5

Intellectual Property Rights and Economic Development: Patents, Growth, and Growing Pains

In 1900, Korekiyo Takahashi, the first president of the Japanese Patent Office, announced during a visit to the US Patent Office:

> We have looked about us to see what nations are the greatest, so that we can be like them. We said, "What is it that makes the United States such a great nation?" and found that it was patents and so we will have patents.[1]

Japan did adopt a comprehensive patent regime, though its features were distinctive from the American and major European systems. It was designed to encourage industrial development through emphasizing technology acquisition from abroad, domestic information diffusion, and incremental innovation. In short, the system was developed with the interests of a technology *follower* in mind. The Japanese regime significantly limited patent scope and breadth. For example, pharmaceutical patents were not provided until the 1970s. Whether this system was important in making Japan a "great nation" is subject to debate, but I believe it played a positive role. As Japan matured into an industrial power and technological leader, features of its patent system attracted increasing complaints from both foreign and domestic enterprises, leading to its reform in 1994.

This story illustrates two important characteristics of intellectual property rights: (l) IPRs can be of material assistance in a country's attempts to encourage its own technological, industrial, and cultural development; failure to provide protection can be damaging for domestic inventive

1. Quoted in Heath (1997, 305).

effort. (2) The terms on which a country might wish to protect IPRs depend on, among other things, its position on the global technology ladder and on social concerns. For example, the United States progressively increased the strength of its patent system and protection for trademarks and trade secrets from the 19th century to the 20th century. The demand for protection rises with economic development and with technological change and entrepreneurship. Accordingly, IPRs are inherently dynamic, both in their formation and in their effects. The relationships between economic development and IPRs are complex, with causation surely running in both directions.

As demonstrated in the last chapter, the strength of IPRs appears to be a nonlinear function of economic development, at first falling as incomes rise and then increasing after that. Only at a per capita income of around $7,750 (in 1985 international dollars) do protection levels return to those of the poorest countries. It therefore seems that as incomes and technical capabilities grow to intermediate levels, adaptive innovation emerges, but competition remains focused largely on imitation, so that the bulk of economic and political interests prefer weak protection. As economies mature to higher levels of technological capacity and as demands for high-quality, differentiated products increase, more domestic firms favor effective IPRs. Finally, at the highest income levels the strength of IPRs shifts up sharply (Evenson and Westphal 1997; LaCroix 1992).[2]

Perhaps this finding suggests that the appropriate international policy is simply to wait until income levels rise enough that there is an automatic rise in standards, as has been suggested in the areas of environmental protection and labor standards. However, it is likely to take considerable time before many significant developing countries approach the necessary per capita income. External pressure from the United States for reform and the negotiation of TRIPs implicitly recognized this problem. In this regard, the world is undertaking an unprecedented experiment: to accelerate the introduction of higher standards into regions that would not ordinarily be expected to adopt them.

This policy shift raises fundamental questions about the role of IPRs in establishing conditions conducive to economic growth. The related issues are subtle and difficult; unfortunately, evidence remains scarce and fragmentary. In this chapter the analysis focuses on the causation chain from IPRs to development. What do we know about how IPRs affect economic growth and living standards? The evidence is not as clear as we would like, although economists have paid attention to the issue recently and some important studies shed light on the question. The

2. This description seems broadly accurate but is not a formal political economy model of the process. Whether governments would choose to provide an "optimal" level of IPRs, even if that could be identified at any point, would depend on the weights they assigned to consumer interests, producer interests, and intergenerational transfers.

basic conclusion from that work is that there is significant complexity surrounding this relationship. This is not surprising given the second-best nature of IPRs in addressing complex market failures: strengthening IPRs may expand growth prospects under certain circumstances but may offer no improvement, or even retard conditions for development, under other circumstances. Strong conclusions are subject to caveats. On both sides of the issue special cases abound.

The broadest conclusion supported by logic and evidence is that IPRs provide an important foundation for sophisticated business structures. While this argument holds at nearly any level of economic development, the function of IPRs as appropriate support mechanisms varies with income and technological capabilities. Structured so as to promote effective and dynamic competition within a context of strong competitive processes and appropriate and transparent regulation, IPRs can play an important role in enhancing technical change and growth.[3]

The remainder of this chapter analyzes mechanisms and evidence on IPRs and growth, setting the stage for the broader analysis in the next chapter. I often illustrate concepts with evidence from Lebanon and China, based on recent field research (Maskus 1997b, 1999, 2000a; Maskus, Dougherty, and Mertha 1998).

How IPRs Contribute to Development

Economists recognize several mechanisms through which IPRs may stimulate economic development and growth. These processes are interdependent, meaning that a broad view of the incentives associated with IPRs is appropriate.

Before turning to particular issues, consider the general proposition that secure property rights are a precondition for growth. While that may defy systematic empirical analysis, there is significant documentary evidence that ownership of rights (1) to exploit tangible property and (2) to exclude others from using such property without approval has played a positive role in the development of advanced economies (North 1981; Powelson 1994). These rights provide incentives to acquire property, improve it with productivity-enhancing investments, and maintain it for purposes of building asset value.

Societies limit the private exploitation of physical property to ensure public safety, provide public goods, and promote environmental, aesthetic, and public-health ends. The observation that limited but exclusive private ownership of rights promises growth-enhancing benefits pertains

3. For extensive reviews see Evenson and Westphal (1997), Maskus (1998b), and Primo Braga, Fink, and Sepulveda (2000). Enthusiastic arguments for a positive role for IPRs are offered by Sherwood (1990) and Rapp and Rozek (1990).

equally to land and physical capital. Perhaps more significantly, the ability to market one's skills freely as a human property right encourages the development of human capital as well. Such investments are critical drivers of growth.

Private property rights are meaningless if they cannot be enforced. Enforcement may range from informal mechanisms based on cultural norms or personal power relationships to fully articulated legislated remedies with legal representation of adversarial parties before an impartial judge. Many have argued that as societies build more complex social and business relationships among their members, informal mechanisms must give way to legal enforcement, both because informal systems become overwhelmed by complexity and because the legal system becomes economically feasible as its high fixed costs may be spread more widely. Those who favor a rule-of-law approach to economic development tout the greater legal certainty of well-specified rules of engagement, making businesses more willing to undertake additional investments.

A fascinating question, which has not been studied adequately in the broad sweep of history, is whether intellectual property rights have the same effects as general private property rights.[4] To a considerable degree the same arguments apply to property created by human inventiveness. Absent rights to exclusive use, the extreme problems of nonexcludability associated with some forms of intellectual endeavors would destroy incentives to create them. Equally, unless rights are well articulated and enforceable, their owners have few incentives to improve their creations through further investment. Thus, standard property rights theory applies in the main to intellectual creations and provides sound justification for the existence of patents, trademarks, copyrights, and trade secrets. Such rights are limited also for purposes of social regulation.

However, these conclusions require qualification. First, intellectual property has characteristics that distinguish it from tangible property. For example, excludability may be more readily achieved without protection than is commonly recognized. As discussed below, imitation costs are significant in many forms of industrial property, technologies evolve rapidly, and goods proceed quickly through product cycles. In this sense, IPRs may not be a necessary spur to investments in creation, except in sectors where imitation is easy and low-cost, and may only supplement extranormal profits from dynamic competition.

