

Incentivizing Innovation: The Imperative of Intellectual Property Protection

ROD HUNTER

Senior Vice President, International Affairs

Pharmaceutical Research and Manufacturers of America

LAST SUMMER MARKED AN ANNIVERSARY—the *quasquibicentennial*, for logophiles—of a seminal event in U.S. history, and it passed almost completely unnoticed. On 31 July 1790, the newly established U.S. government awarded its first patent to an inventor, Samuel Hopkins, who had created a new process for the manufacture of potash, a key ingredient used in fertilizer.¹ In the intervening 225 years, millions of patents have been approved by the U.S. government and by governments around the world. And while every patent is different, they all build on the same basic idea: individuals and institutions can invest resources knowing that if they create a valuable new product or process, their efforts will be rewarded with a grant of temporary exclusivity.

Intellectual property (IP) protections are fundamentally about encouraging the innovation that drives human progress. And these protections have been extraordinarily successful—contributing to rapid increases in global living standards over the past two centuries. Intellectual property continues to fuel debate, but it is more important than ever for governments throughout the world to focus on preserving—if not strengthening—IP protections. Doing so will ensure that people can continue to invest in research and development and share their discoveries with the world.

INTELLECTUAL PROPERTY THROUGH HISTORY

The Republic of Venice is typically credited with adopting the first patent stat-

ROD HUNTER is senior vice president of international affairs at the Pharmaceutical Research and Manufacturers of America and served as senior director for international economics at the White House's National Security Council under President George W. Bush.

Copyright © 2016 by the *Brown Journal of World Affairs*

ute, in March 1474:

Any person in this city who makes any new and ingenious contrivance, not made heretofore in our dominion, shall, as soon as it is perfected so that it can be used and exercised, give notice of the same to our office of Provveditori de Comun [State Judicial Office], it being forbidden up to 10 years for any other person in any territory and place of ours to make a contrivance in the form and resemblance thereof, without the consent and license of the author.²

Included in the statute were enforcement powers, and violators could face fines equivalent to about \$7,000. But it was only with the flowering of breakthrough innovations that intellectual property became a priority for policymakers. The United States' Founding Fathers wrote intellectual property into Article I of the U.S. Constitution—giving Congress the power to secure “for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.”³ To underscore intellectual property's importance in the new nation, a patent act was the third law passed in the first session of Congress.⁴ And the polymath Thomas Jefferson served as one of the first patent examiners—while also holding down another federal job: Secretary of State. Ever since, innovation has fueled the economy of the United States and other countries. Tools ranging from the cotton gin to the computer, coupled with improved healthcare and public health practices, have enabled people to produce more and live longer.

This progress was far from predestined. Indeed, the very idea of human progress is a new concept—for most of recorded history, humans saw no increase in living standards or life expectancy.⁵ That began to change in the nineteenth century for a wide variety of reasons, and the progress accelerated in the first half of the twentieth century. The Nobel laureate economist Robert Solow found that 35 to 40 percent of all productivity and growth gains achieved by the United States could be traced to something seemingly simple: new ideas.

Since 1950, IP protections have taken on renewed importance as the U.S. economy has become increasingly powered by idea-driven innovation. Consider the growth in the value of intellectual property over a recent six-year period. In 2005, economists Robert Shapiro and Kevin Hassett estimated the total value of intellectual capital in the U.S. economy to be between \$5 trillion and \$5.5 trillion. Their more recent analysis estimated that the value of intellectual capital in the 2011 U.S. economy had increased to between \$8.1 trillion and \$9.2 trillion.⁶

Their analysis also revealed that intellectual capital now pervades more

industries throughout the U.S. economy than has been previously observed. While once the province of the pharmaceutical and IT sectors, intellectual property is now a key input in most industries, from the most advanced goods and services to traditional manufacturing. Moreover, intellectual property's deeper

penetration strengthens the U.S. economy and stimulates the creation of high-paying jobs. In 2010, average weekly wages for IP-intensive industries

were \$1,156, which was 42 percent higher than average weekly wages in other (non-IP-intensive) private industries, according to a 2012 report by the U.S. Patent and Trademark Office (PTO).⁷ This wage premium has also been growing—in 1990, it was just 22 percent. Additionally, IP-intensive industries directly or indirectly employ approximately 55 million Americans.⁸

As humans know more, each succeeding knowledge breakthrough will deliver a bigger payoff, which will, in turn, foster higher levels of economic growth.

