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The Economic Justification for the Grant of Intellectuall Property Rights: Patterns of Convergence and Conflict - The Implications of the New Regime for Global Competition Policy

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THE ECONOMIC JUSTIFICATION FOR THE GRANT OF INTELLECTUAL PROPERTY RIGHTS: PATTERNS OF CONVERGENCE AND CONFLICT

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INTRODUCTION

The debate concerning the economic implications of intellectual property rights ("IPRs") is an old one.[1] The globalization of economic activities and the dawning of the digital era have added new dimensions to this debate. As international transactions involving knowledge-intensive products expand, frictions concerning IPRs protection have also increased, fostering demands for international convergence toward higher standards of protection at a worldwide level. The digital "revolution," in turn, by promoting the convergence of telecommunications, computers, and media has created new challenges for existing legal instruments of protection.

This Paper reviews some aspects of the contemporary debate on the economics of intellectual property rights by discussing the abovementioned patterns of convergence (i.e., with respect to geographical coverage and with respect to technology).[2] The process of convergence at international level is an ongoing development that will be strengthened by the recently negotiated Agreement on Trade Related Intellectual Property Rights ("TRIPS"). In a parallel development, the technological convergence generated by the "digital" revolution challenges traditional forms of protection and the "consensus" in

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1. For reviews of the relevant literature see, for example, Carlos A. Primo Braga, *Guidance From Economic Theory, in* STRENGTHENING PROTECTION OF INTELLECTUAL PROPERTY IN DEVELOPING COUNTRIES: A SURVEY OF THE LITERATURE 17 (Wolfgang E. Siebeck ed., 1990); Stanley M. Besen & Leo J. Raskind, *An Introduction to the Law and Economics of Intellectual Property*, 5 J. ECON. PERSP. 3, 3-27 (1991).

2. This Paper relies extensively on Carlos A. Primo Braga, *Trade-Related Intellectual Property Issues, in* THE URUGUAY ROUND AND THE DEVELOPING ECONOMIES (W. Martin & L.A. Winter eds., 1995) (published as World Bank Discussion Paper No. 307).

favor of higher standards of IPRs protection. In the future, the "battlefield" for those engaged in strengthening IPRs protection will be determined not so much by geography, but mainly by the economics of production of knowledge-intensive products in a "digital" environment.

I. THE ECONOMICS OF IPRS

The conventional economic rationale for the protection of IPRs is often framed in terms of Arrow's seminal work concerning the incomplete appropriability of knowledge.[3] IPRs can be understood as second-best solutions to the problems created by the "public good" nature of knowledge. To the extent that they enhance "appropriability," IPRs are expected to foster investment in research and development ("R&D") and knowledge creation. They create, however, a static distortion as they constrain the current consumption of knowledge, by enhancing the market power of title holders. In short, IPRs involve a "bargain" between the producers of knowledge and society, which is mediated by the government.[4]

The above rationale is typically used to explain the economics of patent and copyright laws. With respect to trademarks and industrial designs, the basis for protection is more often framed in terms of incentives for investments in reputation (quality) rather than innovation per se. Trade secrets, in turn, are rationalized as a necessary supplement to the patent system. Their main positive role is to foster innovations that do not comply with the strict requirements for patentability of products and processes. In this Paper, we focus our analysis on IPRs as instruments to promote the creation of knowledge.

The long-term trend with respect to IPRs protection in developed economies has been clearly in the direction of the strengthening of these rights. As pointed out by Winter, however, there is no clear theoretical presumption that a movement towards stronger standards

3. Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS 609 (1962).

4. For an early discussion of the terms of this bargain, see the "monopoly profit incentive" and the "exchange for secrets" theses as presented in SUBCOMM. ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE SENATE COMM. ON THE JUDICIARY, 85TH CONG., AN ECONOMIC REVIEW OF THE PATENT SYSTEM 20-25 (Comm. Print 1958) (Fritz Machlup).

of protection will be always welfare enhancing.[5] Patent races may lead to over-investment in R&D. Private returns may exceed social returns as protection increases and inventors can appropriate additional gains in assets that are complementary to the innovation. And the increase in static distortions in the consumption of knowledge (because of monopolistic practices) may overcome the dynamic benefits of additional R&D.

In spite of these considerations, there is broad recognition that IPRs systems play an important role in the promotion of technological progress. It is true that other institutional arrangements can be used to foster the generation of knowledge without necessarily relying on property rights. The direct production of knowledge by the government, as well as the reliance on subsidies and/or government procurement to foster R&D activities by the private sector illustrate some of the available alternatives.[6] But historical hindsight suggests that market-driven incentives (as exemplified by the proprietary approach) provide the most effective way to organize economic activities, including the creation of knowledge through R&D.

Many questions with respect to the normative implications of IPRs regimes remain unanswered, however. Is the international harmonization of IPRs regimes toward higher standards of protection welfare improving? Are IPRs in a digital environment an effective instrument to promote knowledge creation or just a nuisance? In what follows, we review some of the theoretical aspects of the debate concerning these issues.

II. THE INTERNATIONAL DIMENSION

IPRs are territorial in nature. Nations must reach accommodation as their residents seek protection for their works abroad. The TRIPS negotiations in the context of the Uruguay Round of multilateral trade negotiations can be characterized as the most recent chapter in the long history of attempts to deal with the issue of extra-territoriality of IPRs. What was new in this context was the acceptance of minimum standards of protection (not only in terms of coverage of subject matter and scope of protection, but also with respect to

5. *See* Sidney G. Winter, *Patents in Complex Contexts: Incentives and Effectiveness, in* OWNING SCIENTIFIC AND TECHNICAL INFORMATION: VALUE AND ETHICAL ISSUES 41 (Vivian Well & John W. Snapper eds., 1989).

6. For a discussion of these issues see Partha Dasgupta & Paul Stoneman, *Introduction* to ECONOMIC POLICY AND TECHNOLOGICAL PERFORMANCE (Partha Dasgupta & Paul Stoneman eds., 1987).

enforcement) and the "universal" coverage of the agreement (special and differential treatment for developing countries is limited to the concession of generous transition periods). As discussed in Primo Braga, TRIPS will promote a much greater level of "harmonization" of IPRs protection than was believed feasible a few years ago.[7]

The caveats that apply to the desirability of ever stronger protection for IPRs at the national level gain an additional dimension when the analysis moves to the international level. If the existing (or potential) title-holders are predominantly foreigners, the strengthening of protection raises the possibility of an international rent transfer.[8] The net welfare impact of the reform for the country will depend on how local consumers and producers are affected, as well as on its implications for world levels (and composition) of R&D.

