The Economics of International Agreements and Dispute

Settlement with IPRs

by Eric W. Bond

Department of Economics

Vanderbilt University

Original Draft: March, 2003

Current Draft: June, 2003
International trade agreements are usually thought of as an attempt to solve the prisoner’s dilemma that is inherent in trade policy. Each country would like to protect its own market, either because of powerful political interests in the import-competing sector or the desire to exercise its market power in trade. However, each country’s protection has a negative impact on the welfare of its trading partners by denying market access to their exporters and worsening their terms of trade. Unilateral actions of countries in setting trade policy will thus result in a level of protection that is too high, because individual decisions fail to take into account the negative impact on trading partners. The role of international trade agreements such as the WTO is to provide a forum in which countries can negotiate mutually beneficial reductions in these trade barriers.

As a result of the Uruguay Round, the scope of the WTO was expanded to include an agreement on Trade-Related Intellectual Property Rights (TRIPS). The TRIPS agreement represents a substantial departure from previous international agreements on intellectual property rights. First, it covers a broad range of IPRs, including copyrights, patents, and trademarks, in a single agreement. Previous agreements such as the Berne Convention (copyrights), had been limited to a particular A second departure of the TRIPS agreement is the utilization of the WTO process of dispute settlement to handle disputes between member countries that arise under the TRIPS agreement.

This paper addresses two questions that are raised by the approach to IPR protection embodied in the TRIPS agreement. The first is the appropriateness of the use of WTO negotiating principles and institutions to international agreements on IPRs. I analyze a model below which shows that the national setting of IPR protection involves two types of spillovers that create a prisoner’s dilemma. The first is that the cost to a country of offering IPRs to foreigners is higher than to domestic residents, because in the former case the profits from exploitation of the property right accrue to foreigners. As a result, countries will have an incentive to discriminate against foreigners in granting IPRs. A second spillover arises

\[\text{Maskus (2000, Chapter 2) provides a summary of the key features of the TRIPS agreement.}\]
because some of the benefits resulting from the increased innovation generated by protection of IPRs will accrue to foreigners. This will lead to a level of IPR protection that is below the level that maximizes world welfare.

The history of national policies on IPRs illustrate the prisoner’s dilemma associated with national policies toward IPRs. Goldstein (2001, p. 16) describes the discriminatory nature early laws on copyright, noting that “if they did not altogether exclude protection of foreign materials, they generally conditioned protection on compliance with one or more formal requirements.” In the case of patent laws, Lerner (2002) does an empirical analysis of patent protection in 60 countries and reports that the average patent law in the mid 19th century contained one of four different types of restrictions against foreign applicants for patents. In response to this discrimination, a major focus of early international agreements on IPRs was the extension of national treatment to parties to the agreement. In addition, these agreements typically dealt with the tendency toward under-provision of protection by setting minimum standards for IPR protection.

The model suggests that the application of the tools of international trade agreements to IPRs requires some modifications because of the nature of the spillovers between countries created by innovations. The extension of IPR protection to foreign firms has an adverse terms of trade effect on the home country, because it raises the price at which foreign firms can sell in the home country market. This effect is similar to the adverse terms of trade effect that a large country experiences when it reduces tariffs on imported goods, since the resulting increase in demand will raise the relative price of imported goods. Bagwell and Staiger (2002) argue that the externality in international trade agreements operates through the terms of trade, and that WTO principles and institutions can be understood as a means of dealing with

---

2 The four types of restrictions identified by Lerner were awarding patents of shorter duration, charging higher fees, terminating the local patent coverage if the foreign patent expired first, and granting shorter extensions to foreigners. Penrose (1951) also notes that many national patent laws required foreign patent holders to produce the product locally within a specified period of time. The frequency of these discriminatory policies had been reduced by two thirds by the early part of the twentieth century, presumably as a result of international agreements.
this terms of trade externality. Thus, these institutions should also be useful for dealing with the profit transfers created by the extension of IPRs to foreigners. However, the dynamic spillover created by IPRs has the nature of a public good, because all countries benefit from the increase in innovations that are generated by greater protection of IPRs. This public good effect has no analog in multilateral trade liberalization, so that measures of the benefits of reciprocal liberalization need to be adjusted to take into account the public good effects of innovations. In addition, For example, the patent policy that maximizes world welfare would not involve national treatment if the elasticity of innovation with respect to returns from patents differs across countries.

