

Intellectual Property: Balancing Incentives with Competitive Access

Intellectual property rights can promote development—

One of the most fundamental changes in global commercial policy set out by the Uruguay Round of trade negotiations was the commitment by all World Trade Organization (WTO) Members to adhere to the requirements of the Agreement on Trade-Related Intellectual Property Rights (TRIPS). TRIPS defines minimum standards of protection for intellectual property rights (IPRs) and their enforcement. IPRs seek to balance the incentives necessary to encourage future innovations (such as the ability to recoup the costs and risks of development, and still earn a profit) against the desire to provide wide access to those products in a competitive market. Because the overwhelming majority of intellectual property—new inventions, proprietary commercial information, digital entertainment products, software, trade names, and the like—is created in the industrialized countries, TRIPS decidedly shifted the global rules of the game in favor of those countries. Nonetheless, TRIPS may lead to several long-run benefits for countries that take advantage of its standards in an appropriate and flexible manner, while complementing those standards with broader development and competition regimes.

—but should be appropriate to local capacities and benefits—

Developing countries went along with the TRIPS agreement for a variety of reasons, ranging from the hope of additional access to agricultural and apparel markets in rich nations, to an ex-

pectation that stronger IPRs would encourage additional technology transfer and innovation. However, the promise of long-term benefits seems uncertain and costly to achieve in many nations, especially the poorest countries. In addition, the administrative costs and problems with higher prices for medicines and key technological inputs loom large in the minds of policy makers in developing countries. Many are pushing for significant revision of the agreement.

There are reasons to believe that the enforcement of IPRs has a positive net impact on growth prospects. On the domestic level, growth is spurred by higher rates of innovation—although this tends to be fairly insignificant until countries move into the middle-income bracket. Nonetheless, across the range of income levels, IPRs are associated with greater trade and foreign direct investment (FDI) flows, which in turn translate into faster rates of economic growth.

—so the poorest countries may require assistance and time—

The most appropriate level of IPRs enforcement therefore varies by income level. In particular, poorer countries—which are less able to absorb the associated costs, and least likely to benefit from domestic innovation—may find it advantageous to stage implementation of some aspects of IPRs. Since industrial countries are the main beneficiaries of IPRs, and given the challenges facing developing countries, the former may find it in their interest to

provide assistance to the poorest countries for the implementation of TRIPS.

—and they also may require special consideration in the case of essential medicines

The least-developed countries face critical needs for access to new drugs and vaccines that may be developed for treating human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS), malaria, tuberculosis, and other diseases. Patent protection will raise incentives marginally for drug firms to invent such treatments but could also support considerably higher prices. A mechanism needs to be found to reward innovation in this area while providing new medicines to poor countries at low cost.

Intellectual property rights and development

Rationale

At their most basic level, intellectual property rights exist to strike a balance between the needs of society to encourage innovation and commercialization of new technologies, products, and artistic and literary works, on the one hand, and to promote use of those items, on the other. Intellectual property takes several forms (box 5.1). The need for intellectual property protection arises from the fundamental characteristics of information. It is often costly to develop new technologies and products, requiring considerable investment in research and development (R&D) with uncertain payoffs. The investment extends further to the costs of bringing new ideas to the marketplace.

These costs must be recovered through a temporary ability to set prices above marginal costs of production. If an intellectual creation is potentially valuable but easily copied and used by others, there will be free riding by competitive rivals. Such behavior would quickly drive the price to marginal production cost and prevent the inventor from recouping investment costs, thereby discouraging innovation. Society has a dynamic interest in limiting free riding to

benefit from the introduction of new products and technologies. This goal is achieved by the exclusive market positions afforded by IPRs.

At the same time, society has an interest in promoting widespread access to new products and information. Countries therefore limit the scope and duration of protected exclusivity in order to place goods into the public domain after an adequate expected return has been earned. There is an obvious tension between invention and dissemination.

Despite the inherent difficulty of measurement,¹ a growing body of empirical work suggests that IPRs, as represented by legislated patent rights, influence international economic activity and growth performance.²

Like other economic policies, IPRs are chosen by governments in response to competing interests. Thus the strength of intellectual property protection depends on economic and social circumstances, which in turn affect perceptions of the appropriate tradeoff between invention and dissemination. Historically, countries have adopted stronger IPRs only when domestic interests in their favor became sufficiently strong to decide policy. This is further supported by the wide variation in standards across countries. The stronger the capabilities of a nation's enterprises to develop distinctive products and new technologies, the greater the preferences of consumers for quality guarantees among similar products; the wider the markets in which artists wish to sell their music and literature, and the easier it is to misappropriate the returns to invention through imitation, the more pronounced will be interests in protection.

Enforcement of rights increases with income—

Several stylized facts emerge from the literature about the level of development and IPRs. First, countries with a high ratio of R&D in gross domestic product (GDP) or a high proportion of scientists and engineers in the labor force have markedly stronger patent rights than others. Clearly such countries desire to protect returns to inventive activity.

Box 5.1 An overview of intellectual property rights

At the broadest level, intellectual property has traditionally been divided into *industrial property*, or inventions and identifying marks that are useful for industry and commerce, and *artistic and literary property*, or works of culture. This distinction reflected a perception that cultural creations differed fundamentally from functional commercial inventions. However, this distinction has blurred considerably in the age of information technology and digital products.

There are four primary forms of industrial property rights. First, a *patent* awards an inventor the right to prevent others from making, selling, or using the protected product or process without authorization for a fixed period of time within a country. In return, society requires that the application be published in sufficient detail to reveal how the technology works, thereby increasing the stock of public knowledge. The minimum period of protection required under TRIPS is 20 years from the date an application is filed. Many countries recognize *utility models* or *petty patents*, which award rights of shorter duration to small, incremental innovations requiring some investment in design and development.

A second form is *industrial designs* which protect the aesthetic aspects of a useful commercial article. TRIPS requires that designs be protected for a minimum of 10 years.

A third mechanism includes *trademarks* and *service marks*, which protect rights to use a distinctive mark or name to identify a product, service, or firm. The fundamental objective of these marks is to reduce consumer search costs and remove consumer confusion over product quality and origin.

A related device is *geographical indications*, which certify that such products as wines, spirits, and foodstuffs were made in a particular place and embody quality characteristics of that location.

Artistic, musical, and literary works are protected by *copyrights*, which grant exclusive rights to the particular expression of the work for a period of time, typically the life of the creator plus 50 years (70 years in the United States and the European Union). Copyrights cover only expressions rather than ideas, and therefore provide thinner protection than patents. Rights extend to the duplication, display, performance, translation, and adaptation of the

works. The primary limitation on copyright protection stems from the fair-use doctrine, which defines conditions under which copying for noncommercial purposes is permitted.

TRIPS requires that computer programs be protected, at least by copyrights, under the principle that software code is a literary expression. However, countries may vary in the degree to which reverse engineering of computer programs is permitted under the fair-use doctrine.

Because computer programs may constitute a commercially useful process, a number of developed countries permit firms to patent them. This policy is pushing patent protection more deeply into new areas, including methods of doing business on the Internet. A similar evolution explains the tendency toward awarding patents for biotechnological research tools.

For some technologies *sui generis*, or special, protection regimes exist. One is the design of integrated computer circuits. These are more than literary expressions, but the inventive step is often minimal, suggesting a compromise between patent and copyright. Indeed, a 10-year protection term is provided and requires only novelty in expression. Another is plant breeders' rights (PBRs), which permit developers of new, distinctive, and genetically stable seed varieties to control their marketing and use for a fixed term. Many countries limit these rights by permitting an exception for farmers to use seeds for subsequent replanting, and for researchers to study the seeds.