HOW INNOVATION UNLEASHES GROWTH

The aforementioned figures reflect a fundamental economic truth: innovation is directly tied to job creation and is a cornerstone of economic growth. New York University's Paul Romer has helped to illuminate the nexus between innovation and growth. He was one of the first to pinpoint how knowledge was not, as traditionally thought, "exogenous" (a fancy way of saying external) to economic growth, but rather "endogenous" (or internal).⁹ In other words, knowledge itself could drive increasing returns on investments in knowledge. Thus, as humans know more, each succeeding knowledge breakthrough will deliver a bigger payoff, which will, in turn, foster higher levels of economic growth.

Central to much of Romer's work has been an emphasis on the ability of human beings to pursue "the discovery of better ways to do things."¹⁰ This helpfully distinguishes humans from other living organisms. As Romer has noted, "an ant will go through its life without ever coming up with even a slightly different idea about how to gather food."¹¹ Thus, once better ways of doing things are discovered, and then broadly disseminated, they spark greater efficiency and higher productivity that drive economic growth.

One of the foundations of innovation is an IP regime that incentivizes and rewards discovery. To help foster innovation, Romer has singled out the need to protect patents—and take other measures, such as ensuring there are opportunities for foreign direct investment and avoiding heavy regulation

ROD HUNTER

and high marginal tax rates. Simply put, there must be rewards for discovery. Without these rewards, there will be less research, diminished innovation, and lower living standards.

THE FUTURE OF INNOVATION

While there is little disagreement about the connection between innovation and economic growth, the author of a recently published book is raising questions about the potential for innovation to deliver the big-bang gains of earlier generations. The author, Northwestern University's Robert Gordon, takes a dim view of the future in *The Rise and Fall of American Growth: The Standard of Living Since the Civil War*:

The rise in the U.S. standard of living from 1870 to 1970 was a special century—and won't likely be repeated. Growth over the next quarter century will resemble the slow pace of 2004–2015, not the faster growth rate of 1994–2004, much less the rapid rate achieved between 1920 and 1970. . .

164

No one can foresee the future, but we can ask whether the future is more likely to resemble the 1994 to 2004 decade or the most recent decade, 2004 to 2014. The evidence is that the more rapid growth of [total factor productivity] during the dot-com decade represented a temporary upsurge that is unlikely to be repeated. . . Labor productivity, far from exploding as machines and software replace people, has been in the doldrums, rising only 0.3 percent a year in the five years ending in mid-2015, in contrast to the 2.3 percent a year in the dot-com period.¹²

Professor Romer has offered a different perspective. He believes that science has the potential to unlock many more innovations:

Every generation has perceived the limits to growth that finite resources and undesirable side effects would pose if no new recipes or ideas were discovered. And every generation has underestimated the potential for finding new recipes and ideas. We consistently fail to grasp how many ideas remain to be discovered. The difficulty is the same one we have with compounding: possibilities do not merely add up; they multiply. . .

The periodic table contains about a hundred different types of atoms. If a recipe is simply an indication of whether an element is included or not, there will be 100 x 99 recipes like the one for bronze or steel that involve only two elements. For recipes that can have four elements, there are 100 x 99 x 98 x 97 recipes, which is more 94 million. With up to 5 elements, more than 9 billion. Mathematicians call this increase

in the number of combinations “combinatorial explosion.”

Once you get to 10 elements, there are more recipes than seconds since the big bang created the universe. As you keep going, it becomes obvious that there have been too few people on earth and too little time since we showed up, for us to have tried more than a minuscule fraction of the all the possibilities.¹³

Time will tell whether Gordon or Romer is more accurate. But regardless of whether future innovations are incremental or transformative, we know that individuals (and their institutions) need incentives—including strong IP protections—to pursue those innovations.

This is not to suggest that economic incentives are the only motivator of human conduct. There are countless examples of individuals who are motivated to create not because they expect to grow wealthy but because of their passion for advancing human welfare or, more simply, to satiate their own curiosity. Still, as Adam Smith famously wrote in *The Wealth of Nations*, “It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest.”¹⁴ In the same vein, intellectual property has proven to be a powerful instrument for harnessing self-interest and reinforcing incentives to innovate, particularly for undertakings requiring many participants and substantial capital.

