Intellectual Property Rights

One of the fundamental characteristics, which differentiates humankind intellectually from other species, has been our ability to continually innovate and build upon society’s ever-growing base of knowledge. This perpetual expansion of knowledge and innovation has been the root of the experienced improvements in socioeconomic conditions and the exponential growth that has characterized our history. There is little debate that our continued expansion as a whole is dependent upon continued innovation, but there is great disagreement as how to properly foster knowledge development and to sustain continued growth. Conceiving and creating new inventions is not a costless endeavor. Innovation involves opportunity costs and an investment of factor inputs, thus necessitating the expectation of future rewards in order to be pursued. It is widely held that without some means of insuring that those who make expenditures on successfully developing new products can profit from their undertakings that the incentive motive to embark upon innovative activities would be lost. Thus, in order to insure that appropriate rewards can be reaped from one’s invention, intellectual property rights (IPRs) have become one of the core underpinnings of Western law.

Intellectual property rights, which is the broad title for a number of different more specific types of property protection (patent, copyright, trademark, etc.) have been a richly debated economic and law topic. One of the core debates over IPRs regards what is the optimal strength of protection that can balance the necessity for appropriate rewards to invention while maximizing social welfare. This issue has been particularly
compounded in the last few decades as the rate and forms of innovation has expanded beyond the scope of existing IPR laws. As well, in the post World War II era, international trade has been growing with little indication of a slowing pace. Since intellectual property rights are inherently unique to their respective nation’s system of laws (i.e. differing types and strengths of protection between countries) this has raised the quandary of how to appropriately protect innovators’ rights on the global scale. International agreements, including the Paris and Berne conventions and the more recent Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement negotiated in the Uruguay round, have attempted to reconcile differing international IPR laws into a more uniform code governing international trade. However, the movement towards homogeneous regulations governing international intellectual property rights has raised the question of which countries benefit and which countries suffer from such agreements.

This paper is outlined as follows. Section II provides a discussion of the motivating factors for intellectual property rights and the associated resulting social costs. The third section contains an overview of the three core types of protection available to inventors as well as a discussion of the difficulties in determining the optimal amount of protection. Section IV provides a brief overview of existing international IPR agreements. In the fifth section, I present my own North-South model, which I derived in order to demonstrate the effects of IPRs on global social welfare, and in particular that of less developed countries. Section VI contains a summary of relevant academic literature utilizing more robust models to explore the effects of IPRs on the global scale. Section VII offers a brief discussion of the difficulties facing empirical researchers attempting to test the theoretical models and their conclusions. In the eighth section I present another
original model in which I counter the generally accepted conclusion that stricter IPRs always results in a loss of social welfare for less developed countries. The final section contains a few concluding remarks.

II. Motivation for Intellectual Property Rights

In developing the argument for the necessity for intellectual property rights, it is necessary to first discuss their unique characteristics in comparison to other more tangible commodities (ex. land or personal being). If unconstrained (i.e. no property laws) a purchaser/acquirer of information can resell that information incurring only the cost of transmission, thus creating a “free ride” problem of nearly costless continued dissemination of information without compensation for the original creator. This gives rise to the dilemma of nonappropriability, meaning that the creator is unable to sell the information for more than a fraction of its value. Secondly, information is non-rivalrous in nature in that one persons use of the information does not necessarily diminish its availability for others to use. Finally, although information is costly to develop it is inherently inexpensive to transmit. Thus information suffers from being non-excludable, in that preventing others from retransmission is likely expensive or simply impossible without a set of protecting laws.

A simple motivating example of these concepts would be an individual who develops a computer program that can predict future stock prices. If the creator were to sell the program in the absence of property rights, the purchaser would be unconstrained from reselling the program to others (i.e. non-excludable property). The program is non-rivalrous, meaning that there is no constraint on the number of individuals who could use
the program (although there is a bound on the number of users who could profitably use the program). Finally, because of the near costless ease with which the program could be redistributed, the original producer will receive a mere fraction of its true value (nonappropriability).