The second issue examined in this paper is the desirability of tying agreements on IPRs to trade agreements. The main point here is that since a relatively small number of countries account for the vast majority of technology exports, the expansion of patent protection under the TRIPS agreement is likely to cause a large transfer from technology importing countries to technology exporting countries. McCalman (2001) estimates the net transfers under the TRIPS agreement for 29 (primarily developed) countries and finds that only 6 of the countries are net gainers from the agreement. He finds that the US is the primary beneficiary of the TRIPS agreement, with a gain that is almost 6 times that of the next largest gainer. In order for such an agreement to be in the interest of technology importing countries, it must be tied to trade concessions to the technology importing countries that compensate for the loss on IPRs. Similarly, the dispute settlement process must use trading of concessions across agreements, by allowing technology importing countries that in order to enforce the agreement.

Section II of this paper provides a summary of the WTO dispute settlement procedure, and discusses how the process has been applied to cases involving the TRIPS agreement. It also provides a review of the existing literature on the economics of the dispute settlement process as applied to disputes
involving trade in goods. Section III provides a simple model of patent protection that highlights the basic trade-off between allowing profits to encourage innovation and reducing the deadweight loss due to monopoly created by IPRs. This model is used to identify the international spillovers resulting from national choice of IPRs, and to identify the potential for mutually welfare improving agreements on IPRs. It is shown that when countries set policies unilaterally, they will have an incentive to allow a lower degree of patent protection to foreign firms. Section IV offers some concluding remarks.

II. The Dispute Settlement Mechanism of the WTO

The dispute settlement mechanism of the WTO represents a significant strengthening of the system that operated under the GATT. The GATT system required unanimity among all the parties in order to impose a punishment, so that in many cases defendants in disputes simply ignored findings against them. Under the WTO process, a majority decision against a defendant will result in the imposition of penalties unless a satisfactory adjustment is made in the defendant’s trade policy. The WTO process has been more successful at achieving compliance with rulings from the dispute process. The purpose of this section is to highlight some of the main features of the dispute settlement process as they have applied to trade disputes, and to discuss how this process has been applied in recent cases involving the TRIPS agreement. The literature on the role of the dispute settlement process in the enforcement of trade agreements will then be briefly reviewed.

A. The WTO Dispute Settlement Process and the TRIPS agreement

A key feature of the dispute settlement process is that it is primarily a rule-based system that has the flavor of a judicial proceeding. Article XXIII of the GATT gave member countries the right to initiate a complaint against another member that had taken actions which “nullified or impaired” the benefits resulting from the agreement. These complaints can arise when a member country has taken actions which are either directly in conflict with its obligations under the WTO agreements (a “violation case”) or
which have the effect of undermining benefits accruing to a member country under the agreements (a “non-violation case”). Under the Dispute Settlement Understanding of 1995, these complaints are evaluated by a three member ‘panel of experts.’ Members of the panel are chosen for expertise in international trade policy and law, and evaluate the submissions of the parties to the dispute for their consistency with the WTO agreements. The DSU also establishes an appeals process by which parties to the disagreement may appeal the decision of the panel.

A second feature is that the punishments involve the suspension of concessions or obligations of the complaining party that are of equivalent magnitude to the nullification or impairment suffered as a result of the violation. The DSU indicates a strong preference for the implementation of the findings of the panel, or for the negotiation of mutually agreeable compensation between the parties if the findings are not implemented. Only in the event of failure of compliance or compensation within a reasonable time period are punishments to be imposed. The DSU also provides guidelines on the imposition of punishments which indicate that a complainant should first seek to impose the punishments on the same sector in which the violation has occurred. The DSU states that for violations of obligations on trade in goods, suspension of concessions in any other category of trade in goods is considered to be in the same sector. In contrast, for the TRIPS agreements, a “sector” is defined to be a particular category of intellectual property as identified under the agreement. Thus, a violation of obligations on patent protections should be met with withdrawal of equivalent concessions on equivalent concessions on patent protection by the complaining country.

If punishments of comparable magnitude to the violation are not available in the same sector, the

---

3The original GATT agreement did not clearly specify the process by which complaints were to be handled, and initially disputes were referred to a working party of members. The working party procedure suggests more of a bargaining framework, where disagreements would be resolved through multilateral negotiations. However, the process evolved in 1955 to one of using a panel of experts to evaluate disputes. Jackson ((1998), Chapter 4) interprets this as a shift from a “bargaining” process to a “judicial” or “arbitrational” process. This process continued to evolve over subsequent GATT negotiating rounds in the direction of making the process more legally precise and judicial.
DSU allows for the withdrawal of concessions in other sectors under the same agreement. The second choice for a violation of patent protection obligations would thus be the suspension of concessions on a different category of intellectual property (e.g. copyrights or trademarks). Finally, the DSU specifies that if neither of these options yields appropriate punishment and “the circumstances are serious enough,” the complainant can seek to withdraw concessions under another covered agreement. This process allows for the punishment