Although not literally IPRs, a related area of business regulation lies in defining the boundaries of protection for proprietary *trade secrets* of rival firms. A production process or formula may be kept secret within the firm, but if a competitor learns the confidential information through legitimate reverse engineering, the originator has no rights to exclude its use. Unfair competition includes such activities as industrial espionage, inducing employees to reveal trade secrets, and encouraging defection of technical employees to produce their own versions of a product based on proprietary information. However, there is considerable variability in such definitions across countries.

Source: World Bank staff.

Second, the evidence suggests that interests in encouraging low-cost imitation dominate policy until countries move into a middle-income range with domestic inventive and absorptive capabilities.³ Only at high income levels do patent rights become strongly protective. These findings may be explained by the nature of technological development. Least-developed countries devote virtually no resources to innovation and have little intellectual property to protect. As incomes and technical capabilities grow to intermediate levels, some adaptive innovation emerges but competition flows primarily from imitation. Thus, the majority of economic interests prefer weak protection. As economies mature to higher levels of technological capacity and demands shift toward higher-quality products, domestic firms come to favor protective IPRs. Finally, the strength of IPRs shifts upward at the highest income levels (Evenson and Westphal 1997). Not only do legislated IPRs become stronger, but enforcement and compliance also rise with income levels.

—and with greater openness of trade

Third, countries that are more open to trade tend to have stronger patent rights. This result suggests that trade interacts positively with the demand for intellectual property protection and, possibly, domestic innovative efforts. Finally, the size of an economy, as measured by absolute GDP, has no detectable correlation with patent rights. Thus, even in large developing countries such as India and China it may be some time before patent rights are effectively enforced.

IPRs and international economic activity

In strengthening their IPRs regimes—either unilaterally or through adherence to TRIPS—developing countries may be able to attract greater inflows of technology. The three channels through which technology is transferred across borders include international *trade* in goods and services, *foreign direct investment*, and contractual licensing of technologies.

IPRs can boost trade volumes—

Imports of goods and services can transfer and diffuse technology. For example, imports of capital goods and technical inputs could reduce production costs and raise productivity. An important question is whether IPRs affect such trade flows. Maskus and Penubarti (1995, 1997) estimated changes in imports of manufacturing goods and high-technology manufactures that could be induced by stronger patent rights. A patent index from Rapp and Rozek (1990) was increased by various amounts for different countries to reflect roughly the commitments required by TRIPS. The anticipated impacts on trade volumes depended on the extent of patent revisions, market size, and reductions in the imitation threats from complying with TRIPS. Estimated effects on trade ranged from small impacts in the United States and Switzerland, which were not required to undertake much legal revision, to substantial increases in imports in China, Thailand, Indonesia, and Mexico, which must adopt stronger rights.⁴ Mexico updated its IPRs regime early because of commitments made under NAFTA.

The study found significant impacts of IPRs change on import volumes of developing countries. For example, there was an anticipated increase in manufactured imports into Mexico of \$6.3 billion, amounting to 9.4 percent of its real manufactured imports in 1995. Thus, evidence suggests that the long-run impacts could be substantial. The estimated increase in China's high-technology imports was \$2.8 billion, or just under 2 percent of its total imports in 1995. Note that Coe, Helpman, and Hoffmaister (1997) found that total factor productivity (TFP) is enhanced in developing nations through such imports. In principle there could be a notable bonus to productivity performance.

However, most of the largest predicted impacts were in nations with strong imitation capacities, such as Argentina and Brazil. In contrast, India and Bangladesh would experience relatively weak, though positive, trade impacts.⁵

—and attract FDI inflows and licenses

A primary channel of technology transfer is FDI. IPRs should have varying importance across sectors with respect to encouraging FDI. Investment in low-technology goods and services should depend less on the strength of IPRs and more on input costs and market opportunities. Investors with technologies that are costly to imitate also would pay little attention to local IPRs. However, firms with easily copied products and technologies, such as pharmaceuticals and software, would be quite concerned about the ability of the local IPRs system to deter imitation. Firms considering investing in a local R&D facility would pay particular attention to protection of patents and trade secrets (Mansfield 1994, 1995).

Thus, the strength of IPRs and the ability to enforce contracts could have important effects on decisions by multinational firms in certain sectors on where to invest and whether to transfer advanced technologies. Table 5.1 reports results from the econometric estimation of a model of FDI and patent rights (Maskus 1998).⁶ Using the Ginarte-Park index, there was a negative elasticity of FDI assets with respect to patents in high-income economies, but a strongly positive elasticity among developing economies. Applying these impacts to anticipated changes in patent laws from TRIPS generates the estimated impacts on asset stocks in column 2. Reductions in asset stocks in Japan and Canada would amount to over \$2 billion, for example.⁷ However, FDI assets would rise significantly in Brazil, Mexico, Chile, and Indonesia as a result of stronger patents. Indeed, the increase in the Mexican FDI assets would be 2.6 percent of the 1994 stock of U.S.-owned assets in that country, and in Brazil that would be 7.4 percent. Note that these figures related solely to U.S.-owned assets. If multinational firms headquartered in other developed nations were to react similarly, there would be even larger increases in overall inward FDI stocks.

Other studies of FDI and intellectual property protection bear mixed messages. Lee and Mansfield (1996) statistically related the in-

Table 5.1 TRIPS: who gains?

Estimated changes in Payments for Technology and in FDI Flows for selected countries for full application of TRIPS (millions of 2000 dollars)

Country	Net patent rents	U.S. receipts from	
		U.S.-owned FDI Assets	Unaffiliated Royalties and License Fees
United States	19,083	n/a	n/a
Germany	6,768	-1,180	100
Switzerland	2,000	-102	0
France	3,326	n/a	n/a
Australia	1,097	-279	2
Ireland	18	-267	14
New Zealand	-2,204	-83	4
Portugal	-282	97	n/a
Greece	-7,746	51	n/a
Netherlands	241	-1,503	32
Spain	-4,716	-341	47
Japan	5,673	-2,533	783
United Kingdom	2,968	-1,369	29
Canada	-574	-2,396	69
Panama	n/a	309	n/a
Israel	-3,879	6	0.6
Colombia	n/a	1,190	n/a
South Africa	-11	25	11
Rep. of Korea	-15,333	270	388
Mexico	-2,550	3,465	148
India	-903	139	63
Brazil	-530	3,505	124
Argentina	n/a	721	64
Chile	n/a	1,062	n/a
China	-5,121	687	n/a
Indonesia	n/a	1,966	181

Source: World Bank staff and Maskus (2000a). Figures for net patent rents update McCalman's (2001) coefficients applied to 1995 data. Calculations for the stock of FDI assets use coefficients from an econometric analysis of the impacts of patent rights on patent applications, affiliate sales, exports, and affiliate assets, using data over 1986-94 for the foreign operations of U.S. majority-owned manufacturing affiliates in several developed and developing countries. These coefficients were applied to 1994 asset stocks and updated to year 2000 dollars. Computations for royalties and license fees use coefficients from an econometric analysis of the effects of patent rights on U.S. licensing volumes in manufacturing for 26 countries in 1985, 1990, and 1995. These coefficients were applied to 1995 royalty fees and updated to year 2000 dollars.

vestment decisions of U.S. multinational enterprises to their perceptions of the weaknesses of IPRs in a sample of developing countries. They found that FDI is negatively affected by weak protection. Using firm-level data, Smarzynska (2001) discovered that foreign investors considering operations in the countries of Eastern Europe and the Former

Soviet Union pay attention to patent rights. In particular, investment in technology-intensive sectors is deterred by weak protection; in all sectors weak protection discourages investment in production facilities but does not deter investment in distribution. Smith (2001) also found that international FDI flows are positively related to IP protection. Using a different econometric approach, however, Fink (1997) could not detect a significant impact of patent rights on various measures of FDI activity by U.S. or German multinational enterprises. Thus, there remains statistical ambiguity about the nature of the relationships between IPRs and FDI, though most studies suggest it is positive.

