than protections in the United States, particularly for pharmaceutical inventions).

⁸ See William Hubbard, *Competitive Patent Law*, 65 FLA. L. REV. 341, 354 (2013). This equal access to U.S. patents is generally good for the U.S. economy because protectionism can harm domestic prosperity by increasing prices and insulating domestic businesses from competitive pressures. See *id.* at 361–63 (arguing against protectionist patent law).

⁹ See *Voda v. Cordis Corp.*, 476 F.3d 887, 889–90 (Fed. Cir. 2007) (holding that foreign patents cannot be asserted in the United States); *U.S. Patent Statistics, Calendar Years 1963–2012*, U.S. PAT. & TRADEMARK OFF. (June 2013), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.pdf (illustrating the number of U.S. patents issued to foreign inventors); *World Top Consumer Markets Ranking*, IRESERVOIR (Mar. 5, 2013), <http://www.Ireservoir.com/awow-8788> (ranking the United States as the top consumer market).

¹⁰ See *U.S. Patent Statistics, Calendar Years 1963–2012*, *supra* note 9. Another reason for the traditional misunderstanding of the effects of U.S. patent law on U.S. competitiveness is that analyses of U.S. competitiveness often only consider issues related to firms headquartered in the United States. A broader analysis is appropriate for at least two reasons. First, firms headquartered abroad, but operating in the United States, contribute significantly to U.S. gross domestic product (GDP). Second, even when headquartered in another country, a business unit in the United States can contribute to intense U.S. domestic rivalry, which in turn can help to make firms headquartered in the United States more competitive in global markets. Because of these concerns, this Article defines “U.S. firm” and similar phrases broadly to include all business endeavors that contribute to U.S. GDP. Similarly, “foreign firms” and similar phrases refer to business units that do not contribute to U.S. GDP. See *infra* notes 23–24 and accompanying text.

¹¹ *DeepSouth Packing Co. v. Laitram Corp.*, 406 U.S. 518, 527 (1972) (holding that under U.S. patent law, making or using a patented product outside of the United States does not constitute an infringement); *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1313 (Fed. Cir. 2005) (“Section 271(a) [of Title 35] is only actionable against patent infringement that occurs within the United States.”).

sought to convince other countries to strengthen their patent laws to match U.S. patent law.¹² Although many countries have refused, the United States has nevertheless maintained high levels of patent protection, ostensibly because the benefits still outweigh the costs.¹³ U.S. patent policymakers have also ignored an additional cost inherent to U.S. patent protection: U.S. patents weaken rivalry *among* competitors in the United States—and domestic rivalry substantially impacts competitive advantage.¹⁴ For example, intense domestic rivalry drives firms to improve and to reduce internal inefficiencies.¹⁵ Domestic rivalry also encourages the development of advanced factors of production, like technological information, and helps to spawn important supporting industries, like suppliers and manufacturers of related products.¹⁶

Having failed to consider all of the costs of strong patent protection, U.S. lawmakers have embraced patent laws that actually undermine U.S. competitiveness. To maximize U.S. competitive advantage, patent protection in the United States should be weakened.¹⁷ Yet reducing the strength of U.S. patent rights could undermine incentives to invest in the United States, and new inventions are often vital to U.S. competitiveness. The competitive benefits of weakening U.S. patent rights, then, must be weighed against the costs. This Article proposes both general and specific reforms to U.S. patent law that will improve the balancing of these countervailing effects on U.S. competitiveness.¹⁸

¹² S. REP. NO. 104-394, at 6 (1996) (“For more than a decade, a major objective of U.S. international trade negotiations has been strengthening intellectual property protections worldwide.”); *see also* Kapczynski, *supra* note 7, at 1571 (describing the “trend of ‘upward harmonization,’” pursuant to which foreign law is strengthened to match the protections provided by U.S. patent law).

¹³ *E.g.*, Peter K. Yu, *The Objectives and Principles of the TRIPS Agreement*, 46 Hous. L. REV. 979, 980 (2009) (describing international opposition to the Agreement on Trade-Related Aspects of Intellectual Property Rights (“TRIPS”)); Eric Pfanner, *Europeans Reject Treaty to Combat Digital Piracy*, N.Y. TIMES, July 5, 2012, at B5 (describing the European Parliament’s rejection of the Anti-Counterfeiting Trade Agreement).

¹⁴ PORTER, *supra* note 3, at 117; *see infra* notes 155–167 and accompanying text (discussing how strong U.S. patent law may harm U.S. competitiveness).

¹⁵ Harry S. Gerla, *Restoring Rivalry as a Central Concept in Antitrust Law*, 75 NEB. L. REV. 209, 224 (1996).

¹⁶ *See* PORTER, *supra* note 3, at 45–46, 73–77, 103–06; *see also infra* notes 52–55 and accompanying text (discussing specialized and advanced factors of production).

¹⁷ Weak patent rights should not be confused with patents produced by a weak patent system. For example, a weak patent system may produce low-quality patents, like patents that are likely to be invalid, but patents that provide owners with only limited rights are weak patents.

¹⁸ Admittedly, efforts to increase U.S. competitive advantage may not maximize global wealth. For example, spending a certain amount of U.S. federal tax revenue to improve public education in the United States might improve the quality of the U.S. labor market,

This Article proceeds in three primary parts. Part I examines the importance of competitive advantage and the current state of U.S. competitiveness in global markets, and further describes two important determinants of competitive advantage: factor conditions and domestic rivalry.¹⁹ Part II explores the effect of U.S. patent law on these determinants by analyzing the relationships among patents, competition, and innovation. Using this framework, Part II evaluates the effectiveness of current approaches to using patent law to increase U.S. competitive advantage, concluding that they are ineffective.²⁰ Part III argues that to increase U.S. competitiveness, U.S. patent rights should be weakened, and further analyzes the empirical challenges inherent to any effort to restructure U.S. patent law to maximize U.S. competitiveness.²¹ Part III proposes changes that will cost-effectively weaken U.S. patent protection in ways that will account for these empirical complexities.²²

I. ENHANCING U.S. COMPETITIVE ADVANTAGE

A. *The Importance of Competitive Advantage*

The success in global markets of firms headquartered and operated in the United States is vital to American economic prosperity.²³ If such firms fail to compete against foreign rivals, U.S. citizens will be less able to obtain jobs, and U.S. business owners may lose profits. Diminished U.S. competitiveness also leads to decreased foreign and domestic investment in businesses in the United States, which may further limit domestic employment opportunities. Reduced employment and business activity in the United States generate smaller tax revenues for federal and local governments. The U.S. economy also suffers when a multinational corporation decides to close or downsize a business unit

thereby helping some U.S. companies compete in global markets and marginally increasing global wealth. But spending that same sum of money may have a greater effect on education or public health in another country, thereby increasing global wealth more substantially. The scope of this Article, however, does not extend to the impact of U.S. competitive advantage on global wealth.

¹⁹ See *infra* notes 23–90 and accompanying text.

²⁰ See *infra* notes 91–194 and accompanying text.

²¹ See *infra* notes 195–321 and accompanying text.

²² See *infra* 238–321 and accompanying text.

²³ Cf. MICHAEL A. UTTON, *INTERNATIONAL COMPETITION POLICY: MAINTAINING OPEN MARKETS IN THE GLOBAL ECONOMY*, at vi (2006) (“While more and more countries adopt policies to regulate competition within their borders, at the same time many cases take on an international dimension.”).

located in the United States. And when a corporation expands a foreign business unit rather than a U.S. facility, the U.S. economy may lose a growth opportunity.

As a result, this Article defines “U.S. company” and similar terms broadly to include any business unit that contributes to U.S. gross domestic product (GDP). For example, a U.S. factory is considered a U.S. firm in this Article even if it is owned by a firm with facilities in other countries, and those foreign business units are “foreign firms” for the purposes of this Article. When U.S. companies—under this inclusive definition of that term—succeed in global markets, the U.S. economy prospers. Conversely, when economic endeavors located in the United States fail to compete against international rivals, including foreign business units within the same multinational corporation, the U.S. economy suffers.

The competitiveness of U.S. companies in high-productivity industries is particularly important. Productivity describes the amount of economic value produced by a given quantity of labor, and labor that generates substantial value is commensurately well-compensated.²⁴ Productivity is the primary determinant of national per capita income and, consequently, of national standard of living.²⁵ “If the industries that are losing position to foreign rivals are the relatively more productive ones in the economy, a nation’s ability to sustain productivity growth is threatened.”²⁶ Thus, maintaining and improving standards of living in the United States depends on the capacity of U.S. firms to compete successfully against foreign rivals in high-productivity endeavors.²⁷

Unfortunately, by some measures, the competitiveness of U.S. companies in global markets has been waning.²⁸ For example, the

²⁴ PORTER, *supra* note 3, at 6.

²⁵ *Id.*

²⁶ *Id.* at 8. Similarly, standards of living are threatened “when activities involving high levels of productivity (such as sophisticated manufacturing) are transferred abroad through foreign investment.” *Id.*

²⁷ See Gerla, *supra* note 15, at 254 (“Trillions of dollars, millions of jobs, and the standard of living of the nation ride on the development of [globally competitive] industries.”).

²⁸ See, e.g., PORTER, *supra* note 3, at 12 (“America, with skilled labor, preeminent scientists, and ample capital, has seen eroding export market shares in industries where one would least expect it, such as machine tools, semiconductors, and sophisticated electronic products.”). On the other hand, some economic studies provide a more optimistic view of U.S. competitiveness. See, e.g., Frederick E. Allen, *The U.S. Still Leads the World in Competitiveness*, FORBES (May 30, 2012, 6:39 PM), <http://www.forbes.com/sites/frederickallen/2012/05/30/the-u-s-still-leads-the-world-in-competitiveness/> (describing a recent analysis of competitiveness that concludes that the United States enjoys superlative competitiveness).

World Economic Forum (“WEF”) measures competitiveness by analyzing a number of related characteristics, including the quality of education and training; the efficiency of labor and capital markets; infrastructure; technological readiness; business sophistication; and innovation.²⁹ In 2007 and 2008, the United States topped the WEF competitiveness rankings.³⁰ Thereafter, however, the United States began to drop in the rankings, slipping to second in 2009, fourth in 2010, fifth in 2011, and seventh in 2012.³¹ A recent study conducted by Harvard Business School similarly indicates that the competitiveness of U.S. firms has decreased.³² When more than 50,000 alumni of the school were surveyed about “the extent to which firms operating in the U.S. are able to compete successfully in the global economy while supporting high and rising living standards for Americans,” more than 71% of the respondents believed that U.S. competitiveness would “deteriorate.”³³

Recent measures of some of the factors that affect competitiveness raise further questions about the future of U.S. competitiveness.³⁴ For example, the availability of a highly trained and educated labor force affects the competitiveness of domestic firms. Unfortunately, the U.S. educational system notoriously underachieves, particularly in science, technology, engineering, and math.³⁵ Most of the world’s high school students outperform U.S. high school students on international math and science tests,³⁶ and the United States ranks seventeenth in the

²⁹ WORLD ECON. FORUM, THE GLOBAL COMPETITIVENESS REPORT 2008–2009, at 4–6 (2009).

³⁰ *Id.* at 10.

³¹ WORLD ECON. FORUM, THE GLOBAL COMPETITIVENESS REPORT 2012–2013, at 13 (2012); WORLD ECON. FORUM, THE GLOBAL COMPETITIVENESS REPORT 2010–2011, at 15 (2010); Kai Bucher, *US Competitiveness Ranking Continues to Fall; Emerging Markets Are Closing the Gap*, WORLD ECON. F., (Sept. 7, 2011), <http://www.weforum.org/news/us-competitiveness-ranking-continues-fall-emerging-markets-are-closing-gap>.

³² MICHAEL E. PORTER & JAN W. RIVKIN, PROSPERITY AT RISK: FINDINGS OF HARVARD BUSINESS SCHOOL’S SURVEY ON U.S. COMPETITIVENESS 3 (2012).

³³ *Id.* at 3–4.

³⁴ See *infra* notes 39–41 and accompanying text (illustrating this proposition); *infra* notes 42–90 and accompanying text (discussing the determinants of competitive advantage).

³⁵ See NORMAN R. AUGUSTINE, IS AMERICA FALLING OFF THE FLAT EARTH? 30–34 (2007).

³⁶ COUNCIL ON COMPETITIVENESS, INNOVATE AMERICA: NATIONAL INNOVATION INITIATIVE SUMMIT AND REPORT 49 (2005); see also NAT’L MATH & SCI. INITIATIVE, *The Results Are in: The National Math and Science Initiative’s Comprehensive AP Program Works* 1–2 (2013), http://www.nmsi.org/Portals/0/Images/pages/researchAndResults/NMSI%20Infographic%20Handout_double-sided_v2.pdf (providing statistics regarding the weaker performance of U.S. schools vis-à-vis foreign educational systems).

world in high school graduation rate.³⁷ Performance in higher education is similar: the United States ranks fourteenth in the world in per capita college graduation rates, and thirteenth in the world in doctoral graduation rates.³⁸ Unsurprisingly, this educational mediocrity leads to a lack of researchers in the United States;³⁹ and many U.S. companies now send their research and development efforts overseas.⁴⁰ According to the National Science Foundation, almost a quarter of all research and development workers employed by U.S. companies work outside of the United States.⁴¹

B. *Determinants of Competitive Advantage*

Competitive advantage depends on the interaction of numerous economic considerations. In his seminal work *The Competitive Advantage of Nations*, celebrated economist Michael Porter analyzes the factors that give businesses in some countries competitive advantages over their international rivals. Porter argues that “firms gain and sustain competitive advantage in international competition through [continuous] improvement, innovation, and upgrading.”⁴² Porter identifies four determinants that contribute to the capacity of domestic firms to improve, innovate, and upgrade: (1) factor conditions; (2) related and supporting industries; (3) demand conditions; and (4) firm strategy, structure, and rivalry.⁴³ Each determinant affects the others, and they

³⁷ AUGUSTINE, *supra* note 35, at 19.

³⁸ *Id.* at 19; *New Doctorate Graduates*, OECD iLIBRARY, http://www.oecd-ilibrary.org/sites/sti_scoreboard-2011-en/02/01/index.html?contentType=&itemId=/content/book/sti_scoreboard-2011-en&containerItemId=/content/book/sti_scoreboard-2011-en&accessItemIds=&mimeType=text/html (last visited Oct. 3, 2013). Similarly, the United States ranks twenty-sixth in the world in the percentage of doctoral degrees that are awarded in science and engineering. *New Doctorate Graduates, supra*.

³⁹ See COUNCIL ON COMPETITIVENESS, *supra* note 36, at 49.

⁴⁰ Ron Hira, *U.S. Workers in a Global Job Market*, ISSUES IN SCI. & TECH. ONLINE, <http://www.issues.org/25.3/hira.html> (last visited Oct. 3, 2013). For example, General Electric, a company founded by American Thomas Edison, now has more research and development employees located outside of the United States than within it. *Id.*

⁴¹ Francisco Moris & Nirmala Kannankutty, *New Employment Statistics from the 2008 Business R&D and Innovation Survey*, INFOBRIEF, July 2010, at 1, 1.

⁴² PORTER, *supra* note 3, at 70; see AUGUSTINE ET AL., NAT’L ACAD. OF SCIS., NAT’L ACAD. OF ENG’G, & INST. OF MED. OF THE NAT’L ACADS., *RISE ABOVE THE GATHERING STORM, REVISITED* 43–44 (2010) (arguing that innovation spurs a competitive economy). Porter notes that this process of improving goods and services must be on-going because the advantages of today’s products are superseded by future improvements. PORTER, *supra* note 3, at 51.

⁴³ PORTER, *supra* note 3, at 71. Factor conditions are “[t]he nation’s position in factors of production, such as skilled labor or infrastructure, necessary to compete in a given in-

are all affected by both chance and government, including law.⁴⁴ A full discussion of Porter's analysis of the determinants of competitive advantage is beyond the scope of this Article. Instead, this Article focuses on two determinants of competitive advantage: factor conditions and domestic rivalry.⁴⁵

1. Factor Conditions

Factor conditions depend upon the cost and availability of "factors of production," which are "the inputs necessary to compete in any industry, such as labor, arable land, natural resources, capital, and infrastructure."⁴⁶ For example, the large quantities of arable land in the United States help the nation lead the world in many agricultural markets.⁴⁷ Although countries may face different factor endowments, "globalization has made local availability of some factors less essential."⁴⁸ Raw materials, for instance, can often be purchased on global markets even if they are otherwise unavailable locally.⁴⁹

Some types of factors of production contribute more to competitive advantage than others. In many industries, cheap access to basic factors, like natural resources and unskilled labor, provide little sustainable competitive advantages because businesses in other countries can replicate these factor conditions.⁵⁰ For example, although Chinese businesses have benefitted from cheap unskilled labor, other developing countries may soon have cheaper labor pools, particularly as Chi-

dustry." *Id.* Demand conditions are "[t]he nature of home demand for the industry's product or service." *Id.* Related and supporting industries are "[t]he presence or absence in the nation of supplier industries and related industries that are internationally competitive." *Id.* (footnote omitted). Finally, firm strategy, structure, and rivalry are "[t]he conditions in the nation governing how companies are created, organized, and managed, and the nature of domestic rivalry." *Id.*

⁴⁴ *Id.* at 127.

⁴⁵ Although the remaining determinants are important to competitive advantage, patent law has little direct effect on them.

⁴⁶ PORTER, *supra* note 3, at 73–74.

⁴⁷ *See id.* at 294 (noting that "[t]he United States has been well endowed with natural factors of production, among them an exceptionally large supply of arable land").

⁴⁸ *Id.* at 76.

⁴⁹ *Id.*

⁵⁰ *Id.* at 77. In addition, "[b]asic factors are passively inherited, or their creation requires relatively modest or unsophisticated private and social investment." *Id.* They are important in "extractive or agriculturally based industries (such as timber and soybeans) and in those where technological and skill requirements are modest and technology is widely available." *Id.*

nese economic success raises the cost of labor in China.⁵¹ In contrast, specialized and advanced factors of production, like high-speed internet, modern infrastructure, and highly educated labor, “are now the most significant [factors] for competitive advantage,” particularly in high-productivity economic endeavors.⁵² Creating these specialized and advanced factors of production typically requires significant and sustained investment and effort.⁵³

One important type of advanced, specialized factor of production is technological information. According to Porter, “Technological change can create new possibilities for the design of a product, the way it is marketed, produced, or delivered, and the ancillary services provided. It is the most common precursor of strategic innovation.”⁵⁴ When competitors can cheaply obtain the same technological information, however, it provides little durable competitive advantage. As discussed in more detail below, technological advantages that are patented provide more lasting competitive advantages because, although patents are public documents that disclose the details of a patented invention, the patent holder enjoys exclusive rights to commercialize the invention.⁵⁵

⁵¹ *Id.* (noting that “[a]n unskilled worker is increasingly vulnerable to pressures on wages”). Per capita gross domestic product in China has quadrupled since 1990. Richard A. Easterlin, *When Growth Outpaces Happiness*, N.Y. TIMES, Sept. 27, 2012, at A35, available at <http://www.nytimes.com/2012/09/28/opinion/in-china-growth-outpaces-happiness.html>.

