

## **Chapter 25 Intellectual Property Rights and Economic Policy (2000-present)**

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Intellectual property rights are legal rights to creative and innovative works. Intellectual property includes patents for technological inventions, copyrights for creative expressions, trademarks for business names and symbols, and other forms of protection for intellectual creations, such as new plant varieties, industrial designs, and geographical certifications. The protection of intellectual property in a world of rapid technological change and economic development is a critical driver of economic growth and raising the standard of living for people around the globe. It is a key factor of economic policy. Consequently, much is at stake in the design of national and international intellectual property regimes. Since the formation of the World Trade Organization (WTO) in 1995, intellectual property laws have been reformed worldwide, including in the United States, in accordance with the WTO's multilateral agreement on intellectual property rights (IPRs). These reforms have stirred much debate and controversy, especially about how IPRs affect innovation and the diffusion of innovations.

In principle, intellectual property rights are centered on a bargain. For example, within a country, IPRs grant the inventor or creator some market power for a temporary period of time as an incentive to innovate, enabling the rights holder to charge prices above competitive levels. In exchange, society enjoys the invention or creation, and once the IPRs expire, the invention or creation enters the public domain for the rest of society to exploit non-exclusively. Between countries, global IPR reforms are also premised upon a mutually advantageous exchange. The countries in the North ( *i.e.*, developed world), which own most of the world's intellectual properties, would gain from reduced piracy and imitation. In return, the South ( *i.e.*, developing

world) should also gain by helping to attract technology transfers and investments from the North, which is quite important for developing economies lacking domestic innovative capacities. Moreover, by better protecting their own IPRs, Southern nations could stimulate local, indigenous innovation and catch up to the North.

Nonetheless, the issues surrounding intellectual property rights and the economy are more complex. Academic research, for instance, on the effects of intellectual property protection on innovation and technology transfer is quite diverse, as are the experiences with IPR policies and regulations in the United States and abroad since 2000. To understand economic public policy, it is essential to draw some lessons from this diversity of perspectives and experiences, particularly for policies aimed at promoting technological progress.

## **A PRIMER ON INTELLECTUAL PROPERTY**

. The different forms of intellectual property rights – patents, copyrights, trademarks, and so forth – protect particular cultural, commercial, or other activities. The instrument of protection most relevant to technological change and productivity growth is patent rights, though other instruments can play complementary roles. While other forms of IPRs operate differently, there are some similar underlying principles or rationales for their provision.

**[Insert Photo 25.1, 1870 Patent Office, here]**

In the case of patent rights, market failures are expected to arise in the market for technologies in the absence of patent protection. Knowledge goods have the characteristics of a public good. They are non-excludable, meaning that it is difficult to prevent someone who does not pay from consuming it, and they are non-rivalrous, meaning that one person's consumption of it does not detract from another person's ability to consume the same amount of it. Non-

rivalrous goods are fairly costless to distribute, or re-distribute, to others. In theory, a private market would fail to provide knowledge goods efficiently. Innovators would not be able to recoup their upfront research and development (R&D) costs if rivals or imitators later copy the technology and then supply it competitively, charging a price equal to the marginal cost of production, leaving no room for the innovators to earn sufficient economic profits to compensate for the R&D. Hence, a patent system provides a legal mechanism whereby innovators have exclusive rights to exploit their inventions commercially for a limited period of time, after which time the inventions enter the public domain. The limited period of market exclusivity should enable the innovators to earn above normal profits to cover their R&D costs, which they typically incur before they commercialize their innovations. In this regard, the patent system creates ex ante incentives to innovate and helps bring forth new technologies that might otherwise not be available to society. The chief cost of the patent system, however, is that the market for technologies will not be competitive, but rather monopolistic. Patent holders will possess market power. Thus, a tradeoff exists between technology creation and diffusion: patent protection stimulates technological innovation but limits technology diffusion.

It is important to clarify that patents do not create monopolies per se, in the sense of a single firm in an industry. They merely exclude others from using an innovation commercially but do not function to exclude other firms from entering an industry.<sup>1</sup> Ultimately, the market power effect of a patent depends on the availability of close substitutes of the underlying technology. Also, patent protection affects the diffusion or supply of output embodying the new knowledge. Patents do not restrict the diffusion of knowledge itself. In actuality, they help facilitate it because inventors must disclose the new knowledge underlying the patented innovation, which they would not otherwise need to do if they chose to keep their innovations a

trade secret. Last of all, patents and other IPRs are territorial. They protect rights only in countries or regions where property rights were sought and granted.

### **Globalization of IPRs**

Intellectual property rights have taken on global prominence. Regulations governing IPRs are often discussed in world trade negotiations and policy forums. There are several reasons why. First, much trade exists in intellectual property goods, such as films, music, software, books, pharmaceuticals, medicines, agricultural seeds, high technology products, know-how, and other intangible and industrial property. These goods also penetrate foreign markets through multinational firms that engage in foreign direct investment (FDI) and establish branches in foreign countries and through joint ventures and licensing agreements between firms from different nations. Due to the public goods nature of intellectual commodities, these goods are easily the target of illicit trade, such as unlawful or unauthorized copying and distribution, or counterfeiting, which denies sales to the intellectual property owners and may adversely affect the social interest by reducing incentives for innovation.

Secondly, like traditional trade policy measures, such as tariffs, quotas, or subsidies, patent policies can potentially be an instrument of strategic trade policy; that is, they can be used to favor domestic firms over foreign firms. For example, national governments may better protect the technologies of domestic firms or be lax with regards to the protection of foreign technologies to give domestic firms a competitive edge. Thus, global coordination and rules are important to promote national treatment and nondiscrimination. Moreover, differences in IPR regulations across countries may impose transactions costs on international commerce, as businesses make adjustments in order to comply with local rules. These differences in laws may

therefore act as non-tariff barriers to trade. Reducing them has been a key motivation for the international harmonization of rules and standards.

Last, a global approach to setting intellectual property policy can be rationalized by the fact that “knowledge” generates positive externalities beyond national borders (in much the same way that pollution generates negative externalities internationally). Investments in knowledge benefit not only the country that incurs the cost of investment but also other countries, even if they do not share in the cost. Temptations exist for nations to imitate and free-ride off the innovations and IPR systems of other countries.<sup>2</sup> In the absence of international policy coordination on rules governing intellectual property, global research and knowledge accumulation may be inefficiently conducted.

### **Key Developments in IPRs**

In light of the global nature of IPRs, intellectual property laws around the world have been strengthened and harmonized considerably since 1995. The United States has played a major role in leading this global effort, as would be expected. The U.S. is a leading producer of intellectual property, and its industries have suffered great losses from intellectual property violations around the world. To give a glimpse of the extent of IPR violations around the world, Table 25.1 presents some data on software piracy rates for 1995 and 2011 by geographic region. The table shows that piracy rates tend to be high in regions where IPRs are known to be weak, but those regions are also less economically developed. Poverty is therefore part of the piracy problem. Poorer economies have limited resources for protecting intellectual property rights and limited incentives too (in order to allow their residents to gain access to technologies). A potential repercussion is that weak IPRs could dissuade technology transfers and impede economic

development. The table does indicate, though, that software piracy rates have fallen since global IPR reforms were instituted in 1995.

