

The Role of Intellectual Property in the Economy

Certainly an inventor ought to be allowed a right to the benefit of his invention for some certain time. It is equally certain it ought not to be perpetual; for to embarrass society with monopolies for every utensil existing, and in all the details of life, would be more injurious to them than had the supposed inventors never existed... How long the term should be is the difficult question.

—Thomas Jefferson, 1807

The founders of this country believed that *intellectual property* was so important that one of the specific grants of power to Congress under Article I, Section 8 of the Constitution was the power “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.” This grant gives Congress the power to define and to protect intellectual property through measures such as the issuance of patents and copyrights.

Other powers granted to Congress by Article I, Section 8 of the Constitution include taxation, regulating interstate commerce, coining money, borrowing, and naturalization. (For more on the early history of intellectual property rights in the U.S. see Box 10-1.)

Economic research over the past two centuries confirms the Founders’ wisdom regarding the importance of intellectual property. This chapter examines how intellectual property differs from other, more tangible, forms of property, the justification for having a formal system for its protection, and its role in economic growth. The chapter also looks at certain policy challenges in ensuring that intellectual property protection continues to promote U.S. economic growth and development. The key points of this chapter are:

- Intellectual property rights create incentives for individuals and firms to invest in research and development, and to commercialize inventions and other creations by allowing individuals and firms to profit from their creative activities.
- Well-defined and enforced intellectual property rights are an important element of the American economy and can contribute to the economic growth of all countries.

- The Administration continues to vigorously enforce the laws that protect the rights of American intellectual property owners.

Knowledge Is Different from Other Types of Goods

Economists generally recognize that intellectual property (such as knowing how to make bread) differs from physical property (such as a loaf of bread) in two basic attributes:

1. Can more than one person use the good at a time? Physical property, like a slice of bread, can be effectively used for only one purpose at a time, and that use precludes other uses. For instance, a slice of bread used to make a ham sandwich for one person cannot be used to make a grilled cheese sandwich or a ham sandwich for another person. This makes bread a good that is *rival in consumption*, which means that one use or one person's use of the product partially or wholly prevents another use or another person from using it.
2. Can other people be effectively prevented from using the good? The owner of physical property, such as a slice of bread, can prevent others from using that slice with relative ease. This makes physical goods like bread *excludable*, which means that others can readily be prevented from using the good.

Something that could be intellectual property, such as bread-making knowledge, differs from physical property in both of these attributes. Unlike a slice of bread, any person can use bread-making knowledge without diminishing the practical usefulness of that knowledge to anyone else. This makes bread-making knowledge, like all knowledge, a good that is *nonrival in consumption*.

In addition, it is very difficult to exclude others from using knowledge such as the knowledge of bread-making once it is created and publicized. If someone wanted to reap the economic rewards for his creation of such knowledge, his only option may be to not disclose the information at all. Even this approach may not be sufficient if others take active measures, such as *reverse engineering*, to learn how the knowledge was used to produce a product. Once others learn such knowledge, the person who developed it will be unable to prevent others from using it. Under the rules that apply to physical property, this makes knowledge a *nonexcludable* good.

Most knowledge also differs from physical goods in that the costs of developing knowledge are upfront, fixed costs that do not vary with the number of times the knowledge is used. Once it is produced, knowledge can be replicated repeatedly at effectively no cost. For a firm to have an incentive

to create new forms of knowledge, such as a formula for a new drug or a software program, it must be able to recoup its initial costs of development. It may not be able to do this if the knowledge becomes publicly available and competition forces prices down to the level at which they reimburse the seller only for the material costs of the products produced using this knowledge.

Treating Knowledge as Intellectual Property

Because knowledge is nonrival in consumption and nonexcludable, any person who incurs the fixed cost of developing a new or better product or process will soon find that others, including competitors, are using that knowledge. Competition could drive the price of the product down to the cost of the physical inputs used to make one unit of the product. The innovator would receive little or no financial return for paying the cost and undertaking the risk involved in developing such knowledge. Without the potential to profit from such innovation, most individuals will be unwilling to incur the fixed costs and financial risks associated with creating new knowledge.

This is not to say that there is no innovation without the potential for profit. Some innovations might occur as a by-product of the normal production process. Other innovators might still invest in research and development but try to prevent the use of their discoveries by keeping them secret. For many types of innovations this is likely to be costly and ineffective. However, if innovators cannot control the knowledge they have developed, they are significantly less likely to invest in developing such new knowledge.

An intellectual property system creates an incentive to develop certain types of knowledge by granting exclusive rights, enforceable through government action and a well-functioning legal system, to use that knowledge. These exclusive rights enable individuals to profit from their inventions by excluding others from using the innovation. Most intellectual property systems offer innovators an exchange. The innovator is given the right to exclude others—for a limited time—from the use of the innovation, but must provide the public with the complete details of the innovation. This public disclosure furthers the development of the knowledge base by enabling others to build on the knowledge embodied in the intellectual property and avoids the duplication of research efforts.