⁵² PORTER, *supra* note 3, at 77. Advanced factors help to produce “higher-order” competitive advantages. *Id.* Such higher-order advantages include, for example, differentiated products and proprietary production technology. *Id.* Advanced factors are also “scarcer because their development demands large and often sustained investments in both human and physical capital.” *Id.*

⁵³ *Id.* at 77–78.

⁵⁴ *Id.* at 45–46.

⁵⁵ See *infra* notes 97–100 and accompanying text.

2. Domestic Rivalry

Domestic rivalry is also critical to competitive advantage.⁵⁶ Competitors force one another to innovate, reduce costs, and improve quality and service.⁵⁷ Rivals invest in improving their capacity to compete “as much from fear of falling behind as the inducement of getting ahead.”⁵⁸ New business formation is vital to fostering rivalry because new businesses offer new services and target new markets that older companies do not acknowledge or are too unadaptable to react to themselves.⁵⁹ Indeed, because of the need to challenge the advantages of existing companies, new entrants have clear incentives to develop innovations that render existing products or services obsolete.⁶⁰

Rivalry also helps to reduce the inefficiencies that exist within firms, such as when firms “do not minimiz[e] their costs.”⁶¹ Numerous

⁵⁶ PORTER, *supra* note 3, at 117–24 (describing the strong productive effects of domestic rivalry). Although Porter groups domestic rivalry with firm strategy and structure, this Article focuses on domestic rivalry. Nevertheless, firm strategy and structure also significantly affect competitive advantage. For instance, “[n]ations will tend to succeed in industries where the management practices and modes of organization favored by the national environment are well suited to the industries’ sources of competitive advantage.” PORTER, *supra* note 3, at 108. Similarly, nations will thrive in industries whose firms pursue goals that cultivate sources of competitive advantage. For example, many large corporations in the United States are publicly traded and thus frequently focus on maximizing quarterly and annual share price. In contrast to the comparatively short-term focus of large, publicly traded U.S. companies, many large German corporations concentrate on longer-term goals because significant numbers of shares are held by institutions like banks. *Id.* at 110–11. Although the role of long-term investors in Germany may be changing, these German corporations currently “do well in mature industries requiring ongoing investment in research and new facilities.” *Id.* at 111, 376–77.

⁵⁷ *Id.* at 118; accord Jonathan B. Baker, *Beyond Schumpeter vs. Arrow: How Antitrust Fosters Innovation*, 74 ANTITRUST L.J. 575, 579–81 (2007). As Judge Learned Hand observed more than sixty years ago, “Many people believe that possession of unchallenged economic power deadens initiative, discourages thrift and depresses energy; that immunity from competition is a narcotic, and rivalry is a stimulant, to industrial progress; that the spur of constant stress is necessary to counteract an inevitable disposition to let well enough alone.” *United States v. Aluminum Co. of Am.*, 148 F.2d 416, 427 (2d Cir. 1945).

⁵⁸ PORTER, *supra* note 3, at 118.

⁵⁹ *Id.* at 122.

⁶⁰ See CLAYTON M. CHRISTENSEN, *THE INNOVATOR’S DILEMMA: WHEN NEW TECHNOLOGIES CAUSE GREAT FIRMS TO FAIL* 45–48 (1997); Michael A. Carrier, *Two Puzzles Resolved: Of the Schumpeter-Arrow Stalemate and Pharmaceutical Innovation Markets*, 93 IOWA L. REV. 393, 406–08 (2008).

⁶¹ Gerla, *supra* note 15, at 224; see ROGER S. FRANTZ, *X-EFFICIENCY: THEORY, EVIDENCE AND APPLICATIONS* 35 (2d ed. 1997) (“[Intrafirm inefficiency] was unknown because the orthodoxy of the day (and largely of today) assumes that firms are producing on both their production and cost function.”). Although the concept of intrafirm inefficiency “runs counter to a basic operating assumption of modern neoclassical economics—firms always seek to maximize their profits by maximizing output for a given input and by minimizing costs for a

factors contribute to intrafirm inefficiencies, including lack of motivation, human inertia, and flaws in decision making.⁶² Rivalry helps to reduce intrafirm inefficiencies by pressuring employees of firms to behave more rationally.⁶³ Indeed, several empirical studies have confirmed that rivalry reduces intrafirm inefficiencies.⁶⁴ By one estimate, the cost of this type of inefficiency in the United States is more than \$1 trillion.⁶⁵ Thus, rivalry helps encourage firms to eliminate enormously wasteful inefficiencies.⁶⁶ Moreover, “[t]o the extent that rivalry curbs [intrafirm] inefficiencies in firms it can serve to facilitate the creation and commercial exploitation of innovations.”⁶⁷

Although rivalry between foreign and domestic competitors is important to competitive advantage, domestic rivalry fosters competitive advantage more for at least three reasons.⁶⁸ First, firms are more responsive to competition from domestic rivals. In general, firms face lower transaction costs in gathering detailed information about domestic rivals than about foreign competitors.⁶⁹ For example, language and

given rate”—severe intrafirm inefficiencies have been identified in numerous empirical studies. Gerla, *supra* note 15, at 224; see FRANTZ, *supra*, at 2. Significantly, intrafirm inefficiency is different from the deadweight loss of allocative inefficiency. FRANTZ, *supra*, at 15, 35. Allocative inefficiency occurs when the actions of profit-maximizing firms reduce overall social welfare. *Id.* at 15. For example, allocative inefficiency arises when a monopolist maximizes profits by restricting output and raising prices. Even with a higher price, some consumers will still purchase the monopolist’s products, but these consumers will transfer a greater amount of wealth to the monopolist than would occur under perfect competition. *Id.* Unfortunately, the monopolist’s profit-maximizing strategy reduces social wealth because some consumers will be unable to pay the monopolist’s supracompetitive prices. *Id.* These lost sales do not reflect a wealth transfer from consumers to the monopolist; instead, these sales do not occur at all. Under perfect competition, those same sales generate gains from trade for both consumers and producers. *Id.* The loss of these sales represents a deadweight loss to social wealth. *Id.* Although the monopolist experiences losses from the deadweight loss, it is still willing to restrict production and thereby produce allocative inefficiency—provided those losses do not exceed its gain from the consumer wealth transfer. See FRANTZ, *supra*, at 15.

⁶² FRANTZ, *supra* note 61, at 35.

⁶³ *Id.* at 58; see Gerla, *supra* note 15, at 223.

⁶⁴ FRANTZ, *supra* note 61, at 224; Gerla, *supra* note 15, at 227.

⁶⁵ See Gerla, *supra* note 15, at 227.

⁶⁶ *Id.* at 254.

⁶⁷ *Id.* at 236 (footnote omitted).

⁶⁸ See *id.* at 247 (noting that “all rivalry is not fungible” and that domestic rivalry is more important than foreign rivalry in cultivating competitive advantage). Plainly, from the perspective of competitive advantage, rivalry between U.S. firms and foreign competitors provides similar benefits to both firms and therefore may provide neither firm with significant *relative* advantage over the other.

⁶⁹ PORTER, *supra* note 3, at 120 (“Ideas diffuse faster within the nation than across nations, because it is difficult for firms from other countries to tap into such a process.”); see Brett M. Frischmann & Mark A. Lemley, *Spillovers*, 107 COLUM. L. REV. 257, 268–70 (2007)

cultural barriers may limit access to information about foreign competitors. In addition, firms hire fewer employees from foreign competitors than from domestic rivals, and employee mobility is an important conduit for the diffusion of certain forms of commercial information.⁷⁰

Firms also may respond differently to information about domestic rivals than to information about foreign competitors. Domestic rivalries often extend past economic issues and can become “emotional and even personal” because domestic firms fight for “bragging rights” as well as market share.⁷¹ In contrast, foreign rivals produce less intense competition, in part because the success of foreign rivals may be attributed to other determinants of competitive advantage, such as different factor conditions. In other words, “[w]ith domestic rivals, there are no excuses.”⁷²

Second, domestic rivalry contributes more to competitive advantage than international rivalry because domestic rivals face similar factor conditions. As a result, domestic rivalry prevents firms from depending too heavily on less durable sources of competitive advantage, like cheap labor, because other domestic firms enjoy similar access to the same resources.⁷³ Firms are forced to pursue more advanced factors of production, which are harder to develop and thus are more sustainable sources of competitive advantage.⁷⁴ For example, domestic rivals may create demand for highly trained employees, thereby precipitating specialized training programs.⁷⁵

Third, domestic rivalry contributes more to competitive advantage than international rivalry because domestic rivalry catalyzes another determinant of competitive advantage: related and supporting industries. Importantly, *domestic* rivalry—not foreign rivalry—is the most im-

(asserting that innovation continually begets innovation, especially when geographically concentrated); 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, 576–77 (1999) (describing geographical clusters of firms that form partly as a result of proximity of industry expertise). Concededly, technological innovations like the Internet and language translation software likely have reduced some of these transaction costs to some extent.

⁷⁰ See Frischmann & Lemley, *supra* note 69, at 268.

⁷¹ PORTER, *supra* note 3, at 119.

⁷² *Id.*

⁷³ *Id.*

⁷⁴ *Id.*; see *supra* notes 52–55 and accompanying text (discussing advanced and specialized factors of production).

⁷⁵ PORTER, *supra* note 3, at 134. For example, “[w]ith a group of rivals, there are a number of potential employers for graduates and several supporters and users of specialized facilities, programs, and knowledge.” *Id.*

portant factor in the growth of related and supporting industries.⁷⁶ Domestic rivals produce competitive markets for suppliers and commercial opportunities for related industries.⁷⁷ Indeed, related or supplier companies are often founded by employees who leave domestic firms.⁷⁸ Intense domestic rivalry also helps to generate advanced and specialized factors of production, which may benefit suppliers and related industries.⁷⁹

Related and supporting industries facilitate competitive advantage by producing commercial synergies. Suppliers can “help firms perceive new methods and opportunities to apply new technology.”⁸⁰ Related industries “share activities in the value chain” and therefore provide opportunities for valuable information exchange.⁸¹ For example, successful domestic computer manufacturers may improve the competitiveness of software companies. Moreover, firms generally face lower transaction costs in coordinating with domestic suppliers and related industries than with foreign industries.⁸² One reason for this is that “[p]roximity of managerial and technical personnel, along with cultural similarity, tends to facilitate free and open information flow.”⁸³ Together, the businesses, suppliers, and related industries in one location form an economic “cluster.”⁸⁴ As with the sharing of similar factor conditions, “[t]he existence of a cluster of several industries that draws on common inputs, skills, and infrastructure . . . stimulates government bodies, educational institutions, firms, and individuals to invest in relevant factor creation or factor-creating mechanisms.”⁸⁵ Furthermore,

⁷⁶ *Id.* at 138.

⁷⁷ *Id.* at 140. By way of illustration, “the concentration of rivals in movie and television production in Hollywood has led to the growth of a thriving and highly specialized group of supplier industries, ranging from special effects firms, to costume designers, to firms providing production insurance.” *Id.* at 139.

⁷⁸ *Id.* at 140.

⁷⁹ See *supra* notes 46–55 and accompanying text.

⁸⁰ PORTER, *supra* note 3, at 103. With domestic suppliers and industries, “[f]irms gain quick access to information, to new ideas and insights, and to supplier innovations.” *Id.*

⁸¹ *Id.* at 105.

⁸² *Id.* Nations are often internationally competitive in related industries. *Id.*

⁸³ *Id.* at 103; *accord id.* at 106 (“Proximity and cultural similarity make such interchange easier than is the case with foreign firms.”); see U.S. DEP’T OF COMMERCE, THE COMPETITIVENESS AND INNOVATIVE CAPACITY OF THE UNITED STATES 6–3 (2012) (suggesting that the overseas relocation of supporting manufacturing facilities could impair U.S. research and development).

⁸⁴ PORTER, *supra* note 3, at 135.

⁸⁵ *Id.*

reduced transaction costs within an economic cluster facilitate the coordination of research and development.⁸⁶

In sum, “[a] group of capable domestic rivals . . . creates a fertile environment for creating and sustaining competitive advantage that is difficult to replicate through competition with foreign rivals.”⁸⁷ It is important to note that Porter supported his analysis with both economic arguments and empirical research. Porter analyzed the competitive advantages of firms from ten countries over a period of four years with the help of a team of more than thirty researchers, and among his team’s strongest findings was the connection between domestic rivalry and competitive advantage.⁸⁸ Porter concluded, “It is rare that a company can meet tough foreign rivals when it has faced no significant competition at home.”⁸⁹ This empirical finding—that domestic rivalry significantly contributes to competitive advantage and productivity—has been independently verified numerous times.⁹⁰

II. U.S. PATENT LAW AND COMPETITIVE ADVANTAGE

Government and law can affect the determinants of competitive advantage.⁹¹ For example, education and immigration law can affect the availability of highly skilled labor.⁹² Likewise, environmental law can affect the cost of basic factors of production, like lumber and crude

⁸⁶ *Id.* at 103. Because domestic economic clusters are vital to competitive advantage, outsourcing certain aspects of an industry to foreign businesses can undermine long-term competitive advantage in the United States. See U.S. DEP’T OF COMMERCE, *supra* note 83, at 6–3.

⁸⁷ PORTER, *supra* note 3, at 121. Significantly, firms that are headquartered overseas but operate in the United States can contribute to intense domestic rivalry in the United States, which in turn can help to make firms headquartered in the United States more competitive in global markets. The contribution to U.S. domestic rivalry of firms that are headquartered in foreign countries demonstrates the importance of defining “U.S. firm” and similar phrases broadly to include all business units that contribute to U.S. GDP. See *supra* notes 23–24 and accompanying text (defining U.S. firms for the purposes of this Article).

⁸⁸ PORTER, *supra* note 3, at 117.

⁸⁹ *Id.* at 119.

⁹⁰ Baker, *supra* note 57, at 586–87 & n.29 (collecting sources which illustrate that industries with greater intranational competition have higher productivity); see also Gerla, *supra* note 15, at 247 (endorsing Porter’s analysis).

⁹¹ PORTER, *supra* note 3, at 127. Porter notes that “[i]t is tempting to make government the fifth determinant,” but this is not accurate because government only indirectly affects competition via its impacts on the four determinants. *Id.* at 126–27; see *supra* note 43 and accompanying text (listing the four determinants).

⁹² PORTER, *supra* note 3, at 627–30.

oil.⁹³ In addition, tax law can affect demand conditions for different products and services. For instance, tax credits can increase domestic demand for new technologies, such as high-efficiency solar panels.⁹⁴ Furthermore, antitrust law can foster robust rivalry and shape company strategy.⁹⁵ Like these other areas of law, patent law can affect competitive advantage.⁹⁶ In particular, U.S. patent law affects factor conditions and domestic rivalry in the United States.

A. U.S. Patent Law and Factor Conditions

One way that U.S. patent law affects competitive advantage is by facilitating the creation of an important factor of production: information.⁹⁷ Significantly, patent law encourages the discovery of new information by granting inventors exclusive but temporary rights to their discoveries.⁹⁸ Patents also encourage the discovery of new information by publicizing information regarding new inventions. To obtain exclusive patent rights, inventors must disclose sufficient information in their patents to enable a person of ordinary skill to use the protected invention.⁹⁹ Patent-related disclosures may help subsequent researchers discover new inventions.¹⁰⁰

⁹³ *Cf. id.* at 640–44 (discussing the impact of policies on factor and currency markets).

⁹⁴ *See* 26 U.S.C. § 25D(a)(1), (d)(2) (2006) (describing tax credits for “property which uses solar energy to generate electricity”).

⁹⁵ PORTER, *supra* note 3, at 662–63.

⁹⁶ *See* BOLDRIN & LEVINE, *supra* note 1, at 43. In fact, at least one early version of modern patent law was designed to boost domestic factors of production by “attracting particularly skillful artisans and merchants from other states.” *See id.*

⁹⁷ *See supra* notes 54–55, 76–82 and accompanying text (discussing the importance of information-sharing to competitive advantage).

⁹⁸ *See* 35 U.S.C. § 154(a)(1)–(2) (2006 & Supp. VI 2012). Although patents encourage innovation, they also serve other purposes. Graham et al., *supra* note 1, at 1287, 1299 (reporting numerous reasons to obtain patent rights). For example, patents signal information in a variety of contexts. William Hubbard, *Inventing Norms*, 44 CONN. L. REV. 369, 393–97 (2011) (arguing that patents serve as signals that support social norms); Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 647 (2002) (arguing that a patent signals to sources of capital that the patent owner engages in significant research and development). Expanding defenses to patent infringement rather than raising the costs of obtaining patents may help to support these other benefits of patenting because the vast majority of patents are never asserted in litigation or licensing negotiations. Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1507, 1514 (2001) (arguing that some of the issues of patent law are most efficiently addressed by courts rather than by the Patent Office because only 5% of patents are asserted through litigation or licensing).

⁹⁹ 35 U.S.C. § 112(a) (2006 & Supp. V 2011).

¹⁰⁰ Jason Rantanen, *Peripheral Disclosure*, 74 U. PITT. L. REV. 1, 9–12 (2012). *But see id.* at 13–15 (discussing criticisms of the disclosure function of patents). The value of this disclo-

The factor-creation effect of U.S. patent law, however, may provide little competitive advantage to U.S. firms because U.S. patent law also improves factor conditions for foreign firms. To start, U.S. patents are public documents available to anyone with an Internet connection.¹⁰¹ Moreover, the United States has joined international treaties that guarantee foreign inventors access to U.S. patent rights. For example, under the Agreement on Trade-Related Aspects of Intellectual Property Rights (“TRIPS”), the United States has agreed to “accord to the nationals of other [signatories] treatment no less favorable than that it accords its own nationals with regard to the protection of intellectual property.”¹⁰² U.S. patent law thus serves as a factor-creation mechanism for both foreign and U.S. firms.

Despite this formal neutrality, the application of U.S. patent law could favor U.S. firms for two reasons. First, firms from some countries, particularly developing countries, might face greater costs than U.S. inventors in discovering new inventions.¹⁰³ For instance, highly educated workers are vital to innovation but may be rare in some coun-

sure is limited, however, to the extent that patents prevent competitors from improving upon an initial invention.

¹⁰¹ See *Search for Patents*, U.S. PAT. & TRADEMARK OFF., <http://www.uspto.gov/patents/process/search/> (last modified Aug. 8, 2013, 11:08 AM) (providing a search engine for issued patents). In fact, most patent applications are published eighteen months after they are submitted to the U.S. Patent Office. See 35 U.S.C. § 122(b)(1) (2006).