<b>Table 25.1 Software Piracy Rates</b>		
Region/Country	1995	2011
Asia-Pacific	64%	60%
China	96%	77%
India	78%	63%
South Korea	76%	40%
Taiwan	70%	37%
Vietnam	90%	81%
Africa & Middle East	78%	58%
Central & Eastern Europe	83%	62%
Western Europe	47%	32%
Latin America	76%	61%
North America	27%	19%
:SOURCE: Business Software Alliance. <a href="http://www.bsa.org/country/Research and Statistics.aspx">http://www.bsa.org/country/Research and Statistics.aspx</a> . Accessed Dec. 15, 2012.		

### ***TRIPS: An Essential Step***

The key international document on IPRs is the Trade Related Aspects of Intellectual Property Rights (TRIPS) agreement introduced in 1995 at the conclusion of the Uruguay Round negotiations (1986–1994). The agreement is administered by the WTO and establishes minimum standards for copyrights, patent rights, trademark rights, and other IPRs. Member states, of course, may provide more extensive protection than TRIPS requires. The agreement has some enforcement powers, as disputes over intellectual property rights among member states can be processed through the Dispute Settlement Body of the WTO, whose rulings can be enforced through trade sanctions.

**[Insert “Key Decisions: Agreement on Trade Related Intellectual Property Rights” here]**

The essential goals of TRIPS were to reduce impediments to international trade arising from weak and divergent IPR standards and to promote technological innovation and the transfer of technology for the mutual advantage of both producers and users of intellectual property. In that spirit, the agreement accommodated developing country interests by allowing for transition periods to implement the agreement, namely five years for developing countries and eleven for least developed countries (though these countries have been given further extensions to 2013, and to 2016 to provide pharmaceutical patent rights). The agreement also provides for some flexibilities, allowing member governments to issue compulsory licensing ( *i.e.*, require patent owners to license the technology to third parties) in the event that potential users of the technology have been unable to obtain authorization from the patent owner on reasonable commercial terms within a reasonable time. This flexibility is important in case a critical patented product, such as an essential medicine, is not adequately supplied in a poor country's market. Furthermore, the agreement mandates developed country governments to provide incentives for enterprises in their jurisdiction to transfer technologies to the least developed economies.

### ***IPR Reforms in the United States***

IPR reforms were not limited to developing economies. The United States, for example, also has undertaken major IPR reforms. In 1998, the U.S. enacted a major copyright act – the Digital Millennium Copyright Act, to comply with international treaties. The act regulates Internet and digital materials by, for example, prohibiting the circumvention of copy-protection measures. In 2011, the United States enacted major patent reforms in its patent system through the America Invents Act. The act helps bring U. S. patent laws more in line with those of the rest of the world. For example, new rules award a patent to the inventor who files a patent application first, rather

than to the person who invents first. The latter method of awarding patents can be quite cumbersome in terms of requiring hearings and proceedings. Priority based on first-to-file is simpler and less costly, though it may disadvantage the smaller, less experienced patent applicants. Another key change in U.S. patent law is to allow for post-grant opposition. Third parties may challenge the validity of a patent grant soon after it is issued so as to avoid settling disputes through litigation and trial. U.S. law also allows for a one-year grace period for inventors to apply for a patent after they disclose an invention publicly. Normally, public disclosure would jeopardize the novelty of an invention (which is a critical condition for patentability) and could void a patent. However, a grace period allows inventors time to assess the value of patenting their invention.

**[Insert “Key Decisions: Leahy Smith America Invents Act” here]**

At present, expansions in intellectual property rights are still being pursued through regional free trade agreements (FTAs). Some of these FTAs seek to expand beyond the minimum standards established by TRIPS, hence the term *TRIPS-plus FTAs*. Examples include FTAs between the United States and Jordan and the United States and CAFTA-DR ( *i.e.*, Central America and the Dominican Republic) and the ongoing Trans-Pacific Partnership (TPP) talks. These FTAs vary in their IPR provisions but typically include stronger protections and a broader scope of IPRs. They incorporate rules that strengthen a patent holder’s exclusive rights to pharmaceutical test data. This makes it harder for generic competitors to access test data to obtain marketing approval for their generic drugs and may require them to repeat expensive clinical trials. Rules of patent linkage are also incorporated which prevent the registration of generic drugs until a patent expires. Other TRIPS-plus provisions limit the use of compulsory licensing (to situations of national emergencies or anticompetitive abuses only) or of parallel



importation, which enables a country to access IPR goods from cheaper sources. Limits on parallel imports better enable IPR holders to price discriminate worldwide.

Critics of TRIPS-plus worry that the new provisions will reduce the flexibilities built into the original TRIPS for poorer countries and favor the interests of rights holders over those of IPR users. Hence, recent developments in global IPRs have renewed debate on the effects of intellectual property rights on innovation, technological change, and the distribution of the gains from IPRs.

## **A BRIEF TOUR OF RECENT RESEARCH**

IPRs have strengthened and expanded in both developed and developing countries. Undoubtedly, these changes will impact world innovation and technology transfer. It is thus essential to review theoretical and empirical research on this issue, as well as assess some complementary research--on innovation systems that do not rely on IPRs and on the impact of piracy on creative activity.

### **Effects on Innovation**

In theory, the effects of IPRs on innovation are *a priori* ambiguous and dependent upon several conditions. On the one hand, IPRs should create incentives to conduct R&D or any other creative activity by better enabling the innovator to appropriate the returns to its investments, which is difficult to do when knowledge goods have the characteristics of a public good. On the other hand, because IPRs enhance the market power of the innovator, the latter is able to raise the price of the technological good above competitive levels or limit the supply of the good. Yet this has the effect of raising the cost of conducting innovation or other creative work for other innovators

or future innovators who must pay more to use the IPR protected good; for example, pay higher licensing fees for the use of an R&D input or pay higher royalties for the use of copyrighted musical or literary works. For example, on January 18, 2012, the U.S. Supreme Court held that foreign musical works (such as Prokofiev's *Peter and the Wolf*) that were in the public domain could have their copyrights restored in order to allow the U.S. to be in compliance with certain international treaties (*Golan v. Holder*, Case No. 10-545). The effect of this ruling was to require orchestras to pay licensing fees to perform those foreign works that were previously accessible for free. Thus, IPRs should stimulate innovation on balance if the appropriability effect outweighs the market power effect.

Intellectual property rights, however, are not the only means for creating incentives for innovation. Innovators may be also motivated by non-monetary rewards, such as peer recognition. Some innovators may eschew formal legal title to their work and choose to conduct collaborative research, as in the case of open source software development or open biotechnology projects. Alternative means are also available for innovators to appropriate the returns to their innovation, other than through intellectual property protection. They can count on first-mover advantages—that is, sell a large volume of their output before their rivals can imitate and enter the market—establishing a reputation for product quality and service and building brand name recognition among consumers. If the technology is associated with high capital intensity or high setup costs, the technology has a natural barrier against imitation, because imitators cannot easily reproduce it. Another way for businesses to protect their innovations is to keep them a trade secret. Trade secrecy laws, where they exist, forbid unauthorized commercial use of proprietary information. The benefit of keeping an innovation a trade secret, instead of patenting it, is that the firm avoids divulging important technical information. In a patent

application, the firm must disclose the underlying technology sufficiently to enable a person skilled in the arts to replicate the invention. This carries some risk that competitors may quickly refine and develop a better technology. The cost of keeping an innovation a trade secret, however, is that a competitor may independently develop the innovation. The innovator cannot then claim damages under trade secret law.