The Social Costs of an Intellectual Property System

Social costs could arise from making intellectual property protection too strong. These costs go beyond the obvious bureaucratic costs of intellectual property systems. Economics tends to focus on two of these social costs: the potential for creating monopoly power and the restrictions on exploiting useful technologies.

Box 10-1: Intellectual Property in the Early American Republic

While the phrase “intellectual property” is the product of more modern times, the concept in American thought harkens back to the Constitution. The gradual recognition of intellectual property rights in early America predates the Constitutional Convention, where it was formalized in the Constitution. By 1787, every state but one had passed copyright laws and many had already begun granting patents to inventors. Two delegates to the Constitutional Convention of 1787, James Madison and Charles Pinckney, were ardent advocates of assigning copyrights and patents to promote and protect the rights of the authors and innovators. The Framers of the Constitution assented to giving Congress its mandate in Article I, Section 8 to “promote the Progress of Science and useful Arts.”

This is not surprising. The founders, among them Jefferson and Franklin, were deeply influenced by the British common law system and the preeminence of scientific achievements throughout the Age of Enlightenment. Copyright and patent rights in early America, while distinguishable from their English predecessors, were justified on the same basic premise that defense of property rights precipitated economic growth. George Washington noted in his first inaugural address that the ownership of intellectual property is a necessary means of encouraging “exertions of skill and genius” to foster technological development.

Article I, Section 8 (Clause 8) provided the necessary authorization for Congress to extend intellectual property rights in the form of the patent statutes of 1790, 1793, 1800, 1836, and 1839 that were in effect until the Civil War period. Manufacturing productivity at the firm level in early nineteenth-century America has been documented to have varied directly with the level of patent protections afforded to inventors. Spurred by their belief in individual enterprise and the maximization of social returns through private protections, the early policymakers of the American Republic were prescient in their recognition of the importance of intellectual property rights in a market economy.

As Thomas Jefferson noted in the passage quoted at the start of this chapter, the power to exclude, depending on its length, has the potential to create monopoly power. Modern economic analysis supports this conclusion. The holder of intellectual property has a monopoly over the use of that intellectual property, but this control may not result in monopoly power in any meaningful sense. The potential for monopoly power is related to the breadth

and length of the power to exclude others from making use of the intellectual property. If this power is narrow or for a short duration, others can enter the market and compete in a timely manner, and the innovator will have little or no market power. Overly long or broad grants of exclusivity potentially limit the ability of others to compete and create a greater possibility of market power.

Economic research over the past two decades suggests that another social cost of an intellectual property system is that the power to exclude may deter others from advancing the state of knowledge by building on protected intellectual property since permission to use the property may be too expensive or may not be granted. Finally, the expiration of intellectual property protection after a specific time period may also spur firms to continue to innovate to ensure continued market success.

Intellectual Property Rights Basics

Intellectual property protection allows individuals to profit from their innovative or creative activities thereby creating an incentive to innovate and promote technological progress. Balanced against this benefit are the potential costs of giving the innovator monopoly power and limiting the ability of subsequent innovators to build on that invention. In crafting the existing intellectual property laws, Congress and the states have considered these associated costs and benefits and have granted differing levels of protection for four basic types of intellectual property: patents, copyrights, trademarks, and trade secrets. In recognition of the potential social costs of intellectual property protection for some kinds of knowledge, Congress has refused to allow individuals to claim intellectual property protection for certain types of knowledge.

The boundary between what can and cannot be protected is sometimes difficult to define. However, it is generally understood that intellectual property rights cannot protect things like intellectual concepts, mental processes, and basic laws of nature. While many justifications have been offered for these exclusions, one possible explanation, consistent with an economic understanding of the social costs of intellectual property, is that allowing ownership of any of these types of knowledge will create broad restrictions on innovators and will slow technical progress. To prevent stifling of innovation, intellectual property rights are granted only after fulfilling specific legislatively defined criteria and protect only a *particular* implementation, expression, or representation of an idea.

Patents: Protecting a Particular Implementation of an Idea

Thomas Jefferson wrote the original statute defining what may be patented. The language was brief and has changed little since the passage of the original patent act. “[A]ny new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof” may be patented. Patents protect what is normally called an invention but not the idea the machine or process is implementing.

The Constitution grants Congress the power to establish the requirements an inventor must satisfy before a patent is granted. Under current law, Congress requires that an inventor submit plans describing the invention to the United States Patent and Trademark Office (USPTO). To be granted a patent, the invention or innovation must satisfy a patent examiner under a “preponderance of the evidence standard” that the invention is useful, novel, and nonobvious. Once a patent is granted, its holder can exclude others from making, selling, or using the patented invention or substantially similar inventions for up to a Congressionally mandated 20 years after the patent application was initially filed. (A subset of patents called “design patents,” which protect an ornamental design of a product, provide patent protection for only 14 years.) The scope of this right to exclude depends on the legitimate breadth of the patent’s claims. In general, the more novel and innovative a patented product is, the broader are its claims and its protection.