TRIPS-related disputes have accounted for 23 of the 282 WTO dispute settlement cases to date. Consultations between the parties have resulted in a mutually agreed solution in 13 of these cases, and consultations are pending in four more of the cases. In the remaining six cases, the panel decisions have found at least some violations by the defendant and have requested that laws or practices be altered to make them compliant with TRIPS obligations. Compliance with the panel’s report has been accomplished in three of the cases, and the defendants have agreed to comply within a reasonable period of time in two other cases. In the only TRIPS case so far where punishments have been proposed for a violation, a violation of the copyright section of TRIPS by the US was to be punished by a withdrawal of concessions on EU copyright measures. This punishment is consistent with the principle that the preference for punishments under TRIPS should be for withdrawal of concessions within the same section of the TRIPS agreement. There has also been at least one case where withdrawal of a TRIPS concession has been approved for a violation of an obligation on goods trade if withdrawal of concessions on goods and services are not sufficient to reach the level of the violation.

4 The copyright case involved Section 110(5) of the US Copyright Act (WT/DS160). These punishments have not yet been imposed, as the parties are still negotiating a resolution of the dispute.

5 In the case against the European Union’s regime for importing of bananas, the arbitrators found that Ecuador had suffered nullification and impairment of benefits on over $200 million of trade per year. Ecuador was allowed to request the suspension of concessions on obligations under GATT and GATS (with regard to wholesale trade services). If these suspensions were unable to achieve the required level of compensation, Ecuador was allowed to request suspension on the TRIPS agreement under the sections covering copyrights, geographical indications, and industrial designs.
B. The Economics of the Dispute Settlement Process

One interpretation of the economic role of the WTO dispute settlement process is that it serves as a punishment mechanism to prevent countries from deviating from their WTO obligations. As has been emphasized by Jackson (1998, Chapter ), international trade agreements do not have the force of domestic law in many countries (e.g. the United States) so that policymakers are not bound to follow the commitments made in the agreement. This means that the agreement must be structured so that it is self-enforcing, in the sense that it is in the interest of the countries to follow their WTO obligations. The lack of international mechanisms to enforce contracts between sovereign states has led to the modeling of trade agreements as a repeated prisoner’s dilemma. The theory of repeated games suggests that trade liberalization can be sustained when countries interact repeatedly, because a country that deviates can be punished by a trade war. The agreement will be sustainable if each country is better off by carrying out the promised tariff reductions than it would be by deviating from the agreement and suffering the resulting punishment.6

While the theory of repeated games provides important insights about the value of future trade flows in sustaining current trade liberalization, some predictions of the simplest versions of the theory seem inconsistent with the way the dispute settlement process operates. In order to sustain the greatest amount of cooperation among countries, the theory would suggest that the punishment meted out by the dispute settlement procedure should be credible and should be as severe as possible. For example, the most effective punishment that could be imposed is the use of arbitrarily high tariffs that eliminate all international trade since this would result in the lowest payoff for a country that deviates from an agreement. It is clear that the punishments specified in the dispute settlement process are not intended to

6The approach of treating trade agreements as a repeated prisoner’s dilemma was first proposed by Dixit (1987).
be this severe, because they prescribe compensatory tariffs rather than punitive tariffs to be imposed on a
country that does not fulfill its obligations.\(^7\) Furthermore, disputes can carry on for years, which
substantially reduces the severity of the punishment.\(^8\)

These features of the dispute settlement process do not seem to be well explained by the repeated
game approach. One explanation is that the extremely severe punishments are not renegotiation proof. If
the punishments eliminated all trade, all countries could be made better off by renegotiating tariffs to a
level that allowed positive trade. Extremely severe punishments would not be carried out, and hence
could not be used to deter deviations. Klimenko, Ramey, and Watson (2002) have shown that this
problem is particularly severe if the countries are involved in recurrent trade negotiations, because in that
case no trade liberalization can be supported. Any attempt to imposed punishment on a country that did
not fulfill its obligation in one period would be renegotiated away in the subsequent period’s negotiations.
They argue that the only way to achieve cooperation with recurrent negotiations is to have punishments
imposed by an external enforcement body that does not involve negotiation between the parties. This
approach would explain the value of having the dispute settlement process be a judicial one, rather than a
negotiation between the disputing parties.

Ethier (2001) proposes an alternative explanation for the weakness of punishments, which is that
the trade agreements are incomplete contracts. Since contracts are incomplete, there will be some states

\(^7\)In most trade models, an optimal deviation by a country would involve deviation on a wide range of
products and would also be substantially more severe than simply failing to fulfill a promised tariff reduction. In
contrast, the disputes considered by dispute panels are typically bilateral disputes on a small range of products. The
type of deviation that is considered in the theory may in fact be supported by implicit threats of a trade war that
would follow the breakdown of the WTO.