A key mechanism by which IPRs create incentives for innovation is to grant exclusive rights to exploit an innovation, and thereby prevent rivalry in the marketing of the innovation. However, business competition or competitive pressures are also a motivating factor for innovation. As Phillipe Aghion and his co-writers<sup>3</sup> argue, innovation allows firms to get ahead of the competition. Indeed, excessively strong IPR protection could potentially slow down innovation or delay the introduction of new technologies to the marketplace, as incumbent firms do not feel threatened by rivals and may end up resting on their laurels. For example, during the long period in which AT&T was a monopoly, innovation was quite slow in the telecommunications industry.. Rapid innovation occurred after the weakening of AT&T's monopoly in 1984 and the subsequent deregulation in the industry which then unleashed competition. Competition was further bolstered with the passage of the U.S. Telecommunication Act of 1996.

### **Effects on Technology Transfer**

Technology transfer refers to the dissemination of technologies, including know-how and production processes, via trade, foreign direct investment (FDI), licensing, franchising, or joint ventures. Some transfers can also arise through non-market channels, such as imitation and spillovers of knowledge between organizations. Currently, most of the technologies are

developed and owned by firms in the “North.” Hence, a critical question for countries in the South is whether the strengthening of intellectual property rights in their nations will enhance their access to new technologies. Will foreign companies be encouraged to export their high technology goods to the South, establish affiliates or subsidiaries in the South that manufacture high value-added products, create jobs, or even conduct R&D locally, and will foreign companies be willing to license their intangible assets to local partners or unaffiliated agents? Or, will the IPR-protected goods or technologies be restricted in supply or be too expensive to purchase? These are clearly important issues for countries pursuing economic growth.

The effects of IPRs on technology transfer are also theoretically ambiguous and dependent upon circumstances, which is why empirical evidence is critical to policy debate. On the one hand, stronger IPRs effectively expand the market for technology owners, as rivals and imitators are excluded. This is tantamount to increasing the demand for the products of the technology owners. The market size effect of IPRs should then stimulate technology transfer. For example, if imitation and piracy in China were reduced, the market for legitimate products in China would be effectively larger. Foreign firms would then be more willing to establish sales branches in China. On the other hand, stronger IPRs enable technology owners to better exercise their market power; for example, they may set a price above marginal cost and in the process reduce technologies transferred. The net effect, market size versus market power effects of IPRs, depends on the prevailing level of competitiveness and imitative capacities of the host country. The market power effects of IPRs, for example, would be magnified if the local economy poses little threat of imitation and/or operated under distorted, monopolistic conditions. In contrast, in countries with vibrant competition and genuine risks of imitation, stronger protection for intellectual assets will have an assuring effect on technology owners to transfer their

technologies. Furthermore, firms that do not transfer technologies in expanded markets forgo the opportunity to reap profits.

IPRs also affect not only the volume of technology transfer but also the composition, in terms of trade, FDI, and licensing. As discussed by Pamela Smith<sup>4</sup>, technology owners may switch from exporting to FDI as the level of IPRs in the host country strengthens. Exporting, initially, has the advantage of avoiding the costs of setting up operations abroad and of avoiding imitation risks. Yet FDI has advantages too, such as access to local markets and low cost labor or raw materials. Therefore, if IPR rises abroad and reduces imitation risks, the technology owner has an incentive to locate abroad. Foreign affiliates have the advantage of keeping production in-house, along with tacit knowledge and minimizing the leakage of sensitive technical information; therefore, if IPR protection and enforcement are strengthened further, the firm may have the incentive to license its technology to other parties and reach a larger market of consumers by sharing profits with the licensees. These compositional effects of IPRs are quite important. From an empirical point of view, it is relevant because in some cases the evidence might exhibit a negative association between IPRs and exporting, leading to the inference that IPRs reduce technology transfer. That would be an incorrect conclusion if the technology owner merely switched to a different mode of technology transfer, namely FDI or licensing. From a policy point of view, the method of technology transfer is relevant because inward FDI helps create local employment and may help contribute to lower prices of essential goods (such as medicines and other IPR goods) if local production costs were lower. Licensing is also welcome in the local economy because vital technical know-how may be transferred to local agents and opportunities for greater technological learning created.

## **Empirical Evidence**

A number of empirical studies provide supporting evidence that IPRs can have positive effects on innovation and technology transfer, but are often qualified. The evidence, for example, indicates that the effects of IPR vary by industry and by level of economic development. Industries in which patent protection helps stimulate R&D include the chemical and pharmaceuticals sector, where imitation risk is high. The dependence of pharmaceutical innovation to patent protection is often attributed to the high costs of drug development relative to the marginal costs of production, the high failure rate of drug development, and the relative ease of imitating drug innovations. In contrast, in the heavy machinery and transportation sector, patents are not as important to innovation because these industries have large setup costs and are capital-intensive. These form rather natural barriers against imitation. Across countries, IPRs appear to stimulate innovation largely in developed countries and have weak influences on R&D in developing countries, suggesting that IPRs are effective where the capacity to innovate is present.<sup>5</sup>

The weak effect of patent protection in developing economies even applies in the case of pharmaceutical innovation. As Margaret Kyle and Anita McGahan<sup>6</sup> find, patent protection is a positive influence on R&D investments to treat diseases prevalent in high-income countries, but not the neglected diseases prevalent in developing countries, such as malaria, tuberculosis, or river blindness. The reason given for why patents weakly influence research on neglected diseases is that the R&D effort (clinical trials and so forth) is too costly, given that the science behind it is not as well developed and not as much prospecting by innovators has been done prior. Furthermore, there is the “ability to pay” issue among the population in poorer countries.

Thus, a strengthening of patent rights would not raise the profits of pharmaceutical firms sufficiently to compensate for the high cost of R&D for neglected diseases.

On technology transfer, empirical work finds that IPRs can stimulate trade, FDI, and licensing, as well as induce substitution effects. that is, lead firms to switch from exporting to FDI or from FDI to licensing, which underscores the importance of examining the impact of IPRs on the different modes of technology transfer in a holistic way.<sup>7</sup> The impacts of IPRs on technology transfer also vary by industry, especially for the chemicals and information industries, and work in conjunction with other factors, such as good governance, good regulatory climate, human capital development, market size, access to finance, and other factors. Empirical work also suggests that these impacts can be non-linear; that is, IPRs can encourage technology transfer, but if IPRs are too stringent, further increases in IPRs can reduce technology transfer, because the market power effects of IPRs would outweigh the market expansion effects.