Copyrights: Protecting the Expression of an Idea

Copyrights protect a particular expression of an idea and are generally associated with a variety of creative works including books, music, movies, magazines, paintings, sculptures, and any other expressive work. The key factor for obtaining a copyright is originality, and only a minimal amount of that is necessary. Registering a work with the Copyright Office in the Library of Congress provides some important litigation benefits—including the ability to obtain monetary damages when suing for infringement—but such registration is not necessary. A copyright exists the moment an expressive work is created and, except for work for hire, becomes the property of the author creating the work.

A copyright entitles the holder to exclude others from performing, publishing, or otherwise copying the work. It also entitles the holder to exclude others from producing “derivative works,” such as a movie adaptation of a book or its translation into a foreign language. Copyright protection generally lasts the life of the author plus 70 years. In the case of work for hire or anonymous works, copyright lasts 95 years from publication or 120 years from creation, whichever is shorter.

Trademarks: Protecting the Symbol of an Idea, Product, or Service

Trademarks can be words, phrases, designs, colors, sounds, or any combination of these that are used to distinguish the products or services of one entity from those of another. Trademarks reduce consumer search costs because they make it easier for consumers to identify and find products and services. Trademarks also protect consumers by providing an assurance of quality or attributes that can be expected with the trademarked product. Because the key function of a trademark is to uniquely identify a company, a product, or a service, the qualifying factor for a trademark is distinctiveness. Generic terms for a product and, in some cases, even descriptive terms cannot be a trademark.

Trademarks do not have to be registered with the USPTO but such registration provides the benefit of a legal presumption of nationwide ownership and exclusive right to use the mark for the goods or services identified in the registration. However, a trademark only becomes intellectual property when it is used in commerce to identify a product, service, or company. Trademarks give the holder the ability to exclude others from using that mark to identify any similar product and, in some cases, exclude others from using their mark if that use dilutes or weakens consumer association of the product or service with that mark. Validity of the trademark lasts as long as the trademark continues to identify the product or the company, which in some cases may be for centuries. The oldest U.S. registered trademark still in use today is for Samson Rope and was registered in 1884. However, trademark protection may be lost if the mark becomes associated with a product generically rather than a particular brand as occurred with the term “escalator,” which was once a trademark for escalators sold by the Otis Elevator company.

Trade Secrets: Limited Protection for Knowledge Kept Secret

Trade secrets consist of any information possessed by a firm that the firm takes reasonable measures to keep secret, is legitimately kept secret, and has commercial value because it is secret. This information may include information that could be protected as other forms of intellectual property but also includes knowledge that cannot be so protected, including customer lists, contracts, and other information whose value is diminished if it becomes publicly available.

Trade secrets are not formally protected in the way other intellectual property is protected. Protection is provided under state, rather than Federal, law. For example, protection occurs through the enforcement of the firm’s confidentiality provisions in contracts and the use of the legal system to block those who

have improperly or illegally obtained a firm's trade secrets from using or disclosing them. In general, however, a firm has no legal recourse to prevent others from using its trade secrets if they become publicly available. Trade-secret protection lasts only as long as the firm can maintain secrecy. One of the most successful trade secrets in this regard is the formula for Coca-Cola.

Intellectual Property, the American Economy, and Economic Growth

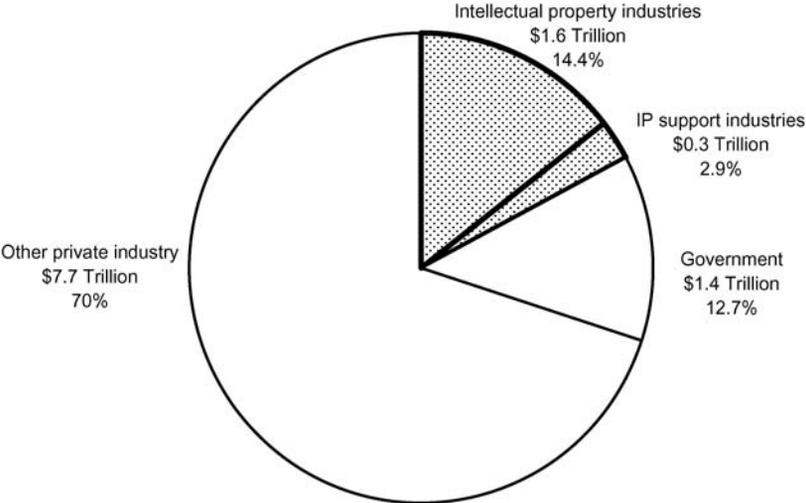
Intellectual property played an important role in the growth of the American economy from a primarily agrarian society through an industrial economy to the current information age. One researcher notes that even in the early part of the nineteenth century, the American patent system granted effective intellectual property rights that led to the development and diffusion of new technologies that fueled economic growth and prosperity. Today intellectual property protection plays an important role in many industries in which the United States has a comparative advantage and contributes to the size, growth, and exports of the American economy.