Many different scenarios can be modeled to capture these effects.[9] If a country is small (i.e., its IPRs regime does not affect world R&D) and it has limited production and innovation capabilities, higher standards of protection are likely to be welfare improving as long as they permit access to products that would not be available otherwise. If, however, the country has some production capabilities (a proxy for its capacity to imitate), but limited innovative capacity (as measured by its R&D basis, for example), higher standards of protection are likely to have a negative welfare impact, as local producers are displaced, prices rise, and a rent transfer from local consumers and producers to foreign title-holders ensues. Finally, if the small country has both well developed production and innovative capabilities (as in the case of the East Asian newly industrialized economies), the result will be indeterminate, depending on the elasticity of supply of domestic innovations with respect to IPRs protection.

7. *See* Primo Braga, *supra* note 2.

8. Available statistics suggests that this is a valid description of the situation of developing countries. By 1982, of the 200,000 patents awarded by developing countries, for example, 175,000 (87.5%) were awarded to foreign patentees. For the major developing countries, the share was around 79%. *See* WORLD INTELLECTUAL PROPERTY ORGANIZATION, 100 YEARS OF INDUSTRIAL PROPERTY STATSITICS (1983); Arvind Subramanian, *Putting Some Numbers on the TRIPS Pharmaceutical Debate*, INT'L J. TECH. MGMT. 1, 1-17 (1994).

9. For formal models see, for example, M.K. Berkowitz & Y. Kotowitz, *Patents Policy in an Open Economy*, 15 CANADIAN J. ECON. 1, 1-17 (1982); Judith C. Chin & Gene M. Grossman, *Intellectual Property Rights and North-South Trade*, *in* THE POLITICAL ECONOMY OF INTERNATIONAL TRADE 90 (Ronald W. Jones & Anne O. Krueger eds., 1990); Alan V. Deardorff, *Welfare Effects of Global Patent Protection*, 59 ECONOMICA 35 (1992); Ishac Diwan & Dani Rodrik, *Patents, Appropriate Technology, and North-South Trade*, 30 J. INT'L ECON. 27 (1991). For a discussion of the optimal level of protection in the South see Claudio R. Frischtak, *Harmonization Versus Differentiation in Intellectual Property Right Regimes*, *in* GLOBAL DIMENSIONS OF INTELLECTUAL PROPERTY RIGHTS IN SCIENCE AND TECHNOLOGY (Mitchel B. Wallerstein et al. eds., 1993).

On the other hand, if the developing country is large enough to affect innovation in the North, then one has also to take into account the possibility of an increase (or reorganization) of R&D investments on a global scale. In such a scenario, higher levels of protection in the South may be a better solution for the world as a whole in a dynamic sense, even if the immediate losses for the South are bigger than the benefits for innovators in the North.

This brief review underscores the limitations of normative recommendations concerning changes in the rules for IPRs at world level. The strengthening of IPRs protection will have different welfare implications depending on the characteristics of each country. Generalizations can only be made if strong assumptions are adopted. For example, if one assumes that the supply of innovations in the South (i.e., in the developing world) is rather inelastic and that IPRs regimes are of limited relevance in influencing trade, foreign direct investment, and technology transfer, then it follows that the Agreement is in essence an exercise in rent transfer.[10] A much more optimistic view of its welfare implications for developing countries, however, can be put together if the opposite assumptions are held.[11]

III. THE TECHNOLOGICAL DIMENSION

The dawning of the digital era poses another set of problems for IPRs regimes. The merger of computer and telecommunication technologies has allowed the explosive growth of computer-mediated networks and the gradual emergence of a global information infrastructure (i.e., a network of networks with global reach and multimedia capabilities). The Internet environment provides an exciting "window" into this future.

Some of the problems for IPRs raised by the emergence of the global information infrastructure ("GII") are not exactly new. It is true that the GII, by promoting the "end of geography," gives a new relevance to the issue of extra-territoriality and increases the demand for convergence among national IPRs regimes. This, however, can be characterized as the next stage in the process of economic globalization. The GII also expands the possibilities for dissemination of information (through copying) and, eventually, for activities that infringe

10. *See* Arvind Subramanian, *TRIPS and the Paradigm of the GATT: A Tropical, Temperate View*, 13 WORLD ECON. 509 (1990).

11. *See* Robert M. Sherwood, *Why a Uniform Intellectual Property System Makes Sense for the World*, *in* GLOBAL DIMENSIONS OF INTELLECTUAL PROPERTY RIGHTS IN SCIENCE AND TECHNOLOGY 68 (Mitchel B. Wallerstein et al. eds., 1993).

on someone's IPRs. Here, again it can be argued that this is simply another chapter in the history of technological progress and that as in the case of photocopying, audio and video-tape capabilities the law will adapt—as time goes by—to face these new challenges. The expansion of legitimate video-tape rental facilities around the world illustrates how the legal system can cope with decreasing costs of copying, while enforcing the protection of IPRs.

There are, however, some issues that are new and for which no definitive answers are available. The frontiers between carriers and content providers become fuzzy in the GII. With a few computer strokes one can download copyrighted material in numerous bulletin board systems ("BBS") around the world in an anonymous fashion. By prosecuting infringing BBS operators (carriers, etc.), one can discourage infringement, but this may inhibit the expansion of the very value-added services that make the GII meaningful.[12] In the same vein, the possibilities for digital manipulation (and dissemination) of copyrighted material are expanding (e.g., colorization of black-and-white movies, multi-media experiments, databases in networks, etc.), and friction among right-holders and users is also bound to increase. For those who are optmistic about the capacity of conventional IPRs laws to deal with these new issues, history is a strong ally to the extent that it highlights the capacity of the system to adapt and address the needs of new technologies (e.g., the protection of software).

Another type of concern re-energized by the proliferation of electronic networks is the question of IPRs and market power. It has been pointed out, for example, that the optimal level of protection for software that benefits from significant network externalities (i.e., software that becomes more valuable as the number of users increase) should be lower than is the case for nonnetwork software.[13] It can be argued, however, that this does not require changes in the IPRs regime. It only highlights the importance of having effective competition laws in parallel to IPRs protection.

A more fundamental question, however, is posed by these technological developments. It can be stated as follows: is there anything

12. For an example of the issues raised by this type of behavior in a concrete case in the United States, see Anne Wells Branscomb, *Liability of Information Providers and Users: Legal Concerns, in* I-Ways, DIGEST OF THE GLOBAL INFORMATION INFRASTRUCTURE COMMISSION (1995).