\(^8\)Clearly punishments should be carried out as quickly as possible, since rapid punishment reduces the gain
from deviation. In the limit, instantaneous observation of deviations would make it possible to support the efficient
agreement. This would argue for delegating the decision to retaliate to the executive branch of the complaining
country, which would be able to retaliate in a very short time period by executive order. This stands in sharp
contrast to the WTO dispute process, which often takes years to handle disputes. However, the dispute settlement
process discourages unilateral action by countries in favor of a judicial process. One explanation of this could be
that third parties to trade disputes might have more trouble determining whether a deviation had occurred, and might
have difficult distinguishing between a deviation and punishment.
of nature where a country will face domestic political pressure to violate some obligations.⁹ Countries will be unwilling to accept an agreement that specifies very severe punishments for violations, because each knows that there is a positive probability that they will want to violate the agreement. He shows that this framework generates punishments that are commensurate with the deviation when a country violates the ruling of the dispute panel. He also shows that the deviating country may either abide by the ruling or violate the ruling, depending on the weight that is put on the adjudication phase.

Although there are questions about the severity of punishment provided by the WTO dispute settlement process, the members themselves seem to think that this process contributes to the enforcement of agreements. Jackson (199) notes that one of the selling points of incorporating the TRIPS agreement in the WTO was the potential for the use of the WTO dispute settlement process. Under the Berne Convention, disputes over copyright law could be taken to the International Court of Justice. However, this mechanism was never used.

III. A Model of Intellectual Property Rights

In this section we consider a simple two country model of intellectual property rights protection in which the government can choose the extent of patent protection to be given to innovators who develop new consumer products. This model captures the basic trade-off between an increased level of innovations and a greater deadweight loss from monopoly that arises when the government strengthens its protection of intellectual property rights protection, and allows for the possibility that governments can offer differential degrees of protection to home and foreign innovators. The purpose of this model is to identify the international spillovers associated with patent protection, and the gains that can be obtained from international agreements on patent protection. The model will also indicate how the withdrawal of equivalent concessions might be defined for patent protection.

⁹The GATT agreement also provided escape clause provisions that could be used by countries that felt that fulfilling a particular commitment would cause undue injury on a domestic injury.
The model follows Deardorff (1992) and Scotchmer (2002) by considering a two period model of innovation. Firms choose the amount of innovation to undertake in the development of a differentiated products in the first period, which will determine the number of varieties of the product that will be available in the second period. The second period in the model can be thought of as representing the useful life of a new innovation. Governments commit to the strictness of patent protection that will be provided to successful innovations at the beginning of the first period, which will determine the fraction of the potential profits that can be obtained from a successful innovation in the second period. This two period model can be thought of as representing the steady state of an infinite horizon general equilibrium model in which firms innovate in every period and products have an exogenously given useful life, as has been shown by Grossman and Lai (2002).

The static efficiency loss from extending patent protection is illustrated in Figure 1, which shows the demand curve in the home market for a representative new product that can be produced with a constant marginal cost of $c$. If a patent on the product is fully enforced, the owner of the patent can generate a monopoly profit of $\pi$ per period and consumers earn a surplus of $S_m$ per period. If the patent is not in force and the technology can be copied by any firm, the market price will be driven to the marginal cost and consumers earn a surplus of $S_c = S_m + \pi + \Delta$. The social cost per period of providing patent protection to the home country of providing patent protection is $\Delta$ when a home firm owns the patent and $\Delta + \pi$ when a foreign firm owns the patent. We can similarly derive per period surpluses $(S_m^*, S_c^*)$ and profit levels $(\pi^*)$ associated with the sale of the product in the foreign market.

Letting $\beta$ denote the present value of $1 per period over the life of the product, the expected profit that a home country patent owner receives in the home market is $\beta \theta \pi$, where $\theta \in [0, 1]$ is the strictness of the home country patent system for home country firms. Similarly, the consumer surplus in the home market is $\beta (\theta S_m + (1-\theta) S_c)$. The parameter $\theta$ can be interpreted as reflecting the duration of the patent and the probability that the patent holder can prevent infringement through legal action during the life of
the patent. For a foreign firm, the strictness of the home patent system is denoted by $\mu$. The foreign patent system can similarly be characterized by the strictness of enforcement of patents held by foreign firms, $\theta^*$, and the strictness applied to home firms, $\mu^*$. The principle of national treatment would require that $\theta = \mu$ and $\theta^* = \mu^*$.