¹⁰² Agreement on Trade-Related Aspects of Intellectual Property Rights art. 3, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299 [hereinafter TRIPS] (citation omitted). TRIPS construes “protection” broadly as “includ[ing] matters affecting the availability, acquisition, scope, maintenance and enforcement of intellectual property rights.” *Id.* art. 3 n.3. Furthermore, under Article 27 of TRIPS, patent rights must be available “without discrimination as to the place of invention . . . and whether products are imported or locally produced.” *Id.* art. 27; see also Paris Convention for the Protection of Industrial Property, art. 2, Mar. 20, 1883, as last revised at Stockholm, July 14, 1967, 21 U.S.T. 1583, 828 U.N.T.S. 305 (“Nationals of any country [that has signed the treaty] shall, as regards the protection of industrial property, enjoy in all of the other countries [that have signed the treaty] the advantages that their respective laws now grant, or may hereafter grant, to nationals . . .”).

¹⁰³ See Jerome H. Reichman, *Intellectual Property in the Twenty-First Century: Will the Developing Countries Lead or Follow?*, 46 Hous. L. Rev. 1115, 1116–17 (2009) (recognizing that intellectual property rights constitute just one of many elements of economic growth and that factor conditions also play a role); Yu, *supra* note 13, at 988 (indicating that, at one point, more than 99% of the world’s stock of patents were owned by nationals of industrialized nations). As a result, countries where firms produce few new inventions have been reluctant to enact robust intellectual property laws. See Reichman, *supra*, at 1116–17 (“[I]n many countries, especially those at an early stage of development, a sound agricultural policy or sound pro-competitive industrial policy with a supportive political and legal infrastructure are more likely to stimulate economic growth than intellectual property laws.”).

tries.¹⁰⁴ As a result, it may be difficult for firms from those countries to discover patentable inventions, and the factor-creation incentives from U.S. patent law would therefore favor U.S. firms.¹⁰⁵ By analogy, a saw is a better factor-creation mechanism in a heavily forested country than in a country covered in grassy plains. Second, U.S. patent law may favor U.S. inventors if transaction costs, including language and cultural barriers, prevent foreign inventors from successfully obtaining or enforcing U.S. patents on their inventions.¹⁰⁶

But even if the application of U.S. patent law sometimes favors U.S. firms regarding the creation of advanced factors of production, that advantage has waned for at least two reasons. First, by many measures, the innovative capacities of firms in many countries have grown in recent years.¹⁰⁷ For example, the Information Technology and Innovation Foundation recently released a study comparing the innovative capacities of forty different countries.¹⁰⁸ The study considered sixteen factors to measure innovative capacity in each country, including the number of science and technology researchers, the amount of capital invested in research, the number of scholarly publications, the availability of technological infrastructure like high-speed Internet, tax rates, gross domestic product per working-age adult, and worker productivity.¹⁰⁹ The study concluded that the United States ranked fourth, behind Singapore, Finland, and Sweden.¹¹⁰ Most alarming, however, was the study's examination of investment in innovation in the past twelve years. In that multi-factor comparison, the United States ranked *thirty-ninth*.¹¹¹

Second, numerous factors have reduced the transaction costs facing foreign firms seeking to acquire U.S. patents. For instance, millions of citizens of other countries have learned to speak English.¹¹² Fur-

¹⁰⁴ PORTER, *supra* note 3, at 79.

¹⁰⁵ See *id.* at 76–80.

¹⁰⁶ Hubbard, *supra* note 8, at 364–65. One example of how language barriers are prevalent may be illustrated by the recent patent infringement suit between Apple, Inc. and Samsung Electronics, Co., in which many of Samsung's witnesses needed interpreters to help with their testimony. Dan Levine & Poornima Gupta, *Analysis: How Apple Overwhelmed Samsung's Patent Case Tactics*, REUTERS, Aug. 27, 2012, available at <http://www.reuters.com/article/2012/08/27/us-apple-samsung-legal-idUSBRE87Q02K20120827>.

¹⁰⁷ See Hubbard, *supra* note 8, at 352 (collecting studies that suggest the United States is not out-innovating the rest of the world).

¹⁰⁸ ROBERT D. ATKINSON & SCOTT M. ANDES, THE INFO. TECH. & INNOVATION FOUND., THE ATLANTIC CENTURY II: BENCHMARKING EU AND U.S. INNOVATION AND COMPETITIVENESS 9 (2011).

¹⁰⁹ *Id.* at 5.

¹¹⁰ *Id.* at 9.

¹¹¹ *Id.* at 11.

¹¹² Hubbard, *supra* note 8, at 365–66.

thermore, the United States has joined international treaties, like the Patent Cooperation Treaty, that allow foreign inventors to rely on foreign patents to streamline the process of obtaining patents in the United States.¹¹³

Consistent with these changes, foreign inventors have been acquiring U.S. patents in steadily increasing percentages. In 1963, foreign inventors accounted for just 18.6% of U.S. patents, but for the past three years, foreign inventors have obtained more than 50% of the patents issued by the U.S. Patent Office.¹¹⁴ In 2010 alone, foreign inventors obtained 111,822 U.S. patents.¹¹⁵ To put this in perspective, if the U.S. Patent Office had only issued patents to foreign inventors in 2010, it would have nevertheless ranked third among patent offices in the world based on the number of issued patents.¹¹⁶

Unfortunately, it is difficult to reform U.S. patent law to improve factor creation by U.S. firms vis-à-vis foreign firms. In a previous article, this Author evaluated whether traditional improvements to U.S. patent law, like reducing the cost and duration of applying for a patent, would improve incentives to discover new inventions more for U.S. companies than for foreign companies.¹¹⁷ If so, then these changes to U.S. patent law would provide U.S. firms with competitive advantages by improving

¹¹³ See Patent Cooperation Treaty art. 3, June 19, 1970, 28 U.S.T. 7645, 1160 U.N.T.S. 231 [hereinafter Patent Cooperation Treaty], available at <http://www.wipo.int/pct/en/texts/articles/atoc.htm>. Under the Patent Cooperation Treaty, foreign inventors can file a patent application in their home country's patent office and then use that foreign application to draft a U.S. patent application. *Id.* Nonetheless, transaction costs may remain high among less sophisticated foreign inventors. See *Patenting by Organizations 2011*, U.S. PAT. & TRADEMARK OFF. AI-1 (Mar. 2012), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/topo_11.pdf (indicating that in 2011, 28% of individual inventors receiving U.S. patents were foreign, but 52% of corporations receiving U.S. patents were foreign).

¹¹⁴ *U.S. Patent Statistics, Calendar Years 1963–2012*, *supra* note 9.

¹¹⁵ *Statistical Country Profiles: United States of America*, WORLD INTELL. PROP. ORG., http://www.wipo.int/ipstats/en/statistics/country_profile/countries/us.html (last updated May 2013).

¹¹⁶ See *IP Statistics Data Center*, WORLD INTELL. PROP. ORG., <http://ipstatsdb.wipo.org/ipstatv2/ipstats/patentsSearch> (last updated Mar. 2013) [hereinafter Total Count by Filing Office] (select “2 – Total patent grants (direct and PCT national phase entries)” under the “Indicator” tab; then select “Total count by filing office” under the “Report Type” tab; then select “2010” under both “Year Range” tabs; then click the “Add All” button; then click the “Submit” button). Foreign patents also provide incentives to invent. See MICHAEL A. CARRIER, *INNOVATION FOR THE 21ST CENTURY: HARNESSING THE POWER OF INTELLECTUAL PROPERTY AND ANTITRUST LAW 3* (2009) (stating that patents have a “natural connection to innovation”). A competitiveness analysis of a country other than the United States might be different than the analysis provided in this Article and would be a fruitful topic for future research.

¹¹⁷ See generally Hubbard, *supra* note 8 (analyzing the incentives produced by possible changes to U.S. patent law with respect to domestic and foreign inventors).

factor conditions for U.S. firms. I concluded, however, that these typical reforms would provide little competitive advantage to U.S. firms.¹¹⁸ Because the factor-creation aspects of U.S. patent law cannot be changed to increase U.S. competitive advantage, the remainder of this Part considers the impact of U.S. patent law on a different determinant of competitive advantage: domestic rivalry.

B. *Patents and General Competition*

The relationships among patents, innovation, and competition are complex. Patents can support innovation by protecting investments in developing new technologies. They provide inventors with exclusive rights to make, use, offer to sell, sell, or import new inventions.¹¹⁹ As a result, patent owners can set the price of their goods or services high enough to profit meaningfully from their investments, and competitors cannot undercut their prices.¹²⁰ Alternatively, inventors can recover the cost of developing a patented invention by licensing the patent.¹²¹ Furthermore, because patents disclose substantial technological information, patents can promote subsequent innovation.¹²²

Unfortunately, the exclusive rights of patents also undermine competition,¹²³ particularly where a patent covers technology essential to competition, such as the active ingredients in some pharmaceuti-

¹¹⁸ *Id.* at 391 (asserting that such reforms could benefit foreign inventors more than U.S. inventors because more foreign inventors utilize the U.S. patent system than U.S. inventors and because foreign inventors may be more responsive to those reforms). This Author also examined whether U.S. competitive advantage could be enhanced through protectionist patent laws and concluded that because patent law cannot (and should not) formally favor U.S. inventors, such measures would fail to achieve that goal. *Id.*

¹¹⁹ See 35 U.S.C. § 271(a) (2006); CHRISTINA BOHANNAN & HERBERT HOVENKAMP, CREATION WITHOUT RESTRAINT: PROMOTING LIBERTY AND RIVALRY IN INNOVATION, at xi (2012) (stating that protection for new inventions is essential to promote innovation); Baker, *supra* note 57, at 578 (noting that firms may not invest in innovation if competitors can obtain some of the benefits from that innovation); Graham et al., *supra* note 1, at 1283 (“[P]atent monopoly is most commonly justified on the ground of providing incentives to innovate . . .”). *But see* Graham et al., *supra* note 1, at 1283 (reporting that patents sometimes “serve as only slight to moderate incentives” to invent).

¹²⁰ DAN L. BURK & MARK A. LEMLEY, THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT 7–8 (2009) (“If we don’t do something to encourage invention by rewarding inventors, everyone will want to be an imitator, not an inventor.”).

¹²¹ Hubbard, *supra* note 98, at 375.

¹²² See *supra* notes 99–100 and accompanying text (discussing this observation).

¹²³ See Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 3 BROOKINGS PAPERS ON ECON. ACTIVITY 783, 788 (1987).

cal.¹²⁴ Similarly, patents may be essential to an industry because they cover technology that is incorporated into industry standards.¹²⁵ After being incorporated into an industry standard, competitors must use this patented technology even though alternate technologies were available before the industry standard was established.¹²⁶ With an actual or threatened injunction prohibiting the infringement of a patent on an essential technology in an industry, the owner of the patent may be able to prevent another firm from effectively competing.¹²⁷ Furthermore, even when the patent owner broadly licenses a patent on an essential technology, competition may be undermined if the patent owner obtains royalties that significantly exceed the value of the patented technology.¹²⁸ Such a license raises marginal costs for the patent own-

¹²⁴ See BOHANNAN & HOVENKAMP, *supra* note 119, at xv (contending that innovation often depends on shared access giving rise to competition); see also BOLDRIN & LEVINE, *supra* note 1, at 8 (observing that drugs cost five to ten times as much when they are patented as when the patent expires and generic competitors enter the market).

¹²⁵ Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CALIF. L. REV. 1889, 1892–93, 1946 (2002). Industry standards are “procedural and technical rules generally followed by most members of an industry. Compliance with standards is voluntary, to varying degrees . . . but it may be impossible to sell products not produced in accordance with a standard.” *What Are Industry Standards?*, WISEGEEK, <http://www.wisegEEK.com/what-are-industry-standards.htm> (last visited Oct. 6, 2013). Industry standards cover a wide variety of products, including mobile phones and personal computers. Lemley, *supra*, at 1896. Patents on such products are often described as “standards essential patents” or “SEPs.” See Jorge L. Contreras, *Standards, Patents, and the National Smart Grid*, 32 PACE L. REV. 641, 655 (2012). By definition, firms in a standards-based industry cannot avoid infringing standards-essential patents. Because of the competitive problems that can arise with industry standards, many standard-setting organizations seek to use private agreements to limit the capacity of patent owners to undermine competition. See Lemley, *supra*, at 1948–54.

¹²⁶ See BOLDRIN & LEVINE, *supra* note 1, at 86. Changing established standards is expensive. *Id.* at 87.

¹²⁷ BURK & LEMLEY, *supra* note 120, at 29. Patent infringement is “[a]n act that interferes with one of the exclusive rights of a patent . . . owner.” BLACK’S LAW DICTIONARY 851 (9th ed. 2009).

¹²⁸ See Graham et al., *supra* note 1, at 1263, 1318 (reporting that entrepreneurs sometimes license patents “solely to avoid a lawsuit”). Determining the value of a patented technology is difficult. See JAMES BESSEN & MICHAEL J. MEURER, *PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK* 95–119 (2009) (exploring various ways to measure the value of patented technologies and identifying difficulties in accurately conducting such measures). Sometimes, a technology is essential to an industry because the technology is an important pioneering discovery. Paying high royalties for such a patent may not undermine competition because those royalties provide incentives for firms to develop new technologies that can be used to compete.

er's competitors and may foster intrafirm inefficiencies for the patent owner, including underinvestment in future innovations.¹²⁹

Finally, even patents on technologies that are not central to an industry—and which thus protect only one way of competing—can affect rivalry because they may raise costs for competitors who accidentally infringe the patents.¹³⁰ For example, one firm may invest substantial resources in developing a technology only to learn later that the technology infringes a rival's patent. Because independent invention is not a defense to patent infringement,¹³¹ the infringing firm may consider switching to a different technology to avoid patent liability.¹³²

Even when non-infringing alternatives are technologically possible, however, switching technologies may be unfeasible for two reasons. First, the costs of switching to a different technology may be substantial. Developing a non-infringing alternative may be expensive.¹³³ Even when alternative technologies are cheaply available, the cost of altering production facilities and distribution chains to implement the non-infringing alternative may be enormous.¹³⁴ Second, a firm might avoid infringing one patent only to infringe another. Many corporations today own massive patent portfolios,¹³⁵ and determining *ex ante* whether a product infringes any patent in that portfolio may be difficult, particularly because precise patent boundaries can be notoriously unclear.¹³⁶ Even worse, a risk-averse firm that closely examines a patent

¹²⁹ See Gerla, *supra* note 15, at 238–39; see *supra* notes 60–64 and accompanying text (discussing intrafirm inefficiencies).

¹³⁰ Such patents are common. See *Ill. Tool Works Inc. v. Indep. Ink, Inc.*, 547 U.S. 28, 42–43 & n.4 (2006); BOHANNAN & HOVENKAMP, *supra* note 119, at xv; see also Graham et al., *supra* note 1, at 1313 (indicating that competitors may try to invent around patents); Levin et al., *supra* note 123, at 802–03 (same).

¹³¹ BURK & LEMLEY, *supra* note 120, at 8.

¹³² See generally Christopher B. Seaman, *Reconsidering the Georgia-Pacific Standard for Reasonable Royalty Patent Damages*, 2010 B.Y.U. L. REV. 1661 (discussing reasonable royalty damages when there is an acceptable substitute to patented technology).

¹³³ See *id.* at 1718–23 (discussing the costs of developing non-infringing alternatives).

¹³⁴ See BURK & LEMLEY, *supra* note 120, at 29.

¹³⁵ See *Patenting by Organizations 2011*, *supra* note 113, at B1-1 (noting that in 2011 alone, Samsung Electronics Co. obtained 4868 U.S. patents). Interestingly, Apple, Inc. obtained only 676 U.S. patents in 2011. *Id.* at B1-2.

¹³⁶ See, e.g., Gretchen Ann Bender, *Uncertainty and Unpredictability in Patent Litigation: The Time Is Right for a Consistent Claim Construction Methodology*, 8 J. INTELL PROP. L. 175, 209 (2001) (“The patent litigator cannot predict the trial or appellate court’s claim construction with any certainty or confidence.”); Tun-Jen Chiang, *Fixing Patent Boundaries*, 108 MICH. L. REV. 523, 525 (2010) (“The normal story of patent law’s boundary problems is that claim language is too vague.”).

and later infringes it may be found to have willfully infringed the patent, thereby risking treble damages and attorney's fees.¹³⁷

In the end, paying royalties for a license to a competitor's patents may be cheaper even if the patent owner can charge royalties that exceed the value of the patented technology.¹³⁸ In the absence of a license, a firm faces switching costs and potential liability for both past and future patent infringement. By raising marginal costs, however, such a license may inhibit competition.¹³⁹ As Justice Anthony Kennedy observed in the 2006 U.S. Supreme Court patent case *eBay Inc. v. MercExchange, L.L.C.*, a patent owner may use an injunction and the "potentially serious sanctions arising from its violation . . . as a bargaining tool to charge exorbitant fees to companies that seek to buy licenses to practice the patent."¹⁴⁰

When patents undermine competition, they not only impose costs on society, but may also retard innovation.¹⁴¹ For example, because in-

¹³⁷ See 35 U.S.C. § 284 (2006 & Supp. V 2011) (establishing treble damages, which multiply compensatory damages up to three times); ROBERT P. MERGES ET AL., *INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE* 421 (6th ed. 2012) (explaining that the willfulness doctrine may disincentivize inventors from reading competitors' patents); see also *In re Seagate Tech., LLC* 497 F.3d 1360, 1370–72 (Fed. Cir. 2007) (en banc) (discussing the legal standard for willful patent infringement).

¹³⁸ See *supra* notes 128–129 and accompanying text (discussing royalty payments).

¹³⁹ See *supra* notes 128–129 and accompanying text.

¹⁴⁰ 547 U.S. 388, 396 (2006) (Kennedy, J., concurring). This concern may have been ameliorated to a certain extent by the Supreme Court's *eBay* decision, which held patent owners are not automatically entitled to injunctive relief when their patents are infringed. *Id.* at 391–94 (majority opinion). Even after *eBay*, however, courts may frequently enjoin infringement. See *id.* at 394–95 (Roberts, C.J., concurring).