At the same time, the nonrivalrous nature of many intellectual assets poses an acute policy conundrum in the international (or interregional or even intersectoral) context. Unlike physical property, intellectual property is internationally mobile at relatively low cost. How can the government of a technology-importing country justify awarding to foreign interests the exclusive rights to exploit information on the local market, when

4. David (1993) provides an interesting historical perspective on the evolution of IPRs.

that information might be freely available through imitation and also might spread quickly within domestic borders?

Of course, this question lies at the heart of the long-running debate over IPRs. An affirmative answer must demonstrate that weak IPRs result in foreign owners not making the desired information available, thereby causing society to forego any benefits from its creation and transfer. The evidence reviewed in the last chapter suggested that it is common for MNEs to undersupply investment and advanced technologies to such countries, buttressing the case for stronger IPRs.

Invention, Innovation, and Diffusion

Traditionally, developing countries have established IPRs systems favoring information diffusion through low-cost imitation of foreign products and technologies, believing that domestic innovation was insufficient to warrant protection. However, inadequate IPRs can stifle technical change even at low levels of economic development because much invention is aimed at local markets and can benefit from local patent or utility model protection. Though in the overwhelming majority of cases invention is simply minor adaptation of existing technologies, the cumulative effect can be critical for growth in knowledge and activity.

To become competitive, firms in developing economies may need primarily to adopt new management and organizational systems and techniques for process and quality control, which can markedly raise productivity. Such investments are costly and likely will only be made when risks of unfair competition and trademark infringement are small. Adequate and enforceable IPRs also help reward new enterprises and entrepreneurs for creativity and risk taking. Countries that retain weak standards tend to remain dependent on uncompetitive firms that rely on counterfeiting and imitation.

Much learning and technical change occurs through adapting domestic and foreign technologies to particular applications. To absorb knowledge and know-how in advanced technologies requires considerable investment in such factors as process control and product quality maintenance. These investments tend to have high social returns in developing economies because they are crucial for raising productivity toward global norms (Evenson and Westphal 1997). Again, IPRs protect firms assuming those costs.

An example of this process is that protection for utility models has been shown to improve productivity in technology-follower countries. Recall that utility models are patents of short duration awarded to incremental inventions that build on more fundamental discoveries. In Brazil, utility models were important in permitting domestic producers to gain a significant share of the farm-machinery market by adapting foreign

technologies to local conditions (Dahab 1986). Utility models in the Philippines encouraged successful adaptive invention of rice threshers (Mikkelsen 1984).

In perhaps the most systematic study, Maskus and McDaniel (1999) considered how the Japanese patent system (JPS) affected postwar Japanese technical progress, as measured by increases in total factor productivity (TFP).[5] The JPS in place over the estimation period 1960-93 was designed to encourage incremental and adaptive innovation and diffusion of knowledge into the economy. Mechanisms for doing so included early disclosure of, and opposition proceedings to, patent applications, an extensive system of utility models, and narrow claim requirements in patent applications. The authors found that this system promoted the development of large numbers of utility model applications for incremental inventions that were based in part on laid-open prior applications for invention patents. Utility models had a strongly positive impact on real TFP growth over the period; patent applications had a weaker though still positive effect. Maskus and McDaniel concluded that utility models were an important source of technical change and information diffusion in Japan, while patent applications had both a direct and an indirect effect on raising productivity. It is interesting that as Japan has become a global leader in technology creation, its patent system has shifted dramatically away from emphasizing learning and diffusion and more toward protecting underlying inventions through patents.

Innovation through product development and entry of new firms seems to be stymied in part by weak trademark protection in poor nations. A recent survey of trademark use in Lebanon provided evidence on this point (Maskus 1997b). Though Lebanon has extensive IPRs laws, they are weakly enforced. Firms in the apparel industry claim to have a strong interest in designing clothing of high quality and style for Middle Eastern markets. Their attempts to do so have been frustrated by trademark infringement by smaller firms in Lebanon and in neighboring countries, where protection is even weaker.

This problem is even greater in the food products sector, where legitimate firms suffer from considerable misappropriation of their trademarks. This misappropriation has limited the success of attempts to build niche markets for Lebanese foods in the Middle East and elsewhere. Similar difficulties plague innovative producers in the cosmetics, pharmaceuticals, and metal products sectors. The essential point is that local product development and entry of new firms may be restrained by trademark infringement targeted largely at domestic enterprises.

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5. Total factor productivity refers to the ratio of GDP to primary inputs (capital and labor) weighted by their income shares. Thus it measures the additional output generated by the technological information embodied in primary inputs.

Similar problems exist in China, as evidenced in a recent survey (Maskus, Dougherty, and Mertha 1998). While the information is largely anecdotal, it seems that trademark infringement significantly and negatively affects innovative Chinese enterprises. In interviews many examples were cited of difficulties facing Chinese producers of their own brands of consumer goods, such as soft drinks, processed foods, and clothing. Establishing brand recognition in China requires costly investments in marketing and distribution. Enterprises that achieve this recognition quickly find their trademarks applied to counterfeit products, in the same or in other product categories. Products of lower quality damage the reputation of the legitimate enterprise, a problem so difficult that it has sometimes forced enterprises to close down or give up their trademarks.

This situation likely has an important deterrent effect on enterprise development in China. It effectively prevents marketing across the country, which would permit economies of scale. It is significant that Chinese trademark infringement currently is concentrated on products with low capital requirements and high labor intensity. These are sectors in which China has strong comparative advantages. Thus, on this evidence, trademark violations may be particularly damaging to enterprise development in poor nations.

Similar comments apply to copyrights. In developing countries copyright industries like publishing, entertainment, and software are likely to be dominated by foreign enterprises (which can absorb temporary losses and afford to deter infringers) and pirate firms. Though lower-quality copies may be widely and cheaply available, the economy's domestic cultural and technological development is slowed down. This process was clear in the Lebanese survey. Lebanon has a small but vibrant film and television industry that believes that with stronger copyright protection it would successfully export to neighboring economies. In China, the domestic software industry has grown rapidly in particular business applications that do not suffer much copying, but has faced obstacles in developing larger and more fundamental program platforms. Thus, domestic commercial interests in stronger copyrights are now playing a role in promoting enforcement. In contrast, India has long had a system of effective copyright protection, which is thought by many observers to have been important in growing and protecting its modern film industry.

These observations suggest that business formation, trademark registration, and simple innovation are elastic with respect to IPRs reform even at low levels of income. Controversy persists, however, over the innovation-inducing properties of IPRs at higher levels of technological sophistication. As noted earlier, survey evidence (Levin et al. 1987) suggests that patent protection is not considered critical by most US firms making decisions to market new products and processes. Exceptions arise only in a few industries, such as pharmaceuticals and chemicals, where fixed costs of R&D are high and imitation is fairly easy. More significant

incentives for innovation come from competitive pressures, market growth, factor costs, and the like, while appropriation of profits relies on imitation costs and lags, product loyalty, maintaining trade secrets, and other mechanisms.