The dynamic gain from a patent system results from the fact that the incentive to innovate will be increasing in the strictness of the patent system. Suppose that there is a continuum of potential products (each with demand curves identical to the one in Figure 1) that can be introduced, with $C(N)$ representing the cost of R&D required to generate a measure $N$ of new products in the home country. Firms will invest in R&D up to the point where the cost of an introducing an additional product equals the expected return from the product over the life of the patent,

$$C'(N) = \beta(\theta \pi + \mu^* \pi^*).$$

Inverting yields the equilibrium level of home country innovation, $\hat{N}(\theta, \mu^*)$, which is increasing in the strictness of patent protection received in each country. Similarly, the measure of foreign products is determined by $C'(N^*) = \beta(\mu \pi + \theta^* \pi^*)$, which yields an equilibrium level of foreign innovation, $\hat{N}^*(\theta^*, \mu)$. Letting $\varepsilon = \frac{C'(N)}{N}$ and $\varepsilon^*$ denote the elasticity of the supply of innovations with respect to the profit from an innovation, the comparative static effect of patent protection on innovations will be

$$\frac{dN}{N} = \varepsilon \left( \frac{\pi d\theta + \pi^* d\mu^*}{\theta \pi + \mu^* \pi^*} \right), \quad \frac{dN^*}{N^*} = \varepsilon^* \left( \frac{\pi^* d\theta^* + \pi d\mu}{\theta^* \pi^* + \mu \pi} \right).$$

Letting $\lambda = \pi/\pi^*$ denote the relative profitability of the home country market, (2) indicates that the extension of patent protection by the home country will have a bigger impact on innovation the greater is
The level of patent protection in the large country market will be relatively more important in determining the level of innovation. The difference in the level of innovation across countries will be determined by comparative advantage in innovation, as reflected in differences in the marginal cost of innovation across countries, and the degree of discrimination in patent laws.

To formalize the magnitude of the static and dynamic effects of patent protection, we can write the discounted welfare from innovations of the home country introduced in the current period as

\[
W = \beta \left[ (\theta S_M + (1-\theta)S^*_C)N + (\mu S_M + (1-\mu)S^*_C)N^* + (\theta \pi + \mu \pi^*)N \right] - C(N)
\] (3)

Totally differentiating (3) and using (1) yields

\[
\frac{dW}{\beta} = -\Delta N d\theta - (\Delta + \pi)N^* d\mu + (\theta S_M + (1-\theta)S^*_C)dN^* + (\mu S_M + (1-\mu)S^*_C)dN + N\pi^* d\mu^*
\] (4)

The first two terms in (4) capture the per period cost of changes in the strictness of patent protection for home and foreign firms, respectively. The third and fourth terms indicate that an increase in the number of home or foreign innovations provide a dynamic gain resulting from the consumer surplus associated with the new products. The final term shows that increases in the strictness of foreign patents will provide a static gain to the home country by increasing the profits earned on home innovations.

The decomposition in (4) illustrates two channels through which foreign patent policies have spillover effects on the home country. The first is through the impact of foreign patent policies on the profits of home firms. This is analogous to a terms of trade spillover, since the denial of patent protection results in a reduction of the price received by home entrepreneurs from \(p^{M^*}\) to \(c^*\) on each unit sold in the home country market. Note however that the magnitude of this price effect is not necessarily proportional to the volume of home exports to the foreign market, since home entrepreneurs may be serving the home
market by licensing the product to foreign producers or by direct foreign investment. The fact that the denial of patent protection will not necessarily be reflected in changes in trade flows means that the GATT structure prior to TRIPS was inadequate for handling the international spillovers created by changes in patent protection.  

The second externality from foreign patent policy is through its impact on the rate of innovation. The extension of patent protection by the foreign government, whether through increases in \( \theta' \) or \( \mu' \), will raise the amount of R&D. All countries will benefit from the increased consumer surplus generated by additional innovations, with the benefit being largest in countries where the surplus levels \( S_C \) and \( S_M \) are largest. This illustrates the international public goods feature of innovation, since the introduction of new products provides an increase in consumer surplus in all markets where the product is available.

A. The Non-Cooperative Equilibrium

By substituting from (2) into (4) we can characterize the optimal home country policy toward protecting innovations by home and foreign innovators, respectively, as

\[
\Delta = \left( \frac{\theta S_M + (1 - \theta) S_C}{\theta + (\mu^*/\lambda)} \right) \varepsilon \quad (5a)
\]

\[
\Delta + \pi = \left( \frac{\mu S_M + (1 - \mu) S_C}{(\theta^*/\lambda) + \mu} \right) \varepsilon' \quad (5b)
\]

The left hand side in each expression is the cost of extending the life of the patent protection, which is the increased static deadweight loss to the home country of granting a patent protection. The right hand side

---

Bagwell and Staiger (2002) argue that the WTO process can prevent countries from using changes in domestic standards (e.g. competition policy or labor standards) to undermine commitments made on tariffs. If the effect of such changes in standards is to reduce the volume of trade, the trading partner can make a “non-violation” complaint under Article XXIII as discussed above. This mechanism would be inadequate in the case of IPRs, because of the other channels through which intellectual property may be used.
is the marginal benefit of extending patent protection, which is the increased consumer surplus generated by increased innovations. Since the right hand side is decreasing in the strength of the respective types of patent rights, (5) will yield unique solutions for $\theta$ and $\mu$, given foreign policies.