¹⁴¹ Gerla, *supra* note 15, at 228–33; Levin et al., *supra* note 123, at 787–88; Reichman, *supra* note 103, at 1121. Scholars disagree sharply regarding the relationship between competition and innovation. See, e.g., BOHANNAN & HOVENKAMP, *supra* note 119, at 9 (noting that "there is probably more empirical literature on the relation between competition and innovation than on any topic in the field of industrial organization economics"). Prominent economist Joseph Schumpeter famously argued that rivalry actually undermines innovation. *Id.* at 8; JOSEPH SCHUMPETER, *CAPITALISM, SOCIALISM, AND DEMOCRACY* 81–106 (3d ed. 1946); Baker, *supra* note 57, at 578. Rivalry, for example, causes duplicative effort. Moreover, firms may be reluctant to invest in projects that will convey significant benefits to rivals, like basic scientific research. See BOHANNAN & HOVENKAMP, *supra* note 119, at 8. Economic conditions in some industries also may favor monopolies because of the benefits of economies of scale. For example, smaller firms find it difficult to compete in the pharmaceutical industry because the cost of developing a new drug may be as high as \$800 million. See BOLDRIN & LEVINE, *supra* note 1, at 212. In contrast to Schumpeter's position, well-known scholars like Kenneth Arrow have argued that competition instead provides significant incentives to innovate. Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in *THE RATE AND DIRECTION OF ECONOMIC ACTIVITIES: ECONOMIC AND SOCIAL FACTORS* 609 (Richard Nelson ed., 1962); Baker, *supra* note 57, at 578–79; Gerla, *supra* note 15, at 230 ("The empirical data indicates that it is more danger-

dependent invention is not a defense to patent infringement, patents can deter competitors from investing in innovation in patent-rich fields.¹⁴² Patents also prevent competitors from improving upon a patented invention, and some improvements could be quite significant.¹⁴³ Moreover, patent owners often face little pressure to make improvements to their patented inventions. For example, “[a] monopolist could spend a great deal of money to make a dramatic improvement—whether by lowering cost, improving quality, or creating a new product—only to find that it does not get much additional business because it already has most of the business there is to get.”¹⁴⁴ Indeed, “there are many instances when a firm that thought it had control over a broad technology rested on its laurels until jogged to action by an outside

ous for innovation if we err on the side of too little rivalry than if we err on the side of too much rivalry.”); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 908 (1990). This Article does not attempt to resolve this debate, nor does this Article depend on a particular resolution to it. The primary focus of this Article is the effect of rivalry on global competition, and numerous empirical studies have demonstrated that domestic rivalry is critical to competitive advantage. Baker, *supra* note 57, at 585–86 & n.29 (collecting studies). For example, Michael Porter’s empirical study of competition in global markets “casts grave doubts” on the claim that monopoly fosters competitive advantage. See PORTER, *supra* note 3, at 117 (“A look at the successful industries in the ten nations we studied . . . belie[s] the simple notion that world leadership grows out of one or two firms who reap economies of scale in the home market.”).

¹⁴² See BURK & LEMLEY, *supra* note 120, at 8. At the same time, an overabundance of patents can force competitors to engage in defensive patenting. For example, one competitor might obtain patents solely to be able to assert them in retaliation to patent claims by another competitor. See Julie Samuels, *The Defensive Patent License and Other Ways to Beat the Patent System*, ELEC. FRONTIER FOUND. (June 10, 2012), <https://www.eff.org/deeplinks/2012/06/defensive-patent-license-and-other-ways-beat-patent-system> (defining defensive patenting as “acquiring patents to deter future litigation” and explaining that “the practice has encouraged companies to seek patents for anything and everything, which—thanks to an overburdened Patent Office—has resulted in a generation of overbroad patents”). Overabundant patents can also lead to cross-licensing. ADAM B. JAFFE & JOSH LERNER, *INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT* 59–60 (2004); see also BLACK’S LAW DICTIONARY, *supra* note 127, at 1003 (stating that cross-licensing occurs when “two or more [patent owners agree] to exchange licenses for their mutual benefit and use of the licensed products”).

¹⁴³ Merges & Nelson, *supra* note 141, at 870.

¹⁴⁴ Baker, *supra* note 57, at 578.

threat.”¹⁴⁵ Competition thus can help to speed the development of improvements of existing technology.¹⁴⁶

Because patents both encourage invention and undermine competition, lawmakers must carefully tailor patent rights to balance these competing concerns.¹⁴⁷ The scope of protection afforded to patents is critical to achieving this balance. Patent scope depends on numerous factors, including the duration of patents; the types of discoveries eligible for patent protection; the breadth of judicial interpretation of the language in patents; the bases on which patents can be invalidated; and the remedies awarded for patent infringement.¹⁴⁸ Increasing the scope of protection—by, for example, substantially extending the duration of patents—might provide greater incentives to innovate, but would probably obstruct follow-on innovation and inhibit competition to a greater extent. The social utility of a potential change in patent scope thus will depend on the marginal costs and benefits of the change.¹⁴⁹ At least in theory, the intersection between marginal cost and marginal benefit curves determines the optimal level of patent protection.¹⁵⁰ Unfortunately, rigorously comparing these marginal costs and benefits is difficult, if not impossible, because they cannot be measured empirically.¹⁵¹

¹⁴⁵ Merges & Nelson, *supra* note 141, at 872. Another way in which patents may reduce the incentive to innovate for patent owners is because “rivalry may promote the elimination of internal inefficiencies which hinder the ability of firms to profit from innovations they create.” Gerla, *supra* note 15, at 229–30.

¹⁴⁶ See Merges & Nelson, *supra* note 141, at 878 (noting that “society prefers to have improvements now rather than later”).

¹⁴⁷ BURK & LEMLEY, *supra* note 120, at 8. Other areas of law provide only limited help in this balancing. For example, antitrust liability typically does not extend to the assertion of lawfully acquired patent rights. *Dippin’ Dots, Inc. v. Mosey*, 476 F.3d 1337, 1346 (Fed. Cir. 2007).

¹⁴⁸ See generally Merges & Nelson, *supra* note 141 (evaluating doctrines of patent scope).

¹⁴⁹ Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 HARV. L. REV. 1813, 1825 n.29 (1984).

¹⁵⁰ See generally Tim Worstall, *The Tabarrok Curve: Why the Patent System Is Not Fit for Purpose*, FORBES (June 23, 2013, 9:39 PM), <http://www.forbes.com/sites/timworstall/2013/06/23/the-tabarrok-curve-why-the-patent-system-is-not-fit-for-purpose/> (embracing a cost-benefit analysis of patent protection).

¹⁵¹ See FRITZ MALCHUP, SUBCOMM. ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE S. COMM. ON THE JUDICIARY, 85TH CONG., STUDY NO. 15, AN ECONOMIC REVIEW OF THE PATENT SYSTEM 80 (Comm. Print 1958). Economist Fritz Malchup famously concluded his study of the U.S. patent system unsure of its social utility:

If one does not know whether a system “as a whole” (in contrast to certain features of it) is good or bad, the safest “policy conclusion” is to “muddle through”—either with it, if one has long lived with it, or without it, if one has lived without it. If we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to rec-

C. *U.S. Patents and Competition by U.S. Firms*

A U.S. patent prevents competitors from making, using, selling, offering to sell, and importing infringing technology in the United States.¹⁵² As a result, U.S. patents not only restrict the commercial activities of U.S.-headquartered firms, which conduct many of their activities in the United States, but also restrict competition by firms founded abroad that conduct business in the United States.¹⁵³ Nevertheless, because of limits on the extraterritoriality of U.S. law, much of the commercial activity conducted by foreign firms occurs beyond the reach of U.S. patent law.¹⁵⁴ U.S. patents, therefore, do not impact foreign firms as much as they affect U.S. firms, and U.S. patents consequently undermine U.S. competitive advantage in two respects.

First, U.S. patents limit competition by U.S. firms in global markets. Often, foreign firms can cheaply avoid liability for infringing a U.S. patent simply by performing certain commercial activities outside of the United States, and U.S. firms face comparatively greater costs in conducting commercial activities outside the United States. For example, a Chinese firm could avoid infringing a U.S. patent by manufacturing and selling its products outside of the United States. For a U.S. company to similarly sidestep a U.S. patent, it would need to establish

commend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it.

Id.

¹⁵² 35 U.S.C. § 271(a) (2006).

¹⁵³ See BESSEN & MUERER, *supra* note 128, at 140 (noting that “a lawsuit filed in the United States might result in a settlement that covers worldwide business”).

¹⁵⁴ See *DeepSouth Packing Co. v. Laitram Corp.*, 406 U.S. 518, 527 (1972) (holding that under U.S. patent law “it is not an infringement to make or use a patented product outside of the United States”); *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1313 (Fed. Cir. 2005) (“Section 271(a) [of Title 35] is only actionable against patent infringement that occurs within the United States.”). Although U.S. patent law generally lacks extraterritorial effect, U.S. patent law may affect conduct in foreign jurisdictions when foreign activities have a sufficient nexus with the United States. For example, if a foreign firm imports a product into the United States that was produced by a patented process, that firm may be liable for patent infringement even if the process was used entirely outside of the United States. 35 U.S.C. § 271(g); see also *NTP*, 418 F.3d at 1317 (holding that, even if part of a patented system is located outside of the United States, the system is “used” in the United States if “control of the system is exercised and beneficial use of the system obtained” in the United States). Even in this situation, however, a successful patent owner may not be able to assert a U.S. patent infringement judgment against a firm’s foreign assets. See Robert C. Casad, *Issue Preclusion and Foreign Country Judgments: Whose Law?*, 70 IOWA L. REV. 53, 75 (1984) (indicating that foreign jurisdictions may not give U.S. judgments preclusive effect).

or enlarge its commercial presence outside of the United States, thereby raising costs for the U.S. firm and reducing the extent to which the firm contributes to the U.S. economy.¹⁵⁵

Second, by restricting the commercial activities of U.S. firms, U.S. patents inhibit competition *among* U.S. firms. In limited respects, U.S. patents can affect rivalry among foreign firms, at least to the extent that foreign firms compete with each other for sales in the United States. A U.S. patent owned by one Japanese company, for instance, could limit the ability of another Japanese company to compete for U.S. sales. Nevertheless, U.S. patents affect rivalry among foreign firms less in their home countries because central aspects of their businesses take place beyond the reach of U.S. patent law.¹⁵⁶ With less domestic rivalry to hone their competitive edges, U.S. firms are less prepared to compete in global markets.¹⁵⁷

To some extent, foreign patents limit competition by and among foreign firms as well. Indeed, important inventions are often patented in many countries.¹⁵⁸ Nevertheless, in two respects U.S. patents reduce U.S. competitiveness more than foreign patents limit foreign competitiveness.

First, the extent to which a patent limits domestic rivalry in a country depends upon the scope of protection afforded to patents in that country, and U.S. patent law generally provides broader rights than many foreign patent systems.¹⁵⁹ Other countries typically have been

¹⁵⁵ The Wright brothers' U.S. patent on basic airplane technology may provide an example of this phenomenon. Some commentators have argued that the Wright brothers' aggressive assertion of their U.S. patent allowed for the development of the aviation industry in France. BOLDRIN & LEVINE, *supra* note 1, at 87–88; *see also id.* at 219 (asserting that “the slow growth of the coloring industry in the United States before the First World War was largely due to patent protection: most [U.S.] patents were held by the large German companies”).

¹⁵⁶ *See supra* note 154 and accompanying text (discussing the limited reach of U.S. patent law on foreign corporations).

¹⁵⁷ *See supra* notes 68–90 and accompanying text (illustrating how domestic rivalry fosters competitive advantage).

¹⁵⁸ In fact, the United States (along with more than 140 other countries) has signed the Patent Cooperation Treaty, which allows an inventor to use a patent application in one country to streamline the patent application processes in other countries. *See* Patent Cooperation Treaty, *supra* note 103, art. 3; *Contracting Parties*, WORLD INTELL. PROP. ORG., http://www.wipo.int/treaties/en/ShowResults.jsp?lang=en&treaty_id=6 (last visited Nov. 17, 2013) (check the “Patent Cooperation Treaty” box; then click the “Search” button).

¹⁵⁹ Some research indicates that “the level of intellectual property protection increases with a country’s real gross domestic product per capita.” COUNCIL OF ECON. ADVISERS, *supra* note 4, at 225. As described in more detail below, the scope of patent protection in the United States has increased in many ways in recent years. *See infra* notes 200–206 and accompanying text.

more reluctant to expand the rights of patent owners, so that “[m]ost indices of the strength of intellectual property protection tend to show that the United States is among the countries with the highest level of protection.”¹⁶⁰ Consequently, even if the same technology is protected by patents in both the United States and foreign jurisdictions, the harm to competition is more pronounced in the United States.

Second, foreign inventions are protected by patents in the United States—all things being equal—more than in many other countries.¹⁶¹ Because the United States is the largest consumer market in the world and because only U.S. patents can be asserted in this market, many foreign firms highly value U.S. patents.¹⁶² Moreover, as described above, the transaction costs for a foreign inventor to obtain a U.S. patent have recently decreased.¹⁶³ As a result of the value and increasing ease of obtaining U.S. patents, foreign inventors have been obtaining U.S. patents in record numbers.¹⁶⁴ In contrast, inventors worldwide are not flocking to many other countries. Excluding patenting in the United States, nonresident inventors in 2010 accounted for only 36% of patents across all patent offices worldwide.¹⁶⁵ Nonresident patenting in some patent-intensive countries is much lower than this global average. For instance, in 2010 nonresident inventors obtained only 16% of Japanese patents and only 25% of Korean patents.¹⁶⁶ Similarly, in 2011,

¹⁶⁰ COUNCIL OF ECON. ADVISERS, *supra* note 4, at 225; *see also* Kapczynski, *supra* note 7, 1588–1616 (demonstrating that patent protections in India are weaker than protections in the United States, particularly for pharmaceutical inventions).

¹⁶¹ *See U.S. Patent Statistics, Calendar Years 1963–2012, supra* note 9.

¹⁶² *See id.* (showing that the U.S. Patent Office has issued more patents to foreigners than to U.S. residents in recent years); *see also* *Voda v. Cordis Corp.*, 476 F.3d 887, 889–90 (Fed. Cir. 2007) (holding that foreign patents cannot be asserted in the United States); *World Top Consumer Markets Ranking, supra* note 9 (ranking the United States as the top consumer market).

¹⁶³ *See supra* notes 112–113 and accompanying text.

¹⁶⁴ *See U.S. Patent Statistics, Calendar Years 1963–2012, supra* note 9.

¹⁶⁵ *See IP Statistics Data Center, supra* note 116 [hereinafter Total Count by Applicant’s Origin and Filing Office] (select “2 – Total patent grants (direct and PCT national phase entries)” under the “Indicator” tab; then select “Count by applicant’s origin and by filing office” under the “Report Type” tab; then select “2010” under both “Year Range” tabs; then click the “Add All” button under both “Select Origin” and “Select Office” categories; then click the “Submit” button).

¹⁶⁶ *Id.* The only other major patent office that issues close to 50% of its patents to foreign inventors is the European Patent Office. *Id.* The reason for this high rate of foreign inventor patenting is likely similar to the U.S. explanation: the European Union is a massive consumer market, and there are few barriers to foreign inventors obtaining patents from the European Patent Office. *See* DELOITTE, CONSUMER 2020: READING THE SIGNS 7 (2011), https://www.deloitte.com/assets/Dcom-Global/Local%20Assets/Documents/Consumer%20Business/8664A_Consumer2020_sg8.pdf (massive consumer market); David

79% of the patent applications received by the State Intellectual Property Office of the People's Republic of China came from residents.¹⁶⁷

Despite the low percentage of nonresident patentees, some foreign countries issue large numbers of patents to resident inventors. These patents can limit competition by and among firms in those countries, thereby reducing their competitive advantage. For example, in 2010, Japan issued 187,237 Japanese patents to Japanese inventors, which is more than three times the number of patents that the European Patent Office issued that year.¹⁶⁸ Nevertheless, patents issued to residents also arguably bolster competitive advantage by providing residents with exclusive rights to discoveries in that country.¹⁶⁹ In contrast, when the U.S. Patent Office issues a U.S. patent to a foreign inventor, competition by and among U.S. firms is limited even though U.S. firms may not obtain exclusive access to the new invention.

Thus, with more foreign inventors obtaining U.S. patents and with U.S. patent law providing more robust rights than many foreign patent laws, U.S. patents limit competition more in the United States than foreign patents limit competition in other countries. This reduced competition in the United States ultimately undermines U.S. competitive advantage.

D. *Current Approaches to U.S. Patent Law and U.S. Competitive Advantage*

Policymakers recognize that enhancing U.S. competitiveness is important and that patent law can affect competitive advantage.¹⁷⁰ Be-

Meyer, "Troll" Warning as EU Gets Unitary Patent Scheme, After Decades of Failure, ZDNET (Dec. 20, 2012, 9:36 PM), <http://www.zdnet.com/troll-warning-as-eu-gets-unitary-patent-scheme-after-decades-of-failure-7000008672/> (arguing that new European Union rules will make it too easy to obtain an EU patent); see also Jerzy Koopman, *The Patentability of Transgenic Animals in the United States of America and the European Union: A Proposal for Harmonization*, 13 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 103, 200 (2002) (stating that patents on transgenic animals can be obtained in a way that such patents in the United States cannot).

¹⁶⁷ Daniel Pruzin, BLOOMBERG LAW, *U.N. Agency Says China Top Recipient for Patent, Trademark, Design Applications*, TRADEMARK & COPYRIGHT L. DAILY, Dec. 12, 2012, at 1, 1–2. The term "resident filers" includes "Chinese firms as well as foreign firms with an established presence in China through which the applications were filed." *Id.*

¹⁶⁸ Total Count by Applicant's Origin and Filing Office, *supra* note 165.

¹⁶⁹ A foreign inventor may also be able to use a foreign patent to obtain patent rights in other countries under the Patent Cooperation Treaty noted above. See Patent Cooperation Treaty, *supra* note 113, art. 3; *supra* note 113 and accompanying text.

¹⁷⁰ See 157 CONG. REC. S5433 (daily ed. Sept. 8, 2011) (statement of Sen. Mark Kirk) (stating that legislation that "strengthen[s] our patent system . . . [will] bolster our global competitiveness [sic]"); 153 CONG. REC. 23706 (2007) (arguing that legislation resulting in weaker patent protection "is a severe threat to American innovation, American jobs and American competitiveness"); 143 CONG. REC. 4359 (1997) ("[W]e have had the strongest

cause policymakers have misunderstood the impact of U.S. patents on U.S. competitive advantage, however, they have sought to increase U.S. competitiveness through two fundamentally flawed approaches.

First, lawmakers have sought to increase U.S. competitive advantage by strengthening the protections offered by U.S. patents and thus (it is hoped) increasing incentives for U.S. firms to discover new inventions.¹⁷¹ As discussed above, however, foreign inventors frequently obtain U.S. patents, and enlarged incentives created through stronger U.S. patents generally will inure to the benefit of both domestic and foreign firms.¹⁷² In fact, because stronger patent rights are more valuable, strengthening U.S. patent rights will encourage more foreign firms to obtain U.S. patents.¹⁷³ Unlike the benefits of stronger U.S. patent rights, the competitive harms of stronger U.S. patents disproportionately impact U.S. firms.¹⁷⁴ As a result, increasing the strength of U.S. patent protection may eventually harm competition by and among U.S. firms such that U.S. competitiveness will decrease. This Article argues below, in Part III, that U.S. patent law has already passed this tipping point.¹⁷⁵

The second approach traditionally adopted by U.S. lawmakers attempting to use patent law to increase U.S. competitiveness is to strengthen foreign patent law to match the protections provided by U.S. patent law—so called “upward harmonization.”¹⁷⁶ Many lawmakers and businesses believe that strengthening patent law in foreign coun-

patent protection of any country of the world, and that is what has ensured the American people for these last 200 years the ability to have a higher standard of living than other countries of the world, because we were able to out-compete them.”); 131 CONG. REC. 21739 (1985) (stating that “strengthening intellectual property rights was cited as a major prescription for ensuring America’s continued prosperity and economic competitiveness”).