165

The field in which I work, biopharmaceuticals, is built on the foundations of intellectual property. Consider the business model: Less than 12 percent of all potential new drugs entering clinical trials result in an approved medicine, after substantial investment and an average of more than 10 years of research and development. The few successes must make up for the many failures. In fact, only 20 percent of medicines achieve returns that match or exceed average research and development costs.¹⁵

PUBLIC POLICY AND PROTECTING INTELLECTUAL PROPERTY

While the precise contours of future innovation remain unknown, there is a broad understanding of intellectual property’s importance in the modern economy. At large U.S. companies, for example, intangible assets like intellectual property account for much of their market value. The authors of one study examined a variety of industries in the U.S. economy and found that, in 2009, intellectual capital—patents, copyrights, databases, brands, and organizational knowledge—held a 44 percent share of firms’ overall market value. While the percentage varied from industry to industry, it was highest for media: 75 percent.¹⁶

There is also a broader benefit to the intellectual capital developed by companies, regardless of jurisdiction: It is often disseminated to other companies and countries throughout the world. That dissemination translates to everything from technologically advanced imports to new management techniques. The companies and countries receiving this intellectual capital are direct beneficiaries, as it can give rise to faster growth in domestic firms, while also spurring

Intellectual capital—patents, copyrights, databases, brands, and organizational knowledge—held a 44 percent share of U.S. firms’ overall market value.

industrial modernization. This knowledge sharing also spawns new local companies that serve as suppliers, thereby boosting employment, aug-

menting workers’ skills, improving productivity, and increasing government revenue. The net effect is to stimulate high-wage job creation across multiple industries and to help raise living standards throughout the world—particularly in developing countries. Since 1980, the biggest economic gains realized by developing economies have been a byproduct of making foreign technologies and business methods available, and thus of the knowledge that drives greater productivity and innovation, while also protecting IP rights.¹⁷

166

While idea-driven innovation has altered the course of world history—taking much of the global population from penury to prosperity—there is no guarantee that this innovation will continue. Indeed, the fate of many one-time empires, such as the Roman, Spanish, and British ones, is a potent reminder that seemingly invincible societies are often anything but. Thus, it is important for policymakers to stay focused on the fundamental idea contained in the 2012 report issued by the U.S. Patent and Trademark Office: “Protecting our ideas and IP promotes innovative, open, and competitive markets, and helps ensure that the U.S. private sector remains America’s innovation engine.”¹⁸

But intellectual capital will only continue to flourish if companies are confident that their intellectual property will not be subject to erosion or outright theft. To that end, robust IP protection and enforcement should be a top priority for policymakers throughout the world, but particularly in developing economies where there is a clear relationship between intellectual property, foreign direct investment (FDI), and economic growth. Robert Shapiro has found a strong correlation between the quality of a nation’s IP regime and flows of FDI to that nation. Using the Ginarte-Park index, which is a country-by-country ranking of patent rights, Shapiro examined the period from 2008 to 2012. He found that each unit increase in a country’s value on the Ginarte-Park index—equal

to about one standard deviation—was associated with a 29 percent increase in its inflows of FDI. And, he says, “The link between a country’s respect for the IP rights of foreign companies and its FDI inflows is especially strong in highly IP-intensive industries, such as pharmaceuticals.”¹⁹

A number of past studies reinforce this finding. One study showed that for every 1 percent increase in patent protections by a developing country, that country realizes a 0.45 percent increase in the stock of investment from U.S. companies.²⁰ Another study looked at 80 countries from 1975 to 1994. It found that while robust IP protections contributed to economic growth in high-income countries, the growth effects were even stronger in low-income countries, thanks to imports and FDI.²¹

To understand how a country’s weak IP laws can choke off progress, consider the case of India. It attracts a mere 3 percent of global R&D spending, while China, with its stronger IP law, attracts about 14 percent, and Japan about 11 percent, reports the Battelle Institute.²² Furthermore, United Nations data show that India’s stock of foreign direct investment was just 12.3 percent of its GDP in 2014. The average for all developing economies during this period was 28.3 percent.²³

Studies by Shapiro and another economist, Aparna Mathur, have assessed the economic benefits of IP protection, with a particular focus on India. They found that when India strengthened its IP regime between 2003 and 2009, foreign firms operating in the country increased the intensity of their R&D—227 percent in the auto industry, 198 percent in the pharmaceutical industry, and 72 percent in the aerospace industry.²⁴ Based on these gains, they have estimated that if India achieved levels of IP protection equivalent to what exists in China, the country’s annual inflows of foreign direct investment would increase by 33 percent annually.