### ***Open Innovation***

An intellectual property regime is not the only kind of system for stimulating innovation and technology transfer. An alternative system is open innovation in which innovators share information within and between organizations, collaborate, and do not in general make their innovations proprietary.<sup>8</sup>

An open innovation system and a closed one, like an IPR system, have important differences. Under the latter, the chief focus is on the expected payoff to R&D and on ensuring that it at least covers the upfront cost of R&D. Commercial laboratories precisely seek IPR protection in order achieve a net positive payoff. However, the IPR system relies on exclusivity and secrecy. Exclusivity helps prevent the competitive dissipation of expected profits. Secrecy is

needed in order to preserve the novelty of the innovation. An innovation cannot be patented if it is not novel, and it is not novel if it is public knowledge. Yet, as Henry Chesbrough<sup>9</sup> and Steven Johnson<sup>10</sup> point out, exclusivity and secrecy can be an impediment to knowledge creation and diffusion. Breakthroughs in knowledge and technical solutions depend on people being able to make connections among hunches and ideas, to follow leads, to view the problem from different angles, and to get the broad perspectives of different individuals with various expertise and experiences. However, in the commercial laboratory framework, ideas, hunches, and leads tend to be heavily guarded. Firms do not want to lose their competitive advantage, and thus do their utmost to prevent the leakage of sensitive information, even within the same organization.<sup>11</sup> As Johnson<sup>12</sup> also discusses, however, innovative breakthroughs arise when various pieces of the puzzle can be brought together, when ideas can be cross fertilized or exapted (that is, where an idea developed for one problem can be used for another), and when discoveries are made purposefully as well as serendipitously. Matt Ridley<sup>13</sup> concurs, pointing out that ideas need to mate and produce new knowledge. The point is that more open, collaborative, innovation networks are conducive to fostering innovation breakthroughs. In some cases, the commercial model of innovation may stifle breakthroughs if it operates in a tightly closed environment where ideas are sequestered. For instance, two companies may each possess some piece of knowledge that the other lacks, but the combined knowledge could result in a technological breakthrough. In the case of Xerox Corporation, several of its rejected technologies became commercial successes. Other companies were able to find valuable uses for them, such as SynOptics, a company that specializes in Ethernet technologies. The value of these ex-Xerox technologies could not be realized within the confines of Xerox laboratories, but once they mixed with the ideas and knowledge bases of other companies, they proved to be useful. As another example,



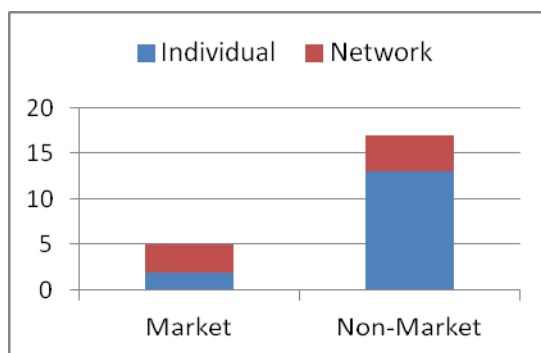
IBM struggled financially in the early 1990s, after many years of commercial success. The market for its mainframe systems was evaporating and other companies were developing product niches in software and workstations. To survive, IBM underwent a transformation from an essentially closed-innovation system to a more open one. It realized that it could not do ‘everything on its own’, and thus utilized the technologies of other companies and embraced open source software and open technology standards (such as the Linux operating system and the Java programming language).<sup>14</sup> Though IBM does not profit directly from these external technologies, those technologies help consumers derive more value from IBM products. Thus, while a closed commercial laboratory helps protect a firm’s competitive advantage and prevent copying, ideas are less mobile and inhibited from “meeting” other ideas so as to contribute to technological improvements or breakthroughs.

The following figures, adapted from Johnson<sup>15</sup>, provide a sense of the importance of open innovation from a historical perspective. The figures show a tally of major ideas and innovations by source. Was the innovation developed by an individual or a network of individuals? Was the innovation intended for the marketplace (where it could be sold or licensed) or allowed to flow freely into the public domain? An example of an individual’s innovation that was developed for the market is air-conditioning; an example of an individual’s innovation not developed for the market is X-rays; a network’s innovation developed for the market is internal combustion; and a network’s innovation not developed for the market is the global positioning system (GPS).

Between 1400 and 1600, markets were not as well developed and opportunities for networking innovations were limited. Technological breakthroughs were few, but what little were created were the result of individual effort in a non-market setting. In the modern era (1800 to the present), there is an increase in market-driven innovations, but note that the innovative

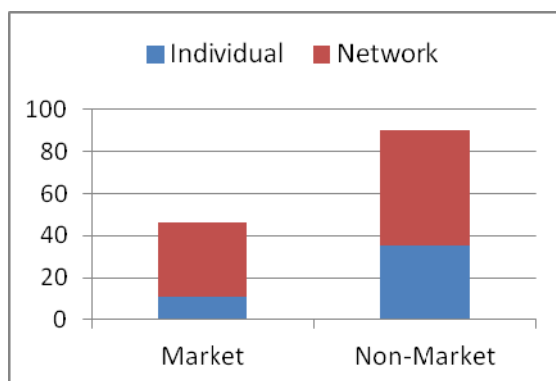
breakthroughs come predominantly from decentralized, non-market activity and are the result of group effort across organizations and regions. The inventor working alone in a commercial laboratory making a breakthrough does occur, but is relatively uncommon. The reason for the high quantity of breakthroughs under open innovation is that it facilitates knowledge mobility, allowing multiple parties to draw connections among clues and to exploit leads. This is not to argue that commercial innovation, along with IPRs, is not successful, for it is. The important lesson here is that innovation is not wholly dependent upon IPRs, and that in some cases, the proprietary system may inhibit innovation by reducing the communication of ideas. Open innovation can and should be utilized to complement commercial endeavors.

**Figure 25.1: Count of Breakthrough Ideas and Innovations, 1400 - 1600**



SOURCE: Adapted from Steven Johnson. *Where Good Ideas Come from: The Natural History of Innovations*. Riverhead Books, 2010.

**Figure 25.2: Count of Breakthrough Ideas and Innovations, 1800 - present**



SOURCE: Adapted from Steven Johnson. *Where Good Ideas come from: The Natural History of Innovations*. Riverhead Books, 2010.)

### ***Piracy***

A chief goal of IPR enforcement is to deter piracy, which reduces the rewards and incentives to engage in creative activity. Empirical research has sought to measure the effects of piracy on innovation and creativity, as well as estimate the effects of IPR laws and enforcement on deterring piracy. Before discussing these strands of research, though, two difficulties associated with piracy research should be noted. First, good quality data on piracy are hard to obtain, because these activities occur in the underground economy. Second, estimates of losses due to piracy are often inexact. The quantity of pirated goods cannot be used to infer the revenue losses, since those goods were either bought at low prices or acquired for free. Had those goods been sold strictly under copyright protection, the prices paid would have been higher and the quantity sold surely lower. Estimates of revenue losses should be based on an estimate of the latter quantity and not on an estimated quantity of illegitimate goods.

Empirical studies on the impact of piracy on copyrighted works are quite revealing. Kai-Lung Hui and Ivan Png<sup>16</sup>, for example, study the effect of piracy on the sales of recorded music. Estimating this effect creates some additional challenges. Because there is a selection bias in that pirates are attracted to items that are in high demand, there is a cause and effect problem. Does piracy affect sales, or vice versa? After controlling for the selection bias, the authors confirm that pirated goods do crowd out the sales of legitimate goods but that piracy could also increase the sales of legitimate goods through sampling effects. More people might be induced to purchase the legitimate version in order to get better packaging and any printed materials, such as the lyrics or booklets. There may also be network externalities, where the value of the good rises

with the number of people who possess the good. Consequently, while piracy does reduce legitimate sales, it is not the case that every pirated CD causes an equal loss in the sale of a CD, due to sampling and network effects. In contrast, Felix Oberholzer-Gee and Koleman Strumpf<sup>17</sup> fail to find that music file sharing on the Internet (via peer-to-peer) has had any adverse effect on record sales. One explanation given is that music downloading permits consumers to learn about the music, and learning promotes legitimate sales.

