R&D subsidy, intellectual property rights protection, and North–South trade: How good is the TRIPS agreement?

Pei-Cheng Liao [a], Kar-yiu Wong [b,c,*]

[a] National Taiwan University, Taiwan
[b] University of Washington, Seattle, WA, United States
[c] Central University of Finance and Economics, China

Abstract

This paper investigates the competition in technology and production between a firm in the North (developed country) and a firm in the South (developing country), and how such competition may be affected by the North's subsidy on technology improvement and the South's intellectual property rights (IPR) protection level. It is argued that allowing the North to choose the policy first could bring Pareto improvement. This paper also shows that requiring only the South to tighten its IPR protection (as required by the TRIPS agreement) without putting similar pressure on the North to provide more R&D hurts the South. A more rewarding outcome exists if both the IPR protection level and the technology subsidy rate are chosen optimally. We point out that maximizing world welfare does not consequently hurt the South, or require a tightening of IPR protection in the South.
© 2008 Published by Elsevier B.V.

1. Introduction

One of the contentious trade issues between the developed (North) and the developing (South) countries is about the "right" level of intellectual property rights (IPR) protection provided by the South.[1] This issue has led to many discussions and debates

---

* Corresponding author. Tel.: +1 206 685 1859;
fax: +1 888 814 9988/206 685 7477.

  E-mail address: karyiu@u.washington.edu (K.-y. Wong).

[1] The literature on IPR protection and related issues is voluminous. For example, Chin and Grossman (1990), Diwan and Rodrik (1991), Deardorff (1992), Helpman (1993) and Zigic (1998) examine the welfare effects of strengthening IPR protection. Taylor (1993) and Vishwasrao (1994) examine the effects of IPR protection on technology transfer. Horowitz and Lai (1996), Lai (1998), Yang and Maskus (2001), Glass and Saggi (2002), and Connolly and Valderrama (2005) study the effects of IPR protection on innovation. McCalman (2002) examines globally efficient patent agreements in a model with an innovative monopolist in the North. Scotchmer (2004) considers the intellectual property policies with public sponsorship of R&D. Both Zigic (2000) and Qiu and Lai (2004), on the other hand, investigate the interaction between IPR protection and tariffs. Qiu and Lai (2004) focus on the different roles of tariffs in the North and the South when IPR protections in both regions are weak. Spencer and Brander (1983) and Kang (2006) concentrate on the rivalry between a domestic firm and a foreign firm in the presence of technology transfer. Even when firms engage in R&D cooperation, at least a small R&D subsidy is always welfare improving (Qiu and Tao, 1998).

between these two groups of countries. If not properly managed, this situation could damage their economic relationship and adversely affect the world trade system.

The World Trade Organization (WTO) passed the Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS). Among other things, this agreement requires all member countries to provide a minimum level of IPR protection, no matter where the technology is developed. However, this agreement's success is subject to debate. The central issue is that it focuses mainly on what the South has to do, but the South has very little incentive to do so.[2] It is suggested that to make the South comply with the TRIPS agreement, the North can tie its tariff reduction to or exert political pressure on the south's effort to provide IPR protection.[3] These policy recommendations can hardly be the solution for three reasons. First, the motive of the South to

---

[2] The IPR protection level suggested by the TRIPS agreement is lowered than what most developed countries are providing but higher than what most developing countries are provided. Thus the TRIPS agreement is practically a constraint on these developing countries.

[3] Lai and Qiu (2003) show that both the North and South gain from the multi-sectoral negotiations with the South raising its IPR protection in exchange for the North lowering its tariffs imposed on the South's traditional goods.

comply with the TRIPS agreement is not so much tariff reductions as the avoidance of tariff increases, which the North can legally impose if the South is found by the WTO to have violated the TRIPS agreement. Second, the South is motivated to accept the TRIPS agreement as part of the WTO due to the promise of liberalization in the area where the North's protection remains high (e.g., textiles and apparel).[4] Third, political pressure can easily lead to unilateral action by the North and unilateralism is rarely the solution to trade disputes in the world.