Intellectual Property and the American Economy

Industries such as chemicals, pharmaceuticals, information technology, and transportation are highly dependent on patent protection to provide the incentives to innovate. Some industries, such as software, entertainment, publishing, broadcasting, and other broadly defined communication industries, are highly dependent on copyright protection to ensure that the creators of such content are fully compensated for their efforts and continue to have the incentive to create such works. The combination of these patent and copyright-dependent industries and any such support industries that are necessary for these industries to function can be grouped together as intellectual property industries. Chart 10-1 shows the total economic activity generated by this group of industries. In 2003, these industries represented approximately 17.3 percent of total U.S. economic activity and approximately one-fifth of private economic activity. Their combined activity exceeds the total economic activity of all levels of government in the United States.

The estimate in Chart 10-1 represents the income generated in intellectual property industries. Equally important is the stock of intellectual property assets that generates these returns. Intellectual property is one of many intangible assets a firm may hold. Other intangible assets include brand value, organizational efficiencies, and firm-specific human capital. It has been estimated that approximately 70 percent of the value of publicly traded companies comes from intangible assets.

Chart 10-1 Intellectual Property Industries' Share of 2003 Gross Domestic Product
In 2003, intellectual property and IP support industries represented 17.3% of total value added.



Note: 2003 GDP equals \$11 trillion.
Source: "Engines of Growth: Economic Contributions of the U.S. Intellectual Property Industries" (2005) by Stephen E. Siwek.

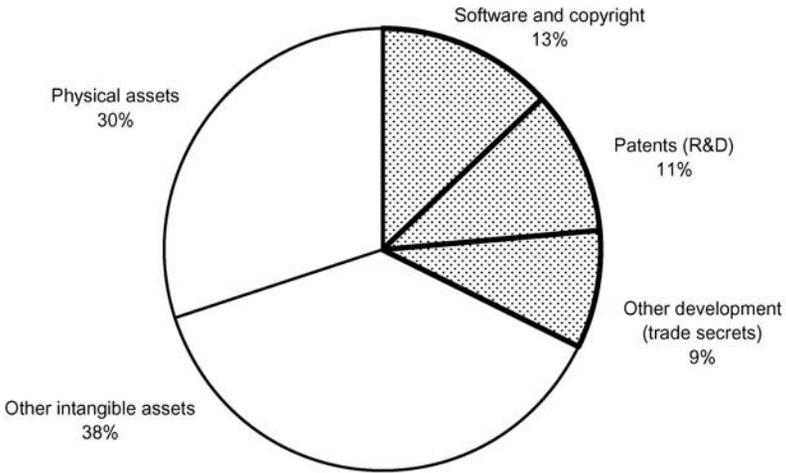
Chart 10-2 shows the total asset value of U.S. publicly traded firms broken out by the value of tangible assets, the value that can be inferred for various types of intellectual property, and the value of other intangible assets. Intellectual property accounts for approximately 33 percent of the value of U.S. corporations—with software and other copyright-protected materials representing nearly two-fifths of this value, patents representing one-third, and trade secrets representing the rest. In all, U.S. intellectual property may be worth more than \$5 trillion.

The one type of intellectual property excluded from the estimate in Chart 10-2 is trademarks. While there is no doubt that trademarks represent an important element of any firm's assets, it is difficult to separate the value of a trademark from the value of the rest of the value of branding. However, the sources used to create Chart 10-2 also suggest that the combined value of branding and trademarks represents approximately 14 percent of the total value of publicly traded U.S. firms. In some instances, this value may be a company's most important asset.

Other studies have indicated that intellectual property-related industries tend to grow at approximately twice the rate of the economy as a whole and are an important contributing factor not only to the productivity growth of the intellectual property-related sectors of the economy but also to the growth of all sectors of the economy. These industries also represent a growing share

Chart 10-2 **Share of Assets in Current Market Value of Public U.S. Corporations**

Intellectual property assets represent approximately one-third of the value of American corporations.



Note: Total value of publicly traded U.S. corporations on 09/06/2005 was \$15.2 trillion.