However, this evidence was assembled before the extensive globalization of technology in the late 1980s. Moreover, the potential importance of patents in inducing innovation under broader protection may well be larger than such surveys anticipate (Mansfield 1988). The general weakness of the global patent system before TRIPs, exacerbated by easy flows of technological information across borders, could have so limited the incentives for R&D as to induce a suboptimal level of new product development. Perceptions that protection will be more effective over time could raise inventive activity. Further, dynamic linkages or intertemporal spillovers between product generations might argue for strong protection.

Technology Transfer and Learning

IPRs also can play a positive role in the dissemination and acquisition of information. Patent claims published anywhere are accessible to all, allowing rival firms to use the information in them as a basis for further inventions. This dissemination process takes place in 10 to 12 months in the United States (Mansfield 1985). Knowledge formation is cumulative: as new inventions build on past practices, technical change accelerates (Scotchmer 1991). Patents, trademarks, and trade secrets also give firms legal certainty and should induce them to trade and license technologies and products, thereby expanding diffusion into the economy.

Turning to international transactions, in strengthening their IPRs regimes, either unilaterally or through adherence to TRIPs, developing countries hope to attract additional inflows of advanced technology from abroad. There are three important and interdependent channels through which technology is transferred across borders: international trade in goods, FDI within MNEs, and formal licensing of technologies and trademarks to unaffiliated firms, subsidiaries, and joint ventures. As discussed in the previous chapter, economic theory indicates that international technology transfers through each channel depend in part on local protection of IPRs, though in complex and subtle ways.

That imports of goods and services transfer and diffuse technology is widely accepted among economists. Imports of capital goods and technical inputs directly reduce production costs and raise productivity in the firms that employ them. The extent of this benefit depends on the technological sophistication of the imports, suggesting that close trade linkages to innovative developed economies engender considerable productivity gains.

As discussed in the last chapter, international trade in many manufacturing commodities, including high-technology goods, depends positively

on the strength of the patent regimes in large developing countries. Consider an illustration that is highly speculative. Suppose that enforcement of China's new patent regime becomes strong enough to make patent rights 25 percent more effective than they are currently. According to the elasticity of imports of machinery with respect to IPRs that was implicit in table 4.8, there would be a rise in such imports of perhaps 0.3 percent of GNP ($2.8 billion in 1998 prices), other things being equal. This would represent a 5.6 percent rise in Chinese machinery imports. In terms of technology content, Coe, Helpman, and Hoffmaister (1997) found that a 1 percent increase in the share in GDP of imports of machinery and equipment from OECD countries tends to raise TFP in developing countries by an average of around 0.3 percent. In this context, assuming GDP otherwise rises by 4 percent per year, stronger patent rights in China could raise long-run TFP by as much as 0.48 percent annually over levels produced by standard determinants of TFP growth, strictly through the increase in machinery imports. To put this in perspective, the average annual increase in Chinese TFP over the sample period of 1971-90 was 3.5 percent. The additional imports would raise this average rate to 4.0 percent.[6]

A rise in TFP of this magnitude has important effects over time. Thus, for example, in 10 years' time Chinese GDP would be higher by 4.9 percent than it would be with existing factor accumulation and TFP growth. This would be a welcome productivity bonus. Yet I consider it a significant underestimate of the potential impact on productivity, given that the trade estimates are outdated and based strictly on a static model. A maximum estimate might be computed by applying Smith's result (1999); then such a change in patent rights would expand Chinese imports from the United States (and presumably from other technology-exporting countries) by around 15 percent. Assuming this percentage applied to machinery and equipment imports, it would imply in turn a long-run TFP bonus of 3.3 percent per year. Clearly, there is considerable uncertainty about this effect, but it would be positive in large economies and economies with significant imitative abilities.

More important channels of technology transfer are FDI, joint ventures, and licensing contracts. Empirical work demonstrates that the strength of IPRs and the ability to enforce contracts have important effects on MNE decisions on where to invest and whether to transfer advanced technologies. The estimates presented in table 4.11 demonstrated that American MNEs are sensitive to IPRs improvements in developing economies. The patent coefficient in the assets equation suggests that a 1 percent rise in local patent strength would raise asset stocks by 0.45 percent. Thus, let us assume that Chinese patents become 25 percent more effective. This

6. This calculation results from the formula: TFP growth = (1.035)*(1.0048) = 1.04.

change would imply, other things being equal, a long-run rise in the American FDI in China of around 11 percent.[7]

The impact of FDI on learning and technology diffusion in host countries has long been a subject of considerable controversy; it is impossible to review this enormous literature here.[8] In principle, FDI provides ample opportunity for productivity-enhancing learning and spillovers because it largely reflects the injection into an economy of an improved technology or other form of efficiency advantage. The essential question is whether such an injection raises productivity. MNEs often have been criticized as enclave producers that fail to integrate effectively with the broader economy in ways that would facilitate learning.

To the extent that additional FDI transfers more technology inward, there would be a positive direct impact on knowledge absorption in host economies. The subsequent diffusion of that knowledge into the broader economy is a complex process. IPRs could enhance that diffusion by ensuring greater contract certainty between enterprises and suppliers and by providing more protection for commercializing technologies in local markets. Further, enterprises would experience stronger incentives to train managerial and technical workers because the workers would feel more pressure not to misappropriate trade secrets. At the same time, IPRs raise imitation costs, thereby limiting diffusion of simple technologies at least temporarily. Learning by honest means could be slowed if the system were so protective that it markedly raised costs of inventing around patents. Finally, legal restrictions on defection of skilled workers would engender conflict between the objectives of training and diffusion.

Thus, two questions are significant here: Do FDI flows provide spillover benefits to the economy? How might IPRs influence this process? Recent empirical evidence supports the FDI learning-spillover hypothesis. There are numerous channels through which this might happen, including on-the-job training, expanded management expertise, other forms of human capital formation through learning of newer technologies, training of suppliers, labor mobility, and imitation. Competitive threats to domestic firms may induce them to adopt better techniques.

Romer (1993) claimed that cross-country evidence suggests that a country's growth performance is importantly associated with its utilization of ideas embodied in FDI. Aitken and Harrison (1993) discovered that, controlling for capital stock and other productivity determinants, higher foreign ownership in Venezuelan manufacturing plants was associated with higher plant-level TFP. However, this impact did not spill over into higher productivity of domestically owned firms, in part due to limited labor

7. This finding may not readily apply because it refers to majority-owned investments, which are controlled in China.

8. See Blomstrom (1989) and Caves (1996).

mobility between domestic and foreign firms. Aitken, Harrison, and Hanson (1994) found that Mexican manufacturing firms were considerably more likely to become exporters when foreign firms were located nearby, evidence of a spillover impact on productivity and quality. Aitken, Harrison, and Lipsey (1996) reported that high degrees of foreign ownership were associated with markedly higher wages in manufacturing industries in Mexico, Venezuela, and the United States, which they attributed to productivity enhancements associated with foreign technologies. Interestingly, higher wages existed mainly in foreign-owned firms: there was little evidence of wage spillovers into domestically owned firms in Mexico and Venezuela. In the United States, there was evidence that higher wages in foreign-owned firms induced rising wages in domestically owned firms because of competition for labor.