¹⁷¹ See *supra* note 170 and accompanying text (collecting congressional records).

¹⁷² See *supra* notes 159–169 and accompanying text; see also Thomas H. Case & Scott R. Miller, *An Appraisal of the Court of Appeals for the Federal Circuit*, 57 S. CAL. L. REV. 301, 322 (1984) (“American patents that are issued to foreigners benefit the inventor regardless of nationality.”).

¹⁷³ See AUGUSTINE, *supra* note 35, at 61. All things being equal, patents in a smaller economy are generally less valuable because they impact less economic activity.

¹⁷⁴ See *supra* notes 152–169 and accompanying text (describing the unique harms suffered by U.S. firms pursuant to strong U.S. patent laws).

¹⁷⁵ See *infra* notes 198–216 and accompanying text.

¹⁷⁶ S. REP. NO. 104-394, at 6 (1996) (“For more than a decade, a major objective of U.S. international trade negotiations has been strengthening intellectual property protections worldwide.”); see also Kapczynski, *supra* note 7, at 1571. Harmonization, more generally, has been defined as “the adoption of standards or agreements that bring state practices closer to one another.” Kapczynski, *supra* note 7, at 1572 n.4.

tries “will be critically important to the success of [U.S.] firms and the American economy.”¹⁷⁷ To this end, the United States has been a major proponent of international treaties that require signatories to provide robust patent protection.¹⁷⁸ For example, the United States was a driving force behind TRIPS, which established minimum levels of intellectual property protection in all countries that are members of the World Trade Organization (WTO).¹⁷⁹ To ensure compliance with TRIPS, the United States has initiated WTO dispute resolution proceedings, including actions against Brazil¹⁸⁰ and China.¹⁸¹ In fact, the United States has initiated numerous dispute resolution proceedings under TRIPS—more than all of the other WTO member countries combined.¹⁸² Furthermore, to strengthen the protection of intellectual property beyond

¹⁷⁷ Peter K. Yu, *The Rise and Decline of the Intellectual Property Powers*, 34 CAMPBELL L. REV. 525, 549 (2012); accord BOLDRIN & LEVINE, *supra* note 1, at 174, 246. Peter Yu notes that the United States is “one of the predominant intellectual property powers pushing for stronger levels of protection and enforcement around the world.” Yu, *supra*, at 541.

¹⁷⁸ For example, in 2012, the chair of the House Subcommittee on Intellectual Property, Competition, and the Internet stated that the United States should use negotiations with numerous Asian countries to generate “stronger, not weaker commitments by other countries to enhance their IP laws.” Tamlin H. Bason, BLOOMBERG LAW, *House Subcommittee Questions IP Czar on Trade Secret Theft, Counterfeit Drugs*, DAILY REP. FOR EXECs., Sept. 24, 2012, at 1, 1–2 (quoting Rep. Robert W. Goodlatte).

¹⁷⁹ John F. Duffy, *Harmony and Diversity in Global Patent Law*, 17 BERKELEY TECH. L.J. 685, 695–96 (2002); Kapczynski, *supra* note 7, at 1579; Yu, *supra* note 177, at 541; see S. REP. NO. 104-394, at 6 (“During the Uruguay Round of the GATT negotiations, the United States persistently sought to include international protection of intellectual property as an element of free trade. This was at the top of our trade agenda and was considered to be an essential ingredient for a successful agreement.”); 140 CONG. REC. 29660 (1994) (asserting that TRIPS “save[s] us billions with stronger intellectual property rights which will protect our most competitive industries”); 140 CONG. REC. 12573 (1994) (arguing that TRIPS is “of great importance to our Nation’s global competitiveness and innovative strength”). See generally TRIPS, *supra* note 102 (establishing international intellectual property standards).

¹⁸⁰ Request for the Establishment of a Panel by the United States, *Brazil—Measures Affecting Patent Protection*, WT/DS199/3 (Jan. 9, 2001). After the WTO constituted a panel to resolve the issue, the United States and Brazil settled. Notification of Mutually Agreed Solution, *Brazil—Measures Affecting Patent Protection*, WT/DS199/4 (July 19, 2001).

¹⁸¹ Request for Consultations by the United States, *China—Measures Affecting the Protection and Enforcement of Intellectual Property Rights*, WT/DS362/1 (Apr. 16, 2007); see also Peter K. Yu, *The U.S.-China Dispute over TRIPS Enforcement*, 5 OCCASIONAL PAPERS IN INTELL. PROP. L. 1, 20, 23 (2010) (reporting that the United States did not prevail on many of its claims in its dispute with China).

¹⁸² *Dispute Settlement: The Disputes, Disputes by Agreement*, WORLD TRADE ORG., http://www.wto.org/english/tratop_e/dispu_e/dispu_agreements_index_e.htm?id=A26#selected_agreement (last visited Aug. 19, 2013). The United States has also been the target of patent-related WTO proceedings. See, e.g., Request for Consultations by Brazil, *United States—US Patents Code*, WT/DS224/1 (Feb. 7, 2001) (challenging U.S. patent law regarding inventions made with federal assistance).

the minimum provided by TRIPS, the United States has also pursued additional treaties with its trade partners.¹⁸³

In addition to the campaign to strengthen intellectual property rights generally, the United States has also embarked on a campaign “to strengthen [the] *enforcement* of intellectual property rights internationally.”¹⁸⁴ Under the Intellectual Property Rights (IPR) Attaché Program, the U.S. Patent Office stations representatives of the U.S. Patent Office in countries around the world and charges these attachés with “encourag[ing] strong IPR protection and enforcement by U.S. trading partners for the benefit of U.S. rights holders.”¹⁸⁵ Similarly, in 2011, the FBI placed an agent in Beijing, China to help quell intellectual property crime.¹⁸⁶ The United States has also helped to train patent examiners in foreign jurisdictions.¹⁸⁷

Strengthening the scope and enforcement of foreign patent law might in some respects increase the competitive advantage of U.S. firms by allowing U.S. firms to better exploit differences in advanced factors of production (e.g., inventions) and by equalizing the competitive conditions for foreign and U.S. firms. Many foreign countries, however, have been reluctant to change their laws. For example, the negotiations that ultimately produced TRIPS were “highly contentious.”¹⁸⁸ As a result, although TRIPS established minimum levels of patent protection, the treaty nevertheless allows countries to adopt patent protections much weaker than those in the United States.¹⁸⁹ Efforts by the United States to negotiate additional treaties that strengthen foreign patent law have often met stiff resistance. For example, the United States attempted to “set a new and higher benchmark for international intellectual property enforcement” through a multilateral treaty entitled the Anti-Counterfeiting Trade Agreement (“ACTA”).¹⁹⁰

¹⁸³ Kapczynski, *supra* note 7, at 1640.

¹⁸⁴ OFFICE OF THE PRESIDENT, 2010 JOINT STRATEGIC PLAN ON INTELLECTUAL PROPERTY ENFORCEMENT 14 (2010) (emphasis added).

¹⁸⁵ *Intellectual Property Rights (IPR) Attaché Program*, U.S. PAT. & TRADEMARK OFF. (July 30, 2013, 3:24 PM), <http://www.uspto.gov/ip/global/attache/index.jsp>.

¹⁸⁶ *International IP Enforcement: Opening Markets Abroad and Protecting Innovation: Hearing Before the Subcomm. on Intellectual Prop., Competition, and the Internet of the H. Comm. on the Judiciary*, 112th Cong. 14 (2012) (statement of Victoria A. Espinel).

¹⁸⁷ Kapczynski, *supra* note 7, at 1624.

¹⁸⁸ Yu, *supra* note 13, at 980; *see also* Kapczynski, *supra* note 7, at 1580–81 (describing opposition to TRIPS by developing countries).

¹⁸⁹ *See* Kapczynski, *supra* note 7, at 1643.

¹⁹⁰ Peter K. Yu, *Of ACTA/TPP and SOPA/PIPA*, 7 OCCASIONAL PAPERS IN INTELL. PROP. L. 1, 3 (2012).

Concerns that ACTA's protection of intellectual property overreached eventually sparked protests worldwide.¹⁹¹

The reasons that many foreign jurisdictions do not embrace more stringent patent protection are complex, but one reason may be that the economies of these countries are better served by patent laws that focus more on encouraging competition than on providing incentives to invent.¹⁹² Indeed, foreign jurisdictions are more likely to focus on competition in their patent laws *because* U.S. patents provide foreign inventors with significant incentives to invent.¹⁹³ Strong U.S. patent law thus undermines incentives for foreign jurisdictions to strengthen foreign patent laws.¹⁹⁴

III. WEAKENING U.S. PATENTS TO INCREASE U.S. COMPETITIVENESS

A. *Effects of Weakening U.S. Patent Law*

Weakening U.S. patent protection can increase U.S. competitive advantage by addressing the asymmetry in U.S. patents described above: U.S. patents provide incentives to innovate for both foreign and

¹⁹¹ David Jolly, *Intellectual Property Pact Draws Fire in Europe*, N.Y. TIMES, Feb. 6, 2012, at B5. Following this public opposition, the European Parliament rejected the treaty. Pfanner, *supra* note 13.

¹⁹² See Yu, *supra* note 13, at 980 (noting that “the perspectives of developed and less-developed countries on the role of intellectual property protection and enforcement remain far apart”).

¹⁹³ Compare BURK & LEMLEY, *supra* note 120, at 8 (indicating that patents can incentivize innovation but can also constrain competition), with Hubbard, *supra* note 8, at 356–58 (chronicling the movement away from protectionism in U.S. patent law and recognizing that the trend has tended to harmonize U.S. and foreign incentives to innovate).

¹⁹⁴ One alternative to encouraging foreign countries to strengthen their patent laws would be to increase the rate at which U.S. inventors obtain foreign patents. If more U.S. inventors obtained and enforced foreign patents, rivalry in the countries issuing those patents might decline. Transaction costs like language barriers may be one reason that U.S. inventors infrequently obtain foreign patents. The United States could encourage such foreign patenting by U.S. inventors by subsidizing the cost of applying for foreign patents, as some countries already do for their inventors. See Tony Dutra, BLOOMBERG LAW, *PTO Reports on Small Business International Rejects Taxpayer-Funded Options*, PAT., TRADEMARK, & COPYRIGHT J., Sept. 20, 2013, at 30, 30–31. Even if more U.S. inventors obtained more patents in foreign jurisdictions, however, they may not enforce them. Attempting to enforce patents in jurisdictions with weak patent laws may provide little return for the patent owners. Moreover, even when enforcement could provide meaningful relief, patent litigation is very expensive, particularly if that litigation is conducted in a foreign country, and U.S. inventors will not enforce foreign patents if the costs of doing so exceed the expected benefits. Indeed, enforcement issues are a major reason that inventors often do not seek patent protection for their discoveries. Graham et al., *supra* note 1, at 1310; see Levin et al., *supra* note 123, at 803 (reporting that lack of enforcement by firms is perceived to weaken the effectiveness of patents).

U.S. firms, but harm U.S. competition more than foreign competition.¹⁹⁵ As a result, weakening U.S. patents would increase competition among U.S. firms more than among foreign firms, and this differential would in this respect help U.S. firms compete more effectively against foreign rivals. But weakening U.S. patent protection will also reduce incentives to invent.¹⁹⁶ Thus, to maximize U.S. competitiveness, U.S. lawmakers should seek to establish an optimum level of patent protection in the United States that will efficiently balance all costs and benefits, including those related to competitive advantage.¹⁹⁷ Unfortunately, determining this optimal level is difficult because empirical obstacles prevent rigorous comparisons of costs and benefits.¹⁹⁸

Despite these empirical challenges, it is likely that U.S. patent protection currently exceeds optimal levels. Policymakers have overstated the extent to which U.S. patents foster U.S. competitiveness by touting the factor-creation effects of U.S. patents for U.S. firms while ignoring the incentives to invent that U.S. patents provide to foreign firms. At the same time, lawmakers have not recognized that the disproportionate harm U.S. patents cause to domestic rivalry in the United States undermines U.S. competitiveness. By overestimating the benefits of U.S. patents while simultaneously underestimating the costs, U.S. lawmakers likely have established a level of patent protection in the United States above the level that would maximize U.S. competitive advantage.¹⁹⁹

Indeed, for decades, U.S. lawmakers have strengthened patent protection in the United States, arguing that such changes would in-

¹⁹⁵ See *supra* notes 159–169 and accompanying text (illustrating this disparity). Patents can be weakened either by reducing the scope of protection afforded to U.S. patents or by making U.S. patents harder to obtain.

¹⁹⁶ Anton et al., *supra* note 5, at 8 (“Generally, weak property rights reduce the prize available to a patent holder.”).

¹⁹⁷ BURK & LEMLEY, *supra* note 120, at 8. Even when the scope of protection for issued patents is optimally calibrated, U.S. patent law can undermine U.S. competitive advantage if the U.S. Patent Office fails to correctly apply the standards for issuing patents, such as when trivial advances over existing technology receive patent protection. Patents on such minor inventions will undermine competition by and among U.S. firms but will not encourage U.S. firms to discover commercially significant technological information. Consequently, patents on trivial technological advancements will undermine competitive advantage in the United States.

¹⁹⁸ See FRITZ, *supra* note 152, at 80 (remarking on the inability to empirically measure the costs and benefits of the U.S. patent system); *supra* notes 147–151 and accompanying text (illustrating the importance of striking a proper balance but observing the empirical impossibility of doing so).

¹⁹⁹ See *supra* notes 4–6 and accompanying text.

crease U.S. competitiveness.²⁰⁰ Thirty-five years ago, genetically modified organisms, software, and business methods were largely ineligible for patent protection, but discoveries in each of these areas are frequently patented today.²⁰¹ U.S. patent law is also less likely to hold patents invalid than foreign patent systems. For example, under U.S. patent law, an inventor can publicly disclose an invention for up to one year before submitting a patent application.²⁰² In most other countries, public disclosure of an invention at any time before the filing of a patent application will usually invalidate a patent.²⁰³ Building on a “consensus for stronger [U.S.] patent protection,” Congress established the

²⁰⁰ See Keith Bentele & Alexander Ibsen, *Exploring the Patent Surge: Increased Incentives or Multiplying Motives?*, 95 J. PAT. & TRADEMARK OFF. SOC'Y 99, 100 (2013) (stating that U.S. patent protection has been strengthened during the past three decades); *supra* notes 4–7 and accompanying text. This one-sided approach has tempered recently to reflect a greater emphasis on optimally calibrating patent strength. For example, in a 2006 report, the Council of Economic Advisers to the President asserted that “[w]ell-defined and well-enforced intellectual property rights are an important component of the U.S. economy and an important element in fostering continued economic growth.” COUNCIL OF ECON. ADVISERS, *supra* note 4, at 229; see also COUNCIL ON COMPETITIVENESS, *supra* note 5, at 81 (stating that the United States “cannot afford to rest on its laurels as the leading innovation economy in the world”). Likewise, in 2012, the Council of Economic Advisers to the President noted that “many observers have raised concerns about the U.S. patent system.” COUNCIL OF ECON. ADVISERS, *THE ECONOMIC REPORT OF THE PRESIDENT* 246 (2012). Nevertheless, while lawmakers have changed their rhetorical emphasis, they have not advocated for rolling back the expansions in patent strength from the last few decades. See *supra* notes 4–7 and accompanying text (illustrating U.S. policymakers’ devotion to a strong patent system).

²⁰¹ See *Bilski v. Kappos*, 130 S. Ct. 3218, 3228 (2010) (holding that some business methods may be patented); *Diamond v. Chakrabarty*, 447 U.S. 303, 318 (1980) (conferring patent protection on organisms produced by genetic engineering); *State St. Bank & Trust Co. v. Signature Fin. Group, Inc.*, 149 F.3d 1368, 1370 (Fed. Cir. 1998) (holding that a data processing system is a patentable invention). In 1988, Congress also expanded the definition of infringement under the Patent Act to include the importation of a product “which is made from a process patented in the United States.” Omnibus Trade and Competitiveness Act of 1988, Pub. L. No. 100-418, § 9005(a), 102 Stat. 1107 (codified as amended at 35 U.S.C. § 295 (2006)).

²⁰² See 35 U.S.C. § 102(b) (2006 & Supp. V 2011). The Leahy-Smith America Invents Act recently changed some of the details of this one-year grace period. Pub. L. No. 112-29, sec. 3(b), § 102(b), 125 Stat. 284, 286 (2011) (codified at 35 U.S.C. § 102(b) (2006 & Supp. V 2011)). Before the Act, an inventor’s public use of an invention would only invalidate a patent if the use took place “more than one year prior to the date of the application for patent in the United States.” 35 U.S.C. § 102(b) (2006) (amended 2011). Under the new law, public use of an invention will invalidate a patent if it took place “before the effective filing date” of a patent application, but public use by the inventor during the year preceding the filing of a patent application does not invalidate the patent. 35 U.S.C. § 102(a)–(b) (2006 & Supp. V 2011).

²⁰³ See Lisa Larrimore Ouellette, Note, *Do Patents Disclose Useful Information?*, 25 HARVARD J.L. & TECH. 545, 591 n.220 (2012).

U.S. Court of Appeals for the Federal Circuit in 1982 and granted this court exclusive jurisdiction over all appeals arising under U.S. patent law.²⁰⁴ In the eyes of many observers, the Federal Circuit has strengthened patent law by construing patents broadly, narrowing the grounds for invalidating patents, and limiting some defenses to patent infringement.²⁰⁵ As a result, it is more likely that patents will be deemed valid today than in the past.²⁰⁶ Because other countries have not followed suit, the scope of protection under U.S. patent law now exceeds that of many other countries.²⁰⁷

In light of these expansions to U.S. patent protection, a growing group of scholars and jurists have begun to assert that the costs of patent protection in the United States exceed the benefits.²⁰⁸ Some prominent scholars have argued that during the late 1990s, patents likely “provided a net disincentive to innovation outside the chemical and pharmaceutical industries.”²⁰⁹ These scholars have concluded that without the U.S. patent system, “[t]he rate of innovation and technological progress

²⁰⁴ BOHANNAN & HOVENKAMP, *supra* note 119, at 61; *see also* BURK & LEMLEY, *supra* note 120, at 3 (describing the “consensus in favor of strong patent protection that has existed since the 1982 creation of the Federal Circuit”).

²⁰⁵ *See* MERGES ET AL., *supra* note 137, at 128 n.17 (collecting citations regarding empirical studies showing the strengthening of patent rights); *see also, e.g.*, *Therasense, Inc. v. Becton, Dickinson & Co.*, 649 F.3d 1276, 1288–90 (Fed. Cir. 2011) (en banc) (restricting the availability of equitable defenses to patent infringement).