These characteristics, and in particular the attribute of nonappropriatibility of value, were the motivating arguments for information economists who concluded that unregulated markets would undersupply creative works, thus necessitating forms of intellectual property rights. By granting innovators property rights, this allows them to appropriate their invention’s social value, thus promoting efficient innovation by aligning incentives for the creation of new ideas with their social value. Yet, the social benefits of IPRs do not come without associated social costs. By excluding others from using a protected idea, there exists an impediment for the dissemination of the idea and the utilization thereof for other potential socially beneficial ideas. To an extent, broad legal protection of ideas and products is analogous to creating a legal monopoly, since the inventor is protected from the development by others of related substitutes. As has been demonstrated in microeconomic studies, non-natural monopolies are inherently socially inefficient since they are able to command and sustain higher prices and lower quantities of production leading to a loss of social welfare (commonly referred to as dead weight loss). Thus, the question remains how to appropriately balance the need to protect innovator’s rights so as to promote investment in new prospective socially beneficial ideas, while minimizing the resulting loss of social welfare due to a legally created monopoly via property rights. In the next section, an overview of the commonly granted
types of intellectual property rights are detailed with a discussion of the factors that affect this balance of financial incentive versus social welfare.

III. Types of Intellectual Property Rights

Patents

A patent, which grants the inventor exclusive rights and use of an invention, is typically received in most countries through a simple application and registration process. Modern patent law is the result of a long evolution originating in the Republic of Venice in 1474. While each country has differing laws regarding patents, there are two key components by which they are characterized, the breadth and duration of protection.

To explicate the meaning and consequences of broad versus narrow patent protection, take the case of two inventors creating similar but different processes. Under a broad patent rule, the inventor who firsts completes their invention and receives their respective patent would obtain exclusive rights over both processes. Thus, one inventor would have the potential to profit from both inventions, whereas the other inventor would receive no compensation. Alternatively, if there was a narrow patent rule, then each inventor would receive exclusive rights pertaining to their respective invention, and therefore both would have the ability to profit. Given this simple example, it intuitively can be seen that under a broad rule rapid duplicative research is promoted, while under a narrow rule slower complementary research is encouraged. Seemingly from this example a narrow patent rule would be socially optimal. Yet the proceeding example only demonstrates part of the typical evolution of an idea to a commercially profitable product.
Research and development often produces “pioneering discoveries” for which there is no current commercial value or profitability, but possess enormous commercial potential. Thus, the question remains, what claim on commercially viable products utilizing the pioneering discovery does the originating firm have? Under a broad rule, a patent for the pioneering invention would also cover the commercially profitable application, even if it were developed by a separate firm, while under a narrow rule separate patents would be required for the discovery and the commercial product. With a narrow patent rule, investment in the pursuit of pioneering discoveries is discouraged by the firm’s inability to recoup any of their investment from the profits of derived applications. From these two examples, it is simple to see the quandary in deciding the optimal breadth of patent rules. While narrow rules encourage more innovation through the necessity to develop separate and more unique inventions, they also discourage investments in pioneering discoveries.

The second characteristic of patent rules is the duration for which they grant exclusive property rights. As previously explained, there must be a balance between maximizing social welfare and granting adequate protection (thereby allowing profitability so as to promote innovation). A longer duration means that the inventor can sustain monopoly profits for a longer period, thus increasing the incentive to invent at the expense of lost consumer surplus. Due to the inherent unique quality of each patented invention and the corresponding demand, there is no simple answer to this dilemma. Ideally, the duration of a patents life would be individually determined for each product so as to appropriately find the duration that would serve as a fulcrum to balance the two
competing objectives. In practicality this is simply impossible, which is evident in the
typical “one length fits all” approach in granting patent lengths.

Copyrights

A copyright “grants writers, composers, and other artists a property right in her
creation upon demonstration that her work is an original expression”. Copyrights differ
from patents in that their exclusive right is inbuilt, meaning that they are naturally
granted without an application and registration process. The issue of the breadth of
copyright protection is somewhat parallel to that of patents. Broad copyright protection
prohibits all unauthorized use of a creative work, while more narrow copyright rules
permit some unauthorized use (e.g. the use of a quote or a photocopy for educational
purposes). Common economic analysis holds that broad protection for underlying works
yields the maximum incentive to produce, but also encourages early release in order to
edge out potential similar works. Alternatively, under narrow protection, increased
opportunities for development of beneficial derivatives are permitted. Thus a balance
must be achieved between granting sufficient incentive (through potential profit) to create
original works while allowing for derivative works. Even more so than patents, the
determination of the breadth of copyright protection is largely determined through court
rulings on a precedent and case-by-case basis.