Feenstra and Hanson (1997) found that FDI in Mexico's maquiladora plants was associated strongly with rising wages of skilled workers and increased the wage disparity between skilled and unskilled workers. Dougherty's regression results (1997) indicated that, across manufacturing sectors, Chinese TFP growth among industrial enterprises was positively and significantly related to the extent of foreign direct investment between 1980 and 1995.

The conclusion to draw from this work is that FDI typically carries efficiency advantages through superior technologies, management skills, and marketing. These direct advantages introduced into host economies bear considerable potential for spilling over into higher productivity through learning and competition. However, the extent to which spillovers occur depends on other factors, such as labor mobility (that is, labor market flexibility), the human capital stock, and the structure of competition, as governed by openness to trade and entry of firms.

To illustrate the important linkages between FDI and local conditions for promoting growth, consider the regression results of Borensztein, De Gregorio, and Lee (1998). They discovered that inward flows of FDI from industrial countries to 69 developing countries over the period 1970-89 contributed positively to growth of the recipient nations, more powerfully than did domestic investment. However, the positive impact of FDI came through only in interaction with a human capital variable (male secondary school-enrollment ratios). That is, the positive contribution of FDI to growth was registered only for countries with human capital above a particular threshold. This threshold was exceeded by 46 of the 69 countries. The regression suggested that, at the average level of educational attainment in the sample, an 0.005 increase in the ratio of FDI to GDP would raise the annual growth rate of the recipient country by 0.3 percentage points. However, the estimated impact of FDI on growth in countries below the educational threshold was negative. The authors attribute this finding to the possibility that the relationship between FDI and growth is nonlinear and therefore poorly estimated at low levels of income.

The essential finding of these authors is that there is a strong complementary relationship between FDI and educational attainment in promoting economic growth. The explanation surely is that countries with greater skill endowments have stronger capabilities to absorb, use, and learn those technologies effectively. Thus, both the direct cost-reducing impact of FDI and the indirect spillover benefits for growth are more in evidence in developing economies with at least moderate levels of education.

In this context, IPRs could play an important role. As discussed in chapter 4, econometric evidence from Maskus (1998a) indicates that FDI reacts positively and elastically to stronger IPRs in large developing economies. Moreover, there is a positive correlation between human capital and the strength of patent rights. Virtually all of the countries in the Maskus sample have secondary enrollment rates in excess of the threshold in Borensztein, DeGregorio, and Lee (1998). Thus, it is reasonable to claim on this evidence that as these nations strengthen their patent regimes, the associated inflows of FDI will have positive growth effects. To illustrate, consider an increase in the GP patent index for Mexico from 2.29 to 3.25, roughly approximating the patent changes required between 1995 and TRIPs implementation.[9] Employing the implicit elasticity of US-owned asset stock to patent rights from table 4.11, this change would result in a long-run rise in these assets of perhaps $3.2 billion (1994 dollars). Assuming this process takes 10 years, there would be an implied increase in annual FDI of around $320 million, which would raise the average FDI-to-GDP ratio for the mid-1990s from 0.038 to 0.039.[10] The finding from Borensztein and his colleagues would then predict a long-run rise in Mexican growth of 0.06 percentage points, say, from 3.00 percent per year to 3.06 percent per year. Once again, this would be a significant growth bonus.

These results are buttressed by Park and Ginarte (1997), who focus on the relationship of patents, capital and R&D investment, and growth. They found no direct correlation between patent strength and growth but a strong and positive impact of patents on physical investment and on R&D spending, which in turn raised growth performance. Thus, it seems clear that IPRs, investment, and human capital accumulation work together to raise productivity and growth.

Turning from FDI to licensing, Mansfield's survey results, discussed in tables 4.9 and 4.10, point to the importance of IPRs in convincing MNE managers to transfer their most advanced technologies. There is practical evidence from China to support these arguments (Maskus, Dougherty,

9. In fact, because Mexico's IPR obligations under NAFTA are even stronger than under TRIPs, the ultimate change in patent strength will likely be even larger.

10. Figures adapted from UNCTAD (1998) and World Bank (1997).

and Mertha 1998). Managers of many foreign enterprises expressed great reluctance to locate R&D facilities in China, citing fear of misappropriation and patent infringement, even after the legal reforms in 1993. Nearly all reported that their enterprises transfer technologies that are at least five years behind global standards (unless other means can be found to protect them) or bring in technologies that will be obsolete within a few years. Note that the importation of lagging technologies is not necessarily inappropriate for a country with China's cost conditions; absorbing such knowledge can help motivate follow-on innovation. However, as nations like China move toward international best practices in several fields of technology the problem should become more restraining.

Note that the effective weakness of IPRs in China seems to affect market structure. For example, foreign enterprises are reluctant to license advanced technologies to unrelated enterprises, preferring instead joint ventures and majority-owned subsidiaries within which they maintain greater control of trade secrets. Importantly, concerns about weak IPRs have helped discourage both foreign-owned and domestic enterprises from fully integrating their Chinese operations. Instead they tend to divide production processes among facilities in order to avoid revealing all their technologies in any one location.

The practical implications of this are important:

1. Countries with weak IPRs are isolated from modern technologies; they must try to develop technological knowledge from their own resources, a difficult and costly task. In the terminology of development economists, they have large "technological distances" (Evenson and Westphal 1997).
2. They get fewer spillover benefits from new technologies in their economies.
3. The technologies that are available tend to be outdated.
4. Nations with weak IPRs experience both limited incentives for domestic innovation and depressed inward technology flows.

Building Markets and Improving Quality

IPRs do more than promote R&D and product innovation. They also encourage the interregional and international distribution and marketing that are important for achieving firm-level scale economies. Weak IPRs limit incentives for such investments because rights owners cannot prevent their marketing outlets from debasing the quality of their products, nor can they readily deter counterfeiting of their trademarks. Thus, IPRs permit effective monitoring and enforcement of activities throughout the supply and distribution chains, giving both innovators and distributors an incentive to invest in marketing, service, and quality guarantees. It is

curious that, despite the obvious importance of these processes for business development, economists have paid little attention to them.

Among these issues, quality assurance is critical to safeguarding the interests of consumers. However, widespread sale of counterfeit products can ruin reputations achieved at considerable cost, especially for new enterprises, and the problem can be overcome only with additional costs. In principle, effective trademark enforcement both raises the average quality of products over time and provides a wider range of qualities from which consumers may choose.[11] This process is particularly important in food products, beverages, cosmetics, and medicines, where counterfeit products can be hazardous for consumers. Indeed, field research in China suggests that despite the advantages to poor consumers of having access to low-cost product knockoffs and unauthorized copies of entertainment products, they are becoming resentful that market saturation by unauthorized goods diminishes the range of legitimate goods available (Maskus, Dougherty, and Mertha 1998).

Global Research and Development

An important possibility is that consumers in nations with weak IPRs suffer because innovation is not aimed at their needs.[12] There is ample evidence that inventive firms in developed economies bias their research programs toward products and technologies for which they expect a large global demand and that may be protected through IPRs and trade secrets. This means that a disproportionately small amount of global R&D is focused on the needs of developing economies with low incomes and weak IPRs. For example, the World Health Organization (1996) claims that of the $56 billion spent globally on medical R&D in 1994, only 0.2 percent was aimed at pneumonia, diarrheal maladies, and tuberculosis, which together account for 18 percent of global illness. Virtually all of that research was undertaken by public agencies or military authorities.