13. *See* J. Farrell, *Arguments for Weaker Intellectual Property Protection in Network Industries*, John M. Ohlin Working Papers in Law, Economics and Institutions (Univ. of Cal. 1995).

intrinsic to the economics of the digital era that makes the rationale for IPRs protection obsolete?

There are some analysts who believe that to be the case. Barlow argues that encryption (i.e., technology), rather than laws, provides the only effective way to protect intellectual property in "cyberspace."[14] The gist of his arguments can be captured by the following propositions: (i) "all information wants to be free";[15] (ii) the economics of information in a networked economy will increasingly be associated with relationships (e.g., ancillary services) rather than property; and (iii) the transaction costs to enforce IPRs in a networked environment are too high.

Some aspects of propositions (i) and (iii) can be addressed by the supporters of IPRs orthodoxy without major problems. After all, IPRs do not protect information in the abstract. In the case of copyright, for example, the requirement of creativity allows one to argue that the protection of intellectual property promotes the production of knowledge and works of art without hampering the possibilities of dissemination of information *stricto sensu*.[16] In the same vein, the issue of transaction costs is not a new phenomenon and IPRs laws have been flexible enough to cope with this problem as illustrated by the special treatment given to private use of copyrighted works in most countries. From this perspective, laws will adapt gradually as experience with the economics of a digital environments accumulates. In sum, no revolutionary change is required.

Proposition (ii), however, poses a more fundamental challenge to IPRs orthodoxy. This line of reasoning is further developed in Dyson.[17] If the economics of networks evolves in such a way that the competitiveness of content providers in the GII is enhanced by distributing their intellectual property for free, while charging for ancillary services and products, than the enforcement of IPRs in this environment will lose its relevance over time. Empirical analyses of this type of phenomenon, however, are still in their infancy. In this context, support for immediate radical changes in the legal system remains limited to the fringes of the relevant industries.

14. *See* John Perry Barlow, *The Economy of Ideas: A Framework for Rethinking Patents and Copyrights in the Digital Age (Everything You Know About Intellectual Property is Wrong)*, WIRED, March 1994, at 84, 129.

15. *See* Stewart Brand, THE MEDIA LAB: INVENTING THE FUTURE AT MIT (1987).

16. For more on this, see Bruce A. Lehman & Ronald H. Brown, *Intellectual Property and the National Information Infrastructure: Report of the Working Group on Intellectual Property Rights* 19-23 (1995).

17. *See* Esther Dyson, *Intellectual Value*, WIRED, July 1995, at 136.

IV. EMPIRICAL ANALYSES ABOUT THE EFFECTS OF CONVERGENCE

The economic implications of international and technological convergence are in essence empirical questions. As already noted, empirical analyses of the impact of IPRs in digital environments remain limited and most assertions at this stage rely on theoretical models. In this Section, we review some of the empirical literature available about the effects of international convergence.

The point of departure for this analysis is the proposition that TRIPS will typically foster higher standards of IPRs protection in the South (i.e., the developing countries) than the ones prevailing in 1994. Accordingly, it will promote greater convergence among IPRs regimes around the world. There are costs and benefits for countries engaged in the strengthening of their IPRs regimes. Costs associated with the required changes include additional administrative and enforcement costs, increase in payments for foreigners' proprietary knowledge, price increases associated with greater market power for knowledge producers, the costs of displacement of "pirate" activities, and the opportunity cost of additional R&D. Potential benefits include new inventions fostered by higher levels of R&D at domestic and international level, and greater technology and foreign direct investment ("FDI") flows.[18] Moreover, convergence is expected to affect trade flows in products that rely on IPRs protection.

In what follows, the discussion focuses on the main potential implications of TRIPS. First, the potential impact of strengthening IPRs on trade, FDI and the transfer of technology is discussed. The basic premise is that these effects may generate allocative and dynamic benefits for the countries in question. After that, attention is given to the rent transfer aspects of TRIPS, its impact on local producers, and on R&D investments in the North and in the South.

V. IPRS AND TRADE FLOWS

IPRs regimes may influence trade flows. Stern, for example, points out that discrepancies among national IPRs regimes generate effects analogous to nontariff barriers.[19] Exporters in the North have

18. For a detailed discussion of each one of these potential costs and benefits, see Carlos A. Primo Braga, *The Developing Country Case For and Against Intellectual Property Protection*, *in* STRENGTHENING PROTECTION OF INTELLECTUAL PROPERTY IN DEVELOPING COUNTRIES: A SURVEY OF THE LITERATURE 69 (Wolfgang E. Siebeck ed., 1990).

19. *See* Richard H. Stern, *Intellectual Property*, *in* THE URUGUAY ROUND: A HANDBOOK FOR THE MULTILATERAL TRADE NEGOTIATIONS 198, 202-03 (J. Michael Finger & Andrzej Olechowski eds., 1987).

additional costs when exporting to the South (as compared to North-North trade) as they have to engage in activities designed to inhibit local imitation. It can also be argued that the international harmonization of IPRs regimes diminishes the transaction costs of operating in different regulatory environments.

The net impact on trade flows of strengthening protection of IPRs in the South is, however, ambiguous. As pointed out by Maskus and Penubarti, the higher level of protection fosters two conflicting effects.[20] First, it will enhance the market power of the title holder, reducing the elasticity of demand for his/her products. Second, it will expand the net demand for the protected products as imitators are displaced. The net trade effect will depend on which effect dominates. If the market-power effect is bigger than the market-expansion effect then trade flows may decrease in the aftermath of the reform. If the opposite holds, then strengthening IPRs protection will lead to trade expansion. In other words, the net trade effect of TRIPS is in essence an empirical question.

Ferrantino, using data from the early 1980s, investigates the role of IPRs regimes in influencing U.S. arm's-length trade, intrafirm trade and "establishment-trade" (i.e., sales of U.S. overseas affiliates in the local market).[21] U.S. exports and sales by affiliates are explained using a gravity model that has several economic (e.g., shipping distance, dummies for landlocked and European countries) and policy (e.g., average tariff rate, foreign exchange regime) distance variables. Gross domestic product, population, and relative labor costs are also used as independent variables. He introduces IPRs in the model as policy distance variables, using dummies for membership in the Paris, Berne and UPOV Conventions, as well as information on the term of patent protection, to construct proxies for the strength of the IPRs regime in U.S. trading partners.

Ferrantino's overall results suggest at best a weak association between IPRs and arm's-length U.S. exports (only the length of patent protection shows a significant positive impact), no influence of IPRs on establishment trade, but significant effects with respect to intrafirm trade. His main conclusion is that intrafirm exports tend to be higher in the case of countries with weaker IPRs protection. This is

20. *See* Keith E. Maskus & Mohan Penubarti, *How Trade-Related Are Intellectual Property Rights?*, 39 J. INT'L ECON. 227 (1995).