While arguments for shorter copyright protections have been made (current U.S.
and European law grant protection for seventy years beyond the author’s death) on the
basis that strong copyright protection grants monopoly ownership of creative works, such
arguments hold little weight in that copyrights have little stifling effect on derivative
creation. The strongest argument for limited copyright protection is the presence of tracing costs, meaning that the original creator or current copyright owner must be contacted in order to give permission for use of copyrighted materials. As the duration of copyright protection increases so do tracing costs thus demanding a finite copyright life.

*Trademarks*

A trademark is a name, symbol, or other identifier whose exclusive right of use is legally restricted to the possessor or those utilizing it with permission. While for the issuance of a patent there is the requirement of novelty, and for a copyright there must be originality, for the trademark there must be a demonstration of distinctiveness. At a minimum, trademarks have a history dating back to the medieval age where guilds would inscribe identifying marks on their wares. Laws prohibited the use of these identifying marks by non-guild members. The modern laws governing trademarks are largely based upon (for the western world) 13th century English law. The origination of trademark protection is not derived from the desire to promote incentives to those pursuing innovative or creative undertakings (as in patents and copyrights), but instead to provide rules for orderly marketing of products and their sources. Trademarks permit consumers to accurately identify products, thereby permitting proper qualification of the good’s quality and producer.

The issue of breadth, when applied to trademarks, deals predominantly with what can and cannot be trademarked. Typical law does not permit trademarking of generic names, thereby facilitating competition rather than creating monopoly power. Trademarks distinctly differ from other intellectual property rights in that they do not
have an expiration. Trademarks, which are not characterized by the same social costs as patents and copyrights (such as the creation of legal monopolies and tracing costs), do not have any detractors requiring a limited life span.

Other Forms of Intellectual Property Rights

The preceding discussion of the issues regarding patents, copyrights, and trademarks covers only three of a number of different existing forms of IPRs. There exist more specific laws governing innovations such as integrated circuit designs, trade secrets, and plant species to name a few. Intellectual property right laws are in a continual evolutionary state, attempting to adapt to appropriately cover new innovations. For example, mathematical algorithms in the U.S. are not patentable. This posed a particularly difficult hurdle for the U.S. legal system since computer programs are merely a series of algorithms. Faced with the dilemma of computer programs forced U.S. courts to amend their rulings to state that while algorithms are not patentable, the application of algorithms, such as in programs, is a patentable process.

IV. International Intellectual Property Rights

As can be seen from the preceding sections, there is little question as to the necessity for intellectual property rights, but there does exist the persisting question of the optimal breadth and duration of protection (if an optimal solution even exists). As globalization and international trade increases, this dilemma is compounded. IPRs are the products of domestic laws and have evolved on the basis of precedents and court rulings (i.e. are unique to each country). Hence, a great disparity between forms and
scopes of protection exist between different countries. As well, each country has their own unique court system and governance for determining if violations have occurred and what damages are to be levied. This disparity of laws has not only created tensions among nations, but has also raised great concern among firms who lose profits through their inability to prevent product duplication and dissemination in other countries with lax regulations.

A number of international agreements have attempted to bring a semblance of continuity to international IPRs. The first major international effort was the Paris Convention for the Protection of Industrial Property, which concluded in 1883. The resulting agreements by 164 nation states were the first major international agreements regarding industrial property, trade names, geographical indications, and industrial designs. The Berne Convention for the Protection of Literary and Artistic Works concluded in 1886, setting the first international minimum standards for the protection of creative works. Since the Paris and Berne conventions, a number of different agreements have contributed to and amended the existing international IPR framework and codes. The most recent encompassing convention has been the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which was negotiated in the 1986-94 Uruguay round. The TRIPS Agreement is the most comprehensive effort to date by World Trade Organization (WTO) members to minimize the disparity between IPR laws. The four core components of the agreement are: what are the minimum amounts of IPR protection, how to enforce IPRs, how to settle violations, and a set of transitional arrangements for less and least developed countries.
While the World Trade Organization is quick to proclaim the success of the TRIPS agreement, many nations and economists alike disagree. As detailed, the positive benefits of stricter IPRs do not come costlessly, even when isolated to a simple one-country example. Expanding the consideration of IPRs to the international stage gives rise to the question of who truly benefits from global property right protection. During the recent Uruguay round, there quite evidently existed a divide over IPRs between developed and less developed countries. The U.S., European community, and Japan were in strong agreement that the then current international trading system provided inadequate protection to IPRs, thus reducing profits, while less developed countries opposed strong IPRs on the grounds that they would increase the profits of monopolistic foreign firms at the expense of domestic consumers. In order to motivate the discussion of the global social welfare effects of IPRs I present in the next section my own simple model to demonstrate the dichotomous effects of IPRs on developed and less developed countries.