However, the aggregate market for pharmaceuticals in the countries that will upgrade their patent protection as a result of TRIPs is sufficiently large that, even at current shares of drugs patented elsewhere, the rise in demand could be as much as 25 percent of global spending (Lanjouw 1997). This figure does not include China, which has already implemented product patents in pharmaceuticals. Thus, the incentives for R&D to focus on poor countries could be significant. While this is a crude calculation, it suggests that pharmaceutical firms could anticipate

11. While this statement is widely accepted by economists and business scholars and finds extensive anecdotal support, I have found no systematic econometric study of whether it applies in developing countries.

12. Diwan and Rodrik (1991) first analyzed this point.

higher profits in developing nations, some portion of which would be devoted to research on their endemic diseases. Note that it is likely that some of this additional R&D would take place in MNE research facilities in developing countries. Such decisions would depend on the strength of IPRs, local skill endowments, public infrastructure, and demand characteristics as markets grow.

While these salutary impacts are possible in principle, the likelihood of their emerging over even a long period of adjustment seems small. Pharmaceutical research aims at markets that not only are protected by patents but also provide sufficient demand. It will be a long time before consumers in the poorest countries, and the many impoverished citizens in middle-income developing countries, will be able to afford advanced therapeutic treatments.[13] Thus, additional research into cures for their ills may not be forthcoming if left to the private market.

How IPRs Hamper Economic Development

While strengthening IPRs has considerable potential for enhancing economic growth in the proper circumstances, it also implies important economic and social costs. Indeed, many developing economies and some rich countries may in the short run experience net welfare losses from global policy reform because many of the costs could emerge earlier than the dynamic benefits. This situation explains why it has proven difficult to organize interests to work for effective reform in many developing countries.

Closing Down Infringing Activities

There are likely to be significant amounts of labor employed in copying and retailing unauthorized products in most economies, though such activity is concentrated in poor countries. As nations introduce stronger trademarks and copyrights and expand their enforcement efforts, this labor must find alternative employment. This is the first challenge for policymakers dealing with stronger IPRs.

Some evidence on this point is available from a survey of the Lebanese economy in 1996 (Maskus 1997b). Lebanon is strengthening its legal basis for IPRs and increasing its enforcement activities in anticipation of a partnership trade agreement with the EU. (Because Lebanon is a small, relatively open economy, the illustration may not extend readily

13. This point has been made forcefully by Sachs (1999) and Sachs, Kremer, and Hamoudi (1999).

Table 5.1 Simulated static effects of stronger IPRs enforcement in Lebanon, 1996

Sector	Infringing employment	Legitimate employment	Net employment	Weighted price (%)
Software	–717	+426	–291	
Software				+18.5
Personal computers				+17.8
Printing & publishing	–642	+298	–343	
Printing services				+13.2
Books, etc.				+7.3
Music, video, & film	–500	+119	–381	
Music & video				+10.1
Film				+2.3
Food products	–2,681	–479	–3,160	+3.8
Cosmetics	–614	–119	–733	+4.3
Pharmaceuticals	–315	–235	–550	+10.0
TOTALS	–5,469	+10	–5,459	n.a.

n.a. = not available.

Source: Maskus (1997b).

to larger, more closed economies.) Lebanon's per capita real GNP in 1996 was $5,990, high enough to encourage emerging domestic interest in stronger intellectual property protection.

Table 5.1 presents simple partial-equilibrium calculations of the static employment and price impacts of stronger IPRs in several Lebanese industries. These calculations reflect the total effects of various aspects of IPRs. For example, copyrights in software were assumed to reduce piracy by 50 percent, which would lower infringing employment by 717 workers. However, it would shift demand toward products of legitimate producers and distributors, which claimed that they did not anticipate any rise in licensing costs from foreign software firms. As a result, legitimate employment would rise by 426 workers, leaving a net employment loss of 291 workers. However, workers in legitimate firms made far higher wages on average than those that would be displaced by copyrights. Moreover, it appeared that many of the skilled and partially skilled displaced workers would find employment in the noninfringing firms or would start their own enterprises.

The model also predicted a rise in software prices of 18.5 percent and in personal computer prices of 17.8 percent. These were sizable increases, reflecting rising markups to legitimate producers as copyrights become enforced. However, they are likely higher than they would be in large countries because Lebanon has a smaller market (preventing scale effects) and because it has quite restrictive sole distributorship laws. Thus, the additional market power generated in Lebanon by copyrights would

be considerably stronger than might be experienced in larger countries, say, China or Brazil.

The remaining copyright sectors may be read similarly. As illegal copying is reduced, there would be net employment losses in printing and publishing and in music, video, and film. Book prices were predicted to rise only by 7.3 percent because the legitimate publishing sector is competitive in Lebanon; however, copyright enforcement would be expected to raise video prices by around 10 percent.

The situation is different in food products, cosmetics, and pharmaceuticals, which are subject to both trademark and patent regulation. The pharmaceuticals sector, for example, is built on copying and marketing active ingredients that may be patented elsewhere but are not currently patented in Lebanon. In the model, new patents were assumed to raise patent licensing fees by 50 percent and to remove imports and exports of infringing products, while trademark enforcement was assumed to reduce counterfeiting by 50 percent and to raise licensing fees by 20 percent. These effects not only would reduce infringement but also would raise costs for legitimate firms. Accordingly, employment would fall in both activities, with a total employment loss of 550 workers and a price increase of 10 percent. Employment effects in the food products sector were bigger because it is a larger industry, but price impacts were small because there are many competitive firms.

Overall, these static calculations suggest that employment in IPR-sensitive Lebanese sectors could fall by some 5,459 workers, about 0.5 percent of the formal labor force in Lebanon. In that sense the problem is small in relation to the overall labor market. However, it would be concentrated in areas where piracy is common or where industries built on copying are significant. Thus, there might be difficulties in providing alternative employment or cushioning adjustment costs. In general, such costs would be minimized in economies with flexible labor markets and rapid economic growth, making it easier to shift workers and firms into legitimate activities.

Market-Power Pricing

A major concern of technology importers is that strong patents and copyrights expand the market power of foreign providers of information and new products, permitting higher price markups. In turn, importing countries would experience losses in their terms of trade, while access to new products and key inputs could be diminished. The evidence on trade flows from Smith (1999), discussed in chapter 4, lends credence to this claim.

Though this basic view of IPRs has some grounding in fact, such fears may be overstated. Obviously, patents cannot apply to currently

unpatented drugs, a fact that is often ignored in policy discussions. More fundamentally, the extent to which prices will rise in response to exercise of stronger market power is a function of several variables:

1. *Market structure* before and after the newer IPRs matters crucially. This area covers such elements as the number of firms (domestic and foreign) competing with rights holders, the type of competition, the ease of market entry and exit, quality differentiation among products, openness to trade, and wholesale and retail distribution mechanisms.
2. *Demand elasticity,* a key variable determining market power, may vary markedly across countries and over time.
3. *Pricing regulations*, particularly for pharmaceuticals, may blunt tendencies toward monopoly pricing, although at some potential cost in terms of reduced willingness of firms to supply markets that have such controls.
4. *Competition policies* may also limit monopoly practices. Examples are whether parallel imports are allowed and whether sole distributorship laws support market power.