Arthur De Vany and David Walls<sup>18</sup> study the effects of piracy on movie box office revenues. Again, pirated copies of a film can crowd out theatre sales but can also increase movie attendance by generating sampling effects. The study finds that on balance piracy reduces box office revenues, but not one-for-one. Likewise, Rafael Rob and Joel Waldfogel<sup>19</sup> find that, among college students, music downloading does not completely substitute for music CD sales; for every five downloads, one CD sale is forgone. More recently, the U.S. General Accounting Office (GAO)<sup>20</sup> surveyed various industry studies on the economic impacts of piracy and criticized their sources of information and methodologies, particularly the assumption of a one-to-one substitution rate between pirated goods and legitimate goods. This assumption holds if consumers pay full retail price for the non-legitimate good, the legitimate good and non-legitimate good are equal in quality, and the consumer is unaware of purchasing a non-legitimate good. As long as any of these conditions do not hold, the substitution rate should be less than one. Moreover, these conditions vary by industry, and so the substitution rate should also differ across products.

Other studies focus on the relationship between piracy and the strength of the IPR regime. This relationship could inform us as to how effectively policymakers can deter piracy by strengthening copyright protection and enforcement. While levels of piracy tend to be higher in

regions where copyright laws are inadequate, piracy is not only a function of copyright laws and enforcement, but also of other factors, such as income and social norms, causing the correspondence between piracy and copyright strength not to be very tight. Donald Marron and David Steel<sup>21</sup>, for example, find that software piracy rates depend on both economic and cultural factors. Walls<sup>22</sup> also finds that social institutions matter in explaining motion picture piracy across countries. The efficacy of laws and enforcement in combating piracy varies by country, as analyzed by Andrew Burke<sup>23</sup> and by Hans van Kranenburg and Annelies Hogenbirk.<sup>24</sup> The relevance of these studies is that combating piracy involves more than toughening laws and enforcement, but it requires developing social institutions and promoting economic development.

## **DISTRIBUTION OF GAINS BETWEEN NORTH AND SOUTH**

Has the signing of the TRIPS agreement affected the global distribution of innovation and technology transfer? . Can a shift in innovation and technology transfer in the “South” be detected? The TRIPS agreement was predicated on both the North and the South gaining from technological change. Table 25.3 provides one measure of innovation, namely patent priority filings by inventor country. Patents measure instances of inventions. The reason to use patent priority filings is that these measure the first application of a patent. Other kinds of patent filings are secondary filings, in which a patent for the same invention is applied for in another country. Including these filings would duplicate the counts of invention. The reason to trace patents by inventor country is to gauge the innovative capacity of domestic inventors. Typically, priority patents in a country can be filed by domestic inventors as well as by foreigners, and domestic inventors can file a priority patent in a foreign country instead of in their home country. The data in Table 25.3 measure domestic inventions wherever they are filed first.

<b>Table 25.3. Global Distribution: Patent Priority Filings by Inventor Country</b>		
Income Group	1995	2009
Developed Countries	85.9%	67.4%
Developing Countries	14.0%	32.5%
<i>Developing Countries (excluding China, South Korea, Taiwan)</i>	<i>2.4%</i>	<i>1.6%</i>
Least Developed Countries	<0.1%	<0.1%
:SOURCE: European Patent Office, PATSTAT database. http://www.epo.org/searching/subscription/patstat-online.html. Accessed Dec. 15, 2012.		

The table aggregates countries by income group ( *i.e.*, whether developed, developing, or least developed country). The grouping is based on the United Nations classification of countries.<sup>25</sup> The table focuses on the share of innovation conducted across country groups. Of course, over time, there are changes in the level of innovation but the objective here is to see if there are more than (or less than) proportionate shifts in innovation.

The table shows that developing countries in 2009 account for a larger share of global innovation than they did in 1995, when the TRIPS agreement was introduced, while developed countries account for less. The share conducted by least developed countries remains marginal. While the table cannot isolate the effects of patent reforms among all the factors that drive innovation (and is not intended to), the table is instructive in showing developments in innovation since 1995. The greater share of innovation conducted by developing countries invites speculation that developing economies have become more innovative post-TRIPS.

However, closer inspection of the data indicates that the bulk of innovation conducted in developing countries is accounted for by just three countries: China, South Korea, and Taiwan. If these three countries are excluded, the share of innovation conducted by developing countries is not only significantly lower in each period but also fell between periods.

The data suggest that these three countries may be an exception among developing countries. Indeed, the next table shows that the innovation output of these countries ranks among those of developed countries. Table 25.4 reveals the top ten countries obtaining patents in the United States. Before 1995, only developed countries were on this list. By 2011, three developing countries were on this list—China, South Korea, and Taiwan.. South Korea is the second leading foreign country acquiring U.S. patents, next to Japan. These data trends suggest that China, South Korea, and Taiwan are outliers. Any studies investigating innovation in developing countries should consider how these three countries might bias any statistical inferences. The innovation performance of these three countries may well relate to their IPR reforms, but major IPR reforms were also undertaken in several other developing countries that are signatories to TRIPS. Yet, only those three countries have expanded their share of world innovation.

<b>Table 25.4 Top Ten Countries receiving U.S. Patent Grants</b>			
Rank 1963 - 1994	Country	Rank in 2011	Country
1	USA	1	USA
2	Japan	2	Japan
3	Germany	3	South Korea
4	UK	4	Germany
5	France	5	Taiwan
6	Canada	6	Canada
7	Switzerland	7	France
8	Italy	8	UK
9	Sweden	9	China
10	Netherlands	10	Israel
Source: U.S. Patent and Trademark Office. <a href="http://www.uspto.gov/about/stats/index.jsp">http://www.uspto.gov/about/stats/index.jsp</a> . Accessed Dec. 15, 2012.			

It would be useful to corroborate the above finding with another measure of innovation, namely research and development. Whereas patents measure inventive outputs, R&D measures the inputs into innovation. Table 25.5 shows the global distribution of business sector R&D.

<b>Table 25.5 Global Distribution: Business Enterprise Research and Development Performed</b>		
Income Group	1995	2009
Developed Countries	89.1%	74.4%
Developing Countries	10.9%	25.6%
<i>Developing Countries (excluding China, South Korea, Taiwan)</i>	<i>4.7%</i>	<i>4.7%</i>
Least Developed Countries	<0.01%	<0.01%
:SOURCE: United Nations Educational, Scientific, and Cultural Organization UNESCO. <a href="http://www.uis.unesco.org/ScienceTechnology/Pages/default.aspx">http://www.uis.unesco.org/ScienceTechnology/Pages/default.aspx</a> . Accessed Dec. 15, 2012.		

Again, similar conclusions can be drawn. The bulk of R&D in the developing world is conducted by China, South Korea, and Taiwan. Their share of world R&D has more than doubled during the post-TRIPS period, while the share of other developing countries has not changed. The share of least developed countries in world R&D also remains extremely low.

The next table shows the global distribution of the chief carriers of technology transfer, namely trade, FDI, and licensing. Trade refers to the sum of exports and imports, FDI the sum of outward and inward stocks of foreign direct investment, and licensing the sum of licensing receipts and licensing payments. Table 25.6 focuses on the shares of different country groups in these world activities. As the table shows, most of these activities are accounted for by developed countries. They are the leading source and destination of technology transfers. However, by 2009, a greater share of these activities occurs in developing countries.