V. A Single Good North-South Model with Differentiated Firm Pricing Abilities

Suppose that there are two countries, the North and the South (denoted by N and S respectively). Assume that the more developed Northern country is the source of new innovations (i.e. a more developed country with adequate capital for use in research and development) which are protected by strict patent laws. The less developed South has the ability to produce the same good (once invented) with the same marginal cost ‘c’ as the North, but does not invent goods of their own. Let the demand functions in each country be linear, given by the equation $x_i^d(P_i) = a_i - \frac{1}{b_i} P_i, i = N, S$. Where $x_i^d$ and $P_i$ are the
corresponding quantity demanded and price in country $i$. The terms $a_i$ and $b_i$ are the unique constants for each country governing the linear demand curve. This equation can be transformed into the respective inverse demand functions $P_{x_i}(x_i) = a_i - b_i x_i$, $i = N, S$. Note: it is assumed that reselling of goods between regions is not allowed.

Case 1: No enforced patent laws in the South

The first case to analyze is the scenario where the strong patent protection in the North does not exist in the South. This means that while the producing firm can obtain monopolistic rents in the North, they are subject to zero profit conditions when competing in the South. Using standard monopoly theory (i.e. optimizing output such that marginal cost equates to marginal revenue) the optimum monopoly output and price in the North can be determined by maximizing the Northern firm’s profit function with respect to output in the North.

$$\pi(x_N) = TR(x_N) - TC(x_N)$$
$$= P_{x_N}(x_N) * x_N - c x_N$$
$$= (a_N b_N - b_N x_N) * x_N - c x_N$$

$$\frac{\partial \pi(x_N)}{\partial x_N} = a_N b_N - 2b_N x_N - c = 0 \quad \Rightarrow x_N^* = \frac{a_N b_N - c}{2 b_N} \quad \text{and} \quad P_{x_N}^* = \frac{a_N b_N + c}{2}.$$ 

Conversely, since by assumption there does not exist a patent law in the South, the optimum output and price can be determined using zero profit conditions (Note: without loss of generality it is assumed for simplicity of notation that one firm is responsible for all production).
\[ \pi(x_s) = TR(x_s) - TC(x_s) = 0 \]
\[ \Rightarrow P_s(x_s) \times x_s - c x_s = 0 \]
\[ \Rightarrow (a_s b_s - b_s x_s) \times x_s - c x_s = 0 \]
\[ \Rightarrow x_s^* = \frac{a_s b_s - c}{b_s} \text{ and } P_s^* = c. \]

Now that the optimum quantities and prices have been determined, it is possible to calculate the social welfare attained in each country.

For the North, the consumer surplus is equal to

\[ CS^N = \int_0^{2b_N} a_N b_N - b_N x_N \, dx_N = a_N b_N \left( \frac{a_N b_N - c}{2b_N} \right) - \frac{b_N}{2} \left( \frac{a_N b_N - c}{2b_N} \right)^2 \]
\[ = \frac{1}{8b_N} (3a_N^2 b_N^2 - 2a_N b_N c - c^2) \]
\[ = \frac{1}{8b_N} (3a_N b_N + c)(a_N b_N - c). \]

For the South, the consumer surplus is equal to

\[ CS^S = \int_0^{b_S} a_s b_s - b_s x_s \, dx_s = a_s b_s \left( \frac{a_s b_s - c}{b_s} \right) - \frac{b_s}{2} \left( \frac{a_s b_s - c}{b_s} \right)^2 \]
\[ = \frac{1}{2b_s} (a_s^2 b_s^2 - c^2). \]

And the rents captured by the Northern firm by monopolistic pricing in the North are

\[ \pi(x_N) = x_N^* \times (P_s^* - c) = \frac{a_N b_N - c}{2b_N} \left( \frac{a_N b_N + c}{2} - c \right) \]
\[ = \left( \frac{(a_N b_N - c)^2}{4b_N} \right). \]