21. *See* Michael J. Ferrantino, *The Effect of Intellectual Property Rights on International Trade and Investment*, 129 WELTWIRTSCHAFFTLICHES ARCHIV: REVIEW OF WORLD ECONOMIES 300 (1993).

interpreted as an indication that U.S. transnational corporations prefer to maintain production within U.S. borders and engage in intra-firm trade rather than risk the loss of proprietary information by adopting a more integrated system of production in partner countries that have weaker IPRs regime.

Membership in IPRs conventions, however, are not robust indicators of the overall strength of an IPRs regime. An alternative procedure is to rely on available measures of strength of patent protection at country level as proxies for the variable in question. Several such measures have been developed (see Box 1 opposing page); for econometric purposes the index compiled by Rapp and Rozek[22] is the most attractive given its broad country coverage. A problem lies in the fact that the strength of an IPRs regime is endogenously determined by the level of economic development and trade flows, thus using the Rapp and Royek index as an explanatory variable in a least-squares regression on trade flows would yield inconsistent estimates. To address this problem, we corrected the "raw" Rapp and Rozek index by adopting an instrumental variable approach. Following Maskus and Penubarti,[23] we chose the following eight instruments: secondary enrollment ratios, GNP per capita, dummy variables for the existence of legislative provision for pharmaceutical and chemical product patents, and dummies for former British and French colonies. The estimation results of this first stage regression are presented in Table 1. It is worth noting, that the regression registered an adjusted R^2 of 0.50 and that most coefficients had the expected signs (the exceptions were the one on secondary enrollment ratios and the one for the dummy for former French colonies). The "corrected" Rapp and Rozek index refers to the fitted values of this regression.[24]

Using bilateral data for the United States from 1989 covering thirty-five partner countries, we estimated a gravity model for the same dependent variables analyzed in Ferrantino:[25] arm's length trade, intra-firm trade, and "establishment trade" for U.S. companies. The explanatory variables used were GDP, population, geographical

22. *See* Richard T. Rapp & Richard P. Rozek, *Benefits and Costs of Intellectual Property Protection in Developing Countries*, 23 J. WORLD TRADE 75 (1990).

23. *See* Maskus & Penubarti, *supra* note 20.

24. It must be acknowledged that the instruments we used are likely to be correlated with the dependent variable in our regression (trade flows). It is questionable to what degree these instruments really can address the endogeneity problem of the IPRs index. Because of this problem and the fact that the estimates using the "raw" Rapp and Rozek index did not differ substaintially from the results with the "corrected" index, we abandoned the instrument variable approach in the other two models.

25. *See* Ferrantimo, *supra* note 21.

Different Measures of IPR Protection

The most comprehensive index on IPR protection was developed by Rapp and Rozek.[a] They rated the patent laws of 157 countries on a scale from zero—for countries without patent laws—to five—for countries with patent laws which fully conform to the minimum standards described in U.S. Chamber of Commerce.[b] The usefulness of this index as a measurse of the strength of IPR regimes can be criticized to the extent that it only considers one type of intellectual property—patents—and does not take into account the enforcement of a country's patent law. However, this index is very attractive given its broad country coverage.

As an alternative, Mansfield surveyed ninety-four U.S. firms in six manufacturing industries: chemicals, transportation equipment, electric equipment, machinery, food, and metals.[c] As an indicator for the level of IPR protection, he introduces the share of firms which report that the IPR regime is too weak to allow investment, transfer or licensing of technology. The survey included sixteen U.S. partner countries. Comparing Mansfield's indicator of IPR protection to the Rapp and Rozek index as far as both measures are available, there only seems to be weak correlation between the two.

A third rating is currently being developed by Sherwood.[d] Starting from a maximum "perfect" score of one hundred points are subtracted for weaknesses in each of the following criteria: enforceability; administration; treaties; and substantive laws for copyrights, patents, trademarks, trade secrets, and life forms. Up to four points can be added for a strong general commitment to IPR protection. So far, fourteen countries have been included in the study. As far as matching availability of ratings allow comparisons, Sherwood's measure of IPR protection is at best weakly correlated with the Rapp/Rozek and Mansfield indices presented above. This may be explained by the fact that Sherwood's index is the most contemporary of these indices and incorporates the most recent reforms pursued by developing countries.

To sum up, several attempts have been made to develop measures on IPR protection. They differ with respect to their applied methodology and their country coverage. As far as comparisons are feasible, they do not seem to be close substitutes.

[a] *See* R. Rapp & R. Rozek, *Benefits and Costs of Intellectual Property Protection in Developing Countries,* Working Paper No. 3 (National Economic Research Associates, 1990).

[b] *See* U.S. CHAMBER OF COMMERCE, GUIDELINES FOR STANDARDS FOR THE PROTECTION AND ENFORCEMENT OF INTELLECTUAL PROPERTY RIGHTS (1987).

[c] *See* Edwin Mansfield, *Intellectual Property Protection, Foreign Direct Investment, and Technology Transfer*, IFC Discussion Paper No. 19 (1994).

[d] *See* Robert M. Sherwood, *Intellectual Property Systems and Investment Simulation: Rating 18 Developing Country Systems*, 37 IDEA: J.L. & TECH. 261 (1997).

distance from the United States, an estimate of trade barriers, dummies for Europe and landlocked countries, and the Rapp and Rozek index. The estimation results are presented in Table 2. The perform-

ance of the model is quite good; almost all of the coefficients have the expected signs, the R^2s are high. Positive coefficients for the IPRs index are found in all equations, but the coefficient is statistically significant only with respect to arm's-length trade in contrast to Ferrantino's result. Taking this result at its face value, it seems that market expansion dominates market-power effects—that is, stronger IPRs protection promotes more trade.

TABLE 1: ESTIMATION OF THE CORRECTED RAPP AND ROZEK INDEX.

Rapp and Rozek index.	
Intercept	-0.752 (-0.98)
Secondary enrollment ratios	-0.639** (-2.48)
Per-capita GNP	0.563*** (3.88)
Dummy for membership in Paris convention	0.913** (2.64)
Dummy for membership in Berne convention	0.499* (1.67)
Dummy for existence of pharmaceutical product patents	0.415 (1.51)
Dummy for existence of chemical products patents	0.688* (1.91)
Dummy for former French colonies	-1.221*** (-2.78)
Dummy for former British colonies	0.684** (2.37)
Usable Observations	69
R-square	0.588

Note: t-statistics in parentheses. ***significant at 1% - **significant at 5% - *significant at 10%. Data on secondary enrollment ratios and per-capita GNP (both 1988) refers to the World Development Report 1990 (The World Bank). Dummy variables for membership in Paris and Berne Conventions and for the existence of legislative provision for pharmaceutical and chemical patents as of 1988 are based on Siebeck (1990). The model was estimated in log-linear form. The estimation technique used was OLS.