Here, China, South Korea, and Taiwan do not account for the bulk of trade, FDI, and licensing in developing countries. Other developing country markets, such as Brazil, India, Russia, and South Africa, are also attractive for foreign investors and producers, in terms of market size, labor costs, and human capital resources. What is clear, though, is that the least developed countries account for a tiny share of world technology transfer activities. There is almost no change in the shares of world FDI and licensing transactions that occur in these poorest of countries.



<b>Table 25.6. Global Distribution: Mechanisms for Technology Transfer</b>						
Income Group	Trade		Foreign Direct Investment		Licensing	
	1995	2010	1995	2010	1995	2010
Developed Countries	71.7%	59.4%	83.7%	75.8%	87.1%	81.0%
Developing Countries	27.7%	39.5%	16.0%	23.8%	12.9%	19.0%
<i>Developing Countries*</i>	20.9%	25.7%	13.3%	20.2%	8.6%	11.8%
Least Developed Countries	0.6%	1.1%	0.3%	0.4%	<0.01%	<0.01%
:SOURCE: United Nations Conference on Trade and Development (UNCTAD)). <a href="http://unctad.org/en/Pages/Statistics.aspx">http://unctad.org/en/Pages/Statistics.aspx</a> . Accessed Dec. 15, 2012  * - <i>excludes China, South Korea, and Taiwan</i>						

## Behind the Statistics

What are some explanations behind the statistics in Tables 25.3 through 25.6? In particular, why has the share of world innovation conducted by developing countries, apart from China, South Korea, and Taiwan, remained so small? Why are technology transfers to the least developed world so limited?

One reason most developing economies account for a low share of world innovation may be that innovative performance responds to policy changes with a long lag. It may be taking more time than expected for institutional changes to result in increases in innovative capacity. Innovation requires several complementary factors to be present, such as a conducive regulatory and investment climate, skilled resources for innovation (both specialized human capital and physical capital), and a research network that can foster knowledge sharing and diffusion. These complementary factors also take time to acquire.

Another reason may be that the minimum standards established by TRIPS are onerous for many developing economies. A one-size, harmonized policy may not fit the needs of all developing economies. According to Gene Grossman and Edwin Lai<sup>26</sup>, IPR standards should not be as strong in the South as they are in the North. The reason is that the market size and innovative capacity of the South are lower. The small market size in the South implies that

raising its IPR standards would provide little additional incentives for innovation, since the market expansion effect is small, but would create an increased burden in terms of higher prices. Furthermore, the low innovative capacity in the South implies that stronger IPRs would not significantly raise the marginal benefits of protection, as Southern firms have a smaller share of world profits from innovation. These considerations suggest that, for developing economies, the marginal benefits and marginal costs of IPRs are balanced at a lower level of IPRs than set in the North. Thus, the implication is that TRIPS may have established standards that may not be appropriate for their stage of economic development and innovation systems.

### **An Alternative IPR System?**

What may be more appropriate for developing economies is to have an IPR system that permits and encourages adaptive and imitative innovation. Yee-Kyong Kim and her colleagues<sup>27</sup> provide an empirical analysis of the impact of utility models on innovation and economic growth. Utility models are intellectual property rights for minor inventions and are sometimes referred to as petty patents. The inventive step required for being granted a utility model is much lower than that for a patent. Kim *et al.* also find that experience with adaptive and imitative R&D helps an emerging economy develop the innovative capacities necessary to produce patentable innovations later on. In other words, adaptive and imitative R&D can be a stepping stone for future innovative R&D. Thus, a system that encourages such R&D by granting protection for incremental innovations and whose patent laws do not preclude such inventions, by declaring them infringing, creates a foundation for technological learning. China, South Korea, and Taiwan have all provided protection for utility models. Before 1995, these countries relied heavily on utility model protection. After 1995, they weaned away from utility models towards patents, and

are currently among the world's leading patenting countries (recall Table 25.3). The lesson here is that the standards of IPR protection in a developing country need not jump from a low level to a high level but evolve with the innovative capacities of the economy.

On the issue of why technology transfers to the least developed countries have been limited, some candidate explanations are their small market size, weak governance and rule of law, and the nature of their industries, which are not very technologically-intense. These disadvantages would more than offset the attractions of IPR laws established in the least developed countries. Much further internal reforms are therefore needed in the least developed world. On the other hand, the attractiveness of a country for technology transfers from abroad evolves as its industrial base develops and becomes more technologically oriented. With this positive feedback in mind, Article 66.2 of the TRIPS agreement requires developed country governments to assist in the setting up of a “viable technological base” in the least developed world by providing incentives for firms or organizations in their territories to transfer technologies to the least developed nations. Thus, one reason why the share of technology transfers accounted for by the least developed countries has remained limited and unchanged since 1995 is that developed countries have weakly complied with their technology transfer obligations.

### **Concerns over Compliance**

In 2003, due to concerns that these that these obligations needed to be implemented more effectively, the TRIPS Council of the WTO mandated that developed country members submit reports annually on how they are complying with the Article 66.2 obligation. Suerie Moon<sup>28</sup> and Owen Barder *et al*<sup>29</sup> have studied these annual reports of developed countries in order to assess

the commitment of developed countries to promote technology transfers to the least developed world. It is difficult to measure compliance (via a scorecard) because there is no standard format for the annual reports and no clear benchmarks for measuring the success or failure of a government incentive or program for encouraging technology transfer to least developed countries.

TRIPS also does not specify what kind of incentive the governments should provide, whether a fiscal one or a government contract. It also does not clarify whether the incentives should be new ones, in addition to those already in existence, or whether nations are compliant if they had incentives and programs already in place. Moon<sup>30</sup> and Barder *et al.*<sup>31</sup> have nonetheless observed some weaknesses with the developed world's compliance with its international technology transfer obligations and the reporting of its activities. Some developed countries in Europe have submitted reports irregularly or not at all. The programs for stimulating technology transfer are not funded very well and the majority of programs do not target the least developed countries but middle- and upper-income developing economies. Not all of the programs are substantive either. Some merely involve language instruction or assisting agencies with writing laws and regulations on intellectual property. A minority of programs would actually qualify as incentives for technology transfer in the sense of facilitating the licensing of technologies or the acquisition of equity abroad, assisting with the cost and overhead or providing insurance against risks.

### **The Future of International Innovation**

Intellectual property rights create both costs and benefits. On the one hand, strong protection and enforcement of IPRs help deter infringement and piracy, protect the sales and earnings of

intellectual property creators, and thereby motivate them to innovate and bring their creative output to the marketplace, not only locally but internationally. On the other hand, IPRs are exclusive. They create market power on the part of intellectual property owners. Their output is not supplied competitively and is priced above marginal cost. The licensing fees and royalties that need to be paid for the use of intellectual property raise the cost of R&D and creative activity for follow-on inventors or creators who wish to build on existing knowledge.

Global reforms in intellectual property laws and regulations have occurred on a wide scale, significantly raising the standards of IPRs in the developing world. These global reforms were premised on mutual gains accruing to both the North and South. The expectation was that these reforms would substantially increase innovative activity worldwide as well as increase access to innovations via global technology transfer activities. However, after more than fifteen years since the TRIPS agreement, the distribution of world innovation remains skewed, being highly concentrated in the developed world. Only three developing nations—China, South Korea, and Taiwan—have made significant gains in their innovative capacities. It remains controversial as to whether the growth in their innovation performance can be attributed to their IPR reforms or to their history of imitation, copying, and adaptation of foreign technologies, which provided them with the means for technological catch-up to the industrialized world.