Case 2: Enforced Patent Laws in the South

Now consider the alternative scenario, where there exists strong patent protection in the North and South. Keeping with the same framework where all innovation occurs
in the North, it is now possible for the Northern firm to capture monopolistic rents in both countries. As is quite evident from the model setup, no changes in quantity, price, consumer surplus, or monopoly profits will occur in the North. In the South, the equilibrium quantity and price will no longer be that of a competitive equilibrium (i.e. not determined via zero-profit conditions). In the South, the equilibrium quantity and price sustained by the Northern firm under the legally supported monopoly will be 

\[ x_s^* = \frac{a_s b_s - c}{2b_s} \quad \text{and} \quad p_s^* = \frac{a_s b_s + c}{2}. \]

By the same method used in the first scenario, it can be seen that the consumer surplus in the South and the monopoly rents attained by the Northern firm in the Southern region will respectively be

\[
CS^s = \frac{1}{8b_s} (3a_s b_s + c)(a_s b_s - c) \quad \text{and} \quad \pi(x_s) = \left( \frac{(a_s b_s - c)^2}{4b_s} \right). \]

**Comparison of Case 1 and Case 2**

Now it is possible to calculate the change in surplus for the South when strict patent rules are implemented.

\[
CS^s \text{ with patent rule} - CS^s \text{ without patent rule} = \left( \frac{1}{8b_s} (3a_s b_s + c)(a_s b_s - c) \right) - \left( \frac{1}{2b_s} (a_s^2 b_s^2 - c^2) \right)
\]

\[= \frac{1}{8b_s} (3c^2 - a_s^2 b_s^2 - 2a_s b_s c). \quad ** \]

For a positive level of output it must hold true that \( a_s b_s > c \). Thus if we let \( a_s b_s - c = \Delta > 0 \) then we can rewrite equation ** as
Thus, it can be seen that if a patent rule is implemented in the South, there is a strict loss of consumer welfare for Southern inhabitants.

As well, it can be seen that on the global scale there exists a loss of social welfare.

We can express the change in global welfare as the difference between the consumer surplus in the North and South and Northern profits under the two scenarios.

\[
(\text{CS}^N + \pi(x^N) + \text{CS}^S \text{ with patent rule}) - (\text{CS}^N + \pi(x^N) + \pi(x^S) + \text{CS}^S \text{ without patent rule})
\]

\[
= \left[ \left( \frac{1}{8b_N} (3a_N b_N + c)(a_N b_N - c) \right) + \left( \frac{a_N b_N - c}{4b_N} \right) + \left( \frac{1}{8b_S} (3a_S b_S + c)(a_S b_S - c) \right) \right] -
\]

\[
- \left[ \left( \frac{1}{8b_N} (3a_N b_N + c)(a_N b_N - c) \right) + \left( \frac{a_N b_N - c}{4b_N} \right) + \left( \frac{a_S b_S - c}{4b_S} \right) + \left( \frac{1}{2b_S} (a_S^2 b_S^2 - c^2) \right) \right]
\]

\[
= \frac{1}{8b_S} \left( c^2 - 3a_S^2 b_S^2 + 2a_S b_S c \right)
\]

\[
= \frac{1}{8b_S} \left( c^2 - 3(c + \Delta)^2 + 2c(c + \Delta) \right) \text{ by the substitution } a_S b_S = c + \Delta \text{ where } \Delta > 0
\]

\[
= -\frac{\Delta}{8b_S} (3\Delta + 4c) < 0.
\]

Thus, there is a decrease in global welfare under global patent protection.

**Conclusions from the Model**

Three important conclusions can be drawn from this model. First, the innovated North will be strictly better off from the implementation of a patent rule in the South. This result comes from the ability of the North to exercise monopoly pricing power in both the North and the South (i.e. the North generates profits in both regions instead of simply in the North). Secondly, the South will be strictly worse off under a patent rule, with a resulting loss of social welfare equal to the difference of the consumer surplus
under a competitive equilibrium and a monopolistic equilibrium. Finally, global social welfare will be strictly less under a strict patent rule in the South. This result holds because when exercising monopoly power in the South, the North is unable to perfectly capture the South’s entire lost consumer surplus, resulting in dead weight loss.