This result is confirmed by Maskus and Penubarti, who use an augmented version of the Helpman-Krugman model of monopolistic competition in examining bilateral trade flows.[26] Imports of good *i* by country *j* from exporter *k* as a share of aggregate expenditure in country *j* are explained by the sectoral exporter output, the importer per-capita income, trade-resistance measures for the importing country (average tariff rates, black-market premia), and the Rapp-Rozek index of patent strength for country *j*. Dummy variables indicating whether the importing developing country has a small or large market are also utilized. It is worth noting that both the sectoral exporter output and the Rapp-Rozek index—in a similar way as described above—are used as predicted by first-stage regressions designed to address endogeneity problems.

The results obtained suggest that firms are influenced by the strength of importing countries' patent regimes when engaging in export activities. Countries with stronger patent regimes import more than what is predicted by the Helpman-Krugman model. Moreover, the impact of patent protection on trade flows is found to be bigger in the larger developing countries.

Following Maskus and Penubarti's methodology,[27] we estimated a similar model with bilateral trade flows as a share of aggregate expenditure as dependent variable.[28] Similarly, our explanatory variables were exporter output; importer per capita income; an estimate for trade barriers; and the Rapp and Rozek index of the importing country interacted with dummy variables dividing the importing countries into high income, large developing, and small developing countries. The results obtained are presented in Table 3. In accordance with Maskus and Penubarti,[29] they show a positive impact of patent protection on trade flows within the Helpman-Krugman model. However, when turning to the interacted variables, our result suggests the impact of IPRs on trade flows to be weaker in large developing countries and stronger in small developing countries.[30]

26. *See* Maskus & Penubarti, *supra* note 20.

27. *See id.*

28. However, our country set and data source were much different from Maskus and Penubarti. We used 1988 total manufacturing trade flows from 91 reporter (exporter) countries to 65 partner (importer) countries as reported to the UNSO Comtrade Database. Maskus and Penubarti relied on 1984 exports of 22 OECD members to 77 partner countries as reported to the OECD Comtap Database.

29. *See* Maskus & Penubarti, *supra* note 20.

30. It is worth noting, that the overall effect of patent protection in large developing countries is still significantly positive (not shown in Table 3).

TABLE 2: TRADE AND IPRS: ESTIMATES OF A GRAVITY MODEL BASED ON FERRANTINO (1993)

	Arm's length trade	*Intra-firm trade*	*Establishment trade*
Intercept	-5.472*** (-2.96)	-23.952*** (-5.26)	-17.563*** (-7.76)
GDP	0.926*** (5.37)	1.974*** (4.65)	0.977*** (4.63)
Population	-0.143 (-0.79)	-1.094** (-2.44)	0.101 (0.45)
Geographical distance	-0.645*** (-3.61)	-0.242 (-0.55)	-0.598*** (-2.73)
Estimate for trade barriers	-0.898*** (-3.20)	-1.356** (-1.96)	-0.082 (-0.24)
Dummy for Europe	-0.857*** (-4.09)	-1.983*** (-3.84)	0.094 (0.37)
Dummy for landlocked countries	-1.175** (-2.36)	-1.083 (-0.88)	-0.363 (-0.60)
Corrected Rapp and Rozek index	0.274** (2.09)	0.066 (0.20)	0.124 (0.78)
Usable Observations	35	35	35
R-square	0.859	0.682	0.876

Note: t-statistics in parentheses. ***significant at 1% - **significant at 5% - *significant at 10%. Data on intrafirm trade and establishment trade was taken from the U.S. 1989 Benchmark Survey (U.S. Department of Commerce); arm's-length trade equals total U.S. exports as reported in the UNSO Comtrade Database minus intrafirm trade. Data on GDP was taken from the World Tables (The World Bank). Data on population are reported by the International Labor Organization (1990). Data on geographical distance was taken from Linneman (1966). Following Maskus and Penubarti (1994), the estimate for trade barriers refers to residuals of a first stage regression of relative price levels on factor endowments to correct for non-traded goods. The construction of the corrected Rapp and Rozek index is described in the text accompanying footnotes 23 and 24. However, estimates based on the raw index did not differ in signs and significance levels from those based on the corrected index used in the presented estimation. The equations were estimated in log-linear form. The estimation technique used was SURE ("Seemingly Unrelated Regression Estimation"). Further details on the estimation are available upon request.

Maskus and Penubarti also analyze sectoral exports by clustering industries in three different categories of expected sensitivity to patent laws: high sensitivity (R&D-intensive industries and those industries that have reported significant damages from "piracy"), low sensitivity, and other industries.[31] They find that on average the coefficients for the patent index in the least patent-sensitive industries seem to be more significant and bigger than for the most sensitive industries. They interpret this result as related either to larger market-power effects or to the interplay between trade and FDI decisions in highly

31. *See* Maskus & Penubarti, *supra* note 20.

TABLE 3: BILATERAL TRADE FLOWS IN A MODEL OF MONOPOLISTIC COMPETITION: THE ROLE OF IPRS

Bilateral trade flows as a share of aggregate expenditure	
Intercept	-35.018*** (-45.22)
Exporter Output	0.489*** (25.06)
Per-capita GNP	0.316*** (3.80)
Estimate for trade barriers	-0.982*** (-4.57)
Rapp and Rozek index	0.426*** (5.56)
Rapp and Rozek index interacted with a dummy for small developing countries	0.337*** (5.26)
Rapp and Rozek index interacted with a dummy for large developing countries	-0.240*** (-4.12)
Usable Observations	3987
R-square	0.195

Note: t-statistics in parentheses. ***significant at 1% - **significant at 5% - *significant at 10%. Bilateral trade flows (1988) were taken from the UNSO Comtrade Database; data on aggregate expenditure and per-capita GNP refers to the World Tables (The World Bank). Following Maskus and Penubarti (1994), the variable exporter output are the fitted values of a first stage regression of total manufacturing output on factor endowments to address simultaneity problems. Similarly, the estimate for trade barriers refers to residuals of a regression of relative price levels on factor endowments to correct for non-traded goods. By construction, the coefficients on the interacted variables represent the additional effect of patent protection in small and large developing countries compared to high-income countries. The equations were estimated in log-linear form. The estimation technique used was OLS. Further details on the estimation are available upon request.

sensitive industries (with FDI replacing trade as a mode of delivery in countries with weaker patent regimes). They also argue that the patent index may be capturing other dimensions of the IPRs regime (e.g., copyright and trademark protection) that are relevant for the low-patent-sensitivity group.