Consider pharmaceutical patents. Under the TRIPs agreement, the nearly 50 developing countries in the WTO that did not provide patent protection for pharmaceutical products must do so by 2005. Indeed, many nations did so upon accession to the WTO. New entrants must also meet the requirements of TRIPs. No aspect of TRIPs is more controversial than the introduction of patents for medicines. The legislature of India, for example, found it difficult to establish the registration procedures and exclusive marketing rights required during the transition period. India has not yet implemented full patent protection.

It is remarkable how little is known about the potential effects of changing global policy regimes in this fundamental manner, despite the fact that the pharmaceutical sector is the most extensively studied of all IPR-sensitive industries. This information gap results from a scarcity of data to support estimation of key elasticities and market-structure parameters, and from uncertainty about the potential effects on prices, profitability, and innovation. However, several articles may help us understand the issues and get a sense of their tentative conclusions. The preponderance of conclusions is pessimistic about the net effects of drug patents on the economic welfare of developing countries (or, more accurately, of net importers of patentable drugs).

Nogues (1993) provided an excellent overview, listing a series of interrelated factors on which pharmaceutical pricing decisions depend. As noted originally by Maskus (1990), a key determinant is the structure of market competition before and after the introduction of patents for

medicinal preparations.[14] Roughly stated, the more competitive the local pharmaceutical market before patents are awarded, the larger the prepatent share of drug production that consists of copies of patentable drugs, and the more inelastic the demand for medicines, then the higher will be the increases in prices associated with patents. Each of these factors depends on the strength of patent protection, of course, but also on collateral determinants of market structure, including trade protection, investment regulations, and marketing and entry restrictions.

The absence of product patents and the relative ease of entry into imitative production means that in countries without product patents significant numbers of small and medium-sized firms produce copies of drugs patented elsewhere. This prepatent structure characterizes (or has characterized) a wide range of countries, including Argentina, Brazil, Chile, India, Italy, Turkey, South Korea, Egypt, and Lebanon.[15] The Chilean study showed clearly that drug prices fell markedly in the presence of competing products (Coloma, Gabrielli, and Williamson 1987). The real price of Glaxo's aerolin fell by some 52 percent over the period 1983–86 as two competing copies came on the market; in the previous five years when aerolin was a monopoly, its real price rose by 45 percent.

Schut and Van Bergeijk (1986) presented evidence that, in a sample of 32 countries in 1975, a standardized pharmaceutical price index was much lower on average in countries without patents than in countries with patents. To isolate the impact of patents they econometrically related the price index to per capita GDP, per capita drug consumption, a dummy variable for the existence of patent protection (either process or products or both), a dummy variable for the presence of pharmaceutical price controls, and a dummy variable accounting for indirect price controls.

The results demonstrated that drug prices rose significantly with per capita income, fell with per capita consumption volume, fell with price controls, and rose with patent protection. The patent coefficient was insignificant, probably due to the inclusion of process patents and the inability to distinguish between enforced and unenforced product patents.

Thus, the preponderance of evidence suggests that preprotection market structures are relatively competitive in middle-income countries with significant imitative capabilities and that prices are sensitive to demand variables and patent protection. Further, there is likely to be a considerable element of oligopoly in the pharmaceutical industries in many developing countries after patents are recognized, because drug firms can differentiate their products through brand loyalty and marketing.

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14. See also Subramanian (1995) and Maskus and Eby-Konan (1994), who develop numerous interesting extensions.

15. See Coloma, Gabrielli, and Williamson (1987), Katz and Groisman (1988), Kirim (1985), Lanjouw (1997), Maskus (1997b), and Scherer and Weisburst (1995).

In this context, it seems likely that the introduction of patents could place pronounced upward pressure on drug prices. As a crude indicator, for 20 products sampled in the United States in the early 1980s, the average gap between prices of branded products and of generic substitutes was 281 percent, with a range of 151 percent to 658 percent (Katz and Groisman 1988). This may overstate the potential effects of patents because the United States is a high-income economy with distinctive insurance markets. However, it may understate the effects because this comparison is between brand names and generics rather than between patented products and copies, which would present larger price gaps.

It is interesting that competition in prescription drugs increased dramatically in the United States in the 1990s, with the share of generic drugs rising from 19 percent in 1984 to 43 percent in 1996 (US Congressional Budget Office 1998). This competition stemmed from 1984 legislation permitting easier entry of generics, drug-product substitution laws permitting pharmacists to dispense generic drugs in place of prescribed brand-name drugs, and public and private cost-containment programs. In turn, manufacturers' discounts on brand-name drugs tend to rise with the number of generic substitutes and patented drugs with similar therapeutic qualities ("me-too drugs"). Thus, rigorous but honest competition can moderate the price effects associated with patents.

Anecdotal evidence compiled in Taiwan and China is consistent with the possibility that protection can induce significant price hikes. For example, it appears that uncontrolled prices of protected drugs at small pharmacies in Beijing and Shanghai have risen by a factor of three or four on average since the introduction of exclusive marketing rights in 1991 and patents in 1993.[16] Given the regression results reported above, such effects could be expected to be even larger in higher-income developing economies, though smaller in poorer nations.

The most extensive study I have come across is by Lanjouw (1997) for India. Her research showed that India currently has a highly competitive pharmaceutical sector: there are some 250 large pharmaceutical firms (12 of the 20 largest are Indian) and another 16,000 small producers. These firms are quite capable at product adaptation. For example, within seven years of its introduction in India, 48 firms were producing a version of Ciprofloxacin, which is patented in Europe and the United States. When Glaxo Corporation marketed a version of Zantac, it was quickly met with several local competitors who had already copied the drug, though Glaxo retained 40 percent of the market.[17] Interestingly, many of the companies competing with these patented drugs are foreign-owned MNEs.

Thus, competition is based essentially on product differentiation and brand recognition. In India brand advantages are important, reflecting

16. Based on interviews conducted in December 1997.

17. I am grateful to Jayashree Watal for this observation.

quality control, reputation, and physician prescription practices. Yet they seem to capture only perhaps a 10 percent price premium on uncontrolled products.

In such a setting, the introduction of pharmaceutical product patents could be expected to raise prices considerably if they are not controlled. Lanjouw (1997) compared the relative prices in 1995 of four patented drugs in India, the United Kingdom, and the United States.[18] The price of Ranitidine was 26 times higher in the United Kingdom and 57 times higher in the United States than in India. For Ciprofloxacin, the relative differences were 10 times and 15 times. Whatever the difficulties in these comparisons, it is clear that drug prices in India are very low in comparison with those in the United Kingdom and the United States.

As noted earlier, some of these differences are attributable to higher per capita incomes in the developed economies. Another distinction is that only about 4 percent of India's population is covered by medical insurance with prescription benefits, so that most consumers must buy drugs directly, making them more price sensitive. It seems that pharmacists are generally willing to substitute cheaper alternatives for prescription pharmaceuticals. Moreover, the Indian government subjects a large part of the pharmaceutical market to price controls. Finally, an important distinction between India and the United States is simply that the US provides product patents. For these reasons, India has drug prices that are quite low on a world scale.