VI Summary of International IPR Literature

While the previous model achieved its desired goal, it is admittedly weak on several accounts (which will become quite clear in the subsequent discussion). A number of much more robust models have been proposed, ranging from a static duopolistic competition model by Chin and Grossman (1990) to a dynamic North-South model by Helpman (1993). Despite the differing structures and particular focuses of the models addressing IPRs on the international scale, there is a remarkable congruency among the authors’ resulting conclusions. The main question that has been addressed by the different models has been who “wins” and who “loses” from stronger protection. There is agreement among the existing theoretical models that the South always loses from stronger IPRs. Stricter laws result in the elimination of cheaper imitation goods made in less developed countries, and a greater proportion of monopoly priced goods from the more developed countries, thus resulting in a decrease of LDC social welfare. However, this is only part of the larger picture. Stricter IPRs increases the financial motive for Northern firms to engage in research and to develop new products. This gives rise to the question of whether the social welfare benefits from an increased rate of new product development (due to stronger IPRs) outweighs the loss of social welfare from the elimination of imitation goods. While this possibility is enticing, the general consensus
among the theoretical models addressing this issue is that the benefits from an increased
innovation rate cannot keep pace with the loss of social welfare from the elimination of
imitation production and the persistence of monopoly pricing.

While the outlook on the effect of stricter global IPRs is decidedly clear-cut for
the South (they always lose), the question of whether the North benefits is ambiguous
when multiple goods and the location of production is taken into consideration. As
shown in the previous model, stronger IPRs allow Northern firms to operate with
monopoly power and without the imitation by Southern firms, thus resulting in an
increase in Northern firm profits at the expense of the South. However, there are two key
opposing effects. The elimination of imitation goods produced by the South also
decreases the availability to Northern consumers of cheaply priced products, thus
resulting in a loss of Northern consumer surplus. As well, tighter IPRs shift production
away from the South (where factors are assumed to be less expensive) to the North
(where factors are assumed to be more expensive). This effectively decreases production
efficiency (less efficient factor allocation) resulting in losses for both the North and the
South. When these additional considerations are addressed, the analysis of whether the
North always benefits from stronger global IPRs is unclear. Helpman (1993)
demonstrates that there do exist scenarios under differing rates of innovation
development in which the North could gain in the short term while ultimately losing in
the long run. The theoretical conclusion that the South always loses and the North only
benefits under certain conditions has led to the proposition that there exists a mutually
beneficial degree of IPRs. Under the optimal level of protection, there would exist a
balance between imitation production by Southern firms and the financial incentive driving innovation by Northern firms.

**VII Summary of Empirical tests of IPRs**

While there is a sizable quantity of literature addressing the issue of intellectual property rights from a theoretical vantage, there is a conspicuous dearth of empirical studies. To complicate matters, the existing empirical analyses of the effects of international IPRs are quick to note the sizable gaps in their studies, and the need for more robust investigations. One of the key dilemmas that has made conducting an analysis of IPRs a difficult feat has been how to rate or rank countries based upon their IPRs. Each country inherently has a different set of laws, procedures for making claims against violators, and penalties. While international agreements have attempted to set forth a cohesive set of IPR laws, there is little disagreement as to the persistence of violations without retribution. As well, the mere presence of a law certainly does not dictate to what degree it is enforced, thus making qualitative judgments of a country's IPRs decidedly difficult. To avoid this issue, several empirical test have had to rely upon perception based indexes or surveys of executives in order to rate countries upon their degree of intellectual property protection. Others problematic factors include lack of industry and firm level data for cross-country analysis and the persistence of collinearity and endogeneity problems within the test models. The end result of the difficulties facing empirical tests has been very little conclusive evidence as to the effect of IPRs on foreign direct investment (FDI) or the capital composition of investments.
VIII  A North-South Model with Disjoint Global Demand Functions and Firm
Research and Development Choice

In my first model, I demonstrated that when there is an absence of property laws, imitation by Southern firms would lead to a competitive equilibrium in the South, thus preventing Northern firms from exercising monopoly pricing power. This means that the financial motive for Northern firms to innovate comes from profits generated in the North. If the North and South are both governed by the same demand functions, then imitators in the South benefit via a “free ride”, since the Northern firm makes expenditures on research and development of goods that Southern firms can reproduce (without R&D costs). But what happens if demands in the North and South differ? Consider the example of the U.S., where agriculture is a highly capital-intensive activity, and LDCs, where agriculture is a labor-intensive activity (due to the availability of inexpensive labor). U.S. firms have great incentive to innovate and improve upon capital-intensive aspects of farming because they are able to generate monopoly profits under strict U.S. property protection laws. However, in the absence of international IPRs the U.S. has little incentive to research and develop improvements for labor-intensive aspects of agriculture since demand only exists outside the boundaries of property protection. Thus, innovations that would be potentially beneficial only to the South would not be developed by Northern firms.