In sum, there is mounting evidence that IPRs are indeed "trade-related."[32] These results are, of course, model specific and should be interpreted with care.[33] They suggest, however, that the implementation of TRIPS will have a net trade creating impact. Although no precise welfare predictions can be derived from them, they suggest

32. *Id.*

33. The problem of endogeneity was already mentioned. The results may be further misleading as the strength of an IPRs regime is correlated with the level of economic development and thus the estimated coefficients may pick up other development related effects in the dependent variables. We are currently undertaking research trying to address some of these issues.

that TRIPS may have a positive allocative impact at global level and that market-expansion will dominate the market-power effect in developing countries.

VI. IPRs AND FDI

It is often argued that foreign firms avoid investing in countries with weak IPRs regimes.[34] The magnitude of the impact of weak protection on FDI decisions, however, is debatable. First, evidence based on surveys of foreign investors that identify IPRs as a relevant variable for FDI decisions tend also to point out that other considerations—in essence the overall investment climate of the country—are more important.[35] Second, as already pointed out, FDI may replace trade flows as firms try to maintain control of proprietary information in countries with weak IPRs protection. In this case, the impact of TRIPS would be to diminish the incentives for FDI at the margin for R&D-intensive industries.[36]

Mansfield provides some new insights on the IPRs-FDI link.[37] His analysis, based on survey data collected from patent attorneys and executives of major U.S. manufacturing firms, makes clear that IPRs regimes are relevant for some, but not all types of FDI decisions. Not surprisingly, IPRs protection was found to be much more relevant for decisions on investment in R&D facilities than for FDI in sales and distribution outlets. Sharp differences were also found concerning the perceptions of different industries on the importance of IPRs regimes in influencing their decisions on FDI. While the chemical (and pharmaceutical) industry reported that IPRs played a major role in their decisions with respect to investment in joint ventures abroad, the metals and food industries considered IPRs protection to have marginal significance.

Mansfield also reports ongoing econometric work that tries to explain U.S. foreign direct investment flows to the sixteen countries en-

34. *See Economic Arguments for Protecting Intellectual Property Rights Effectively*, OECD Doc. No. TC/WP/88 at 90 (1993).

35. *See* Fritschtak, *supra* note 9.

36. See the results obtained by Keith E. Maskus & Denise Eby Konan, *Trade-Related Intellectual Property Rights: Issue and Exploratory Results*, *in* ANALYTICAL AND NEGOTIATING ISSUES IN THE GLOBAL TRADING SYSTEM 401 (Alan V. Deardorff & Robert M. Stern eds., 1994), in this respect.

37. *See* Edwin Mansfield, *Intellectual Property Protection, Foreign Direct Investment, and Technology Transfer*, IFC Discussion Paper No. 19 (1994) [hereinafter Mansfield, IFC Discussion Paper No. 19]; Edwin Mansfield, *Intellectual Property Protection, Foreign Direct Investment, and Technology Transfer: Germany, Japan and the United States*, IFC Discussion Paper No. 27 (1995).

compassed by his survey, using the host-country GDP and his own index of protection as independent variables (a dummy for Mexico is also included in the model).[38] The overall results are not particularly robust, but when Japan and Spain are excluded from the sample, he does find that both aggregate manufacturing FDI flows as well as FDI flows to certain industries (particularly machinery and food) are sensitive to weaknesses in IPRs regimes—that is, U.S. FDI flows increase with the perceived strength of the IPRs regime.

A similar exercise was implemented by the authors, relying on a larger set of countries and the Rapp and Rozek index. Total assets of U.S. firms in 1992 for total manufacturing and certain manufacturing industries were used as dependent variable. As explanatory variables we used GDP, a dummy for Canada and Mexico, and the Rapp and Rozek index.[39] The estimation results are presented in Table 4. The results are most powerful with respect to manufacturing as a whole. All coefficients are statistically significant and the R^2 lies in the eightieth percentile. The coefficient on the Rapp and Rozek index shows IPRs to have a positive impact on the level of U.S. investment abroad. The sectoral results are less robust, although the coefficient on the Rapp and Rozek index always shows a positive sign and is statistically significant for "primary and fabricated metals" and "electric and electronic equipment."

These results are tentative and additional work needs to be done in this area. In particular, a formal model of equilibrium of the international distribution of FDI is needed for one to derive more precise inferences about the IPRs-FDI link. It can be argued, however, that in a world characterized by growing competition for FDI flows, future compliance with the minimum standards of TRIPS will be perceived as a threshold indicator. It will influence perceptions of foreign investors about the relative attractiveness of competing investment locations, even though its direct impact on FDI flows at country level remains an open question.

VII. IPRs AND TRANSFER OF TECHNOLOGY

Probably the most traditional argument for IPRs protection in developing countries is that technology owners are less willing to

38. *See* Mansfield, IFC Discussion Paper No. 19, at App. II.

39. Estimates for trade barriers and growth rates were also tested as explanatory variables, but neither did they contribute to the overall explanatory power of the model—mostly the coefficients were statistically insignificant—nor did they change the result with respect to the other explanatory variables.

TABLE 4: U.S. FOREIGN DIRECT INVESTMENT AND IPRs

	Total manufacturing	*Food and kindred products*	*Chemicals and allied products*	*Primary and fabricated metals*	*Machinery except electrical*	*Electric and electronic equipment*
Intercept	−17.324***	−13.774***	−14.239***	−15.008***	−27.642***	−16.056
	(−8.07)	(−3.76)	(−5.53)	(−4.80)	(−3.98)	(−2.94)
GDP	0.970***	0.739***	0.799***	0.732***	1.256***	0.776***
	(10.98)	(4.93)	(7.55)	(5.68)	(4.62)	(3.477)
Dummy for Canada and Mexico	1.635**	2.336**	1.613**	2.199*	1.340	2.236
	(2.35)	(2.08)	(2.13)	(1.85)	(0.953)	(1.67)
Rapp and Rozek index	0.255**	0.208	0.179	0.332**	0.308	0.434*
	(2.53)	(1.25)	(1.58)	(2.53)	(1.41)	(1.92)
Usable Observations	42	37	42	37	31	33
R-square	0.820	0.544	0.691	0.640	0.504	0.474