Yang and Maskus (2001) studied technology licensing. The figures in the last column of table 5.1 update their results of estimating the impacts of international variations in patent rights on the volume of unaffiliated royalties and licensing fees (a measure of arm's length technology transfer) paid to U.S. firms. Japan had a large absolute response, reflecting the importance of licensing in the Japanese economy. However, large impacts were also discovered in the Republic of Korea, Mexico, Brazil, and Indonesia. Indeed the analysis suggested that licensing volumes would double in Mexico and India, and would go up by a factor of nearly five in Indonesia.

The findings discussed here are econometric predictions of long-run impacts of patent reforms on imports, FDI, and market-based technology transfer. The figures are not definitive but do support the view that stronger IPRs could have potentially significant and positive impacts on the transfer of technology to developing countries. This conclusion is strongest for middle-income developing countries. The results are less positive for the least-developed economies, where the potential for market-power effects looms larger.

IPRs and innovation in developing countries

Developing nations also hope that stronger intellectual property protection could encour-

age domestic innovation, product development, and technical change. It is possible to structure IPR systems in ways that promote dynamic competition through technology adaptation, learning, and follow-on innovation. However, many developing countries have regimes that favor imitation of foreign products and technologies and discourage domestic technical change. Indeed, inadequate IPRs can limit innovation even at low levels of economic development. This is because much invention and product development are aimed at local markets and could benefit from domestic protection of patents, utility models, and trade secrets (see box 5.1). In the vast majority of cases, invention involves minor adaptations of existing technologies and products. The cumulative impacts of these small inventions can be critical for growth in knowledge and productive activity.

An example is that protection for utility models (or "petty patents")—minor adaptations to existing technologies—improved productivity in some countries (Evenson and Westphal 1997). In Brazil, utility models helped domestic producers gain a significant share of the farm machinery market by encouraging adaptation of foreign technologies to local conditions. Utility models in the Philippines encouraged successful adaptive invention of rice threshers.

In another example, the Japanese patent system (JPS) affected postwar Japanese technical progress (Maskus and McDaniel 1999). The JPS in place over the period 1960–93 was designed to encourage incremental and adaptive innovation and diffusion of technical knowledge into the economy. It stimulated large numbers of utility model applications, which were based in part on published prior applications for invention patents. In that study utility models had a strongly positive impact on real TFP growth over the period, because they were an important source of technical change and information diffusion. It is interesting to note that as Japan has become a global leader in technology creation, its patent system has shifted away from encouraging diffusion and more toward protecting fundamental technologies.

If constructed well, IPRs also stimulate acquisition and dissemination of new information. *Patent* claims are published, allowing rival firms to use the information in them to develop further inventions. A recent study on *trademark* use in Lebanon suggests that innovation through product development and the entry of new firms is motivated in part by trademark protection, even in poor nations (Maskus 2000b). Firms in the Lebanese apparel industry are capable of designing clothing of high quality and style aimed at Middle Eastern markets. Their efforts have been frustrated by trademark infringement in Lebanon and in neighboring countries. Firms in the food products sector suffered from rivals passing off goods under their trademarks. The problem has restrained attempts to build markets for Lebanese foods in the Middle East and elsewhere. Related difficulties plagued innovative producers in the cosmetics, pharmaceuticals, and other sectors. Thus, product development and enterprise growth have been stifled by trademark infringement targeted largely at domestic enterprises.⁸

Copyright protection can induce investments in creative activities and also stimulate innovation. Where protection is weak, such copyright industries as publishing, entertainment, and software are dominated by counterfeiting rather than domestic creation. Thus, lower-quality copies are widely available, but the economy's cultural and technological development may be hampered. For example, Lebanon has a small but vibrant film and television industry that could successfully export to neighboring economies if those countries adopted stronger copyright protection (Maskus 2000b). In the face of difficulties in expanding their markets, Chinese software enterprises are now playing a role in promoting enforcement (Maskus, Dougherty, and Mertha 1998). Finally, work in such countries as Jamaica and Senegal shows that weak copyrights and the absence of supporting institutions, such as professional collection societies, significantly reduce incentives for local musicians to record and market their compositions (World Bank 2000).

At the same time, in many poor countries, the effectiveness of all types of intellectual property instruments is held back by inadequate administration and enforcement procedures. These inadequacies may be due to corrupt and inflated bureaucracies or weaknesses in the legal system at large—frequently affecting also the security of real and physical property rights. Hence, a weak overall governance structure typically poses one of the biggest challenges to harnessing the positive contribution IPRs can make to the development process.

IPRs can boost growth prospects

The analysis reviewed here suggests that selecting appropriate IPRs systems could boost economic growth. History does not provide strong guidance on this hypothesis. At different times and in different regions of the world, countries have realized high rates of growth under varying degrees of IPRs protection.

Two recent empirical studies have considered this question in a cross-country econometric framework. Gould and Gruben (1996) related economic growth rates across many countries to a simple index of patent strength and other variables. They found no strong direct effects of patent rights on growth, but there was a significantly positive impact when those rights were interacted with a measure of openness to trade. The impact of stronger patent laws in open economies was to raise growth rates by 0.66 percent, on average. This suggests that market liberalization and IPRs jointly increase growth.

Park and Ginarte (1997) studied how IPRs affect growth and investment. They found no direct relation between patent strength and growth, but there was a strong and positive impact of patent rights on physical investment and R&D spending, which in turn raised growth rates.

While these results are encouraging, the link between IPRs and long-term economic growth remains poorly understood, and is likely to remain controversial. More research is necessary to provide better guidance to policymakers.

Costs of enforcing IPRs

While developing countries may enjoy long-run gains from strengthening their systems, the transition to stronger protection involves short-run costs that are not trivial.

Administrative costs

It is costly to develop the administrative and enforcement mechanisms necessary to support a modern system of intellectual property protection. Costs include upgrading offices for registering and examining patents and trademarks, and for accepting deposits of plant materials; training examiners, judges, and lawyers; improving courts to manage intellectual property litigation; and training customs officers and undertaking border and domestic enforcement actions. The United Nations Conference on Trade and Development (UNCTAD 1996) provided some estimates of the administrative costs of complying with TRIPS in various developing countries. In Chile, additional fixed costs from this upgrade were estimated at \$718,000 and annual recurrent costs at \$837,000. Egyptian fixed costs would be perhaps \$800,000, with additional annual training costs of around \$1 million. Bangladesh anticipated one-time costs of administrative TRIPS compliance (drafting legislation) amounting to \$250,000, and over \$1.1 million in annual costs for judicial work, equipment, and enforcement efforts. If training costs were included it is likely that a comprehensive upgrade of the IPRs regime in the poorest countries could require an up-front expenditure of \$1.5 to \$2 million, plus recurrent costs. Finger and Schuler (1999) report World Bank surveys finding that these costs could be far higher.

Given other pressing needs in education, health, and policy reform it is questionable whether the least-developed countries would be willing to absorb these costs, or indeed whether they would achieve much social payoff from investing in them. Moreover, note that poor countries are extremely scarce in trained administrators and judges, suggesting that one of the largest costs would be to divert scarce professional and technical resources out of potentially

more productive activities. Indeed, in many poor countries, devoting more resources to the protection of tangible property rights, such as land, could benefit poor people more directly than the protection of intellectual property.

Three factors could help offset these costs. First, intellectual property offices may charge fees to defray their costs. Fees should be set to meet the innovation and commercialization needs of each country. Second, poor countries may petition for technical and financial assistance from industrial countries and from the World Intellectual Property Organization (WIPO) and the WTO. Unfortunately, the resources available are small in relation to the underlying needs. Third, authorities may take advantage of cooperative international agreements to reduce administrative costs. Membership in the Patent Cooperation Treaty, for example, provides significant economies because examiners may read the opinions made by major patent offices about novelty and industrial applicability, rather than undertake such technical examinations themselves.