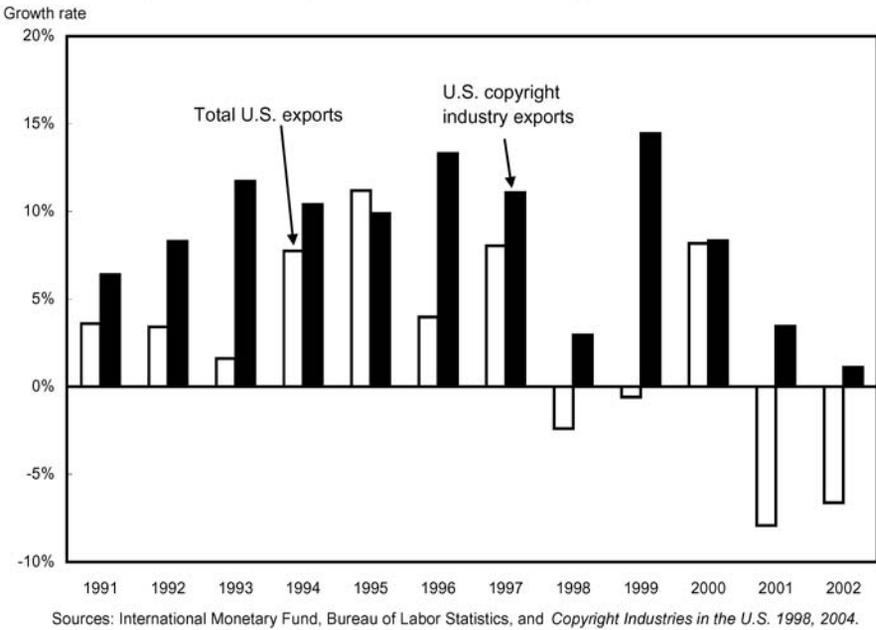
Sources: Council of Economic Advisers' calculation based on "The Economic Value of Intellectual Property" by Shapiro and Hassett (USA for Innovation) and "Measuring Capital and Technology: An Expanded Framework," Table 3 by Corrado, Hulten and Sichel (Finance & Economics Discussion Series 2004-65, Federal Reserve Board).

of exports. Chart 10-3 shows the annual growth rates for the exports from U.S. copyright-based industries from 1991 to 2002. In all but one of those years (1995), exports from copyright industries grew at a faster rate than total exports. Indeed, on average, U.S. copyright exports grew faster by approximately six percentage points than total exports and have become an increasing share of our total exports.

This analysis, however, obscures an important point about the role of intellectual property in the economy and undervalues its contribution. There are many industries that are not counted among the intellectual property industries but generate innovations and rely on patent and other intellectual property protection to create incentives for innovation and growth. More importantly, many innovations from the past have led to significant productivity advances in industries such as medicines, textiles, railroads, steel manufacture, and farm equipment. The capital value of these innovations was dissipated as the intellectual property protecting these innovations expired and the innovative knowledge and information entered the public domain. Even after these innovations become public knowledge, however, the country still benefits from the productivity gains the innovations produced. Any complete consideration of the overall importance of intellectual property to the American economy should include the value of these advances. Such a consideration is beyond the scope of this chapter but would suggest that the

Chart 10-3 **Growth Rate of U.S. Exports**

Since 1991, the growth rate of copyright industries has exceeded the growth rate of overall exports.



estimates discussed above underestimate the importance of intellectual property to the American economy.

Intellectual Property Protection and Economic Growth

The protection of intellectual property rights plays an important role in inducing technological change and facilitating economic growth. Intellectual property protection does not directly lead to growth, but it helps create an incentive structure that encourages research and development, which in turn leads to increased innovation. Increased innovation generates greater rates of economic growth.

The link between improved intellectual property protection and increased innovation can be seen at the firm level for companies in developing and developed countries. One study showed that 80 percent of 377 firms surveyed in Brazil would invest more in internal research if more legal protection, such as improved intellectual property-right protection, were available. A similar study of U.S. firms showed that the availability of patent protection in the United States was a critical factor in research and development decisions. Using a random sample of 100 U.S. manufacturing firms, this study found that had it not been for the availability of patents, 60 percent of the inventions in the pharmaceutical industry and nearly 40 percent of the inventions in the chemical industry would not have been developed.

A number of other recent economic studies have shown a more direct link between greater intellectual property protection and capital investment. One study of the relationship between patent protection and investment in research and development found that countries with the lowest level of patent protection invested less than one-third of 1 percent of their GNP in research and development while countries with the highest level of protection invested six times as much. Likewise, another study suggests that increasing intellectual property protection increases capital and research investment. As intellectual property protection makes investment in research and development more attractive, the supply of knowledge is increased, lowering the cost of innovation. The increase in innovation leads to an increase in the rate at which new products are introduced, resulting in greater economic growth.

Intellectual property protection alone does not drive economic growth. There must be an existing research base in the country, a relatively unconstrained trade regime, a stable macroeconomic environment, the rule of law, and well-functioning institutions that grant, monitor, and enforce the intellectual property rights.

Intellectual Property Policy Challenges

Technological and economic change sometimes expose weaknesses in existing intellectual property laws and necessitate modifications of those laws to ensure their continued effectiveness in protecting intellectual property and ensuring economic growth. The Administration has continually reviewed and implemented policies to improve the intellectual property laws to ensure the efficiency of the patent review process, to protect the intellectual property of American firms engaged in international trade, and to prevent potentially dangerous counterfeit products from entering U.S. and foreign markets.

Ensuring the Integrity of the Patent Process

As noted earlier, patents have broader protection than copyrights or trademarks and, of these three, patents have the only formal review process prior to being granted. The effectiveness of the patent system in fostering technical progress and economic growth is tied to the efficiency of this review process. Patents granted in error may create market power without any offsetting benefit of inducing innovation. If a patent increases the cost of using existing technology, it may deter innovation or simply cause a firm to use a less-efficient technology. In 2004, the USPTO issued 187,170 patents. Occasionally a very small percentage of patents are challenged or overturned, and it is this particular process within the patent system that is examined below.