Note: t-statistics in parentheses. ***significant at 1% - **significant at 5% - *significant at 10%. Data on the FDI-stocks in manufacturing was taken from U.S. Direct Investment Abroad, Preliminary 1992 Estimates (U.S. Department of Commerce, 1994). Data on GDP (1992) refers to the World Tables (The World Bank). The model was estimated in log-linear form. The estimation technique used was OLS.

transfer proprietary knowledge to countries with weak protection because of the risk of "piracy." Support for this proposition typically comes from surveys of firms in the North. Mansfield, for example, finds that U.S. firms "tend to regard intellectual property protection as being more important in decisions regarding the transfer of advanced technology than in investment decisions."[40]

Some analysts, however, remain skeptical about the relevance of this effect. Subramanian points out that North-South conflict occurs mainly in those fields (e.g., pharmaceutical and chemical products, software) where imitation is possible independently of technology transfer.[41] Accordingly, the potential benefits of higher IPRs protection are disputed to the extent that imitation is argued to be a sound alternative for formal transfer of technology. Nogues in turn argues "that the decision to license and transfer technology depends much more on the legal strength of the licensing agreement and the adaptable capacity of the buyer to absorb technology" than on the strength of the IPRs regime.[42]

It is important to acknowledge, however, that firms in the North react to copying by investing in "masking" technologies (e.g., encryp-

40. Mansfield, IFC Duscussion Paper No. 19, *supra* note 37.

41. *See* Subramanian, *supra* note 10.

42. *See* J.J. Nogues, *Social Costs and Benefits of Introducing Patent Protection for Pharmaceutical Drugs in Developing Countries*, 31 DEVELOPING ECON. 24 (1993).

tion of software codes) that raise the costs of imitation.[43] Moreover, lack of protection in sectors that are imitation-prone influences the overall perception of the IPRs regime in the developing country. If the country is perceived not to be playing by the "rules of the game," it will find increasingly difficult to obtain the transfer of technology in fields in which the cooperation of the inventor is fundamental. Finally, it can be argued that imitation as a "mode" of technology transfer will be of limited efficacy to the extent that knowledge about a particular technology is "tacit" and "circumstantial."[44] On balance, one should expect more North-South transference of technology in response to TRIPS.

VIII. IPRs AND RENT TRANSFER

One of the main concerns of developing countries with respect to TRIPS is related to the potential impact of higher standards of protection on domestic prices and with respect to rent transfer abroad.[45] The potential for rent transfer is significant to the extent that, as already noted, nonresidents account for most of the patents granted in developing countries.

The introduction of patents for pharmaceutical inventions, for example, has attracted considerable attention.[46] This is an area in which many developing countries do not offer IPRs protection and where price levels are closely monitored in the context of health policies and other social objectives. Estimates of price increases, domestic welfare losses (encompassing consumer surplus and domestic producer surplus losses), and potential rent transfers (as measured by the rise in foreign profits) are available in the literature. As expected, the static effects of the introduction of patent for pharmaceutical inventions in developing countries imply domestic welfare losses for the South which are larger than the benefits accrued to innovators in the North. The estimates, however, are quite sensitive to assumptions concerning market structure and firm behavior.

43. *See* M. Scott Taylor, *TRIPS, Trade, and Technology Transfer*, 16 CANADIAN J. OF ECON. 625, 626 (1993).

44. *See, e.g.*, R.E. Evenson & L.E. Westphal, *Technological Change nd Technology Strategy*, *in* 3 HANDBOOK OF DEVELOPING ECONOMICS (T.N. Srinivasen & Jere Behrman eds., forthcoming); U.N. Transnational Corps. & Management Div., Dep't of Econs. & Soc. Dev., *Intellectual Property Rights and Foreign Direct Investment* ST/CTC/SER.A/24 (1993).

45. See for example Dani Rodrik, *Comments*, *in* ANALYTICAL AND NEGOTIATING ISSUES IN THE URUGUAY ROUND (Alan V. Deardorff & Robert M. Sterns eds., 1994).

46. *See, e.g.*, Maskus & Konan, *supra* note 36; Nogues, *supra* note 42; Subramanian, *supra* note 10.

A worst case scenario in terms of welfare losses and rent transfer can be developed if one assumes that a domestic competitive industry becomes a foreign-owned monopoly as a consequence of the introduction of patents.[47] The domestic welfare loss is determined by the significant price increase that occurs in such a scenario. If the original market structure is characterized by a duopoly with a domestic and a foreign firm that evolves into a foreign controlled monopoly, then the scope for a price increase is limited, but a significant welfare loss still ensues mainly as a consequence of the loss in domestic producer surplus.

As Maskus and Konan point out, however, these scenarios do not capture in a realistic fashion the market for pharmaceutical products in most developing countries.[48] Once one assumes that in the pre-reform situation the dominant foreign firm faces a competitive fringe of imitators and, eventually, of producers of generic drugs that are close substitutes for the patented drugs, the results change. First, the price impact and consumer surplus losses are significantly reduced. They will be larger in countries in which the competitive fringe of imitators is relatively bigger (e.g., India, Argentina) than in others where imitators have a more limited market share to start with (e.g., Brazil).[49] Second, the potential for rent transfers also decreases dramatically.

The basic message of these exercises is that although TRIPS will generate rent transfers from the South to the North, the magnitude of these transfers is unlikely to be as large as in the worst case scenarios discussed above. Moreover, as discussed in Subramanian,[50] the transitional provisions of TRIPS further dilute these static losses. It takes on average ten years after a patent is filed for a drug to receive marketing approval. Accordingly, the direct impact of TRIPS will only begin to be felt in developing countries by 2005. And the full impact—that is, complete displacement of imitators—will only materialize by 2015, assuming a linear rate of introduction of new drugs in the world pharmaceutical market.[51]

47. *See* Nogues, *supra* note 42.

48. *See* Maskus & Konan, *supra* note 36.

49. In all these exercises, information on market size and relative importance of patented, copied, and nonpatented drugs relies on INTELLECTUAL PROPERTY RIGHTS: GLOBAL CONSENSUS, GLOBAL CONFLICT? (R. Michael Gadbaw & Timothy J. Richards eds., 1988).

50. *See* Subramanian, *supra* note 10.

51. Note that the least developed countries can postpone this adjustment even further. See Primo Braga, *supra* note 2, for further details.

IX. IPRs AND THE DISPLACEMENT OF PIRATES

Estimates of revenues foregone by innovators in the North due to weak IPRs protection in the South vary widely, but there is no doubt that the values involved are significant.[52] In the same vein, the economic interests of "pirates" (that is those free riding on intellectual property of others, independently of the legality of their actions) in the South are substantial, particularly in those industries in which imitation is relatively easy (e.g., trademarked goods, software).