Rent transfers

Patents are overwhelmingly owned by inventors in the industrialized countries. For example in Mexico in 1996, only 389 patent applications came from domestic residents, while over 30,000 came from foreign residents, mostly in the United States and the EU. Brazil's domestic applications were just 8 percent of total applications in that same year. In the poorest countries virtually no patents are granted to domestic residents. As patent rights are strengthened, this relative imbalance could be reversed to some degree, particularly in countries that develop innovation systems and inventive enterprises. However, inventors from developed countries are expected to apply for most patents for the foreseeable future.

As patents and trade secrets are better protected, imitation costs rise and the ability of patent holders to set higher prices and license and royalty fees is enhanced. Thus, one impact of TRIPS will be to transfer economic rents from technology importers to technology developers.

Suggestive evidence is provided in table 5.1. Firms own patents in various countries, the values of which depend on local protection and market size. In an interesting study, McCalman (2001) used an econometric model to compute the value of these patents in 1988. World Bank staff used his methods and regression coefficients to compute the values of international patents among 28 nations in 1995, using the Ginarte-Park patent index, patent applications, and GNP levels. Note that both patent applications and GNP had reached far higher levels in the later year, thereby raising the value of patent portfolios. To assess the change in patent rents associated with stronger IP protection, the index for each country was increased to reflect obligations accepted in the TRIPS Agreement.

The figures in the first column of table 5.1 show that overwhelmingly the United States would gain the most income in terms of static rent transfers, with a net inflow of some \$19.1 billion per year. U.S.-headquartered firms owned numerous patents in many countries that were required by TRIPS to strengthen their intellectual property protection, while U.S. law was subject to little change. Germany would earn an additional net income of \$6.7 billion on its patent portfolio. Many countries would experience a rising net outflow of patent rents because they tend to be net technology importers. Korea would register the largest net outward transfer of some \$15.3 billion because of the large rise in volume of patents registered there. Developing countries also would pay more on their patent stocks, with China experiencing a net outward transfer of around \$5.1 billion per year. These calculations are static and ask only what the additional income on existing patents would have been under TRIPS. They suggest that TRIPS could have a significant impact on net incomes earned from foreign patents.

Prices of patented drugs

By January 1, 2005, developing countries must provide patents for new pharmaceutical products and most have already implemented pa-

tents or exclusive marketing rights. Nothing is more controversial in TRIPS. It is conceivable that patent protection will increase incentives for R&D into treatments for diseases of particular concern to poor countries. However because purchasing power is so limited in the poorest countries, there is little reason to expect a significant boost in such R&D. Accordingly, many developing countries see little potential benefit from introducing patents.

In contrast, potential costs could be significant. Pharmaceutical supplies in many developing countries often come from domestic or imported generic competition. Such competition for drugs on patents in the industrialized countries helps sharply lower drug costs in developing nations with active pharmaceutical industries. In the future, enterprises in these countries must wait until patent expiration before they can compete with generic versions, or else must produce under license to patent holders. It should be noted that if firms choose not to register patents in certain countries, this issue will not arise.

There is some scope for stronger patents to encourage local firms to develop patentable drugs themselves. Several Indian enterprises claim to be developing treatments that may be patentable abroad, although they currently refuse to place them on the Indian market for fear of imitation.⁹ In most cases, however, local enterprises will come under pressure to close down or form alliances with larger firms, resulting in a concentration of the industry. There is evidence that patents generate considerably higher prices for protected drugs than for copied and generic drugs (Lanjouw 1998; Fink 2001). Watal (1999) computed that static price impacts of patent coverage in India could raise average patented drug prices by at least 26 percent from a 1994 base.

In light of this possibility, developing countries need to gird themselves with policies that, while consistent with TRIPS, bear potential to moderate the price impacts of new patents. Recent attempts by South Africa and Brazil to push the boundaries of TRIPS in this regard have proven contentious, as discussed in box 5.2.

Box 5.2 Pharmaceutical policies and the limits of TRIPS

In response to TRIPS, South Africa and Brazil recently introduced new laws bearing directly on the ability of those countries to react to price increases that may emerge from patents. The greatest spur to these attempts to limit patent rights came from a desire to procure AIDS drugs at affordable prices in order to manage that enormous health-care crisis. Both laws are controversial.

South African Medicines Law

In November 1997 South Africa enacted significant amendments to the Medicine and Related Substances Control Act. The amendments permit the health minister to revoke pharmaceutical patent rights in South Africa if he deems the associated medicines to be too expensive. They further empower the minister to order compulsory licensing if the patentee engages in abusive practices, defined basically as a failure to sell a drug in adequate amounts to meet demand, or a refusal to license the product on reasonable terms so that domestic firms may meet demand. They also permit parallel importation (imports of original or generic versions without the authorization of the South African patent holder) of drugs, and allow the health minister to override regulatory decisions concerning the safety and registration of medicines. The law requires pharmacists to employ generic substitution (prescribe generic versions of patented drugs) unless the doctor or patient forbids it, sets limits on pharmacy markup rates, and bans in-kind inducements from drug manufacturers to physicians.

While it may be a heavy dose of regulation, South Africa's law is probably consistent with TRIPS (Abbott 2000). While some legal scholars claim that patent rights necessarily extend to an ability to preclude parallel imports, the bulk of opinion is that Article Six of TRIPS provides full latitude for each country to choose its own policy on exhaustion. Beyond this issue, Article 31 of TRIPS provides ample grounds under which compulsory licenses may be issued, subject to certain conditions (Watal 2001). In particular, licensing may be compelled where a prospective user has failed to achieve a license from the patent holder on reasonable commercial terms within a reasonable period of time, so long as market-based compensation is paid. Compulsory

licenses may be issued without observing even these constraints in cases of national emergency. Finally, the price-control provisions of the South African amendments do not seem to be restrained by TRIPS, which does not address domestic health regulation.

Brazilian Industrial Property Law

Brazil passed an industrial property law (Law No. 9,279) that came into effect in 1997. The law updated most aspects of Brazil's industrial property regime to comply with TRIPS. It provides patents for pharmaceutical products as required. However, it permits the issuance of compulsory licenses in cases where patent holders choose to supply the market through imports rather than local production. That is, Brazil's law does not recognize imports as a method for meeting its "working requirements" on the Brazilian market. The legislation explicitly defines "failure to be worked" as "failure to manufacture or incomplete manufacture the product" or "failure to make full use of the patented process." While the Brazilian industrial property law refers to all patents, its most aggressive use is aimed at transferring production of AIDS drugs to domestic firms and government agencies in order to reduce their prices below those on the U.S. and European markets. Media reports indicate that this active intervention has dramatically reduced treatment costs in Brazil.¹⁰ In combination with prevention programs and effective methods for distribution and clinical stays, the country has limited AIDS mortality to far lower levels than those in Sub-Saharan Africa.

It remains to be seen whether Brazil's insistence on local production as a working requirement may be sustained within TRIPS. Because it applies to all patented items and not solely to medicines, the law may generate less sympathy among the WTO membership than the South African law, despite its evident value as a threat to bring down prices. In negotiating TRIPS, patent advocates strongly favored an end to domestic production requirements, lending support to the American view on their inconsistency.

Source: World Bank staff.

Agricultural inputs

Under TRIPS, patents must be awarded to agricultural chemicals and biotechnological inventions, and effective protection must be provided for plant breeders' rights (PBRs). Because farming is the mainstay of economic activity in many developing countries, policies that increase costs of key agricultural inputs could be damaging. Plant strains bioengineered for pest- and drought-resistance are of particular interest to many developing countries. Note that plant patents preclude the breeder's research exemption and, unless explicitly allowed for in the rules, also the farmer's privilege to retain seeds for replanting. Experience from Latin America suggests that providing PBRs while retaining this privilege does not much disadvantage farmers (Maskus 2000a).