²⁰⁶ MERGES ET AL., *supra* note 137, at 128.

²⁰⁷ *See supra* notes 188–191 and accompanying text (illustrating resistance by foreign corporations to increases in intellectual property protections). *Compare, e.g.*, Opinion of the Economic and Social Committee on the ‘Proposal for a European Parliament and Council Directive on the Legal Protection of Biotechnological Inventions,’ 1996 O.J. (C 295) 11 [hereinafter EU Opinion Regarding Biotechnological Innovation] (evaluating whether the availability of patent rights for biotechnology inventions helped U.S. interests excel in biotechnology research), *and* BOLDRIN & LEVINE, *supra* note 1, at 46 (observing that business practices and financial securities are patentable in the United States), *with* European Patent Convention art. 52, Oct. 5, 1973, 1065 U.N.T.S. 255 (stating that “methods for . . . doing business” are not eligible for patent protection), *and* *Harvard Coll. v. Canada*, [2002] 4 S.C.R. 45 (Can.) (“Patenting higher life forms would involve a radical departure from the traditional patent regime.”). Concededly, some expansions of the scope of U.S. patent law may increase U.S. competitive advantage by improving incentives to invent. *See, e.g.*, EU Opinion Regarding Biotechnology Innovation *supra*, at 11 (considering whether patents on biotechnological inventions bolstered biotechnology research).

²⁰⁸ *See* BOHANNAN & HOVENKAMP, *supra* note 119, at 60 (suggesting that “the U.S. patent system is in crisis” and observing that “[i]t has been subjected to withering attacks by critics of every political stripe”); BURK & LEMLEY, *supra* note 120, at 21 (“Public policy circles are replete with arguments that the patent system is broken, perhaps irretrievably.”); LANDES & POSNER, *supra* note 2, at 21 (noting that “the high social costs of intellectual property rights create uncertainty as to whether on balance such rights are, from an overall social standpoint, cost-justified at all”).

²⁰⁹ BESSEN & MEURER, *supra* note 128, at 142.

might have been even greater, perhaps much greater.”²¹⁰ Other prominent scholars have conducted similar analyses of the costs and benefits of the patent system and concluded that U.S. patent law is “in crisis”²¹¹ and “broke.”²¹² These scholars have argued that patent law is “an unnecessary evil,”²¹³ and that “abolishing intellectual property protection is the only socially responsible thing to do.”²¹⁴ Jurists have also begun to express their concern regarding the tradeoff struck by U.S. patent law. Judge and scholar Richard Posner recently stated, “It’s not clear that we really need patents in most industries.”²¹⁵

Significantly, these critiques of U.S. patent law have not considered the harmful impact of U.S. patents on U.S. competitiveness. If the assessments of these commentators are correct and U.S. patent law needs reform *without* considering the impact of U.S. patents on U.S. competitive advantage, then change is certainly warranted under a more comprehensive analysis. Competitiveness analysis thus both corroborates and provides additional evidence for these analyses.²¹⁶ When all of these critiques are considered alongside lawmakers’ incomplete understanding of the impact of U.S. patent law on U.S. competitiveness, it appears likely that U.S. patent protection should be weakened in order to maximize U.S. competitive advantage.

²¹⁰ *Id.* at 146.

²¹¹ BURK & LEMLEY, *supra* note 120, at 3.

²¹² See JAFFE & LERNER, *supra* note 142, at 1; *see also* CARRIER, *supra* note 116, at 1 (“Innovation . . . has been threatened in recent years. Part of the blame, surprisingly enough, lies with the U.S. legal system.”); Graham et al., *supra* note 1, at 1263 (“On the whole, technology entrepreneurs tell us that the patent system is neither working particularly poorly nor well for their companies and industries.”).

²¹³ BOLDRIN & LEVINE, *supra* note 1, at 3; *see also* Don Tiller, *Devaluing Invention: The Push for Patent Reform*, 14 TEX. WESLEYAN L. REV. 119, 121 (2007) (“Recently, it has been argued that the U.S. patent system is broken and has become a social burden, merely serving to grant unnecessary economic monopolies at the expense of consumers without creating an extra incentive to invent; or worse, that the patent system actually reduces incentive to invent.”).

²¹⁴ BOLDRIN & LEVINE, *supra* note 1, at 243–44.

²¹⁵ John Brodtkin, *Judge Who Threw Out Apple/Moto Case Calls Patent Litigants “Animals,”* ARS TECHNICA (July 5, 2012, 11:35 AM), <http://arstechnica.com/tech-policy/2012/07/judge-who-threw-out-applemoto-case-calls-patent-litigants-animals/>. Judge Posner made these comments shortly after he dismissed patent claims and counterclaims in a suit between technological powerhouses Apple, Inc. and Motorola, Inc. *See generally* Apple, Inc. v. Motorola, Inc., 869 F. Supp. 2d 901 (N.D. Ill. 2012) (dismissing patent lawsuit in its entirety).

²¹⁶ *Cf.* BURK & LEMLEY, *supra* note 120, at 21 (“[W]hen that many people with that many different perspectives have decided that something is wrong, it is time to sit up and take notice.”).

B. *Cost/Benefit Recalibrations to U.S. Patent Law*

Although the impact of U.S. patent law on domestic rivalry has been largely overlooked, commentators have long recognized that patents generally promote innovation but undermine competition and that many patent law doctrines affect this tradeoff.²¹⁷ Despite agreement on the existence of this tradeoff, scholars disagree about whether reforms to U.S. patent law will improve or worsen it. By identifying additional costs inherent in current U.S. patent law—including the harms to U.S. competitiveness stemming from reduced domestic rivalry—the analysis of competitive advantage provides additional support for some of these reforms.

For example, some scholars argue that inventors should be required to provide more information regarding their inventions in their patent applications.²¹⁸ This additional information could provide better notice regarding the scope of patent rights and thus help competitors develop non-infringing alternatives to patented technologies. On the other hand, requiring patent applicants to provide additional information would raise costs for inventors, thereby reducing incentives to invent. As a result, other scholars have argued that the costs to inventors due to additional disclosure requirements may outweigh resulting benefits to competitors.²¹⁹ An analysis of competitive advantage may help to resolve this dispute. To the extent that expanding the disclosure requirements for U.S. patents fosters competition, such a change would increase domestic rivalry among U.S. firms more than rivalry within foreign countries. In contrast, the additional costs of increased disclosure would be borne by both U.S. and foreign inventors.²²⁰

Similarly, considerations of competitive advantage suggest that greater resources should be spent reducing the number of invalid pat-

²¹⁷ See *supra* notes 170–187 and accompanying text (explaining that U.S. policymakers have strengthened U.S. patent protection to incentivize innovation and have attempted to strengthen foreign patent law to limit competitive disparities).

²¹⁸ See, e.g., BESSEN & MEURER, *supra* note 128, at 239; Kelly Casey Mullally, *Patent Hermeneutics: Form and Substance in Claim Construction*, 59 FLA. L. REV. 333, 371–80 (2007); Harry Surden, *Efficient Uncertainty in Patent Interpretation*, 68 WASH. & LEE L. REV. 1737, 1809–17 (2011); see also John R. Thomas, *Claim Re-Construction: The Doctrine of Equivalents in the Post-Markman Era*, 9 LEWIS & CLARK L. REV. 153, 164 (2005) (noting that “many commentators believe that it is only fair that inventors should claim their inventions precisely”).

²¹⁹ William Hubbard, *Efficient Definition and Communication of Patent Rights: The Importance of Ex Post Delineation*, 25 SANTA CLARA COMPUTER & HIGH TECH. L.J. 327, 359–60 (2009) (discussing tradeoffs inherent in communicating the scope of patent rights).

²²⁰ See *Voda v. Cordis Corp.*, 476 F.3d 887, 889–90 (Fed. Cir. 2007) (indicating that foreign investors must abide by U.S. patent law requirements because foreign patents are not assertable in the United States).

ents issued by the U.S. Patent Office. U.S. patents may be invalid for many reasons. For example, a valid patent must describe an invention that is useful and substantially different from existing technology, and it also must provide sufficient information for a person of ordinary skill in the relevant technological field to utilize the patented invention.²²¹ Though the U.S. Patent Office strives to issue only valid patents, mistakes are common, in part because budgetary constraints force patent examiners to spend very little time reviewing each patent application.²²² Moreover, proving that patents are valid after they issue can be difficult because challengers must prove that patents are invalid by clear and convincing evidence.²²³

Like all patents, invalid patents can reduce competition in the United States. But unlike the harm to competition caused by valid patents, the harm to competition caused by the possibility of patent invalidity is not commensurately justified by inventive benefits.²²⁴ One way to reduce the number of invalid patents issued by the U.S. Patent Office is to increase the resources that the U.S. Patent Office can devote to patent examination, for example by raising the filing fees for patent applicants.²²⁵ Although raising patenting costs for inventors would reduce the net value of patents and thus, to some degree, reduce incentives to invent, an analysis of competitive advantage suggests that, to some extent, reduced incentives to invent may be justified because re-

²²¹ 35 U.S.C. § 101 (2006 & Supp. V 2011) (usefulness); *id.* § 102 (novelty); *id.* § 103 (non-obviousness); *id.* § 112 (sufficiency of information).

²²² Doug Lichtman & Mark A. Lemley, *Rethinking Patent Law's Presumption of Validity*, 60 STAN. L. REV. 45, 61 (2007); Michael J. Meurer, *Patent Examination Priorities*, 51 WM. & MARY L. REV. 675, 679 (2009). By one estimate, patent examiners spend on average only eighteen hours reviewing a typical patent application. John R. Allison & Mark A. Lemley, *The Growing Complexity of the United States Patent System*, 82 B.U. L. REV. 77, 135 (2002).

²²³ *Microsoft Corp. v. i4i Ltd.*, 131 S. Ct. 2238, 2251 (2011). *But see* David. L. Schwartz & Christopher B. Seaman, *Standards of Proof in Civil Litigation: An Experiment from Patent Law*, 26 HARV. J.L. & TECH. 429, 432 (2013) (finding in an empirical study that mock jurors found a patent invalid under a clear and convincing standard at rates statistically indistinguishable from invalidation under a preponderance of the evidence standard).

²²⁴ *See* Katherine E. White, *Preserving the Patent Process to Incentivize Innovation in Global Economy*, 13 SYRACUSE SCI. & TECH. L. REP. 27, 30–33 (2006) (“Making it easier to invalidate patents will lessen their economic value. It is likely that such a change will have a negative affect [sic] on the incentive to innovate.”).

²²⁵ James Bessen et al., *Can New Fees Fix the Patent System? Experts Weigh In*, WIRED (Sept. 6, 2012, 2:10 PM), <http://www.wired.com/opinion/2012/09/can-new-fees-fix-the-patent-system/> (suggesting that “[m]ore patent applications mean more low-quality patents” and observing that “[t]he [U.S. Patent Office] is well-known for its tendency to grant patent applications rather than go through the cost and hassle of denials and referrals”).

ducing the number of invalid U.S. patents would increase U.S. competitiveness in global markets.

Competitive advantage analysis indicates that if patenting fees increase, those costs perhaps should not rise for all types of inventors. As described above, U.S. patents do not provide equal incentives to invent for foreign and U.S. inventors when language barriers, cultural differences, and other transaction costs significantly raise the costs of foreign inventors obtaining U.S. patents.²²⁶ Such costs are likely greater for small businesses in foreign countries than for sophisticated foreign corporations.²²⁷ Consequently, U.S. patents may provide more significant incentives to invent for small businesses in the United States than in foreign countries. Raising patenting costs among small businesses would reduce this advantage because U.S. businesses would shoulder the bulk of the increased financial burden—and thus invent less. In contrast, raising fees among large corporations would more equivalently reduce incentives to invent for both foreign and U.S. firms. In fact, U.S. patent law already requires larger companies to pay higher fees to obtain U.S. patents,²²⁸ a feature that may contribute to U.S. competitive advantage.²²⁹

Although weakening U.S. patent law by adjusting patent law doctrines related to patent scope and validity may increase U.S. competitive advantage, implementing such reforms is difficult because empirical challenges hinder the effective recalibration of U.S. patent law.²³⁰ For example, if disclosure obligations for patent applicants in the U.S. Patent Office should increase, empirical challenges make it difficult to determine *how much* those obligations should increase. Likewise, even if sophisticated inventors should pay larger fees when applying for patents, it is not clear *how much* larger those fees should be. Because of

²²⁶ See Hubbard, *supra* note 8, at 364–65; *supra* note 106 and accompanying text.

²²⁷ Cf. *Patenting by Organizations 2011*, *supra* note 113, at A1-1 (reporting that in 2011, 28% of individual inventors receiving U.S. patents were foreign, whereas 52% of corporations receiving U.S. patents were foreign).

²²⁸ 35 U.S.C. § 41(h)(1) (2006 & Supp. V 2011) (stating that small businesses, independent inventors, and nonprofit organizations shall have fees “reduced by 50 percent”). The Leahy-Smith America Invents Act established even lower fees for particularly small and unsophisticated patent applicants. Pub. L. No. 112-29, sec. 10(b), 125 Stat. 284, 316–17 (2011); see Tony Dutra, BLOOMBERG LAW, *PTO Publishes Final Rule on Micro Entity Status for Reduced Patent Application Fees*, DAILY REP. FOR EXECS., Dec. 21, 2012, at 1, 1–2.

²²⁹ The overall innovative contribution of unsophisticated inventors, however, is unclear. See BESSEN & MEURER, *supra* note 128, at 166 (contending that “the role of the small inventor is frequently hyped and distorted”); Hubbard, *supra* note 98, at 410–11.

²³⁰ See FRITZ, *supra* note 152, at 80; *supra* note 151 and accompanying text.

these empirical obstacles, lawmakers should be careful when adjusting U.S. patent law to increase U.S. competitiveness.

One way to address these empirical challenges is to focus on reforms that do not significantly reduce incentives to invent. Although patents are designed to create meaningful incentives to invent, empirical studies have found that, in some industries, patents are less important for encouraging invention.²³¹ For example, one recent study found that software entrepreneurs consider patents to be only “[s]lightly important” to protecting new discoveries.²³² Despite industry differences, the scope of patent protection is in many respects identical for all types of technology.²³³ In industries where patents provide weaker incentives to innovate, the competitive cost of U.S. patent law is more likely to exceed the factor-creation benefits. As a result, modestly weakening patent protection in such industries may allow rivalry to flourish without reducing innovation.

Industry-specific patent reform, however, may not increase U.S. competitive advantage for several reasons. First, accurately identifying technologies for which patents provide less incentive to invent is difficult. Empirical studies that evaluate the incentive effect of patents use broad industry categorizations that include many different types of technologies within them.²³⁴ Second, it would be difficult to draft legislation that appropriately defined the relevant industries, as industry boundaries are “vague and notoriously mutable.”²³⁵ Statutory categorization likely would be imprecise too, particularly as technology changes over time.²³⁶ Third, even if lawmakers could accurately identify technologies where patents provide less incentive to invent, patents may still be a significant factor. For example, the study that found that patents

²³¹ Graham et al., *supra* note 1, at 1283; Levin et al., *supra* note 123, at 796–97, 818.

²³² Graham et al., *supra* note 1, at 1290.

²³³ The U.S. Patent Act contains few technology-specific provisions. *See generally* 35 U.S. §§ 101–103, 112 (2006 & Supp. V 2011) (establishing basic patent law parameters). Courts may, however, apply these technology-neutral laws differently to different technologies. *See generally* BURK & LEMLEY, *supra* note 120 (arguing that U.S. patent law should treat different technologies differently and that the judiciary is better suited to this task than Congress).

²³⁴ *See, e.g.*, Graham et al., *supra* note 1, at 1290 (describing the incentive effect of patents for “[b]iotechnology”); Levin et al., *supra* note 123, at 797 (describing the incentive effect of patents for computers, communications equipment, and motor vehicles).

²³⁵ BURK & LEMLEY, *supra* note 120, at 98.

²³⁶ *Id.* at 98–99 (“The history of industry-specific statutes suggests that many fail because they are drafted with then-current technology in mind and are not sufficiently general to accommodate the inevitable changes in technology.”); *see also* Hubbard, *supra* note 8, at 377–78 (describing some pitfalls of employing industry-specific measures).

were “[s]lightly important” to protecting software did not find that patents were “[n]ot important at all.”²³⁷

C. *Patent Harmonization and Competitive Advantage*

Patent harmonization provides another potential avenue for weakening U.S. patent law to increase the competitive advantage of U.S. firms. As noted earlier, when U.S. patent law provides stronger rights than foreign patent law, U.S. patents harm domestic rivalry in the United States more than foreign patents harm rivalry in their home countries.²³⁸ Consequently, harmonizing U.S. patent law with foreign patent laws could eliminate some of the asymmetries currently undermining U.S. competitiveness. For instance, the United States recently changed from a “first-to-invent” patent system, which used invention dates to determine certain issues of validity and patent ownership, to a “first-to-file” system, which relies instead on patent application filing dates.²³⁹ At the time the United States made this change, every other patent system in the world was a first-to-file system.²⁴⁰ Some lawmakers opposed the change, arguing that it would “weaken our unique U.S. system by forcing our country to ‘harmonize’ U.S. patent standards downward to the level of the weaker systems in Europe and Asia.”²⁴¹ Even if concerns regarding the weakening effect of this harmonization were correct, these opponents may have supported the change if they were aware that it might promote U.S. economic prosperity.

Despite its potential advantages, harmonization can reduce U.S. competitiveness when the optimal balance between incentives to invent and domestic rivalry is different for the United States than for other countries.²⁴² As described above, stronger patent laws are more likely to increase the competitive advantage of countries in which factor conditions, like the availability of highly educated workers and the presence of advanced research universities, lower the cost of discovering new in-

²³⁷ Graham et al., *supra* note 1, at 1290.

²³⁸ See *supra* notes 159–169 and accompanying text (illustrating this point).

²³⁹ Hubbard, *supra* note 8, at 367.

²⁴⁰ WENDY H. SCHACHT & JOHN R. THOMAS, CONG. RESEARCH SERV., R41638, PATENT REFORM IN THE 112TH CONGRESS: INNOVATION ISSUES 7 (2011).

²⁴¹ Dana Rohrabacher, *Toward Better Patent Reform*, POLITICO (June 20, 2011), <http://www.politico.com/news/stories/0611/57394.html>; see Kevin Noonan, *Senator Feinstein Opposes First-to-File Provisions of Patent Reform Bill (S. 23)*, PAT. DOCS (Mar. 3, 2011, 11:59 PM), <http://www.patentdocs.org/2011/03/senator-feinstein-opposes-the-first-to-file-provisions-of-s-23.html>.