In the pharmaceutical sector—which is highly vulnerable to IP infringement—a stronger IP regime could increase FDI flows from \$1.5 billion in 2014 to \$8.3 billion in 2020. Pharmaceutical R&D would double to \$1.3 billion, and the increased FDI would create 18,000 new jobs in the pharmaceutical sector.²⁵ If India could transform its IP regime to resemble that of the U.S. system—which is even more robust than China’s—Shapiro and Mathur project that FDI flows could increase by 83 percent a year, with pharmaceutical FDI reaching as much as \$77 billion in 2020, pharmaceutical R&D rising to \$4.2 billion, and 44,000 new pharmaceutical jobs being created by decade’s end.

Since taking power in 2014, Prime Minister Modi has stressed the importance of innovation to India’s future. He has sought to attract foreign direct

investment and recognized the importance of intellectual property to India's economic growth. Speaking in London last year, he was more forthright than many of his predecessors in emphasizing IP protections: "I am personally convinced and want to assure you that India is committed to protect IP rights of all innovators and entrepreneurs."²⁶ While the Indian government seems to have stopped its direct assault on intellectual property, a recent report by the U.S. International Trade Commission found that the country has not yet made meaningful reforms to existing legislation that undermines IP incentives.

INNOVATION'S BIGGEST BENEFICIARIES: CONSUMERS

One common misconception is that the biggest beneficiaries of IP protections are the companies holding the relevant patents. While companies clearly benefit, it is users and consumers who realize even greater gains from innovation and from having access to the patented products. Nearly a century ago, manufacturing breakthroughs drove down the price of automobile production, leading Henry Ford to repeatedly reduce the price of a new car between 1921 and 1925.²⁷ Later, the airplane created a travel revolution, and in the 1980s, the proliferation of computerized spreadsheets (initially popularized by Lotus) unlocked large efficiencies in corporate financial departments, which contributed to the productivity gains that underpin economic growth and job creation. Similarly, the advent of Internet searches for information, using Google and other search engines, saved consumers as well as companies a significant amount of time and money that would otherwise have been devoted to searching through libraries (or paying others to do so).

While new products and technologies have sparked gains in productivity and living standards throughout the world, the benefits going to the innovators have been relatively modest. Research by Yale University's William Nordhaus shows that from 1948 to 2001, innovators captured, on average, only 3.7 percent of the social surplus from their innovations.²⁸ (Social surplus refers to all of the economic value of innovations that accrue to consumers, above and beyond what has accrued to the innovators.) There have also been large-scale gains from the development of medical breakthroughs, with an overwhelming share of the benefits also accruing to consumers. The use of statin therapy in the United States between 1987 and 2008 generated nearly \$950 billion in social value for consumers—equivalent to 76 percent of the total social value.²⁹ Consumers have realized an even greater share of the social value from cancer treatments. From 1988 to 2000, medicines to treat cancer created an additional

23 million life years, which translated to approximately \$1.9 trillion in social value—with 80–95 percent of this value going to consumers.³⁰ Similarly, 95 percent of the value derived from HIV/AIDS drugs launched since the 1990s has gone to consumers.³¹

INTELLECTUAL PROPERTY AND ITS DISCONTENTS

Amid the compelling evidence that IP protections contribute to innovation and economic growth, there have also been longstanding debates over the legitimacy of IP protections and the broader IP regime. Some critics point to inefficiencies of the IP system, with certain large companies using intellectual property as a weapon to fend off com-

petitors, claiming ownership of general ideas and threatening to sue anyone drawing on those same

ideas. A related issue, noted by a former head of the U.S. Patent and Trademark Office David Kappos, is that “there has been a greater prevalence of IP abuse over the past decade, particularly related to patents.”³² Indeed, individuals or companies that acquire patent rights merely to file lawsuits claiming patent infringement have become widespread. The vast majority of claims by these “trolls” are dismissed, but the legal wrangling can still be costly for the targeted companies—both in terms of fees and lost productivity. Apple has been sued a number of times for alleged patent violations, and earlier this year a court in Texas ordered the company to pay \$625 million to a patent holder.

Other critics have charged that IP protections prevent the poorest from gaining access to select products, particularly medicines. But in the pharmaceutical sector, there is a keen understanding of the obligation to meet the needs of patients throughout the world. Initiatives being undertaken by pharmaceutical companies to enable access to better health care are catalogued on the website of Global Health Progress. Additionally, many biopharmaceutical companies are continually working to deliver innovative treatments that address the world’s most devastating diseases while also advancing life-saving innovations. For example, in 2012, a consortium of companies joined the London Declaration on Neglected Tropical Diseases and pledged to donate 1.4 billion treatments per year to help eradicate 10 diseases.