Equations (5) can be used to derive predictions about unilateral policies. One prediction concerns the size of the market and policies. Very small countries (i.e. $\lambda \sim 0$) will have no incentive to protect intellectual property, whether it is produced by foreigners or domestic residents, because the local market contributes too little to firm profits to affect the rate of innovation.

Equations (5) also indicate that there will be a bias toward providing less protection to foreign patent holders. The static cost of extending patent protection to foreign firms is higher than to domestic firms, since the profits go to foreign entrepreneurs. The home country will want to discriminate against foreign innovators as long as foreign innovations are not more responsive to patent policy than are home country innovators. A similar welfare decomposition can be derived for the foreign country, and optimal foreign policies are given by an expression similar to (5).

Before turning to the potential for trade agreements between countries, it is useful to characterize the patent policies that would maximize world welfare. Individual countries will tend to provide too little patent protection (given foreign policies), because they ignore the spillover benefits received by the rest of the world from a higher innovation rate. However, the efficient international patent protection could still involve protection taking place in only one country. To see this, note from (1) that a given level of home country innovation can be financed by combinations of home and foreign patent protection that hold $\theta \pi + \mu^* \pi^*$. Consider an adjustment in international patent protection such that $\pi d\theta = -\pi^* d\mu^* > 0$. This adjustment will raise world welfare iff $\Delta/\pi > \Delta^*/\pi^*$. If this condition is satisfied, then the efficiency cost of providing patent protection at home is always lower because the deadweight loss per dollar of profits generated in the home country is lower. If this inequality holds, the policy that maximizes world welfare will only involve the use of IPRs in the foreign country in cases where protection in the home market is at
\( \theta = 1. \) If \( \Delta / \pi = \Delta^* / \pi^* \), then the efficient combination of patent policy would not be uniquely determined because any combination of \( \theta \) and \( \mu^* \) that yield the efficient level \( N \) will yield the same world welfare. 12

A similar exercise can be performed to determine whether the policy that maximizes world welfare will exhibit national treatment. Suppose that there is national treatment at home (\( \theta = \mu \)) and abroad (\( \theta^* = \mu^* \)), and a discriminatory adjustment in patent protection such that \( d\theta = - C''(N)d\mu/C''(N^*) > 0 \). From (2), this adjustment has the effect of increasing home innovation by exactly the same amount as foreign innovation decreases. It can be shown using (4) that this discriminatory adjustment in favor of home innovators will raise world welfare iff \( \epsilon > \epsilon^* \). Discrimination in favor of home innovations is desirable when home innovators are more responsive to extending patent life, because the same amount of innovation can be obtained with lower deadweight loss. This result shows that national treatment will be efficient from a world welfare perspective only if \( \epsilon = \epsilon^* \).

We now turn to an examination of the gains from cooperative agreements on IPRs, and how dispute mechanisms could be used to punish countries that deviate from the agreed terms. We concentrate on two features of the TRIPS agreement, which are the requirement of national treatment and the setting of minimum standards for the life and enforcement of patents.

**B. International Agreements on National Treatment**

Figure 2 illustrates the prisoner’s dilemma that arises in the setting of \( \mu \) and \( \mu^* \). The value \( \mu^N \) (\( \mu^N^* \)) in Figure 2 denotes the Nash equilibrium values of patent lives for non-residents in the home (foreign) country, and the \( V^N \) (\( V^N^* \)) contour illustrates the values of \( \mu \) and \( \mu^* \) that yield the same home (foreign) country welfare as in the Nash equilibrium (given \( \theta \) and \( \theta^* \)). It follows from (3) that each country benefits from a strengthening of property rights protection for its firm in the other country’s

---

12In the case of an iso-elastic demand curve, \( \Delta / \pi \) will be decreasing in the elasticity of demand. Efficiency would then call for stricter protection in markets where demand is more elastic. Grossman and Lai consider the case in household demands are identical across countries, so that markets differ only in scale and \( \Delta / \pi = \Delta^* / \pi^* \).
An increase in $\mu^*$ will raise the profits earned by home firms in the foreign market and will raise the rate of home innovation, both of which raise home welfare. Therefore, points to the right of $V^N$ will yield higher home country welfare than is attained in the Nash equilibrium, and points above $V^{N^*}$ will yield higher foreign welfare than in the Nash equilibrium. The fact that $V^N$ is vertical at the Nash equilibrium results from the fact that $\mu$ maximizes home welfare at the given value of $\mu^*$. A similar argument establishes that $V^{N^*}$ will be horizontal at the Nash equilibrium point.