Genetic materials and indigenous knowledge

Because firms can attain patents in some industrialized countries on products developed from plant and animal resources they find anywhere, incentives exist to extract such materials as sources for new drugs, food products, and cosmetics. New patents in developing countries will increase such incentives. This "bioprospecting" raises several concerns. First, foreign patents have been awarded to products and formulas that were already known in the source countries, or were simple improvements, preventing those with the original know-how from marketing abroad (Duran and Michalopoulos 1999). Second, genetic materials often do not bear adequate property rights. Plants may be extracted from public lands or from farms and villages that cannot assert ownership or represent collective interests. The resources may be acquired without compensation or attention to socially optimal extraction rates.

There is much know-how in developing countries among tribes, villagers, and other collective units about how to produce foodstuffs, apparel designs, and artistic works. Because the knowledge is a collective good, and therefore of uncertain ownership, it has proven difficult to

apply standard intellectual property tools to its protection. Many such products and designs have found their way into international commerce under protection in foreign countries, however, as firms abroad copy and register them.

These problems point to a shortcoming in TRIPS. That agreement makes it clear that inventions from genetic resources are patentable except in unusual circumstances. However, it is silent on the issue of how nations may regulate their extraction, an issue in which IPRs are only one consideration. Similarly, it contains no provisions for defining and protecting rights in collective knowledge. It is important for the global community to work out appropriate mechanisms for ensuring the appropriate valuation of resources and knowledge and for effecting payments that both conserve the materials and provide incentives for efficient innovation.

IPRs policies for promoting development

Despite the significant costs, stronger intellectual property protection could produce gains in the long run through greater domestic innovative activity and cultural creation, profitable international exploitation of that activity, enhanced structural transformation, and increased technology transfer. These gains are more likely to materialize if countries adopt standards and supporting policy regimes that promote competitive processes on their markets.

IPRs standards at varying levels of development—

TRIPS prevents countries from discriminating between domestic and foreign firms in the treatment of IPRs. Beyond this basic stipulation, however, TRIPS contains considerable flexibility in implementing and enforcing standards that are conducive to development. One important principle of a pro-competitive development of IPRs policy is that the standards adopted tilt the balance in favor of second-coming rival firms. A second principle is that governments should not discourage inward

transfer of technology and should not suffocate innovative efforts of domestic firms. The essential goal is to move local entrepreneurs from “free-riders” to “fair-followers” in Reichman’s apt phrase.¹¹

Table 5.2 divides developing countries into three types and lists IPRs standards that are likely to be most appropriate for each group.¹² The first country type is low-income nations, or the least-developed countries and some countries in transition, which have weak environments for advanced invention but some capability at small-scale innovation and cultural creation. The second is middle-income nations, which have a strong imitative capacity and a reasonable degree of human capital. Such countries need to encourage technology adoption and incremental innovation. The third is high-income nations, which have a strong human capital stock and a growing capacity for innovation. It is evident that as countries become more developed they may choose to strengthen their IPRs. Table 5.2 is only a guideline; individual countries may choose to pursue their own standards as interests require. This section analyzes possibilities for the low-income and middle-income nations.

—allowing poor countries the possibility of exemptions

While countries must meet the general obligations of TRIPS, there are some areas in which poor nations are afforded special status. Under Article 66, those least-developed countries experiencing difficulties in implementing legislation may petition the TRIPS Council for time extensions, and there is no specified limit on the number of such petitions. While it is important to consider carefully the signals a delay would send to the global community, some countries may wish to take advantage of it, particularly as regards the complex and controversial subject of patents.

Both low-income and middle-income countries would benefit from greater flows of technical and financial assistance to develop, implement, and enforce IPRs. Poor developing countries also should push the developed coun-

tries to do more to encourage private technology transfer. The weakness of such action to date remains a sore point leading some observers to question the balance of interests in TRIPS.

Administration

Administration and enforcement are costly. Authorities in low-income nations could achieve some gains by publicized raids and consumer awareness programs. While such actions would face opposition among infringing enterprises, they would signal some commitment to IPRs and also encourage domestic creative interests to become more active. The awareness itself may be the most valuable, and authorities could limit economic damages by imposing moderate penalties for first offenses, with the severity of the fines rising with the extent of the piracy and the number of violations.

Low-income countries cannot readily afford patent examination offices and should rely on patent registration instead. However, authorities need to consult international patent offices and databases to see if applications were denied elsewhere. Thus, developing countries would benefit from the cost savings of using foreign sources of information, such as the Patent Cooperation Treaty. Countries could also gain from adherence to regional examination systems. Electronic access to international patent and trademark registries also cuts costs of performing prior art examinations. As countries grow richer and technologically more sophisticated, the patent system could move toward domestic examinations.

Application and renewal fees for patents and trademarks may be set to cover the costs of administering those regimes. It is sensible to select fees in ways that promote desirable innovation and use of IPRs. It is possible, for example, to set lower patent application fees for small and medium enterprises than for large firms. Patent renewal fees may rise over time in order to encourage firms to let protection lapse on less-valuable inventions. This can be an important means of pushing technologies into the public domain.

Table 5.2 TRIPS-consistent IPRs standards: options for developing countries

Area of TRIPS	Low-Income	Middle-Income	High-Income
General transition periods	Consider Article 66 extensions in patents, trade secrets		
Assistance	Push for technical and financial assistance, including an international fund	Push for technical and financial assistance	
Technology transfer	Push for fulfillment of technology transfer commitments		Consider providing technology transfer
Administration Enforcement and customs	Reduce piracy and counterfeiting through raids and awareness Moderate fines and civil penalties Train customs officers for periodic inspections Upgrade professionalism	Reduce piracy and counterfeiting through raids and awareness Stronger fines and civil penalties Train customs officers for inspections on demand	Full enforcement Deterrent penalties
Judiciary	No special IP court Training for judges and attorneys	No special IP court Training for judges and attorneys	Consider special IP court
Patents Administration	Registration system Rely on international grants data Rapid and full disclosure Post-grant opposition Differential fees by applicant size Rising renewal fees	Registration or limited examination system Rely on international grants data Rapid and full disclosure Pre-grant opposition Differential fees by applicant size Rising renewal fees	Examination system Consult international grants data Full disclosure Pre-grant opposition More uniform fee Structure Rising renewal fees
Standards and scope	Fullest exemptions from patent eligibility High inventive step using rigorous international examinations Oral prior art considered Narrow claims Narrow or no doctrine of equivalents Permit experimental use	Broad exemptions from patent eligibility High inventive step Oral prior art considered Narrow claims Narrow doctrine of equivalents Permit experimental use	Consider appropriate exemptions Moderate inventive step Oral prior art considered Broader claims Broader doctrine of equivalents Permit experimental use
Compulsory licenses	National emergency use Public non-commercial use Antimonopoly tool	National emergency use Public non-commercial use Antimonopoly tool	National emergency use Antimonopoly tool
Working requirements	Permit imports to satisfy Liberal definition of demand	Permit imports to satisfy	Limited working requirements
Utility models	Recognize utility models	Recognize utility models	
Industrial designs	Recognize design rights Originality requirement Supplement with copyrights Nonvoluntary licenses of right	Recognize design rights Originality requirement Supplement with copyrights Non-voluntary licenses of right	Recognize design rights Originality and novelty Supplement with copyrights Nonvoluntary licenses of right
Plant breeders' rights	Provide PBRs Recognize farmers' privilege Permit breeders' exemption UPOV 1978 model with national treatment Public research and extension	Provide PBRs Recognize farmers' privilege Permit breeders' exemption UPOV 1991 model Public research and extension	Consider patents Limited exemptions for farmers Permit breeders' exemption UPOV 1991 model or patents Extension services

(continued)

Table 5.2 TRIPS-consistent IPRs standards: options for developing countries *(continued)*