On the other hand, there have been questions as to whether the TRIPS agreement is helping to solve the problem or making the problem worse. One of the functions of the WTO is to provide a place for member governments to negotiate trade agreements and to settle trade disputes; whatever the WTO does will have an impact on the economic development and the welfare of the negotiating parties. From this premise we can raise several questions: (a) How will the TRIPS agreement affect the world's welfare? (b) Does an improvement in the world's welfare necessarily require an increase in the IPR protection provided by the South? (c) Are there things the North can do to induce the South to provide tighter IPR protection and at the same time improve the world's welfare? (d) Can an improvement in South's IPR protection be Pareto improvement? (e) What is the optimal policy for the world's welfare, i.e., what should the South and the North both do to maximize the world's welfare?

The objective of this paper is to provide a simple model to analyze the related issues and to suggest some alternative solutions. Using a simple model, we found that the answers are far from trivia. First, we argue that the TRIPS agreement, in its present setting, does not necessarily improve the welfare of the world. Second, an improvement in the world's welfare could require a drop in the IPR protection provided by the South. Third, there are things the North can do to induce the South to provide more IPR protection, without exerting political pressure or *quid pro quo* trade policies. Fourth, there do exist cases in which an increase in the South's IPR represents a Pareto improvement. Fifth, this paper argues that to maximize the world's welfare, both the South and the North should be required to choose the appropriate policies.

One key feature in the present model is that the North is choosing an appropriate R&D subsidy. That innovation in the North could generate externality is well recognized in the literature; for example, Lai and Qiu (2003) and Grossman and Lai (2004, 2006). However, not too many papers analyze explicitly the optimal R&D subsidy of the North in a competition game between the North and the South. Lin (2002) is an exception, but he assumes that the IPR protection chosen by the South is exogenously given. The main contribution of our paper is to analyze the rivalry between the North and the South by considering cases in which the R&D subsidy and the IPR protection are chosen either simulta-

neously or sequentially to maximize either an individual country's welfare or the world's welfare.

The remainder of the paper is organized as follows: Section 2 provides the features and assumptions of the model. Section 3 describes a game in which both governments choose their policy parameters simultaneously. The optimal production levels and the optimal R&D activities are derived. In Section 4, the optimal subsidy rate and the optimal IPR protection are derived. The Stick case and the Carrot case are explained. Section 5 examines the case in which the North is able to choose a credible subsidy first before the South picks its IPR protection. Section 6 considers the level of IPR protection that maximizes the world's welfare. Two cases are explained: the one in which the North chooses its own subsidy rate, and the one in which both the IPR protection level and the subsidy rate are chosen to maximize the world welfare. The last section concludes.

2. The model

Consider two countries labeled North and South and a homogeneous product. In each country, there is one firm producing the product, with the firm in North (South) being named firm N (S). The demand for the product, x^i, in country i is represented by $p^i = p^i(x^i), i = n, s$, where the subindex n (s) is used to denote a variable of North (South), and p^i is the market price. The demand function satisfies the normal properties: $p^{i'}(x^i) < 0$ and $p^{i''}(x^i) < \varsigma$, where ς is a sufficiently small positive number and a prime represents a derivative. Under free trade and zero transport costs, the markets are assumed to be fully integrated so that in equilibrium the two countries face the same market price of the product. The two demand functions can be combined together to give an aggregate demand function, $P = P(X)$, where $X = x^n + x^s$.[5]

Initially firm N is able to produce the product with a marginal cost of α^n while firm S's initial marginal cost is α^s. To be consistent with the situation under consideration, we assume that $\alpha^s > \alpha^n$. Both marginal costs are independent of the production level, and for simplicity both firms' fixed costs are assumed to be insignificant. Both firms are able to improve its technology, i.e., to lower their marginal costs, through different channels. Firm N, by spending an amount of k on R&D, can lower its marginal cost by an amount of $f(k)$, where $f'(k) > 0$ and $f''(k) < 0$, with $f'(0)$ sufficiently big and $f'(\infty) \to 0$. Firm S either is not able to carry out any R&D activities or chooses not to. It improves its technology through spillover effects, but the extent of the spillover depends on how tight South's government protects IPR.[6] Let us use a variable $\beta \in [0, 1]$ to represent the degree of IPR. Specifically, given that firm N has spent an amount k on R&D, firm S can expect to lower its marginal cost by $\beta f(k)$ through spillover. This also means that a lower β represents a tighter control of IPR. Through R&D and

---

[4] We thank the reviewer for providing the first two reasons.

[5] It can be shown that $P'(X) < 0$ and $P''(X)$ is less than a sufficiently small, positive number. See, for example, Wong (1995, Chapter 7).

[6] Both firm N and North's government also have an incentive to protect the firm's intellectual property rights.