Challenging a patent's validity can be costly and time-consuming. Estimates suggest that median litigation costs average \$4 million each for the plaintiff and defendant when more than \$25 million is at stake in a patent suit. Research has found that on average it takes approximately three and a half years to challenge a patent through litigation and that the typical patent challenge is initiated after the patent has been in force for approximately eight and half years. An unwarranted patent could be in force for more than twelve years of a twenty-year term before the legal system would find it to be invalid.

Challenging a patent's validity can also be financially risky. Generally a firm cannot sue to have a patent invalidated. It must first infringe on that patent, wait for the patent holder to sue, and then claim patent invalidity as a defense to infringement. Firms that do this incur a great financial risk because intentional infringement of a patent may result in triple damages. Patents are presumed to be valid and an accused infringer must prove it is invalid by "clear and convincing evidence" to overturn this presumption. This is greater than the burden that a patent application must satisfy before a patent is issued. Despite the hurdles faced by a firm challenging the validity of a patent, researchers have found that 46 percent of the fully litigated patent challenges between 1989 and 1996 ultimately resulted in the patent being judged to be invalid.

In recent years, businesses and commentators have noted substantial increases in the number of patent applications received by the USPTO. This trend, combined with an increased availability of patents in areas such as business methods, has led some to question whether wrongly issued patents might affect the competitiveness of the U.S. economy. Patent policy can foster innovation, but must also be balanced with the consumer protection provided by competition in the marketplace.

Because of increased interest in how best to balance patent and competition interests, in 2002, the Federal Trade Commission (FTC), together with the Antitrust Division of the Department of Justice (DOJ), held extensive hearings with testimony and written comments from investors, entrepreneurs, antitrust organizations, and scholars. While hearing participants praised many aspects of the current patent system, many participants expressed concerns about poor patent quality and legal standards that may inadvertently create market power and reduce innovation.

In 2003, the FTC issued a report based on the information gained in the hearings conducted in the prior year. This report contained several recommendations to alleviate the problems discussed above. Two of these recommendations were also supported by a subsequent report issued by the National Academy of Sciences.

The first recommendation was to create an administrative post-grant appeal procedure that would allow firms to challenge the validity of a questionable patent within a limited period after it has been issued. This procedure could

significantly shorten the time period in which a wrongly issued patent is in force and reduce the risk of some patent challenges. The second recommendation was to reduce the firm's risk of triple damages in cases in which firms infringe a patent with knowledge of that patent. This change would encourage firms to read their competitors' patents more frequently, to develop noninfringing business plans, and to reduce wasteful duplication of effort.

Intellectual Property and International Trade

As intellectual property became a more important element of international trade starting in the 1980s, differences in the level of protection for intellectual property across various countries started to lead to an increasing number of trade disputes about the use and alleged misuse of the intellectual property belonging to others. These trade frictions had the potential to disrupt the benefits of increased worldwide trade. In the Uruguay Round of trade negotiations from 1986 to 1994, the members of the World Trade Organization (WTO) negotiated an agreement to introduce more order and predictability into the international protection of intellectual property rights. The WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) is the first comprehensive and enforceable global set of rules covering intellectual property rights.

The TRIPs Agreement helps alleviate trade frictions by reducing nontariff trade barriers related to differing intellectual property protection regimes and by setting minimum intellectual property rights standards for all WTO members. The agreement established transparency standards that require all members to publish laws, regulations, judicial decisions, and administrative findings that affect the treatment of intellectual property. The agreement also requires nondiscrimination between nationals and non-nationals and for the first time applies the Most-Favored Nations (MFN) obligation (prohibiting discrimination across trading partners) to international intellectual property rights.

The TRIPs Agreement took effect in 1995, but only industrialized countries had to ensure that their laws and practices conformed to it by January 1, 1996. Developing countries and transition economies were given five years, until 2000, and the least-developed countries were given 11 years, until 2006 to comply. The 2006 deadline applicable to least-developed countries was recently extended to 2016 for pharmaceutical patents and July 2013 for other obligations. Questions remain, however, about the extent to which some developing countries are in compliance with their TRIPs obligations, and many least-developed countries are unlikely to be in full compliance by July 2013. In addition, many developed countries have implemented a variety of cost-containment efforts that greatly reduce the value of intellectual property. Thus, an apparent strong patent protection stance may, in fact, not be a completely accurate representation, at least across all industries. Consequently, the level of intellectual property-rights protection varies across countries.

Developing Countries Tend to Have Weaker Intellectual Property Regimes

Economists have developed a number of indices to determine the strength of various countries' intellectual property protection regimes. While the results of the research using these indices are not uniform, they suggest that the level of intellectual property protection increases with a country's real gross domestic product per capita. Economists have offered some explanations for this relationship. Rising income increases the demand for higher-quality, differentiated products. This increase in demand leads to growing preferences for the protection of intellectual property, such as patents, copyrights, and trademarks, which provide an innovator with certain protections when producing such products.