Area of TRIPS	Low-Income	Middle-Income	High-Income
Biotechnology	Maintain exemptions from patentability Strict standards for patent eligibility Narrow claims Contracts for efficient and equitable extraction	Maintain exemptions from patentability Weaker standards for patent eligibility Broader claims Contracts for efficient and equitable extraction	Limited exemptions from patentability Weaker standards for patent eligibility Broader claims
Integrated circuits	TRIPS minimum standards	TRIPS minimum standards	TRIPS standards plus possible patents
Trademarks	Indefinite registration with rising renewal fees Registration contingent on use after 3 years Fair use of descriptive terms Register service marks Define sector broadly for which trademark is “well-known” Limits on protecting marks against dissimilar goods Protect domain names	Indefinite registration with rising renewal fees Registration contingent on use after 3–5 years Fair use of descriptive terms Register service marks Narrower definition Protect domain names	Indefinite registration Registration contingent on use after 5 years Register service marks Narrower definition Protect domain names
Geographical Indications (GI)	List generic and semi-generic names Registration system for indications to be protected Oppose or cancel registration of own GI abroad Push for common WTO list for wines and spirits Expand TRIPS protection for relevant products	List generic and semi-generic names Registration system for indications to be protected Oppose or cancel registration of own GI abroad Push for common WTO list for wines and spirits Expand TRIPS protection for relevant products	List generic and semi-generic names Registration system for indications to be protected Oppose or cancel registration of own GI abroad Push for common WTO list for wines and spirits Expand TRIPS protection for relevant products
Copyrights	Reduce piracy and raise awareness TRIPS minimum period Liberal fair use and compulsory licenses for education, research Reverse engineering in software Non-voluntary licenses of right in software Establish collection societies, contracts, infrastructure Identify copyrightable works Compliance with minimum standards in WIPO treaties Require creativity for data compilations	Reduce piracy TRIPS minimum period Liberal fair use and compulsory licenses for education, research Reverse engineering in software Non-voluntary licenses of right in software Improve infrastructure Compliance with minimum standards in WIPO treaties Require creativity for data compilations	Liberal fair use Permit patents under tight criteria Adopt WIPO treaties Require creativity for data compilations
Trade secrets and test data	Minimum definition of unlawful disclosure methods Limit employment restraints in hiring High standard for defining “new chemical entity” No period for excluding prior applicant’s test data	Moderate definition of unlawful disclosure methods Limit employment restraints in hiring High standard for defining “new chemical entity” Short period for excluding prior applicant’s test data	Moderate definition of unlawful disclosure More permissive toward employment restraints Longer period for excluding prior applicant’s test data

Source: World Bank staff.

Encouraging innovation

For reasons of promoting dynamic competition, developing countries should require rapid publication of patent applications (most of which will have been published elsewhere in any case), with full disclosure of the technical processes involved in producing the inventions, and how to reduce them to commercial practice. This should encourage local firms to invent around patents and use the disclosed knowledge to improve their manufacturing methods. Countries with a registration system should permit active opposition after grants are made, in order to invalidate inappropriately awarded patents. Those countries that undertake examination could permit pre-grant opposition.

Developing countries could permit oral prior art to defeat claims of novelty. They could also provide a limited grace period in order to maximize the inventions available in the public domain to domestic firms. Authorities could also preserve the rights of prior users of newly patented inventions to continue to use them with appropriate license fees.

For patents, countries could set high standards for the inventive step, thereby preventing routine discoveries from being patented. Regarding patent scope, it is sensible to exercise strict claims and discourage multiple claims in patent applications.

Under limited circumstances governments may resort to compulsory licensing to promote the public interest in health, welfare, security, competition, and other grounds. Low-income countries may wish to ensure that their patent legislation and health regulations permit the issuance of compulsory licenses in patented medicines under sharply defined conditions. In addition to being consistent with the requirements of TRIPS, compulsory licensing should be transparent and not arbitrary in order to avoid discouraging entry of foreign firms and development of new technologies by domestic firms. Compulsory licenses are available also as a primary restraint on monopolistic behavior. Indeed, the United States has an extensive record of compelling licensing from technology

owners to rival firms as a remedy for anticompetitive activity.

Protection for industrial designs can also promote innovation in developing countries. Providing rights to registered designs with a small novelty requirement, for a limited time period, can promote product innovation. Such rights may be supplemented in two ways. First, designs may be protected under copyright law, even without registration. Second, countries could experiment with systems in which, after a shorter defined period of protection, rivals are able to acquire licenses to use the designs in their own work.

Protection of plant varieties remains controversial. When establishing PBRs, poor countries would be advised to follow the UPOV 1978 model,¹³ providing the farmers' privilege and a wide exemption for rival breeders to use protected seeds to develop their own strains. There is a role for public agencies to undertake research and disseminate new seed varieties. Middle-income economies are seeing development of plant breeders, and there are potential gains from protection.

In biotechnology, lower-income economies may prefer to recognize narrow patent claims and retain exemptions from patentability where allowed by TRIPS. Countries with stronger industries, such as China and Brazil, might award stronger protection in order to promote technology transfer and domestic invention.

Recognition of trademarks can promote domestic enterprise development. In developing countries it is often domestic entrepreneurs who are frustrated in building their enterprises because their marks are infringed by inferior products. This problem raises confusion on the part of consumers about the inherent quality of commodities they wish to purchase. Thus, recognition of trademarks can be an important development spur, even for poor countries.

Geographical indications may be of particular interest to numerous developing countries. Again, such indications reflect the quality characteristics of products coming from a particular location. Because many developing nations have a comparative advantage in agricultural

products and processed foods and beverages, significant gains could be realized from registration of such place names. This is one area in which developing countries might be advised to push for extended global standards.

Cultural resources—including folkloric arts, designs, and traditional remedies—could be protected by a combination of copyright and trademark principles. The difficulty here is that such resources are often collective knowledge and effectively in the public domain. Efforts are needed to work out appropriate standards for protecting such knowledge and the economic advantages that can be earned from it.

A distinction should be made between straightforward duplication of published and recorded goods—also called piracy—and access to new information. While the former activities only yield short-run benefits, they do little to enhance the technological capabilities of copying nations.

Countries are free to determine the fair-use exceptions they will permit in the copyright area. Copyrighted materials may be made available on a limited and noncommercial basis for use in teaching, research, libraries, museums, and charitable organizations. Indeed, the preamble to the 1996 WIPO Copyright Treaty contains language promoting this balance of interests and encouraging nations to carry forward such limitations into the digital network environment.

TRIPS requires copyright protection for data compilations. The EU has gone well beyond TRIPS' standards in specifying strong protection for databases even when their compilation involves no creative step. Developing countries should insist upon a demonstration of creativity before recognizing such protection.

Recognition of the need to protect confidential business information can also be pro-competitive. A natural lead-time is provided to the owners of trade secrets because rivals must invest in learning the technical information they embody. This effort can contribute to the technical knowledge capital of an economy and encourage follow-on innovation. Follow-

ers may prefer to acquire trade secrets by purchasing licenses from the originator, thereby paying some share of the invention rents and raising incentives for future inventive activity. Trade secrets are also instrumental in encouraging technology transfer from abroad.

Poor nations would be advised to adopt the least stringent regulations set out in the Paris Convention and perhaps also actively encourage technology transfer. Middle-income countries could establish more protective regimes, for example by imposing more stringent requirements on technical employees who are induced to change employment.

Governments have some obligation to prevent the public disclosure of confidential test data submitted for approval of medicines and agricultural chemicals for some period. Developing countries could establish a high standard for what constitutes a new chemical entity and deny such protection to simple reformulations or repackaging. For those submissions meeting the originality test, data need to be protected, even though denying such information to rivals would extend the time before generic competition ensues.