In the alternative scenario, where there exists strong global property protection, the Northern firm is able to reap monopoly profits in the North and South. Thus, Northern firms would have the financial incentive to research and develop products to maximize profits based upon global demand (North demand plus South demand).
Continuing with the previous agricultural example, U.S. firms would now have a stronger incentive to develop labor-intensive farming improvements because they now may enjoy monopoly profits in the South.

In all of the literature surveyed, North and South demand functions are assumed to be identical or based upon homothetic preferences. The case of identical demands (as in Deardorff (1992)) seems highly unlikely given the disparity of tastes and socioeconomic statuses of world consumers. In the case of Helpman (1993), where aggregate demand is derived from individual preferences (which are assumed to be homothetic), it is assumed that the elasticity of demand is constant and greater than one. I contend that if the assumption of identical demand functions or constant elastic demands is abandoned, that the generally accepted postulate that the South always “loses” from stricter global IPRs might be flawed.

**Proposition**

Under differentiated or segmented global demand, stricter intellectual property protection laws could result in an overall social welfare increase for LDCs by aligning the profit motive for research and development by firms in developed countries with the needs and demands of consumers in LDCs.

**Model**

Suppose that there are two countries, the North and the South (denoted by N and S respectively). Assume that the more developed Northern country is the source of new innovations, which are protected by strict patent laws. Assume that there is only $1
available for expenditure in research and development by the North. From the expense of the one dollar, the North can, with probability of 100%, produce either good W or Z. The less developed South has the ability to produce the same good (once invented) with the same marginal cost ‘c’ as the North, but does not invent goods of their own.

Let the demand functions for good W and Z in each country be linear given by the equations

\[ W_i^d(P_{W_i}) = a_i - \frac{1}{b_i} P_{W_i}, \quad i = N, S \]

and

\[ Z_i^d(P_{Z_i}) = d_i - \frac{1}{f_i} P_{Z_i}, \quad i = N, S. \]

Where \( W_i^d \) and \( P_{W_i} \) are the corresponding quantity demanded and price in country I for good W, and \( Z_i^d, P_{Z_i} \) are similarly for good Z. The terms \( a_i \) and \( b_i \) are the unique constants for each country governing the linear demand curve W. The constants \( d_i \) and \( f_i \) govern the demand functions for good Z. The corresponding inverse demand functions are

\[ P_{W_i}(W_i) = a_i b_i - b_i W_i, \quad i = N, S \]

and

\[ P_{Z_i}(Z_i) = d_i f_i - f_i Z_i, \quad i = N, S. \]

**Case 1: No enforced patent laws in the South**

As previously discussed, the Northern firm will only control monopoly power in the North (zero profit in the South). Therefore, without a patent law in the South, the North will choose to research the product that will generate higher profits in the North. Assume without loss of generality that product W generates higher profits in the North so

\[ \pi(W_N) = \left( \frac{(a_N b_N - c)^2}{4b_N} \right) > \pi(Z_N) = \left( \frac{(d_N f_N - c)^2}{4d_N} \right). \]

Now, given that the North will produce good W, the welfare benefits for the North and South are respectively
\[
Welfare \text{ in North} = \pi(W_N) + CS^N = \left(\frac{(a_Nb_N - c)^2}{4b_N}\right) + \frac{1}{8b_N}(3a_Nb_N + c)(a_Nb_N - c).
\]

\[
Welfare \text{ in South} = CS^S = \frac{1}{2b_S}(a_S^2b_S^2 - c^2) \quad (1).
\]