The greatest obstacle to medicine access in developing countries and emerging economies is a lack of health care infrastructure. In India, for example, the

Critics have charged that IP protections prevent the poorest from gaining access to select products, particularly medicines.

government devotes a mere 1.04 percent of its GDP to health care, a level lower than that of Haiti and other least developed countries. The lack of resources and prioritization by officials has human consequences. As the IMS consultancy has found, in India, there is a shortage of doctors, clinics, and hospitals, especially in rural areas.³³ Even the existing public clinics and hospitals are often rendered useless by high rates of absenteeism by doctors.³⁴ Medicine, however affordable, is of no value if no one is available to prescribe or administer it.

Furthermore, there is little access to insurance programs in India, particularly for outpatient care and medicines, and less than 20 percent of the population has health insurance coverage.³⁵ Even the most essential medicines may be available at government pharmacies only 20 percent of the time, according to the World Health Organization.³⁶ This, coupled with the lack of a public safety net, makes health problems a leading source of economic hardship, even for middle-class families. In India and other emerging countries, the focus on intellectual property is (at best) a distraction from the real obstacles to care and treatment. Working to develop their health care infrastructure will dramatically improve delivery and expand access.

THE FUTURE . . . THROUGH THE PAST

170

One of mankind's greatest achievements over the past century has been the dramatic increase in life expectancy and, more broadly, living standards, for people throughout the world. This progress has been a byproduct of many different forces, but innovation has been fundamental: it has led to new products and processes that drive the growth in productivity and income.

Emblematic of this progress has been the development and dissemination of medicines that have greatly reduced the incidence of diseases that have been fatal for most of human history. These medicines did not arise spontaneously—they emerged only after scientists spent years (and often decades) researching possible cures. The curiosity and creativity of such scientists—what the late economist Julian Simon referred to as “the ultimate resource”—need to be encouraged and continually nurtured.³⁷ And the companies that employ them must be confident that the fruits of their labors will be protected, particularly given the outsized role of these companies in supporting the development of new medicines. The world's leading biopharmaceutical companies invest more than \$140 billion per year in research and development.³⁸

Innovation is only going to assume greater importance in the years ahead as companies create a higher share of value not from their physical assets but

from their intellectual ones. This underscores the importance of protecting the intellectual capital that is created. This is a modern idea, but it is based on long-standing principles. Abraham Lincoln, the only U.S. president to have ever been granted a patent (for a boating contraption), was a strong advocate of IP protections. In a speech delivered the year before he was elected president, he said that the patent system had “added the fuel of interest to the fire of genius” and given rise to “the discovery and production of new and useful things.”³⁹ His wisdom remains highly relevant today, as protecting intellectual property will help drive the innovation that unleashes greater opportunity and prosperity for people in the United States and throughout the world. 

NOTES

1. “First U.S. Patent Issued Today in 1790,” United States Patent and Trademark Office, July 31, 2001, <http://www.uspto.gov/about-us/news-updates/first-us-patent-issued-today-1790>.
2. “Venetian Statute on Industrial Brevets, Venice (1474),” in *Primary Sources on Copyright (1450-1900)*, ed. L. Bently & M. Kretschmer, www.copyrighthistory.org.
3. U.S. Const. art. VIII, § 8, cl. 8.
4. “The Day that Changed the World: April 10, 1790,” *IPWatchdog*, April 9, 2015, <http://www.ipwatchdog.com/2015/04/09/the-day-that-changed-the-world-april-10-1790/id=56422/>.
5. James C. Reilly, *Low Income, Social Growth, and Good Health: A History of Twelve Countries* (Oakland: University of California Press, 2007).
6. Kevin A. Hassett and Robert J. Shapiro, *What Ideas Are Worth: The Value of Intellectual Capital and Intangible Assets in the American Economy* (Sonecon, December 2006).
7. Economics and Statistics Administration and the United States Patent and Trademark Office, *Intellectual Property and the U.S. Economy: Industries in Focus* (U.S. Department of Commerce, March 2012).
8. “World IP Day: Protecting Innovation to Protect the U.S. Economy,” PhRMA, April 24, 2013, <http://www.phrma.org/world-ip-day-2013>.
9. Paul Romer, “The Origins of Endogenous Growth,” *The Journal of Economic Perspectives* 8, no. 1 (Winter 1994): 3–22.
10. Ronald Bailey, “Post-Scarcity Prophet,” *Reason*, December 2001.
11. Paul Romer, “Ideas and Things,” *Economist*, September 11, 1993.
12. Robert J. Gordon, “Goodbye, Golden Age of Growth,” *Bloomberg View*, January 26, 2016.
13. Romer, “Economic Growth,” *Paul Romer* (blog), October 12, 2015, <http://paulromer.net/economic-growth/>.
14. Adam Smith, *The Wealth of Nations* (London: W. Strahan and T. Cadell, 1776).
15. “2015 Profile: Biopharmaceutical Research Industry,” PhRMA, http://www.phrma.org/sites/default/files/pdf/2015_phrma_profile.pdf.
16. Hassett and Shapiro, “What Ideas Are Worth.”
17. The World Bank, *World Development Indicators: 2011* (Washington, DC: The World Bank, April 2011).
18. Economics and Statistics Administration and the United States Patent and Trademark Office, *Intellectual Property and the U.S. Economy*.
19. Shapiro, “The Idea-Based Economy and Trade” (lecture, Conference on Trade Policy and the Ideas-Based Economy, European Center for International Political Economy, Brussels, January 29, 2014).
20. Hassett and Shapiro, “What Ideas Are Worth.”
21. *Ibid.*
22. Battelle, *2013 Global R&D Funding Forecast* (Battelle and R&D Magazine, December 2012).