²⁴² See Reichman, *supra* note 103, at 1116–17 (arguing that intellectual property law disparately affects countries with divergent factor conditions).

ventions.²⁴³ Countries where firms rarely discover new inventions, like developing countries, have consequently been reluctant to enact robust intellectual property laws.²⁴⁴ Thus, particularly for aspects of patent law for which there is not global uniformity, the United States should exercise caution when weakening patent protection through harmonization.²⁴⁵

As with other possible changes, empirical challenges make it difficult to determine whether adopting the patent laws from another legal system would increase U.S. competitiveness.²⁴⁶ For instance, as noted earlier, public disclosure of an invention before an inventor files a patent application will invalidate a patent on that invention in many countries, but U.S. patent law provides a one-year grace period.²⁴⁷ In some respects, the one-year grace period may bolster U.S. competitiveness. The grace period potentially accelerates the public disclosure of new inventions and also increases incentives to invent by strengthening the validity of U.S. patents.²⁴⁸ On the other hand, by limiting the circumstances in which patents are invalid, U.S. patent law provides stronger patent rights than those available in most other countries, and stronger U.S. patents inhibit competition by and among U.S. firms.²⁴⁹ Moreover, the grace period's benefits are available to foreign inventors who apply for U.S. patents.²⁵⁰ Ultimately, it may be difficult (if not impossible) to measure accurately whether eliminating the one-year grace period would increase U.S. competitiveness.

²⁴³ See *supra* notes 103–106 and accompanying text; see also PORTER, *supra* note 3, at 80 (discussing the impact of “public and private educational institutions” on competitive advantage).

²⁴⁴ See Reichman, *supra* note 103, at 1116–17 (observing that developing countries may not benefit significantly from strong intellectual property regimes); Yu, *supra* note 13, at 988. Indeed, firms in such countries may rely on the availability of patents in other countries, including the United States, to provide sufficient incentives to innovate.

²⁴⁵ Cf. Gerla, *supra* note 15, at 249 (warning against the dangers of a “monomaniacal devotion to rivalry”).

²⁴⁶ See FRITZ, *supra* note 151, at 80; *supra* note 151 and accompanying text.

²⁴⁷ See *supra* notes 203–204 and accompanying text. Compare 35 U.S.C. § 102(b)(1) (2006 & Supp. V 2011) (creating a one-year grace period for patent disclosures), with Ouellette, *supra* note 203, at 591 n.220 (indicating that most other countries do not have a grace period for patent disclosures).

²⁴⁸ H.R. REP. NO. 112-98, at 38, 41 (2011).

²⁴⁹ See *supra* notes 159–169 and accompanying text (illustrating how strong U.S. patent rights inhibit domestic competition and consequently global competition).

²⁵⁰ See *supra* notes 159–169 and accompanying text (explaining that foreign holders of U.S. patents receive the same patent protections that U.S. holders of U.S. patents receive and also indicating that more foreign inventors obtain U.S. patents than U.S. inventors).

Because of these empirical challenges, narrow reforms may be better suited to boosting U.S. competitive advantage than broad ones. Changes could be focused on situations where there is strong evidence that changes will drastically increase domestic rivalry while only marginally reducing incentives to innovate.²⁵¹ Because domestic rivalry is often the most important determinant of competitive advantage, such changes are more likely to increase competitive advantage.²⁵² The following Subsections analyze reforms to two defenses to patent infringement for which harmonization is likely to increase U.S. competitive advantage.

1. The Experimental Use Defense

Experimentation on patented inventions is vital to competition.²⁵³ Through experimentation, competitors can “invent around” a patent; that is, they can develop competing technology that avoids infringing a patent.²⁵⁴ Without efforts to invent around a patent, the patent owner may be able to obtain supracompetitive returns to the detriment of society even though alternative technologies otherwise could be found.²⁵⁵ Experimentation also enables competitors to improve upon a patented invention.²⁵⁶ Indeed, a successful follow-on innovator may be able to obtain a patent on an improvement to a patented invention.²⁵⁷ In addition, experimentation may be required to ensure that, when a patent expires, a firm is ready to begin competing with the former patent

²⁵¹ Cf. Baker, *supra* note 57, at 589 (advocating for targeted rules and enforcement priorities in antitrust law to promote innovation).

²⁵² See *supra* notes 43–90 and accompanying text (discussing the determinants of competitive advantage).

²⁵³ Ted Hagelin, *The Experimental Use Exemption to Patent Infringement: Information on Ice, Competition on Hold*, 58 FLA. L. REV. 483, 499 (2006) (“[I]f the public and competitors are unable to use patented inventions for genuine experimentation, then scientific knowledge is retarded and market competition is limited.”).

²⁵⁴ *Id.* at 533.

²⁵⁵ Cf. Graham et al., *supra* note 1, at 1311 (reporting that a significant reason companies do not patent inventions is because other inventors may invent around those inventions); Levin et al., *supra* note 123, at 802–03 (indicating that a major weakness in patent protection is the capacity of competitors to invent around patents). Competitors, however, may also be able to invent around a patent without experimenting on the patented invention.

²⁵⁶ Hagelin, *supra* note 253, at 533; see also Alan L. Durham, *The Fractal Geometry of Invention*, 53 B.C. L. REV. 489, 490 (2012) (“Most inventions are variations on what has come before and have the potential to generate further variations or refinements.”).

²⁵⁷ See generally BLACK’S LAW DICTIONARY, *supra* note 127, at 1235 (defining an improvement patent as “[a] patent having claims directed to an improvement on a preexisting invention”).

owner.²⁵⁸ Although patents must provide significant information regarding an invention, these disclosure requirements do “not require an inventor to meet lofty standards for success in the commercial marketplace.”²⁵⁹ Given this dearth of information, considerable experimentation may be required to commercialize a patented invention.²⁶⁰ For all these reasons, unless competitors can perform such experimentation during the term of a patent, meaningful competition regarding the invention may not commence until well after the patent expires.

Current U.S. patent law does not explicitly allow competitors to experiment on patented technology. Instead, a U.S. patent simply grants its owner the exclusive right to “use” an invention, and the basic provisions of the Patent Act do not provide any significant limits on the uses covered by that right.²⁶¹ Courts initially interpreted “use” narrowly, holding that experimentation is not a “use” of technology subject to patent infringement liability.²⁶² As Justice Joseph Story explained in 1813, “it could never have been the intention of the legislature to punish a man, who constructed . . . a machine merely for philosophical experiments, or for the purpose of ascertaining the sufficiency of the machine to produce its described effects.”²⁶³

More recently, however, the Federal Circuit has all but eliminated the defense.²⁶⁴ For example, the Federal Circuit has held that the ex-

²⁵⁸ Under current law, patents generally expire twenty years from the date the patent application was filed with the U.S. Patent Office. 35 U.S.C. § 154(a)(2) (2006 & Supp. V 2011 & Supp. VI 2012).

²⁵⁹ *CFMT, Inc. v. Yieldup Int’l Corp.*, 349 F.3d 1333, 1338–39 (Fed. Cir. 2003).

²⁶⁰ See Karl F. Jorda, *Patent and Trade Secret Complementarity: An Unsuspected Synergy*, 48 *WASHBURN L.J.* 1, 23 (2008); see also Graham et al., *supra* note 1, at 1290 (observing that entrepreneurs tend to find “first-mover advantage” more important than patents in gaining competitive advantage); Levin et al., *supra* note 123, at 794–95 (noting that in many industries “learning curve advantages” are more important than patent protection).

²⁶¹ See 35 U.S.C. § 271 (2006 & Supp. IV 2010). Other provisions of U.S. patent law appear to encourage experimentation but do not explicitly sanction it. For example, U.S. patent law requires that a patent applicant disclose sufficient information about an invention to enable a person of ordinary skill to practice the invention. 35 U.S.C. § 112 (2006 & Supp. V 2011); see also Hagelin, *supra* note 253, at 513–15 (arguing that the enablement requirement of section 112 demonstrates the need for an experimental use defense).

²⁶² See *Poppenhusen v. Falke*, 19 F. Cas. 1048, 1049 (C.C.S.D.N.Y. 1861) (No. 2262) (“It has been held, and is no doubt now well settled, that an experiment with a patented article for the sole purpose of gratifying a philosophical taste, or curiosity, or for mere amusement, is not an infringement of the rights of the patentee.”); *Sawin v. Guild*, 21 F. Cas. 554, 555 (C.C.D. Mass. 1813) (No. 12,391); *Whittemore v. Cutter*, 29 F. Cas. 1120, 1121 (C.C.D. Mass. 1813) (No. 17,600).

²⁶³ *Cutter*, F. Cas. at 1121.

²⁶⁴ See, e.g., *Madey v. Duke Univ.*, 307 F.3d 1351, 1362–63 (Fed. Cir. 2002); *Embrex, Inc. v. Serv. Eng’g Corp.*, 216 F.3d 1343, 1349 (Fed. Cir. 2000); *Roche Prods., Inc. v. Bolar*

perimental use defense applies only to experiments “for amusement, to satisfy idle curiosity, or for strictly philosophical inquiry.”²⁶⁵ Any experiment “in furtherance of the alleged infringer’s legitimate business” does not qualify for the defense.²⁶⁶ In fact, the Federal Circuit has even refused to apply the defense to experiments designed to identify *non-infringing* alternatives to a patented invention.²⁶⁷ For instance, the court refused to apply the defense to efforts by a pharmaceutical company to obtain Food and Drug Administration (FDA) approval for a generic version of a patented drug even though the company did not intend to produce the generic drug until after the patent on the drug expired.²⁶⁸

On the other hand, one aspect of the experimental use defense has broadened in recent years. In response to the Federal Circuit’s rulings that the experimental use defense does not protect efforts to develop generic drugs, Congress added a new provision to the Patent Act that extends the experimental use defense to “uses reasonably related to the development and submission of information under a Federal law which regulates the manufacture, use, or sale of drugs.”²⁶⁹ The Federal Circuit initially interpreted this provision narrowly, holding that it applied only to “clinical testing to supply information to the FDA” and did not apply to general biomedical research.²⁷⁰ Ultimately, though, the Supreme Court reversed, holding that the provision permits reasonable experimentation even in early stages in the development of a compound that might one day be submitted for FDA approval.²⁷¹ Thus, for biomedical research, the experimental use defense provides robust protection. But outside of this technological arena, the defense is all but meaningless.²⁷²

Pharm. Co., 733 F.2d 858, 1860–61 (Fed. Cir. 1984). *See generally* 28 U.S.C. § 1295 (2006 & Supp. V 2011) (establishing the Federal Circuit Court of Appeals’ jurisdiction).

²⁶⁵ *Madey*, 307 F.3d at 1362–63 (quoting *Embrex, Inc.*, 216 F.3d at 1349).

²⁶⁶ *Id.*

²⁶⁷ *See Embrex*, 216 F.3d at 1346, 1349 (holding that an inventor infringed a patent by experimenting with a patented method of inoculating birds even though the inventor intended to design around the patent).

²⁶⁸ *Roche Prods., Inc.*, 733 F.2d at 1860–61.

²⁶⁹ 35 U.S.C. § 271(e) (2006 & Supp. IV 2010).

²⁷⁰ *Integra Lifesciences I, Ltd. v. Merck KGaA*, 331 F.3d 860, 866 (Fed. Cir. 2003), *rev’d* *Merck KGaA v. Integra Lifesciences I, Ltd.*, 545 U.S. 193 (2003).

²⁷¹ *Merck KGaA*, 545 U.S. at 207.

²⁷² Beyond the realm of utility patents (patents granted for a process, a machine, a manufacture, or a composition of matter), the Plant Variety Protection Act, 7 U.S.C. §§ 2321–2382 (2012), which protects novel varieties of sexually reproduced plants, explicitly contains a broad experimental use defense to claims asserted under its provisions. 7 U.S.C. § 2544 (“The use and reproduction of a protected variety for plant breeding or other bona fide research shall not constitute an infringement of the protection provided

Importantly, expanding the experimental use defense in the United States would not significantly undermine incentives to invent. Instead, a broader experimental use defense would merely ensure that inventors receive rights no broader than those explicitly established by law. For example, experimentation that prepares a competitor to use patented technology *after* the patent expires does not limit the scope of exclusive patent rights *during* the statutory term of the patent. Similarly, exempting from patent liability experimentation that allows competitors to develop non-infringing alternatives to a patented technology simply limits patent protection to the invention described in the patent. So long as Congress, the courts, and the U.S. Patent Office have established adequate incentives to invent through aspects of patent law only tangentially related to the experimental use defense, strengthening the experimental use defense will not reduce those incentives.²⁷³ Indeed, without a meaningful experimental use defense, patent owners may receive excessively broad patent rights that actually impede future efforts to invent by preventing researchers from building on patented discoveries.²⁷⁴ Thus, rather than reducing incentives to invent, a broader experimental use defense can actually encourage invention.

Moreover, unlike U.S. patent law, the patent laws of many foreign jurisdictions provide broader protection for experimentation.²⁷⁵ For example, Japanese patent law states that “[a] patent right shall not be

under this chapter.”); *see also* BLACK’S LAW DICTIONARY, *supra* note 127, at 1236 (defining utility patent).

²⁷³ It is unlikely that, in determining the appropriate scope of patent protection in the United States, Congress, courts, and the U.S. Patent Office relied on the absence of a meaningful experimental use defense. For example, as noted above, a robust experimental use defense will sometimes be necessary to ensure that a patent does not prevent competitors from developing non-infringing alternatives to the patented technology. The Federal Circuit Court of Appeals has recently expressed its belief that patent rights should be limited to the scope of the patented invention, and thus should not restrict the development of non-infringing technologies. *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1353 (Fed. Cir. 2010) (en banc) (holding that “the scope of the right to exclude . . . [should] not overreach the scope of the inventor’s contribution to the field of art as described in the patent specification” (internal quote marks omitted) (quoting *Univ. of Rochester v. G.D. Searle & Co.*, 598 F.3d 1336, 1353–54 (Fed. Cir. 2010))).

²⁷⁴ *See supra* notes 147–149 and accompanying text (explaining that broad patent rights can inhibit follow-on invention).

²⁷⁵ *CARRIER*, *supra* note 116, at 270; *see Hagelin*, *supra* note 253 at 520–22. Notably, Chinese patent law contains an explicit experimental use exception, but the scope of this defense is unclear as it applies to use of patented technology “specially for the purposes of scientific research and experimentation.” Patent Law of the People’s Republic of China (promulgated by the Standing Comm. Nat’l People’s Cong., Mar. 12, 1984, effective Mar. 12, 1984), art. 69, STATE INTELL. PROP. OFF. OF THE P.R.C. (Jan. 19, 2011), http://english.sipo.gov.cn/laws/lawsregulations/201101/t20110119_566244.html.

effective against the working of the patented invention for experimental or research purposes.”²⁷⁶ Similarly, Korean patent law explicitly allows for use of a “patented invention for the purpose of research or experiments.”²⁷⁷ The patent laws of all but one of the countries in the European Union expressly contain experimental use defenses.²⁷⁸ In fact, the Czech Republic, Denmark, France, Germany, Ireland, Luxembourg, Spain, Sweden, and the UK all have nearly identical provisions that create an experimental use defense in each country.²⁷⁹

Because the experimental use defense is weaker in the United States than in other jurisdictions, U.S. patent law limits domestic competition more than foreign patent law restricts foreign competition, thereby reducing the competitive advantage of U.S. firms. Moreover, allowing experimental uses would not significantly undermine incentives to innovate in the United States. Expanding the experimental use defense thus is an example of a situation in which harmonization with other patent systems is likely to increase the competitiveness of U.S. firms in global markets.²⁸⁰ Indeed, in the absence of a robust experimental use defense in U.S. patent law, some U.S. companies may be forced to locate research facilities outside of the United States.²⁸¹

2. The Prior Use Defense

Broadening the prior use defense is another change to U.S. patent law that would likely increase the competitive advantage of U.S. firms.

²⁷⁶ Tokkyohō [Patent Act], Act No. 121 of 1959, art. 69-1 (Japan), *translated in Patent Act (Act No. 121 of 1959)*, CABINET SECRETARIAT, <http://www.cas.go.jp/jp/seisaku/hourei/data/PA.pdf> (last visited Sept. 23, 2013).

²⁷⁷ T’ukhopop [Patent Law], Act No. 950, Nov. 28, 1949, art. 96, *amended by* Act No. 9985, Jan. 27, 2010 (S. Kor.), *translated in Republic of Korea*, WORLD INTELL. PROP. ORG., http://www.wipo.int/wipolex/en/text.jsp?file_id=214463 (last visited Sept. 23, 2013).

²⁷⁸ P. VAN EECHE ET AL., MONITORING AND ANALYSIS OF TECHNOLOGY TRANSFER AND INTELLECTUAL PROPERTY REGIMES AND THEIR USE: RESULTS OF A STUDY CARRIED OUT ON BEHALF OF THE EUROPEAN COMMISSION (DG RESEARCH) 149 (2009).

²⁷⁹ *Id.* The experimental use defense in many European countries also explicitly applies to “studies and trials” undertaken to develop generic versions of patented medicines. *Id.* at 144 (quoting Council Directive 2004/27/EC, art. 10, 2004 O.J. (L 136) 39 of the European Parliament and of the Council of 31 March 2004 on the Community Code Relating to Medicinal Products for Human Use, art. 10, 2004 O.J. (L 136) 39).

²⁸⁰ Establishing the appropriate scope of an experimental use defense involves additional challenges, including, as usual, empirical difficulties. See Hagelin, *supra* note 253, at 541–47 (proposing a broader experimental use defense after evaluating a variety of approaches).

²⁸¹ *Cf.* Moris & Kannankutty, *supra* note 41, at 1 (reporting that according to the National Science Foundation, almost a quarter of all research and development workers employed by U.S. companies work outside of the United States).

Sometimes, the first inventor to seek patent protection is actually the second person to discover an invention. As a result, issuing a patent to the second person would enable that inventor to prevent the first-in-time inventor from utilizing the invention. A prior use defense addresses this situation by allowing an earlier inventor to continue to use a discovery, despite the issuance of a patent to a later inventor.²⁸²

Protecting prior uses from patent infringement generally increases domestic rivalry by exempting from patent liability any competitors who began to use a technology before the patentee filed a patent application.²⁸³ Prior uses are often particularly important to competition because the prior user has no opportunity to avoid investing in infringing technology. By definition, the prior user begins to use technology before a second inventor obtains a patent on it.²⁸⁴ Consequently, without this defense the prior user often must choose between licensing or

²⁸² See 35 U.S.C. § 273(a) (2006 & Supp. V 2011) (codifying the prior use defense). Prior public uses sometimes will invalidate a patent altogether. Secret prior uses, though, often do not invalidate patents. For instance, in 1998 in *Woodland Trust v. Flowertree Nursery, Inc.*, the Federal Circuit stated:

If the invention was known to or used by others in this country before the date of the patentee's invention, the later inventor has not contributed to the store of knowledge, and has no entitlement to a patent. Accordingly, in order to invalidate a patent based on prior knowledge or use, that knowledge or use must have been available to the public.