Countries with lower per capita gross domestic product may prefer intellectual property regimes with little or weak intellectual property protection because they believe it allows free access to information that would otherwise have to be paid for. These countries may also believe that lack of intellectual property protection allows them to access technological development through imitation and domestic efforts to build upon the existing stock of worldwide knowledge. However, the lack of intellectual property protection may slow development in these countries by inhibiting the development of domestic innovative and creative industries that generate much of the economic growth in more-developed countries. Furthermore, the ubiquity of counterfeit products that is generally associated with weak intellectual property protection may have health and safety implications because it is difficult for consumers to be certain of the origin and efficiency of medicines, machine parts, and other critical products.

Countries like the United States, with greater levels of intellectual property protection and with comparative advantages in knowledge-intensive goods and services, place a high priority on intellectual property-rights protection. Most 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. More objective measures also suggest that the United States has a comparative advantage in knowledge-intensive goods. The United States holds one of the highest shares of global patents and has a trade surplus in intellectual property-dependent services and in royalties and license fees.

Economic Costs of Intellectual Property Theft in Foreign Markets

Theft in foreign markets of intellectual property belonging to American companies is significant. In China alone, industry estimates suggest that in 2003 and 2004 the piracy rate was 90 percent or more, which means that at least 90 percent of the existing copies of a particular work (such as CDs and DVDs) in China were produced without the copyright holder's permission. Industry estimates show that the piracy rates in Latin America were more than

60 percent and the global software piracy rate was approximately 35 percent. Some of these pirated copies are exported to the United States. Piracy is an especially serious problem for American companies because of the strong comparative advantage they hold in intellectual property-related goods.

Turning these estimates of piracy rates into estimates of lost revenues involves consideration of two factors: (1) how many copies would have been sold by legitimate producers in the absence of the pirated copies, and (2) the price that would have been charged for those copies. Without the competition from pirated copies, the legitimate holder of the copyright might have been able to sell the product for a higher price and earn higher revenues. In addition, because pirated products are generally sold at a much lower price than what a legitimate producer charges, fewer copies might have been sold if consumers had to pay the higher prices for the legitimate copies. Many estimates assume that sales of intellectual property-protected goods would correspond to the current sales of the infringing goods. Under this assumption, industry estimates suggest that in 2004 software piracy alone cost U.S. developers at least \$6.6 billion.

Preventing Global Intellectual Property Piracy

The Administration is strongly committed to addressing the issues of piracy (unauthorized copies of copyrighted materials) and counterfeiting (unauthorized reproduction of trademarked or patented goods) without sacrificing the benefits to be gained through trade and specialization. To accomplish these goals, the White House initiated the Strategy Targeting Organized Piracy (STOP!) in October 2004. The STOP! initiative brings together nine federal agencies, including the Office of the U.S. Trade Representative, the Department of Commerce, the Department of Justice, the Department of Homeland Security, and the State Department. Under STOP!, these agencies and departments have and continue to develop new tools to help U.S. businesses better protect their intellectual property, increase efforts to seize counterfeit goods at our borders, pursue criminal enterprises involved in piracy and counterfeiting, and aggressively engage our trading partners to join our efforts. Through STOP!, new forms of federal assistance are being provided to U.S. companies, increased law enforcement resources are being provided, and the Administration has developed an international law enforcement network to increase criminal enforcement abroad.

Domestically, the Department of Justice has created a Task Force on Intellectual Property and increased from 5 to 18 the number of Computer Hacking and Intellectual Property Units in U.S. Attorneys' Offices across the country. This increased to 229 (one in each Federal district) the number of specially trained prosecutors available to focus on intellectual property and high-tech crimes.

Internationally, the United States has conducted several hundred intellectual property rights enforcement and technical assistance projects around the world. The Administration has established a “Global Intellectual Property Rights Academy,” located within the USPTO, to consolidate and expand intellectual property training programs for foreign judges, enforcement officials, and relevant administrators. These programs are designed to foster respect for intellectual property, encourage governmental and rights holders’ efforts to combat infringement, and promote best practices in the enforcement of intellectual property rights. The Administration is also expanding its intellectual property attaché program at our embassies in China, India, Brazil, and Russia. These attachés will assist American businesses, advocate U.S. intellectual property policy, and conduct intellectual property rights training. STOP! objectives have also been endorsed in numerous multilateral forums including the G-8, Organization for Economic Cooperation and Development, the U.S.-EU summit, and Asia-Pacific Economic Cooperation sphere.

The Administration also created a new senior-level office of the Coordinator for International Intellectual Property Enforcement. This office will coordinate the strategies of the Federal Government to use its capabilities and resources to provide an internationally secure and predictable environment for American intellectual property.