23. United Nations Conference on Trade and Development, *World Investment Report 2015: Reforming International Investment Governance* (Geneva: United Nations, 2015).
24. Robert J. Shapiro and Aparna Mathur, *The Impact of Intellectual Property Protections on Research and Development in India and on the Growth and Wages of Key Indian Industries* (Sonecon, November 2015).
25. Shapiro and Mathur, *How India Can Attract More Foreign Direct Investment, Create Jobs, and Increase GDP: The Benefits of Respecting the Intellectual Property Rights of Foreign Pharmaceutical Producers* (Sonecon, January 2014).
26. "India committed to protect Intellectual Property Rights," *Times of India*, November 13, 2015, <http://timesofindia.indiatimes.com/india/India-committed-to-protect-Intellectual-Property-Rights-PM-Modi/articleshow/49761700.cms>.
27. Amar Bhidé, "The Demise of US Dynamism is Vastly Exaggerated—But Not All is Well" (working paper no. 84, The Center on Capitalism and Society, Columbia University, January 26, 2015).
28. William D. Nordhaus, "Schumpeterian Profits and the Alchemist Fallacy" (working paper no. 6, Economic Applications and Policy Discussion, April 2, 2005).
29. David C. Grabowski et al., "The Large Social Value Resulting from Use of Statins Warrants Steps to Improve Adherence and Broaden Treatment," *Health Affairs* 31, no. 10 (2012): 2276–85.
30. Darius N. Lakdawalla et al., "An Economic Evaluation of the War on Cancer," *Journal of Health Economics* 29, no. 3 (2010): 333–46.
31. Tomas J. Philipson and Anupam B. Jena, "Who Benefits from New Medical Technologies? Estimates of Consumer and Producer Surpluses for HIV/AIDS Drugs," *Forum for Health Economics & Policy* 9, no. 2 (2006): 1–31.
32. David Kappos, "Spurring Creative Genius for Society's Benefit," in *Growing Global: Lessons for the New Enterprise* (New York: Center for Global Enterprise, 2015).
33. IMS Institute, *Understanding Healthcare Access in India: What is the current state?* (IMS Institute, June 2013).
34. Karthik Muralidharan et al., "Is There a Doctor in the House? Medical Worker Absence in India," (working paper, Harvard University, April 12, 2011).
35. "Less than 20% of population under health insurance cover: Report," *Times of India*, September 24, 2015, <http://timesofindia.indiatimes.com/india/Less-than-20-of-population-under-health-insurance-cover-Report/articleshow/49082784.cms>.
36. The World Health Organization, "Health Systems," chap. 6 in *World Health Statistics 2013* (Geneva: World Health Organization, 2013).
37. Julian Simon, *The Ultimate Resource* (Princeton, NJ: Princeton University Press, 1981).
38. International Federation of Pharmaceutical Manufacturers and Associations, *The Pharmaceutical Industry and Global Health: Facts and Figures 2015* (Geneva: International Federation of Pharmaceutical Manufacturers and Associations, 2015).
39. Abraham Lincoln, "Discoveries and Inventions," (lecture, Bloomington, IL, April 6, 1858), <http://www.abrahamlincolnonline.org/lincoln/speeches/discoveries.htm>.