The displacement of "pirates" per se does not necessarily entail a social welfare loss, as these producers may be replaced by others operating under licenses from foreign title-holders. There is some evidence, from countries that have reformed their IPRs regimes (e.g., Singapore), that "pirates" often are well positioned to switch to legitimate activities once the legal environment changes, particularly in industries characterized by low barriers to entry (e.g., production of video and audio cassettes).

For trademarked goods, the issue is in essence one of enforcement.[53] As mentioned before, institutional weaknesses and lack of resources are expected to continue to constrain developing countries despite their TRIPS obligations. This is an area in which technical and financial assistance from the North can play an important role, assuming that the political will to curb "piracy" is mustered.

X. IPRs AND INVESTMENTS IN R&D

The analysis so far has concentrated mainly on the allocative implications of TRIPS. This is a partial approach to the extent that it does not take into account potential dynamic benefits associated with the strengthening of IPRs regimes. The impact of TRIPS on R&D investments in both developed and developing countries is the main issue in this context.[54]

52. *See, e.g.*, UNITED STATES INT'L TRADE COMMISSION, FOREIGN PROTECTION OF INTELLECTUAL PROPERTY RIGHTS AND THE EFFECT ON U.S. INDUSTRY AND TRADE: REPORT TO THE UNITED STATES TRADE REPRESENTATIVE, INVESTIGATION NO. 332-245, UNDER SECTION 332(G) OF THE TARRIFF ACT OF 1930 (1988); INT'L INTELLECUTUAL PROPERTY ALLIANCE, 1994 SPECIAL 310 RECOMMENDATIONS AND ESTIMATED TRADE LOSSES (1994).

53. The net welfare impact of combating counterfeiting of trademarked goods is ambiguous. Most analysts, however, agree that deceptive counterfeiting can be particularly harmful to consumer interests. *See* Gene M. Grossman & Carl Shapiro, *Counterfeit-Product Trade*, 78 AM. ECON. REV. 59 (1988); Gene M. Grossman & Carl Shapiro, *Foreign Counterfeiting of Status Goods*, 103 Q. J. ECON. 79 (1988).

54. It is implicitly assumed that there is underinvestment in R&D at global level and that stronger protection of IPRs fosters investment in R&D. This does not necessarily imply that

Evidence on the response of investments in R&D in developing countries to changes in IPRs protection remains scarce.[55] Still, there is growing appreciation for the role played by innovation in economic development. Gould and Gruben, for example, have found evidence that IPRs protection has a marginally significant positive effect on economic growth.[56] They attribute this to the role of IPRs in fostering R&D investments. They also find that the contribution of IPRs to economic growth increases with the openness of the economy. Based on these results, an argument can be made that the trade liberalization fostered by the Uruguay Round will enhance the potential dynamic benefits of TRIPS. More research, however, is needed to confirm this proposition.

Another aspect of the TRIPS-R&D link concerns the potential impact of higher protection of IPRs in the South on R&D investments in the North. The small-country assumption adopted in the analysis of the pharmaceutical industry, for example, may not be appropriate on aggregate terms or with respect to products of special relevance to developing countries (e.g., drugs to fight tropical diseases). The relevance of such a proposition remains an empirical question, but in theory it opens the door for "Pareto-efficient" bargains between developed and developing countries.[57]

TRIPS may also affect the composition of R&D investments in the South. Agricultural research in developing countries, for example, has traditionally been implemented by the public sector. The introduction of protection for plant varieties is expected to foster the privatization of agricultural research. The reaction of national or international governmental research centers to this trend is likely to have important economic implications. As innovators claim IPRs over plant varieties, the policy of free exchange of germplasm among research centers will have to be adapted.[58] A danger in this context, is the adoption of cumbersome bureaucratic procedures for germplasm exchanges in response to the introduction of property rights.

stronger IPRs protection will be welfare improving as pointed out by Elhanan Helpman, *Innovation, Imitation, and Intellectual Property Rights*, 61 ECONOMETRICA 1247 (1993).

55. It is worth noting, however, that there are examples of countries that have significantly increased the R&D intensity of their economies, before reforming their IPRs regimes under external pressure (*e.g.*, South Korea and Taiwan, Province of China).

56. *See* David M. Gould & William C. Gruben, *The Role of Intellectual Property Rights in Economic Growth*, 48 J. DEV. ECON. 323 (1996).

57. *See* Subramanian, *supra* note 10.

58. For a detailed discussion of this subject see John H. Barton & Wolfgang E. Siebeck, *Material Transfer Agreements in Genetic Resources Exchange—The Case of the International Agricultural Research Centres*, 1 ISSUES IN GENETIC RESOURCES 1 (1994).

Summing up, from a static perspective, TRIPS is an exercise in rent transfer from the South to the North. Its negative welfare implications for developing countries are, however, significantly diluted by the long transitional periods adopted. Moreover, there are positive-sum games that can be explored by developing and developed countries in the areas of trade, foreign direct investment, and transfer of technology as protection of IPRs is strengthened.

CONCLUSION

The patterns of convergence discussed in this paper have different implications for the economic debate about IPRs. As countries introduce the minimum standards of protection required by TRIPS, a gradual strengthening of IPRs on a global scale will ensue. In this context, international convergence is happening at a faster pace than most analysts believed possible ten years ago.

It is true that this process of international convergence should not be interpreted as announcing the end of international frictions concerning IPRs protection. The question of enforcement and differences in the scope of protection across countries will continue to generate debate. Moreover, the achievements of TRIPS fall short of the expectations of knowledge-intensive industries in developed countries.[59] Unilateral action as a lever to promote change will continue to be supported by these industries. It is fair to say, however, that the prospects for international convergence remain favorable and this is consistent with a gradual strengthening of IPRs around the globe.

The technological convergence promoted by the digital revolution, in turn, raises new challenges for IPRs regimes. Our understanding of the implications of global networks and the digital environment for IPRs is still limited. In the near future, however, technological convergence is more likely to weaken than to reinforce the trend toward stronger IPRs protection identified above.

59. See, for example, INDUSTRIAL FUNCTION ADVISORY COMMITTEE-3, COMMITTEE REPORT ON TRADE-RELATED ASPECTS OF INTELLECTUAL PROPERTY RIGHTS INCLUDING TRADE IN COUNTERFEIT GOODS (TRIPS) (1994), for a summary of the perceptions of U.S. knowledge-intensive industries on TRIPS.