Assessing these factors, it is likely that the most significant price-restraining difference is that India has not patented drugs since 1972, a fact that itself partially supports the competitive structure of the Indian market. Thus, as Indian patents are introduced in the next decade, prices are likely to be substantially higher on newly patented drugs than they would otherwise have been. Again, how much depends on numerous collateral factors. Much will depend on whether a new product dominates a therapeutic application or whether (and how quickly) alternative treatments (both on- and off-patent) become available. Put more simply, the larger the share of the drugs market that is patented, the higher will be the price impacts, which would vary also across therapeutic classes. The last point is important, for even though a relatively small share of overall registered drug sales in India in the 1990s were of products containing substances patented in Europe, the shares in particular therapeutic groups could be much higher. Note also that as incomes rise and as more consumers are covered by insurance, the demand for patented and branded drugs should become less elastic, supporting higher prices.

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18. See also Danzon and Kim (1995), who documented carefully that international price comparisons in pharmaceuticals are difficult to make due to differences in price measures, dosages, and currency conversions.

This review suggests that the preponderance of forces will support markedly higher drug prices in economies like India as patents are introduced. Accounting only for static price impacts under elasticities assumed to vary by therapeutic class, Watal (1999) computed the potential price effects of introducing patents in India.[19] She assumed that patents would convert domestic pharmaceutical markets, currently highly competitive, into monopolies dominated by foreign patent owners. This assumption implied that price increases would be the maximum possible. Watal found that the weighted-average price increase for the patentable portion of the market would be 26 percent under linear demand and 242 percent under constant-elasticity demand from a 1994 base. Associated welfare losses amounted to between 3 percent and 8 percent of the total pharmaceutical market. These losses were much smaller than those simulated by Maskus and Eby Konan (1994), Subramanian (1995), and Nogues (1993), because Watal took pains to characterize competition in the prepatent market more accurately.

Considering the qualifications mentioned earlier, Watal's estimate is probably conservative. Keep in mind that such increases potentially accrue only to new products that receive patent protection, not to existing products. Indeed, Rozek and Berkowitz (1998) could find no evidence of unusual price increases for pharmaceutical products already on the markets in South Korea, Mexico, Taiwan, and Hungary after they introduced patents. Factors that limited possible price hikes included competition within therapeutic classes, price regulation, monopsonistic (government) purchasing practices, and provisions in the patent laws aimed at maintaining competition.[20] Offsetting the potential for higher prices is the possibility of certain dynamic benefits that should not be ignored:

1. It is possible that a higher proportion of new drugs will be made available to countries as they protect patents, though product introduction in India seems to be not much different from protected markets.
2. Additional global research, as noted earlier, might be devoted to the diseases of poor nations, which currently attract a small proportion of global R&D funds.
3. Some of the additional R&D is likely to take place in MNE research facilities in developing economies. Market development activities could particularly be enhanced. Stronger patents (and trade secrets and brand

19. This is an update of an earlier study (Watal 1996).

20. As Watal (1999) pointed out, the Rozek-Berkowitz results likely are biased because they did not compare baskets of patentable and patented drugs but included all drugs in particular therapeutic categories.

protection) should have the effect of lowering contracting costs and facilitating know-how transfers in the industry (Arora 1996; Yang and Maskus 2000a).

Finally, some observers argue that stronger drug patents will encourage local firms to devote additional R&D spending to developing patentable substances, a possibility about which Lanjouw (1997) is optimistic. In fact, the preponderance of evidence suggests that domestic pharmaceutical companies in developing countries are unlikely to marshal the considerable resources required to compete successfully at this end of the business. Evaluations of pharmaceutical stock prices in South Korea after patents were adopted suggest that investors expected drug firms to lose business and profits, though the situation was more positive in Japan (Kawaura and LaCroix 1995; LaCroix and Kawaura 1996). Nogues (1990) found no reason to expect increases in R&D by local pharmaceutical firms in Argentina. Similarly, survey results in Lebanon found no intention on the part of local drug firms to compete through product research (Maskus 1997b).

Finally, the establishment of product patents in 1978 in Italy was not accompanied by any increase in the inflation-adjusted trend of R&D expenditures or in the introduction of new chemical entities in that country (Scherer and Weisburst 1995). Some years after product patents came into force, there was, however, considerable consolidation of the Italian industry in terms of the number of firms, though employment and output have gone up faster there than in the general economy (Korenko 1999). Much of the consolidation was associated with takeovers by foreign enterprises. Moreover, real R&D expenditures have risen, but with a shift in their emphasis toward product development and marketing. Thus, the Italian evidence is not altogether clear on the innovation-inducing aspects of patents.

Another area of considerable concern in developing countries is the potential for IPRs to support monopolization of plant breeders' rights (PBRs). Under TRIPs, countries are obligated either to provide patents for new plant varieties and seed strains or to provide effective sui generis protection for inventors for minimum periods. Many developing countries have no protection for plant varieties. Patents give inventors exclusive rights for the production, sale, and import of seeds and varieties. The concern is that farmers in poor countries might not be able to afford key agricultural inputs priced under patent protection and would be forced to use older technologies. An environmental worry is that protection of breeders' rights could reduce genetic diversity over time. Questions are raised also about whether stronger protection will affect the ability of public research laboratories to develop and disseminate protectable materials.

In recognition of these problems, many countries have adopted other protections for plants, further limiting the exclusive rights granted. The

farmers' privilege allows farmers, after buying protected seeds, to retain for their own use enough seed to plant the following year's crops. The breeders' exemption allows competing breeders to use varieties freely in conducting research leading to new plants. Neither limitation would generally be available under patent protection.

Unfortunately, there is virtually no empirical information available on the economic impacts of PBRs. One recent study in Argentina, Chile, and Uruguay, which have established such systems (Jaffe and van Wijk 1995), looked only at qualitative indicators of how PBRs affected private investments in plant breeding, plant breeding policies of public research institutes, international transfer of germ plasm, and seed diffusion among farmers. The systems of rights adopted have had mixed effects on these Latin American economies:

1. They have markedly improved the ability of private breeders to control local seed markets and prevent unauthorized trade in protected varieties. The controlled share of seed supply is above 55 percent in wheat and around 40 percent in soybeans, figures that compare favorably with those in the United States. As a result, market prices for seed have risen, though the extent of these increases was not reported.
2. These rights have increased access to privately developed foreign seed varieties, the developers of which are more willing to market their products in those countries.
3. The systems have well-defined farmers' privileges, which means that farmers have not been much disadvantaged. However, unauthorized seed dealers have seen their costs rise and some have been squeezed from the market. Over time increasing concentration of the market could result in further price increases.
4. It is interesting to note that government research institutes express strong support for the new systems because they can use the rights to protect the results of their research.