Intellectual property rights are important to innovation but are not the only factors that drive innovation. Innovation also depends on the ability of innovators to build upon existing knowledge. Excessive secrecy and exclusivity work against that. It is important to harness both commercial and open innovation systems for purposes of promoting technological progress.

Perhaps the least successful aspect of the global IPR reforms thus far is the limited progress in transferring technologies to least developed countries. Much work is required of both the least developed countries and developed countries. Governments in least developed countries must address issues concerning governance, market reforms, infrastructure, and education, among others. Governments in developed countries must show more commitment to and compliance with their obligations to promote international technology transfer.

Some policy implications can be drawn from the academic research and country experiences discussed thus far. First, innovation is multifaceted, and technology policymakers should not focus single-mindedly on IPRs but adopt a comprehensive approach to innovation, embracing both property rights and open innovation mechanisms. Unauthorized copying and distribution of intellectual property materials must be contained and the integrity of creative work protected, but policymakers cannot combat piracy and other such activities by strengthening intellectual property rights and enforcement alone. Cultural factors and income levels are also determinants of those activities.

In less developed countries, the priority for policymakers should be to develop a foundation for technological innovation. Merely instituting or reforming intellectual property laws does not serve that purpose. In order for developing economies to best utilize IPRs for their economic development, some basic innovative capacity must be present. In other words, there must be some R&D sector for the policy levers to influence. Innovative capacity is also likely to develop in gradual steps, through learning-by-doing and through experience with incremental, imitative, and adaptive innovation. In that case, the standards of IPRs for a country must be appropriate for its stage of economic development. For this reason, TRIPS-plus amendments that call for further IPR reforms across countries must be approached carefully. Many developing

economies have found it a challenge just to be TRIPS-compliant. IPRs should be secure enough to induce investments in innovation but not too burdensome as to raise the cost of R&D activity or the transactions costs of negotiating licensing agreements across multiple IPR owners. IPRs must also be sufficiently secure to motivate technology transfers but must not in turn pose an obstacle to the dissemination of technologies; for example, restricting generic competition in drugs or delaying the entry of protected works into the public domain.

In the very poorest of countries, innovative capacity is not likely to emerge endogenously from within, at least in the near foreseeable future. Some push is needed from external sources. In that regard, developed countries must do their part to comply with their TRIPS obligation to encourage technology transfer to the less developed countries, particularly technologies and “know how” that will help lay the necessary foundation for technological innovation. It is useful to be reminded that global IPR reforms were intended to be for the mutual benefit of all parties, and requires commitments on the part of all parties.

### **BOX Politics and Economic Policy: Stopping Piracy in China**

In 2011, China accounted for 14% of the world’s commercial unlicensed software.<sup>32</sup> An online poll taken by the *China Youth Daily* found that over 90% of the respondents admitted to purchasing or using pirated products.<sup>33</sup> A United States Trade Representative report<sup>34</sup> indicates that software piracy is very high in the State-owned enterprises sector, that illegal downloading accounts for nearly all of music downloads in China, and that there are internet sites in China that stream pirated media content.

Combating piracy no doubt involves strong laws, enforcement, and deterrents, but it also requires exploring the structural roots. Commercial piracy in China was not a major global issue until China opened up to international trade in the early 1990s. The country was poor and developing. Its comparative advantage was largely its low labor costs, which attracted foreign direct investment. But entry into China exposed foreign companies to risks of intellectual property infringement and leakage of proprietary technology. In retrospect, therefore, piracy in China is positively correlated with its inward FDI.

As Daniel Chow and Edward Lee<sup>35</sup> point out, an economy emerged around illicit trade. Entire industries and towns derive their livelihood from piracy activities. Local officials tend to be

either complicit in these illicit activities or unresponsive for fear that crackdowns or shutdowns could result in large unemployment and social instability.

China has made efforts recently to strengthen its copyright laws. Copyright laws were formally introduced in 1991, amended in 2001, and again in 2010. During 2012, Chinese copyright rules were being redrafted, and a new set of regulations should be in the offing. In October 2010, the Chinese government began a *Special IPR Enforcement campaign*. Websites that violated intellectual property laws were shut down, illicit goods seized, raids conducted, and arrests made. In November 2011, a *National Intellectual Property Enforcement Office* was created (headed by a high-ranking member of the Chinese government) to centrally coordinate national efforts to combat piracy.

Despite these efforts, piracy remains active. Demand is strong, as consumers covet Western brand-named goods (even if they are ‘fakes’ or imitations). Supply is abundant, partly because enforcement actions against pirates are weak. Policing and apprehension are constrained by limited resources, and strong deterrent penalties are absent, such as criminal sanctions against copyright piracy. At issue is whether China is complying with Article 61 of TRIPS which requires criminal penalties in the case of willful copyright piracy on a commercial scale.

Another factor that impedes enforcement is the complex institutional matrix for enforcing copyright laws, as researched by Andrew Mertha.<sup>36</sup> IPR laws are made at the national level, and it is the central government that receives pressure from foreign governments to stop piracy. However, enforcement occurs at the provincial or local levels, where bureaucracies can be complex and the chain of command convoluted. It is important to get provincial jurisdictions more involved and to reorganize local communities so that their economies are not dependent upon illicit trade.

## **FURTHER READING**

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**See also: Chapter 26: Economic Public Policy: An Ethical Perspective (2000s-present); Chapter 27: Cost-Benefit Analyses of Economic Policies (2000s-present); Chapter 28: U.S. and International Economic Organizations (1990s-present); Chapter 29: Sustainable Development and Emerging Economies (2000-present).**

### **Key Decisions: Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), January 1, 1995**

The Agreement on Trade-Related Aspects of Intellectual Property (TRIPS) established minimum standards for the protection of property rights by bringing Intellectual Property Rights (IPR) systems around the world together under a common international set of rules, thus addressing problems of international piracy and IPR infringements. TRIPS established minimum global standards governing the scope, availability, and use of IPR and patent protection. TRIPS also attempted to strike a balance between providing incentives for research and development (R&D) and allowing people to have access to and use existing inventions and creations.

#### **Preamble**

*Members . . . [desire] to reduce distortions and impediments to international trade, and taking into account the need to promote effective and adequate protection of intellectual property rights, and to ensure that measures and procedures to enforce intellectual property rights do not themselves become barriers to legitimate trade;*

*. . . [Recognize] also the special needs of the least-developed country Members in respect of maximum flexibility in the domestic implementation of laws and regulations in order to enable them to create a sound and viable technological base;*

*Article 7 Objectives*

The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.

*Article 64.1 Dispute Settlement*

The provisions of ... the Dispute Settlement Understanding shall apply to ... the settlement of disputes under this Agreement except as otherwise specifically provided herein.

*Article 66.2 Least-Developed Country Members*

Developed country Members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members in order to enable them to create a sound and viable technological base.

:SOURCE: [http://www.wto.org/english/tratop\\_e/trips\\_e/t\\_agm0\\_e.htm](http://www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm). Accessed Dec. 15, 2012.

**Key Decisions: Leahy-Smith America Invents Act, H. R. 1249, January 5, 2011**

The America Invents Act was the most comprehensive patent reform change since 1952 and most notably switched the U.S. patent system to “first to file” from “first to invent.” The act was a bipartisan, bicameral bill that updated the nation’s patent system to encourage innovation, job creation, and economic growth. Both houses of Congress overwhelmingly supported the proposal and President Barack Obama (2009- ) signed the bill into law on September 16, 2011.