A simultaneous increase in $\mu$ and $\mu^*$ (holding $\theta$ and $\theta^*$ constant) in the neighborhood of the Nash equilibrium must raise the welfare of both countries, since it moves the patent protection into the lens of mutually welfare increasing agreements that lies to the northeast of the Nash equilibrium in Figure 2.

While small mutual reductions in the degree of discrimination must be welfare improving, there is no guarantee that both countries are better off by eliminating discrimination entirely. Figure 2 illustrates the case in which both countries are better off relative to the Nash equilibrium.

Figure 2 illustrates the case in which each country discriminates against patent holders in the other country.

National treatment requires setting $\theta = \mu$ and $\theta^* = \mu^*$. It is clear from Figure 2 that there will exist agreements with reciprocal reduction in the degree of patent discrimination that will make both countries better off relative to the Nash equilibrium. Since this represents a prisoner’s dilemma as in the

---

13This point is made by Scotchmer (2002).
case of trade liberalization, dispute settlement will play a role similar to that in the case of trade disputes. An agreement to impose national treatment in this case could be supported by the threat to revert to the Nash equilibrium level of discrimination if the countries place enough weight on future payoffs using standard folk theorem arguments. One factor that may agreements on IPRs more difficult to sustain is the difficulty of observing deviations. The longer it takes a country to observe a deviation, the more attractive it will be for a country to deviate and therefore the more difficult it will be to sustain an agreement on national treatment. Since the protection of IPRs requires firms to be able to pursue damages against infringers, deviations from national treatment that involved discrimination against foreigners in the ability to enforce IPRs through the court system might take longer to be detected. The minimum discount factor required to support a given level of collusion will be higher when the delay in detecting a deviation is greater.

In order to characterize the reciprocal increases in patent protection that will raise home welfare, we combine (2) and (4) to obtain

\[ \frac{dV}{\beta} = N \left[ \pi^* + \frac{[\theta S_M + (1-\theta)S_0] \rho \pi^*}{(\theta \pi^* + \mu^* \pi^*)} \right] d\mu + N \left[ - (\pi + \Delta) + \frac{[\rho S_M + (1-\rho)S_0] \rho \pi^*}{(\theta^* \pi^* + \mu \pi^*)} \right] d\mu \] (6)

Expression (6) can be used to obtain a definition of reciprocity for IPR agreements, and also to identify what might be considered to be the equivalent concessions to be withdrawn by the dispute process if a country deviates from its obligations. The second bracketed expression in (6) will be negative for concessions that exceed the unilateral optimal patent treatment of patent lives. The reciprocal lengthening of patent lives will yield home firms increased profits of \(N \pi^* d\mu\), but will have a consumer cost of \(N' \pi d\mu\) through higher profits to foreign firms. One strategy for defining a reciprocal increase in patent lives is to choose the extension such that the net profit transfer is 0. This will leave two effects of the reciprocal patent extension: the deadweight loss from the extension of the life of patents in the home market and the
increased consumer surplus from the increase in home and foreign product varieties.

C. Minimum Standards for IPRs

A similar argument to that above can be used to show that the welfare of both countries can be improved by a mutual increase in $\theta$ and $\theta'$ in the neighborhood of the Nash equilibrium. This is illustrated in Figure 3, which shows iso-welfare contours for the home and foreign countries associated with the Nash equilibrium choice of $\theta$ and $\theta'$. The home welfare decomposition in (3) shows that home welfare will be increasing in $\theta'$ because an increase in $\theta'$ raises $N'$. Thus, there will be an under-protection of amount of domestic innovations in the Nash equilibrium because some of the benefits of increased innovation in one country accrue to consumers in other countries. There will exist mutually welfare-improving agreements that result in the extension of patent life in both the home and foreign countries.

In contrast, the setting of a minimum standard on patents will not necessarily raise welfare of both countries. Suppose that $\theta^N > \theta^N'$. A minimum standard that requires the foreign country to set the same patent standard as the homecountry will reduce the welfare of the foreign country, as illustrated in Figure 3. In order for the foreign country to be willing to participate in an agreement on minimum standards, it must be compensated by the home country with concessions on some other aspect of the agreement. For example, suppose that the home country imposes a tariff at rate $\tau$ on some other good that it imports from the foreign country. Since foreign country welfare is decreasing in $\tau$, the foreign country would be willing to trade reductions in $\tau$ for increases in $\theta'$. In order to make this agreement enforceable, the dispute process must allow punishment of a violation on IPRs by a withdrawal of concessions on goods trade as is