There are no systematic studies of how computer software prices vary across countries with differing levels of copyright protection and enforcement. It is often claimed that stronger protection would raise prices markedly in developing countries in light of comparisons between retail prices of legitimate and copied programs. For example, in December 1997 it was possible in Hong Kong to purchase a pirated copy of Microsoft Office 97 for approximately $6 (US), while the retail price for a legitimate copy was around $1,500. In the summer of 1998 the same product sold for around 8,000 RMB (approximately $1,000) in Beijing.[21] Thus, if

21. Field research done by the author. Prices are likely lower now.

strong enforcement were to support the substantially higher price of legitimate programs, the price impact on computer users would be severe. This is consistent with the static calculations for Lebanon reported earlier.

However, it appears that software firms prefer to sell in places like Hong Kong and China at low volumes with substantial markups, reflecting small markets with inelastic demand from corporate and government users. The markups accrue partially to local distributors, who may be protected also by restrictive distributorship laws. Thus, in a dynamic sense it is likely that as markets develop under copyright protection, authorized software firms will supply more copies of programs at considerably lower prices. Indeed, prices of copyrighted software have fallen sharply in Taiwan since the aggressive crackdown on counterfeiting in the mid-1990s, in part because of additional competition from local developers.[22] This is consistent with the fact that retail copies of Office 97 typically sell in the United States for $160-$200.

In summary, there are reasons to be concerned about elevated prices supported by the market power inherent in IPRs. However, if IPRs are introduced into competitive markets, these effects may be limited. Indeed, it makes little sense to protect market positions with both strong IPRs and barriers to competitive entry.

Higher Imitation Costs

One basic point of IPRs is to raise the costs of copying and imitation in order to expand innovation and learning through market channels. In nations where information diffusion comes largely through copying and imitation, growth prospects could be diminished. It should be noted that straightforward counterfeiting of copyrighted and trademarked goods is unlikely to achieve much technical progress, so raising those costs would not reduce growth.

The more fundamental issue is access to technological information. As suggested above, by raising imitation costs, pharmaceutical and biotechnological patents place considerable pressure on imitative enterprises in developing economies. Improving trade secrets protection will make it more difficult to acquire technologies through misappropriation, copying blueprints, and encouraging defection of technical personnel. Effective systems of PBRs could raise costs of developing similar plant strains. Copyright protection for software makes it more difficult to copy programs; if that change were accompanied by a ban on decompilation for learning purposes the ability of competing software firms to work on inventive applications would be diminished.

22. Interviews in Taipei, December 1997.

Such potential costs are real and explain the reluctance of many countries to improve their IPRs regimes. However, they must be put into broader perspective:

- These costs are counterbalanced by the potential for greater incentives to transfer technology through trade, FDI, and licensing. Indeed, it is likely that many pharmaceutical enterprises will find it necessary to achieve production and technology-sharing and marketing agreements with international pharmaceutical firms in order to survive.
- Stronger IPRs should improve prospects for innovative enterprises to enter markets with new products, a process that should accelerate with time and learning.
- Rising imitation costs need not be damaging if IPRs are introduced into a competitive economy in which firms can choose among many potential suppliers of technology and products.

Potential Abuses of IPRs

The essence of IPRs is to define the boundaries within which the creator of a piece of information with economic value enjoys exclusive rights to its use. These rights are limited by public policy interests in access, dissemination, and dynamic competition.

Abuses of the rights inherent in a patent, trademark, or copyright relate primarily to business strategy, including selling practices and licensing restrictions, that extend the scope of property rights beyond that intended.[23] There are few concrete guidelines because of the complicated nature of markets for information and technology. Vertical licensing agreements, for example, may ensure downstream product quality on the part of local vendors, which aids competition. However, tie-in sales to technology purchasers of unrelated products could represent an attempt to extend the scope of the initial property right, thus injuring competition.

In a later chapter, I discuss potential competitive problems raised by the exploitation of IPRs and appropriate competition policy approaches. Here it suffices to point out that the potential for competitive abuses is curtailed to the extent that competition policy is vigilant and, more importantly, to the extent that markets are open to both domestic and foreign entry. This observation points to the critical role of access to domestic markets in supplementing stronger IPRs.

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23. There is a vast literature on the competitive effects of market power created by patents, trademarks, and protected know-how. Discussions may be found in OECD (1989), UNCTAD (1996), and Gallini and Trebilcock (1998).

Evidence on the Overall Impact of IPRS on Growth

Reforming IPRs could raise or lower economic growth, though the relationships would be complex and dependent on circumstances. Again, we are left with a difficult empirical question and only a limited body of evidence. One recent study considered the question empirically. Gould and Gruben (1996) related economic growth rates across many countries to the Rapp-Rozek index of patent strength, among other variables. They found no strong direct effects of patents on growth, but there was a significantly positive effect when patents interacted with a measure of openness to trade. That is, stronger patents in open economies raised growth rates by 0.66 percent on average, suggesting that market liberalization in combination with stronger IPRs tends to increase growth. The argument is that open economies experience greater competition, higher competitive FDI, and a need to acquire advanced technologies in order to raise product quality. Moreover, firms in open economies are more likely to undertake the costs of effective technology transfer and adaptation to local circumstances. However, such innovation will be more in evidence in economies with protection for intellectual property.

The growth impact of IPRs in open economies, associated with inward trade, investment, and technology flows, is significant. To illustrate, consider two economies with an initial real income per capita of $5,000. Over a 10-year period, if output in one economy grows 2.0 percent faster than population, real income per capita will reach $7,430. An identical (but more open) economy growing 2.66 percent faster than population would achieve real income per capita of $8,453. An important implication of this is that as developing countries strengthen their IPRs, accompanying market liberalization provides a more affirmative path to economic growth. Combining this outcome with the results in Park and Ginarte (1997), IPRs, openness, FDI, and human capital accumulation seem to work together to raise productivity and growth. To be sure, striking the appropriate balances among these complex processes is a considerable challenge.

Summary

Despite the complexity in the many relationships involved, empirical evidence supports an optimistic view about the potential impacts of stronger global IPRs on international economic activity, innovation, and growth and development. It is tempting to supplement these observations by pointing out that industrialized countries, which have strong systems of intellectual property protection, remain the overwhelming sources of new invention and artistic creation. Developing economies with weak IPRs generate few patentable inventions. These facts support the view that

IPRs and innovation go hand in hand and that IPRs are an important factor in technological and cultural development.

Or are they? The difficulty with strong conclusions is that counterexamples abound. As discussed in chapter 3, the United States refused to award copyrights to foreign authors until its own, highly competitive, authors were disadvantaged by an absence of reciprocity in Britain. Japan is commonly thought to have engineered its phenomenal technological "catch-up" by acquiring foreign technologies at concessionary terms, a process buttressed by a system of industrial property rights favoring dissemination of knowledge over its creation (Ordover 1991; Maskus and McDaniel 1999). Korea was able to absorb and develop considerable amounts of adaptive technological information in the absence of meaningful IPRs through the 1970s and early 1980s.

The role of IPRs in economic development is complex and multifaceted. Protecting intellectual property offers gains in innovation and market deepening but imposes costs through higher prices, reduced imitation, and potential abuses. I claim that IPRs can play an important and positive role in economic advancement, with the role becoming larger as economies grow richer. Even among poor economies, however, IPRs can be an important condition for business development, so long as they are well structured and accompanied by appropriate collateral policies. This is the essential challenge as economies adopt stronger IPRs under the new global system. It is the subject of the next two chapters.