Other policies can support technological progress

While the standards sketched above are important in promoting competition and innovation, simply adopting a stronger set of IPRs cannot be sufficient to ensure a positive outcome. Intellectual property protection is but a component of broader business regulation, innovation promotion, and consumer protection that must be conjoined in an effective overall system.¹⁴

Perhaps the most important complementary factor is a commitment to *education*, training, and skill development. The positive role of educational attainment in economic growth is well established empirically. It is plausible that a positive relationship exists between the strength of IPRs and the level (or growth) of human capital, given the results reviewed earlier.

Economies that are more *open to trade* and FDI experience a growth premium from strengthening their IPRs relative to closed economies. Competitive markets help limit the scope of intellectual property rights to their intended function, which is to encourage investments in new products but not to prevent fair entry. In addition, a liberal stance on inward trade and FDI improves a country's access to available international technologies, intermediate inputs, and producer services. As discussed earlier, IPRs are a factor that encourages inward FDI under appropriate conditions.

Making IPRs stronger invites consideration of *competition rules* to discipline anticompetitive practices. To abuse an intellectual property right is to try to extend its exclusive use beyond permissible limits. Claims that a rights holder has engaged in anticompetitive behavior are complex, and resolving them requires significant judicial and legal expertise. Administrative costs may limit a country's ability to undertake competition enforcement but the issue is sufficiently important to merit a high priority.¹⁵

IPRs need to be supplemented by *programs to promote national technical change*. However, there are opportunity costs to the allocation of scarce budgetary resources to R&D programs. To the extent that investment in product development is underprovided by the private market, there is a rationale for public assistance. The limited R&D could be caused by such factors as an inadequate environment for risk-taking, taxation systems that fail to recognize R&D as a business cost, and missing information about technological opportunities. Policies could aim to relax such restraints. This could be particularly important for small- and medium-size enterprises, which remain the source of much innovation in developing countries.

Multilateral actions and IPRs in a development round

The TRIPS Agreement ushered in a new global regime for protecting intellectual property. There are numerous means by which

developing countries may benefit from this change, at least in the long run, although there are bound to be significant short-run costs. However in the short run, the developed countries are likely to be the primary beneficiaries. Moreover the introduction of global IPRs into such areas as pharmaceutical products, agricultural inputs, biotechnology, environmental technologies, and electronic databases has serious development consequences that merit careful consideration. This situation suggests policies in three general areas:

1. Collective international actions that can be combined with the new protection regime to help achieve important public goods
2. Ways developed countries can ease the transition burden for poor countries
3. Approaches to IPRs that developing countries could take in the "Development Round"

International collective goods

The new global IPRs system could affect the willingness and ability of the international community to find effective solutions to a number of critical public-goods problems. Consider three of the most important issues.

First, the health status of impoverished people in the least-developed countries continues to deteriorate. Beyond the debilitating costs diseases impose on patients, medical systems, and government budgets, it has spillover effects on other countries through exposure to infection and reduced productivity. A role for public intervention exists in resolving the crisis.

By requiring countries to provide patents for new pharmaceutical products, TRIPS sets up incentives that may work at cross-purposes. By slowing down generic competition, patents could raise prices of new drugs in developing countries and reduce the ability of patients to acquire drugs at reasonable cost. At the same time, the promise of wider and stronger patent protection could raise incentives for private pharmaceutical firms to engage in more R&D into the diseases of poverty. There is little private research undertaken in

such diseases (Sachs and others 1999). This situation stems from both the absence of patent protection and the extremely low purchasing power of patients in poor countries. TRIPS affords a solution to the former problem but not to the latter. Consequently, TRIPS could raise costs without providing much incentive for innovation.

Effectively addressing the diseases endemic to poor countries requires separation of the dynamic incentives for R&D from the need for widespread distribution at low cost.

Any comprehensive solution to the problem requires significant increases in foreign assistance from industrialized countries and financial support from multilateral organizations and private donors. These resources would be used for two purposes. One is to provide an incentive to firms to engage in R&D into new and effective vaccines and medicines. This incentive could involve purchasing targeted drugs at negotiated prices or paying royalties for licenses that permit designated countries to produce and distribute them. By their recent actions in the area of HIV/AIDS drugs, pharmaceutical firms have indicated a willingness to sell medicines cheaply, provided that exports back to developed countries, where prices would be higher, are prevented. The other task is to fund the development of effective health-care delivery systems in poor countries.

A second issue relates to incentives set up by TRIPS to extract biogenetic resources from developing countries. In principle contracts could be devised to manage extraction of genetic materials. However it is not easy to determine appropriate royalties when the resources are developed in areas without clear rights in natural property. Ownership may be collective within a village or even undefined.

Thus contracts need to be developed that pay attention to both private incentives and public objectives. A role for governments arises here to ensure equitable and efficient sharing of the economic rents to IPRs earned on products from extraction of domestic resources. For example, some countries now require firms

to demonstrate that they have attained the approval of local villages before going bio-prospecting or removing resources.

A third issue is how TRIPS affects incentives to develop new transgenic crops through biotechnological research. Widespread introduction of new crops raises concerns about biodiversity. The rapid increase in output of genetically modified plants attests to their advantages in terms of enhanced disease resistance, reduced use of chemical inputs, and higher yields. It also suggests that traditional varieties could be pushed out of the market. IPRs provide incentives for producing better crops but ultimately might limit consumer choice.

It makes little economic sense to retard incentives for developing new plants and food products by restricting exploitation of IPRs beyond their usual limitations. A more promising and direct approach would be labeling programs that permit consumers to express preferences for traditional crops and provide market incentives to sustain their production. Further if the disappearance of plant varieties were seen as potentially damaging in environmental terms, an argument would exist for domestic and international public agencies to stockpile such strains for purposes of keeping them alive as a form of social insurance.

To some extent the global IPRs system is inconsistent with public interests in resource conservation and biodiversity. For example, the United Nations Convention on Biological Diversity stipulates that countries have sovereign rights over biological resources, while TRIPS recognizes private rights to own microorganisms and microbiological processes. Developing countries that are the sources of genetic resources and natural plant strains need to assess their interests in revising TRIPS to deal with this inconsistency. If Article 27 of TRIPS (dealing with patents in life forms and protection for plant varieties) is revised, many developing countries should push for a resolution of the concept of resource rights and collective ownership, along with the obligations of firms that extract resources. Thus for example, countries could push to forbid patents

on plant-based products obtained from materials in international germplasm banks and other deposit institutions.

In many of these new areas, the legal and technical expertise needed to design carefully balanced intellectual property and related regulations is likely to exceed the capacities of least-developed countries and even middle-income countries. Multilateral assistance can play an important role in ensuring that policies promote development and in complementing direct funding for research on technologies addressing poor country needs.

Policy options for developed countries on TRIPS

Technology-exporting countries have a strong interest in sustaining TRIPS. Because of systemic difficulties among developing countries in adjusting to the new obligations and concerns about its implications, industrialized nations could consider several options to make the agreement more directly supportive of development.

First, in recognition of extreme budgetary and institutional difficulties, least-developed countries should be afforded latitude in exercising delays in implementation of TRIPS, especially in the technically complex and controversial areas of pharmaceutical patents and plant protection. Similarly, noncompliance problems should not be the subject of dispute resolution unless they constitute willful departures from basic TRIPS obligations.

Second, it should be recognized that developing countries need to have lower and more flexible IPRs standards than do their developed counterparts. TRIPS provides such flexibility in many areas and the developing countries should be afforded the opportunity to operate at the lower limits if it is in their development interests to do so.

Third, developed countries could go a long way toward raising enthusiasm for TRIPS if they would actively implement their “best efforts” commitments to encourage technology transfer to the least-developed countries and to provide technical and financial assistance for developing countries. While some assistance is

on offer now, it is insufficient for the major job of reforming IPRs administration. The current approach, whereby grants are made to such organizations as WIPO and UNCTAD for undertaking specific projects, is inadequate given various bureaucratic constraints.