---

14 This argument is based on the assumption that $\mu$ and $\mu'$ are being held constant. A similar argument can be used in the case where national treatment has been imposed, so that $d\mu = d\theta$ and $d\mu' = d\theta'$. In this case an extension of patent life by the foreign country will increase home profits, the number of home brands, and the number of foreign brands. All three of these effects provide favorable spillovers to the home country, so the home country iso-welfare contours will be similar to those in Figure 3 for this case as well.
This model is capable of showing that an agreement with minimum standard for IPRs can be supported by concessions on tariff rates by the countries above the minimum standard. However, such an agreement does nothing to deal with the potential spillovers associated with innovations by countries whose IPRs are above the minimum level. This raises the question of why the TRIPS agreement took the form it did, rather than calling for a reciprocal expansion of patent lengths in all countries. An agreement with reciprocal expansion of patent lengths would not need to be tied to a trade agreement to be self-enforcing, because violations of the patent agreement could be punished by a withdrawal of equivalent patent extensions. The fact that the impetus for TRIPS came from developed countries suggests that the developing countries placed relatively little value on expansions of patent length by the developed countries. The welfare decomposition in (4) shows that the home country will receive a small benefit from the strengthening of foreign country patents (under national treatment) when N is small and when the extension in foreign patent life has a small effect on the total number of innovations. Thus, the form of the agreement could be explained if the developed country patent levels had already internalized the beneficial spillovers created by increases in the number of innovations. The minimum standard would then be a way of transferring income from developing to developed countries.

The theoretical model utilized here assumes that the expiration of patent rights in one location has no effect on the security of patent rights in another country. If border enforcement is not perfect, then the expiration of patent rights in one location might make it more costly to enforce patent rights in countries where the patent rights are still in effect. This type of spillover might strengthen the argument for an agreement that specified a minimum standard for IPRs, since low IPRs would provide a negative spillover on other countries. However, this would still not change the basic observation that the setting of minimum standards would involve a transfer from low standard to high standard countries.

C. Commitment and Dispute Settlement
The discussion in this section has been based on the assumption that each government is able to commit to a level of IPR at the beginning of the period. Suppose instead that the government of the home country is unable to commit to enforce property rights. This can be modeled by assuming that the government makes its choice of enforcement after the firms have chosen their level of R&D.

When the home government cannot commit to its choice of $\theta^*$ and $\mu^*$ at the beginning of the first period, then the level of $N$ and $N'$ will be given at the time that patent policy is chosen. From (4), it follows that $\partial V / \partial \theta = -\Delta N$ and $\partial V / \partial \mu = -(\Delta + \pi^*)N^*$. The optimal patent policy in this case will be to set $\theta^* = \mu^* = 0$, since the policy choice has no effect on the level of innovation. As a result, no firms will be able to earn profits from sales in the home country market. This outcome will yield lower welfare to the home government than can be obtained when it is able to commit to its patent policy.

In this case the dispute settlement process could have an impact by serving as a commitment device for the home country. If the home country fails to meet the standard set in the agreement, then it will pay a price in that it loses concessions that have been made on tariffs by the foreign country. If this price is sufficiently high, then it will be in the interest of the government to comply with its promises on IPRs. Since this compliance is anticipated by the innovators, the additional IPR protection in the home country will stimulate the total amount of innovation.

IV. Conclusions

This paper has examined the role of the dispute settlement process in the TRIPS agreement, and has identified several ways in which disputes under on IPRs may differ from those on trade issues. One difference is the greater difficulty of identifying a deviation on intellectual property rights. The presence

---

15 The use of a two period model implies that the government is not able to develop a reputation for providing IPRs. I would conjecture that in an infinite horizon model the government might be able to sustain a positive level of protection, but less than the amount that could be sustained with commitment. The dispute settlement mechanism would still have a role to play in that case.
of laws satisfying the requirements of the TRIPS agreement may not be satisfactory to protect intellectual property if the laws are not enforced, and the intensity of enforcement may be more difficult to observe and prove in the dispute process. This will reduce the level of cooperation on IPRs that can be supported, because the cost of deviating from the agreement will be lower.

A second difference arises due to the fact that the costs of deviations from an agreement will be more difficult to quantity because of the international spillovers created by innovation. While the cost of TRIPS violations in terms of foregone profits could be calculated by a dispute panel, the impact on the rate of innovation may be much more difficult to quantify. Finally, the fact that the TRIPS agreement involves the setting of minimum standards means that the agreement will reflect a transfer from countries with lax IPRs to countries with strict IPRs. This will mean that deviations from TRIPS cannot in many cases be punished by withdrawal of equivalent concessions under TRIPS. For these cases it will be necessary to withdraw concessions made under other parts of the WTO agreement. This suggests that a major gain from the incorporation of TRIPS into the WTO, rather than having it as a separate agreement, is the ability to punish using tariffs on goods trade.
References