*“§ 102. Conditions for patentability; novelty*

(a) NOVELTY; PRIOR ART.—A person shall be entitled to a patent unless—

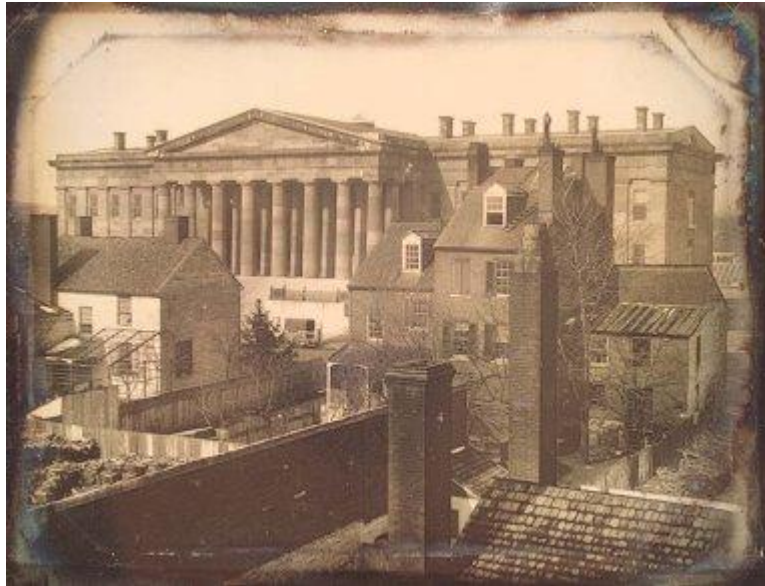
(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention ...

(b) EXCEPTIONS.—

(1) DISCLOSURES MADE 1 YEAR OR LESS BEFORE THE EFFECTIVE

FILING DATE OF THE CLAIMED INVENTION.—A disclosure made 1 year or less before the effective filing date of a claimed invention shall not be prior art to the claimed invention under subsection (a)(1) ....”

:SOURCE: <http://www.govtrack.us/congress/bills/112/hr1249/text>. Accessed Dec. 15, 2012.

**[Photo ECON- 25.1 1870s patent office building in Washington, DC]**

A photograph from the 1870s shows the U.S. Patent Office in Washington, D.C. Early on, the U.S. government recognized the importance of protecting intellectual property; the first patent act was signed into law in 1790. In 1836, the U.S. Patent Office became a part of the Department of State; today, it is a part of the Department of Commerce.

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**ENDNOTES**

<sup>1</sup> Entry barriers would be created, though, if the patent covers a research tool or a product standard.

<sup>2</sup> Suzanne Scotchmer. *Innovation and Incentives*. Cambridge, MA: MIT Press, 2004.

<sup>3</sup> Philippe Aghion, Nick Bloom, Richard Blundell, Rachel Griffith, and Peter Howitt, "Competition and Innovation: An Inverted-U Relationship." *Quarterly Journal of Economics*. Vol. 120, pp. 701 – 728, 2005.

<sup>4</sup> Pamela Smith. "How do Foreign Patent Rights Affect U.S. Exports, Affiliate Sales, and Licenses?" *Journal of International Economics*. Vol. 55, No. 2, pp. 411 - 439, 2001.

<sup>5</sup> See Brent Allred and Walter Park (2007) and Joshua Lerner (2009).

<sup>6</sup> Margaret Kyle and Anita McGahan. "Investments in Pharmaceuticals Before and After TRIPS." *Review of Economics and Statistics*. Vol. 94, No. 4, pp. 1157–1172, 2012.

<sup>7</sup> For a survey, see Keith Maskus (2012), Walter Park (2008), and Amanda Watson (2011).

<sup>8</sup> See Chesbrough (2003) for a fuller discussion of the nature of open innovation.

<sup>9</sup> Chesbrough.

<sup>10</sup> Steven Johnson. *Where Good Ideas come from: The Natural History of Innovations*. Riverhead Books, 2010.

<sup>11</sup> Johnson discusses how some employees within *Apple* are not privy to what is going on in other divisions.

<sup>12</sup> Johnson.

<sup>13</sup> Matt Ridley. *Rational Optimist: How Prosperity Evolves*. New York: Harper, 2010.

<sup>14</sup> These case studies are more fully discussed in Chesbrough, Chapters 1 and 5.

<sup>15</sup> Johnson.

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- <sup>16</sup> Kai-Lung Hui and Ivan Png. "Piracy and the Legitimate Demand for Recorded Music." *Contributions to Economic Analysis & Policy*, Vol. 2, Issue 1, Article 11, 2003.
- <sup>17</sup> Felix Oberholzer-Gee and Koleman Strumpf. "The Effect of File Sharing on Record Sales: An Empirical Analysis." *Journal of Political Economy*. Vol. 115, No. 1, pp. 1 - 42, 2007.
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- <sup>23</sup> Andrew Burke. "How Effective are International Copyright Conventions in the Music Industry?" *Journal of Cultural Economics*, Vol. 20, pp. 51 - 66, 1996.
- <sup>24</sup> Hans Van Kranenburg and Annelies Hogenbirk. "Multimedia, Entertainment, and Business Software Copyright Piracy: A Cross-National Study." *Journal of Media Economics*, Vol. 18, No. 2, pp. 109 - 129, 2005.
- <sup>25</sup> See UNCTAD *Handbook of Statistics 2012*, United Nations, Geneva, pp. xiv - xvi.
- <sup>26</sup> Gene Grossman and Edwin Lai. "International Protection of Intellectual Property." *American Economic Review*, Vol. 95, pp. 1635-1653, 2004.
- <sup>27</sup> Kim, Yee-Kyong, Lee, Keun, Park, Walter, and Choo, Kineung. "Appropriate Intellectual Property Protection and Economic Growth in Countries at Different Levels of Development," *Research Policy*, Vol. 41, pp. 350 - 375, 2012.
- <sup>28</sup> Suerie Moon, *Does TRIPS Art. 66.2 Encourage Technology Transfer to LDCs? An Analysis of Country Submissions to the TRIPS Council (1999-2007)*. Policy Brief No.2. UNCTAD- ICTSD Project on IPRs and Sustainable Development. Geneva: UNCTAD-ICTSD, 2008.
- <sup>29</sup> Owen Barder, Walter Park, and Liza Reynolds, "Evaluating Europe's Contribution to the Technological Development of Developing Nations." *Center for Global Development Discussion Paper*, Washington, D.C., 2013.
- <sup>30</sup> Moon.
- <sup>31</sup> Barder *et al.*
- <sup>32</sup> Based on Business Software Alliance, <http://www.bsa.org/country/Research and Statistics.aspx>, Accessed Feb. 15, 2013.
- <sup>33</sup> [http://www.chinadaily.com.cn/bizchina/2012-05/03/content\\_15201094.htm](http://www.chinadaily.com.cn/bizchina/2012-05/03/content_15201094.htm). Accessed Feb. 15, 2013.
- <sup>34</sup> U.S. Trade Representative's 2012 *Special 301 Report*. [http://www.ustr.gov/sites/default/files/2012\\_Special 301 Report\\_0.pdf](http://www.ustr.gov/sites/default/files/2012_Special_301_Report_0.pdf), Accessed February 5, 2013.
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