148 F.3d 1368, 1370 (Fed. Cir. 1998); see also U.S. PATENT & TRADEMARK OFFICE, REPORT ON THE PRIOR USER RIGHTS DEFENSE 29 (2012) (stating that “[p]rior user rights tend to work against the excludability function of patents”).

²⁸³ For example, in the 2002 U.S. District Court for the Eastern District of Michigan case *Seal-Flex, Inc. v. W.R. Dougherty & Associates*, a patent owner (Seal-Flex) accused a competitor (Dougherty) of infringing a patented method for constructing athletic surfaces. Dougherty argued that it should not be liable for infringement because it had been commercially using the patented method more than a year before Seal-Flex submitted its patent application. 179 F. Supp. 2d 735, 736–37 (E.D. Mich. 2002). The court, however, found that Dougherty had waived any claim to prior use., *id.* at 741–42, and later awarded Seal-Flex substantial damages. See *Seal-Flex, Inc. v. W.R. Dougherty & Assos.*, 254 F. Supp. 2d 647, 660 (E.D. Mich. 2003) (determining remedies for plaintiff). Had the court applied the prior use defense, Seal-Flex might have faced more intense rivalry. Indeed, Seal-Flex had already asserted the patent against other competitors in two separate lawsuits. See *Seal-Flex, Inc. v. Athletic Track & Court Constr.*, 870 F. Supp. 753, 755 (E.D. Mich. 1994); *Seal-Flex, Inc. v. Atlas Tracks, Inc.*, No. 1:92-CV-194, 1993 WL 763152, at *1–2 (W.D. Mich. Feb. 12, 1993), *vacated*, No. 93-1432, 1994 WL 745348 (Fed. Cir. Mar. 9, 1994). In one of these cases, the district court held that the patent was invalid, but the court of appeals vacated that ruling pursuant to settlement agreements and a joint motion to vacate. *Atlas Tracks, Inc.*, 1994 WL 745348, at *1.

²⁸⁴ BLACK'S LAW DICTIONARY, *supra* note 127, at 1314 (defining prior user right as “[t]he right of a first inventor to continue using an invention after someone else has patented it”).

incurring significant costs to switch to a non-infringing alternative. In either case, the prior use defense protects competitors from costs that reduce rivalry.²⁸⁵

Despite the competitive benefits of the prior use defense, the defense may reduce rivalry in one narrow sense: it can encourage some firms to protect their discoveries with trade secrets rather than patents.²⁸⁶ To obtain a patent, an inventor must disclose substantial information about an invention, including sufficient information to enable a person of ordinary skill to practice the invention without undue experimentation.²⁸⁷ Competitors may use this information to compete with a patent owner, particularly once a patent expires.²⁸⁸ The prior use defense shelters from liability firms that avoid disclosing their inventions to competitors through patents and opt instead for trade secret protection. As a result, a prior use defense may undermine incentives to disclose information that promotes competition.²⁸⁹

Nevertheless, even if prior use rights undermine disclosure, any resultant reduction in competition is more than offset by an increase in competition arising from independent innovation. This is because the protection afforded by trade secrets is comparatively fleeting. Patents provide broad rights to exclude; even independent invention is not a defense to patent infringement.²⁹⁰ In contrast, the owner of a trade secret has no claim against a competitor that independently invents or reverse engineers the secret.²⁹¹ Indeed, some courts and commentators

²⁸⁵ See *supra* notes 128–129 and accompanying text (discussing the costs of licensing); *supra* notes 133–134 and accompanying text (discussing switching costs).

²⁸⁶ U.S. PATENT & TRADEMARK OFFICE, *supra* note 282, at 34. A trade secret is information that “derives independent economic value . . . from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use, and . . . is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.” UNIF. TRADE SECRETS ACT § 1(4) (1985).

²⁸⁷ 35 U.S.C. § 112(a) (2006 & Supp. V 2011); see Brian J. Love & Christopher P. Seaman, *Best Mode Trade Secrets*, 15 YALE J.L. & TECH. 1, 3 (2012). Indeed, some firms choose to forgo patent protection in order to avoid disclosing information that may be helpful to competitors. Graham et al., *supra* note 1, at 1313.

²⁸⁸ Jorda, *supra* note 260, at 26; see *supra* notes 264–268 and accompanying text (discussing legal obstacles to experimenting on a patented technology during the term of the patent).

²⁸⁹ U.S. PATENT & TRADEMARK OFFICE, *supra* note 282, at 31; see Anton et al., *supra* note 5, at 5. Even when an invention is disclosed through a patent, however, significant amounts of information necessary to successfully commercialize the invention may be protected with trade secrecy. Jorda, *supra* note 260, at 28–31.

²⁹⁰ Christopher A. Cotropia & Mark A. Lemley, *Copying in Patent Law*, 87 N.C. L. REV. 1421, 1460–61 (2009).

²⁹¹ See UNIF. TRADE SECRETS ACT § 1 cmt. Trade secret law protects the owner of a trade secret from the misappropriation of confidential information. See *id.* § 1(2).

assert that competitors frequently discover inventions protected by trade secrets “long before the time when a patent would have expired,” even when trade secrets are not misappropriated.²⁹² In other words, “[w]here patent law acts as a barrier, trade secret law functions relatively as a sieve.”²⁹³

A strong prior use defense will not significantly reduce incentives to innovate for two reasons. First, a prior use defense does not impact the patent owner’s ability to hold liable an infringer that begins to use the patented invention after the inventor submits a patent application. In such a situation, the defense does not apply.²⁹⁴ Moreover, because the transferability of the prior use defense is severely limited, later infringers cannot avoid liability by purchasing the defense from a prior user.²⁹⁵ Accordingly, even with a strong prior use defense, patents will provide substantial incentives for inventors to discover and disclose inventions.

Second, to the extent that a prior use defense reduces the incentive to innovate derived from patent protection, the defense simultaneously increases the incentives to innovate secured by trade secret law. Like patents, trade secrets provide important incentives to innovate.²⁹⁶ As the Supreme Court has noted, “[c]ertainly the patent policy of encouraging invention is not disturbed by the existence of another form of incentive to invention.”²⁹⁷ Indeed, trade secrets often are more effective incentives for promoting innovation than patents.²⁹⁸ For example,

²⁹² Jorda, *supra* note 260, at 6–8 (quoting *Dunlop Holdings Ltd. v. Ram Golf Corp.*, 524 F.2d 33, 37 (7th Cir. 1975)); *accord* *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 490 (1974). By one estimate, trade secrets have an average life of less than five years. Jorda, *supra* note 260, at 7. *But see* *Kewanee Oil*, 416 U.S. at 494 (Marshall, J., concurring) (“State trade secret law . . . in its unlimited duration is clearly superior to the [limited] monopoly afforded by the patent laws [T]rade secret protection provides in some instances a substantial disincentive to entrance into the patent system, and thus deprives society of the benefits of public disclosure of the invention”). One empirical study reports that many firms find their own independent research to be a better source of information regarding competitors’ technologies than patent disclosures. Levin et al., *supra* note 123, at 806.

²⁹³ *Kewanee Oil*, 416 U.S. at 490. Moreover, trade secrets may be disclosed through licensing agreements. *Id.* at 486.

²⁹⁴ *See generally* 35 U.S.C. § 273(a)(2) (2006 & Supp. V 2011) (describing conditions under which the prior user defense applies).

²⁹⁵ Jurisdictions that recognize the prior use defense generally restrict the transferability of the defense. *See, e.g., id.* § 273(e)(1)(B) (limiting the transferability of the prior use defense under U.S. patent law).

²⁹⁶ *Kewanee Oil*, 416 U.S. at 481; *see* Jorda, *supra* note 260, at 1.

²⁹⁷ *Kewanee Oil*, 416 U.S. at 481.

²⁹⁸ *See id.* at 487–89 (discussing the value of trade secrets when there is “a legitimate doubt” as to the availability of patent protection for an invention).

numerous empirical studies have found that, for some types of patentable inventions, firms prefer to protect their discoveries with trade secrets rather than patents.²⁹⁹ Protecting an inventor's reliance on trade secrecy therefore promotes innovation, and prior use rights do not materially reduce incentives to innovate.

The scope of the prior use defense under U.S. patent law has fluctuated recently, but it likely remains too weak to maximize competitive advantage. For many years, U.S. patent law lacked an explicit prior use defense,³⁰⁰ partly because U.S. patent law strongly favored the disclosure of new discoveries. But it also generally protected public prior use by providing that such uses often completely invalidated later patents.³⁰¹ In contrast to public prior uses, U.S. patent law heavily disfavored secret prior uses:

As between a prior inventor who benefits from a process by selling its product but suppresses, conceals, or otherwise keeps the process from the public, and a later inventor who promptly files a [U.S.] patent application from which the public will gain a disclosure of the process, [U.S.] law favors the latter.³⁰²

Even secret prior uses were protected, however, provided that they were incidental to subsequent disclosure in a patent; if a secret prior user was the first inventor to discover an invention, but the second person to file a patent application, U.S. patent law would often grant patent rights to

²⁹⁹ Levin et al., *supra* note 123, at 794–95 (finding that firms believe secrecy to be more effective than patents for process inventions and vice versa for product inventions); see Graham et al., *supra* note 1, at 1290 (finding secrecy to be more effective than patents in protecting software inventions, although less effective than patents in protecting medical device and biotechnology inventions). One important benefit of trade secrecy over patents is that an inventor need not incur the significant cost of obtaining a patent. See VAN EECHE ET AL., *supra* note 278, at 133 (noting that prior use rights allow prior users to avoid the high cost of obtaining a patent).

³⁰⁰ Before 1952, U.S. patent law *did* include a prior use defense. U.S. PATENT & TRADEMARK OFFICE, *supra* note 282, at 30.

³⁰¹ For patents issued prior to 2012, a prior use that was public will invalidate a patent, provided that the prior use took place either (1) before the patent owner's date of invention or (2) more than a year before the patentee applied for the patent. 35 U.S.C. § 102(a)–(b) (2006) (amended 2011). Moreover, for patents issued prior to 2012, a prior use kept secret during the pendency of a patent application can invalidate another inventor's patent. See *Flex-Rest, LLC v. Steelcase, Inc.*, 455 F.3d 1351, 1356, 1358–59 (Fed. Cir. 2006).

³⁰² *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1550 (Fed. Cir. 1983). *But see* Jorda, *supra* note 260, at 1 (stating that “[p]atents and trade secrets are not incompatible but dovetail”).

the secret prior user.³⁰³ Prior uses that were protected by trade secrets, however, received no protection from valid patents.³⁰⁴

Recent legal reforms have expanded prior use rights. In 1999, Congress created an explicit prior use defense in response to a decision by the Federal Circuit that broadened the patent eligibility of methods of conducting businesses.³⁰⁵ The new prior use defense, however, was limited to business method patents. Congress further restricted the new prior use defense to uses that were “reduced to practice at least 1 year before the effective filing date of [a] patent” and “commercially used” before the effective filing date of a patent.³⁰⁶

On September 16, 2011, Congress passed the Leahy-Smith America Invents Act, which drastically reshaped the law regarding prior uses.³⁰⁷ Perhaps most significantly, the Act changed the U.S. patent system from a “first-to-invent” system to a “first-to-file” system. Under the new law, when two people independently discover an invention, the first person to file a patent application will obtain the patent on the invention, even if that person was the second to discover the invention.³⁰⁸ To ameliorate the impact of the new first-to-file system on initial inventors who are second to file patent applications, the Act expanded the prior use defense to include all types of patented inventions.³⁰⁹

The Act, however, limited the prior use defense in two significant respects. First, the defense does not apply to inventions that, at the time of the invention, were “owned or subject to an obligation of assignment to either an institution of higher education . . . or a technology transfer organization for [such an institution].”³¹⁰ Second, a prior commercial use must generally begin at least one year before the patent’s effective filing date.³¹¹ A patentee can extend the required period for public use

³⁰³ 35 U.S.C. § 102(g) (2006) (amended 2011).

³⁰⁴ *See id.* § 102(a)–(b), (g).

³⁰⁵ *See State St. Bank & Trust*, 149 F.3d at 1375–77.

³⁰⁶ 35 U.S.C. § 273(a)–(b) (2006) (amended 2011).

³⁰⁷ *See* Pub. L. No. 112-29, sec. 5, § 273, 125 Stat. 284, 285–87, 297 (2011) (codified at 35 U.S.C. § 273 (2006 & Supp. V 2011)).

³⁰⁸ *Id.* § 102.

³⁰⁹ *See id.* § 273(a).

³¹⁰ *Id.* § 273(e)(5)(A). This limitation does not apply if the invention’s reduction to practice “could not have been undertaken using funds provided by the Federal Government.” *Id.* § 273(e)(5)(B). This provision appears to apply, though, even if the institution of higher learning later transfers the patent to a private enterprise. *See id.*

³¹¹ *Id.* § 273(a)(2). Under the older first-to-invent system, a secret prior user did not need to use an invention for more than a year to win a priority dispute. 35 U.S.C. § 102(g) (2006) (amended 2011).

to almost two years by publicly disclosing the invention before filing a patent application.³¹²

Importantly, the patent laws of many foreign jurisdictions recognize a prior use defense that is not subject to these two limitations.³¹³ No other country in the world contains an exception to the prior use defense for patents developed by an “institution of higher education.”³¹⁴ Similarly, foreign patent systems do not require that a prior use be commercialized for lengthy time periods to be eligible for the defense.³¹⁵ Indeed, unlike the U.S. requirement for “commercial use” for at least one year before a patent’s filing date, most foreign patent systems require only that, before the filing date, a firm undertake “effective and serious preparations” to begin commercial use.³¹⁶ For example, under Korean patent law, the prior use defense applies to anyone who “[a]t the time of filing of a patent application . . . has been working [an] invention commercially or industrially . . . or has been making preparations therefor.”³¹⁷ Similarly, patent law in the United Kingdom requires only “effective and serious preparations” for commercial use before a patent’s filing date.³¹⁸

Thus, the prior use defense is often narrower under U.S. patent law than under foreign patent law.³¹⁹ Consequently, stronger prior use defenses help rivalry to flourish in foreign countries, whereas a weaker

³¹² 35 U.S.C. § 273(a)(2)(B) (2006 & Supp. V 2011).

³¹³ Some of the other limitations in the U.S. prior use defense also appear in foreign patent laws, however. For example, under U.S. patent law, the prior user defense only applies to use “in the United States.” *Id.* § 273(a)(1). The patent laws of many European countries contain an analogous geographical requirement. VAN ECKE ET AL., *supra* note 278, at 99.

³¹⁴ U.S. PATENT & TRADEMARK OFFICE, *supra* note 282, at 28 (“In this regard, it appears that the United States is rather unique in including a provision benefitting the academic sector.”).

³¹⁵ *Id.* at 20–21.

³¹⁶ VAN ECKE ET AL., *supra* note 278, at 103; *accord* U.S. PATENT & TRADEMARK OFFICE, *supra* note 282, at 15. One form of “effective and serious preparation” explicitly qualifies as “commercial use” under U.S. law: “Subject matter for which commercial marketing or use is subject to a premarketing regulator review period during which the safety or efficacy of the subject matter is established . . . shall be deemed to be commercially used.” *See* 35 U.S.C. § 273(c)(1) (2006 & Supp. V 2011).

³¹⁷ T’ukhopop [Patent Law], Act No. 950, Nov. 28, 1949, art. 103, *amended by* Act No. 9985, Jan. 27, 2010 (S. Kor.), *translated in Republic of Korea*, WORLD INTELL. PROP. ORG., http://www.wipo.int/wipolex/en/text.jsp?file_id=214463 (last visited Sept. 23, 2013).

³¹⁸ Patents Act, 1977, c. 37, § 64 (Eng.).

³¹⁹ *See* U.S. PATENT & TRADEMARK OFFICE, *supra* note 282, at 21 (“This makes the U.S. temporal approach significantly more restrictive than that for any other prior user rights system.”).

prior use defense limits domestic rivalry in the United States.³²⁰ Strengthening the defense in the United States to align with the patent laws of other countries, however, would not significantly reduce incentives to invent for U.S. companies. Consequently, to increase the competitive advantage of U.S. firms, the United States should embrace harmonization regarding the prior use defense.³²¹

CONCLUSION

The competitive advantage of U.S. firms, particularly in industries characterized by high worker productivity, is vital to U.S. economic prosperity. As a result, to maintain or increase standards of living in the United States, lawmakers should work to maximize U.S. competitive advantage. U.S. patent law affects this goal in at least two respects.

First, U.S. patents provide incentives for U.S. firms to discover new inventions, and U.S. firms can use innovations to develop products and services that are better or cheaper than those offered by foreign rivals. Nevertheless, because U.S. patents also encourage foreign firms to develop new technologies, the incentive effect of U.S. patents often provides little competitive advantage to U.S. firms compared to their international rivals. In fact, because only U.S. patents can be asserted in the United States and because the U.S. economy is the largest economy in the world, nonresident patent acquisition in the United States is more common than in many countries.

Second, U.S. patents undermine U.S. competitive advantage by restraining competition in the United States, including domestic rivalry. Intense domestic rivalry generally promotes competitive advantage because it drives firms to improve, to reduce intrafirm inefficiencies, and to develop more advanced factors of production. Intense domestic rivalry also spawns related and supporting industries. By reducing domestic rivalry in the United States, U.S. patents reduce U.S. competitive advantage. In contrast, due to limits on the extraterritorial effects of U.S. law, U.S. patents do not significantly undermine the competitive conditions facing foreign firms.

³²⁰ In fact, U.S. firms often cannot even compete equally against local firms in foreign jurisdictions that recognize robust prior use rights because those jurisdictions typically require prior use in that country. *See id.* at 21–22; VAN EECKE ET AL., *supra* note 278, at 99.

³²¹ The extent to which expanding the scope of the prior use defense may affect U.S. competitiveness is, however, unclear. In many jurisdictions, few patent defendants rely on the defense. VAN EECKE ET AL., *supra* note 278, at 106. As a result, some commentators have concluded that “the actual impact of prior user rights is quite small in practice.” *Id.* at 135.

Thus, it is likely that U.S. patents today often harm U.S. competitive advantage more than they help it. Moreover, due to legal and economic differences between the United States and other countries, foreign patents do not similarly undercut the competitive advantage of firms in other countries. For example, because foreign patent laws provide less powerful exclusive rights to inventors, foreign patents do not limit rivalry in those countries as much as U.S. patents limit domestic rivalry in the United States.

To maximize U.S. competitiveness, the strength of U.S. patent rights likely should be reduced, and this Article lends further support to a burgeoning call for weakening patent rights in the United States. U.S. lawmakers should nevertheless be cautious in doing so because U.S. patents provide important incentives to invent. One promising approach to weakening U.S. patent rights is to harmonize U.S. patent law with weaker foreign patent laws, where doing so would only marginally reduce incentives to innovate. This Article offers two examples of such an approach: expanding in the United States both the experimental use defense and the prior use defense.