**Case 2: Enforced Patent Laws in the South**

With patent protection, the firm will now choose to research the good that will yield the greatest profits globally. So the firm’s choice of production depends upon the greater of \(\pi(W_N) + \pi(W_S)\) and \(\pi(Z_N) + \pi(Z_S)\). This can be expressed by the inequality

\[
\left(\frac{(a_Nb_N - c)^2}{4b_N}\right) + \left(\frac{(a_Sb_S - c)^2}{4b_S}\right) \geq \left(\frac{(d_Nf_N - c)^2}{4d_N}\right) + \left(\frac{(d_Sf_S - c)^2}{4d_S}\right).
\]

In case one, it was assumed that product W is more profitable than product Z in the North. Express the difference in profits in the North between the two goods as \(\pi(W_N) - \pi(Z_N) = q \text{ where } q > 0\). Now consider the scenario where Southern demand for product Z is sufficiently greater than for product W such that global profits for the Northern firm are maximized when producing W. Meaning that

\[
4q + \left(\frac{(a_Sb_S - c)^2}{b_S}\right) \geq \left(\frac{(d_Sf_S - c)^2}{f_S}\right) \quad (2).
\]

The respective welfare benefits for the North and South when good Z is produced are

\[
Welfare \text{ in North} = \pi(Z_N) + \pi(Z_S) + CS^N = \left(\frac{(d_Nf_N - c)^2}{4f_N}\right) + \left(\frac{(d_Nf_N - c)^2}{4f_N}\right) + \left(\frac{(3d_Nf_N + c)(d_Nf_N - c)}{8f_N}\right).
\]

\[
Welfare \text{ in South} = CS^S = \frac{1}{8f_S}(3d_Sf_S + c)(d_Sf_S - c) \quad (3).
\]
Comparison of Case 1 and 2

Now the question remains, is the social welfare in the South maximized with or without enforcement of patent laws. This can be seen by comparing equations (1) and (3)

\[ CS_{\text{no patent rule}}^S = \frac{1}{8f_S} (3d_S f_S + c)(d_S f_S - c) \]
\[ CS_{\text{patent rule}}^S = \frac{1}{2b_S} (a_S^2 b_S^2 - c^2) \] (4).

Assume without loss of generality that \( f_S = 1 \). So equation (4) can be rewritten as

\[ \frac{1}{8} (3d_S + c)(d_S - c) \leq \frac{1}{2b_S} (a_S^2 b_S^2 - c^2) \] (5).

Since \( a_S b_S \geq c \) for a nonnegative output, equation (2) can be rewritten as

\[ \frac{a_S^2 b_S^2 - c^2}{2b_S} < \left( \frac{(d_S - c)^2}{2} \right) - 2q \] (6).

Substituting (6) into (5) yields

\[ \frac{1}{8} (3d_S + c)(d_S - c) \leq \left( \frac{(d_S - c)^2}{2} \right) - 2q = (d_S - 5c)(d_S - c) \leq 16q. \]

Thus, if \( (d_S - 5c)(d_S - c) > 16q \) then the Southern firm will be strictly better off if the Northern firm produces good Z as opposed to good W. Herein lies the dilemma. Under lax patent protection in the South, the Northern firm will develop good W because their profits are maximized by producing the good for which there is higher demand in the North. Under strict patent protection, the Northern firm researches the product that will offer the greatest profits globally. This model demonstrates that if demand in the South is sufficient (\( d_s \) sufficiently large), social welfare in the South will be strictly improved by implementing strong patent protection, despite permitting the Northern firm to operate as a legal monopoly within its boundaries.
IX Conclusion

Determining the optimal strength of intellectual property rights, even when isolated to analysis of a single isolated country, is a problematic endeavor. When analysis is broadened to encompass multiple countries of differing economic statures, the dilemma is compounded. With the passing of the TRIPS agreement, it is apparent that the world is moving towards a more unified stricter stance on protection (although the level of enforcement is still questionable). While empirical evidence of the effects of IPRs is fairly lacking, relevant theoretical models generally agree that strong protection never benefits less developed countries and only benefits more developed countries under certain conditions. The first model presented in this paper, although simplistic, does demonstrate the preponderance of a decline in social welfare for LDCs under stronger protection rights. To counter the postulate that LDCs always lose under strong property protection, the second model demonstrates that if demand functions are allowed to differ between countries, conditions can exist such that LDCs do in fact benefit from enacting strict patent protection. A much more complete model combining the differentiated demand functions with country dependent factor input prices, rates of innovation, and FDI among other considerations would be necessary before any robust conclusions could be derived.
References