Technological Change and Intellectual Property Reform

As technology has advanced, it has become cheaper for legitimate producers to produce many types of intellectual property-related products, including medicines, CDs, DVDs, automotive and airplane parts, and other products. Technology also holds the promise for new, more efficient means of distribution of intellectual property-related products, including digital music and video content. Producers of these products have a great opportunity to take advantage of changing technologies and a great challenge to limit the use of these technologies to legitimate producers of these products. Based on current distribution preferences, intellectual property holders have lost some control over the distribution of their products.

There are many manifestations of this loss in control. For instance, some peer-to-peer networks provided technology that enabled individuals to freely download copyrighted music from the computers of other individuals on these networks. Moreover, current technology can less expensively and more faithfully reproduce some intellectual property-protected materials than previous technologies could. These illegal copies are difficult to detect. In the United States and internationally, this has resulted in a significant increase in the production and sale of counterfeit products. These counterfeit copies may directly harm consumers through the sale of fake medicines and defective products, such as batteries, automobile parts, and airplane parts. Furthermore, in the long run, counterfeiting

harms all consumers by reducing the profitability of and the incentive to produce new and interesting innovative products and creative works.

Box 10-2: The Free Software Licensing Movement

In the early stages of computing, a number of software developers wanted to put their work in the public domain, but also wanted to prevent individuals who modified the software from limiting its accessibility. This resulted in the development of free software licensing, sometimes called open source, wherein software is licensed for free use and modification but requires that any subsequent modifications also remain available for free use and modification by others. Many of the developers of free, or open-source, software are individuals in academic environments where open and cooperative development projects are especially important. Others are hobbyists or companies that are in the business of providing computing support services to third parties.

General Public Licenses (GPLs) and other free software licenses differ from traditional commercial licenses by granting to their users the freedom to run, study, improve, and redistribute copies of the program. A GPL uses traditional copyright law to ensure that these freedoms are retained in derivative works by requiring those works to also be licensed under GPL terms. Many advocates of these types of licenses believe that they increase network benefits by creating a pool of commonly accessible work and requiring any improvements made to the original software code to be contributed to that pool. These advocates believe that by having an unlimited number of developers viewing the source code and working to modify and improve it, the quality and testing of software are improved.

GPL licensees are permitted to charge for copying or distribution of their works. Further, nothing prevents software from being licensed under both GPL and traditional licensing. Dual-licensing was developed to respond to consumers of free software who were unwilling or unable to accept the reciprocity requirements of an open-source license and were willing to pay to avoid them. Open-source licensing such as GPL licenses is just another business model of software development that has been embraced by such companies as Sun Microsystems, Intel Corporation, and IBM.

Traditional and open-source development models currently compete in the market. Different developers are motivated by different aims and have different target customers. A system that neither favors nor discourages either licensing model would best serve a market consisting of diverse customers and developers. Competition on a level playing field would ensure that the better licensing system becomes the most successful. If each system has different advantages, it is likely that both systems will survive and find success.

In November 2005, the Administration forwarded proposed legislation to Congress that would implement some of the changes necessary to respond to these technical developments. The Intellectual Property Protection Act of 2005 would strengthen intellectual property protection, toughen penalties, and increase the range of investigative tools in both criminal and civil intellectual property-law enforcement.

In the past, it might not have been necessary to sanction criminally certain types of actions because they had little impact on the level of the counterfeiting of intellectual property. For instance, while there are criminal sanctions for selling a counterfeit good, there are no criminal sanctions against giving it away. It has only recently become profitable for a company that engages in, or contributes to, infringement to give a counterfeit product away and profit from the sale of auxiliary products and services. Technically, these actions are not criminal violations, but they still diminish the value of the intellectual property to its owner. The Administration's proposed legislation provides for criminal sanctions for distributing any infringing materials for the purpose of commercial advantage, including the selling of complementary products.

Because the production of a large number of copies is now cheap and easy, it is much easier for a counterfeiter to flood the market with illegal copies. Because current intellectual property law was designed when such an action was not easily accomplished, merely possessing a large number of infringing products with the intent to sell does not necessarily constitute a crime. Only the sale of the good itself is a criminal violation. Infringers are now capable of flooding the market and imposing significant financial harm on the intellectual property holder before criminal sanctions can be applied to limit the damage from this activity. The Administration's proposed legislation modifies the law to criminalize the possession of infringing materials with the intent to sell and will help stop the sale of counterfeits before they have an injurious impact on intellectual property holders.

Conclusion

Well-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. Intellectual property differs from other more tangible property in at least two key characteristics: it is nonrival in consumption and nonexcludable. An intellectual property system creates an incentive to innovate by rewarding the developers of new inventions with the right to exclude others from using that innovation for a limited period of time. In this way, inventors can benefit financially from their innovation. Economic research supports the conclusion of the American founders that a well-defined

intellectual property system rewards innovation and fosters economic growth. By continually adapting to economic and technical change, the American intellectual property law system will continue to foster economic growth in the United States and throughout the world.