A valid justification for expanding assistance is found in the asymmetric costs and benefits from TRIPS. Intellectual property developers in rich countries stand to be the primary gainers from the new systems, while there is little promise of gains for poor countries, at least for a considerable period of time. It could also be a wise investment in promoting compliance with TRIPS and enforcement of IPRs, which might otherwise emerge only slowly. Thus, developed countries could convert their “best efforts” promises to binding commitments, with benefits on both sides.

Finally, the most important action developed countries could take to affirm confidence in TRIPS is to meet and expand their obligations to provide greater market access for the exports of developing countries. Especially important would be new attempts to reduce barriers to agricultural trade, which would greatly benefit many developing nations. Moreover, agricultural liberalization would raise the incentives of firms in developing countries to invest in new agricultural technologies protected by IPRs, thereby cementing faith in TRIPS.

Developing countries and TRIPS reform

The interests of developing countries in altering or extending TRIPS vary greatly because, in part, they have different levels of income and technological sophistication. To rebalance the agreement in some measure toward the interests of the poorest countries, while allowing for the quite diverse circumstances of countries, would help promote development.

First, extending the transition periods beyond 2005 for the least-developed countries would ease their administrative burdens. Although they have a limited opt-out procedure as discussed earlier, a general recognition by the WTO membership of needs for extensions could be beneficial in avoiding disputes. Such extensions should

be accompanied by serious commitments to work toward ultimate implementation.

Second, the low-income and middle-income countries should weigh carefully the introduction into TRIPS of significant new protection for IPRs that would reduce their access to information and technology. Extending patents in biotechnology to additional life forms and to plant variety protection could impose significant costs on developing countries, as would any attempt to globalize the highly protective database systems in place in the European Union or under contemplation in the United States. Another form of protection to weigh carefully is patents for software and methods for doing business. Similarly, erecting global restraints on parallel trade might have adverse potential competitive effects on future prices. On the other hand, many developing countries have economic interests in extending protection for geographical indications to their food products and handicrafts. This may help to ensure that valuable geographic indications do not become generic terms. Further, there are sound reasons for introducing the WIPO Copyright and Phonograms Treaties into TRIPS obligations, so long as they retain flexibility for establishing liberal fair use of Internet transmissions.

Third, despite proposals to remove from patent eligibility those drugs that are on, or will be on, the WHO "Essential Drugs" list, it is unlikely that such discrimination by product would be acceptable and, moreover, it could significantly reduce incentives to develop critical new drugs. A better alternative, discussed above, is to use public funds to purchase drugs or licenses. So long as the financial offers cover anticipated R&D costs the incentives to develop new drugs would improve.

Fourth, current TRIPS rules may not allow governments to grant a compulsory license to foreign firms, and may not permit firms producing under compulsory licenses to export much of their production.¹⁶ This situation threatens to raise the costs of drugs in countries where domestic production capacities cannot ensure adequate supply of essential medicines. A revision of the Agreement in this regard may

be necessary to permit small, poor, countries the right to import from foreign producers offering low-cost or generic products prior to patent expiration. Such a provision would provide greater flexibility in addressing public health crises. Even if such licenses may not actually be granted, the option itself would likely increase the bargaining power of governments with regard to pharmaceutical multinationals.

Fifth, many developing countries are interested in establishing new forms of IPRs over collective and traditional knowledge. Such knowledge covers literary creations, such as oral histories, artistic works, music, designs, pharmaceutical preparations, and methods of production. It is difficult to protect these items with traditional IPRs precisely because they are traditional (and therefore not novel) and collectively known, without easily assigned property rights. Thus, development of new rights, combining elements of trademarks, copyrights, and trade secrets along with *sui generis* recognition of traditional practices, could be beneficial. A global principle that patents are not available for items that had been known to the public by means of oral tradition or written description also would be beneficial for poor countries. Coordinated public efforts may be required to catalogue these pieces of traditional information.

As these final comments suggest, IPRs evolve dynamically over time to meet the needs of inventors and creators in market economies. The TRIPS Agreement significantly increased the requirements for protecting intellectual property incumbent upon nations that wish to be part of the global trading system. While promising some eventual benefits, the new regime is asymmetric in its likely effects across countries. Low-income economies may expect to incur net costs for some time, suggesting that patience and assistance are needed, along with programs to limit potentially negative effects in such areas as new medicines. The picture in middle-income economies is more complex as they feature a mix of interests between intellectual property developers, users, and imitators. Experience with the negotiation and

implementation of TRIPS should improve the ability of developing countries to participate effectively in the further evolution of international norms.

Notes

1. It is difficult to quantify the strength of IPRs because they are rules concerning conditions of dynamic competition rather than taxes or subsidies applied to particular sectors. Moreover, those rules have different impacts under different economic circumstances.

2. This material is summarized from Maskus 2000a.

3. Controlling for other influences, there is a quadratic (U-shaped) statistical relationship between the strength of patent rights and real per capita GDP. Specifically, patent rights become weaker as incomes grow to a level of approximately \$2,000 per capita in 1985 international dollars (\$3,000 today assuming an average growth rate of 2.5 percent), then become increasingly stronger as countries get richer.

4. China has largely met TRIPS requirements in its legislation in anticipation of joining the WTO.

5. Smith (1999) found a similar outcome.

6. The figures in column 2 of table 5.1 use coefficients developed in a four-equation simultaneous decision framework, which incorporated the impacts of patent rights on patent applications, affiliate sales, exports, and affiliate assets. The model was estimated with data from 1986 to 1994 for the foreign operations of U.S. majority-owned manufacturing affiliates in several developed and developing countries. The assets equation had a negative coefficient on patent rights, suggesting that, on average, across countries stronger patents would diminish the local asset stock. However, there was a large positive coefficient on patents interacted with an indicator variable for developing countries, resulting in a positive and significant net impact in those nations. This result likely means that at low protection levels internalization decisions encourage FDI as patents get stronger. However, as protection exceeds some level there emerges a substitution effect favoring licensing over investment.

7. One possible explanation for this negative impact is that firms may exploit their IPRs in richer countries relatively more through arm's length licensing relationships. Indeed, economic theory suggests that as IPRs are strengthened, firms would choose to substitute licensing contracts for FDI (Horstmann and Markusen 1987).

8. Similar problems exist in China (Maskus, Dougherty, and Mertha 1998). Interviews suggested that trademark infringement negatively affected innovative Chinese enterprises. Numerous cases were cited of difficulties facing Chinese producers of consumer goods. Establishing brand recognition in China requires

costly investments in marketing and distribution channels; enterprises that achieved it found their trademarks applied to counterfeit products. Such products were of lower quality and damaged the reputation of the legitimate enterprise. This problem deterred enterprise development and prevented interregional marketing.

9. *The Economist*, June 22, 2001.

10. *New York Times*, "Look at Brazil," January 28, 2001.

11. See Reichman 1996/1997, which provides the basis for some of the analysis in this section. See also Watal 2001.

12. Evenson and Westphal (1997) provide a more nuanced categorization of countries but provide little concrete guidance regarding IPRs.

13. UPOV refers to a series of revisions of a treaty for the protection of plant varieties, which is known by its French acronym. The 1978 revision serves as a model for developing countries, but is not now available for accession. The 1991 version provides stronger protection for breeders and is available for membership.

14. Maskus 2000a provides extensive discussion.

15. The papers in Anderson and Gallini 1998 provide an excellent and comprehensive overview.

16. The European Union submitted a paper to the WTO TRIPS Council arguing that such licenses are acceptable under the Agreement ("Paper Submitted by the EU to the TRIPS Council for the Special Discussion on Intellectual Property and Access to Medicines," 20 June 2001, IP/C/W/280), but legal opinion is divided.

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