

# Intellectual Property Rights as a Signal

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## Abstract

Despite results from both theoretical and empirical literature that show the benefits of increasing intellectual property rights (IPR) protection, some developing countries are still reluctant to adopt a strong IPR regime. This paper offers an alternative perspective capturing the above observation using a very simple signaling model.

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## **1. Introduction**

An important issue in economic development is what can account for the differences in the levels of income and the economic growth rate between developed and developing countries. The typical explanation is that developing countries have less capital and human capital. Consequently, the cure for developing countries would be to increase the capital resources both through direct capital transfer and to encourage savings within these countries.

Another cure for the economic growth gap between developed and developing countries, suggested by Stiglitz (1989), is to correct the market imperfection in developing countries. The most imperfect commodities are knowledge and information. In many respects, knowledge is like a public good. Firms may have difficult time absorbing their returns to knowledge, which results in an under-supply of knowledge and has impact on firms' investment decisions and innovation of products within developing countries.

As suggested by Fulton (1997), intellectual property rights (IPR) can create incentives for firms to invest in R&D through the creation of non-rival excludable goods. Langford (1997) also suggested that IPR can help increase allocative efficiency as resources are directed toward the creation and technology transfer of new high-value products. Langford (1997) concluded that countries that are the first to modernize their IPR regimes are likely to benefit more than laggard countries. Therefore, to correct the market imperfection, to create the incentives for domestic firms to invest more, and to attract foreign direct investment, developing countries can use intellectual property rights as a tool to do so.

The literature in this area shows that by improving IPR protection, a country not only increases the innovation rate (Helpman (1993), Diwan and Rodrik (1991), Lai (1998), Yang and Maskus (2001) Deolalikar and Roller (1989), Lach (1995), Park and Ginarte (1997), Maskus and McDaniel (1999), Crosby (2000) among others) but also attract more foreign direct investment (Lee and Mansfield (1996), Smith (2001), Maskus et al (2005), Puttitanun (2006), Nicholson (2001)). Some of the existing studies even prove the link between IPR and economic growth (Gould and Gruben (1997), Thompson and Rushing (1996, 1999)). However, while the literature shows that IPR protection is beneficial to the growth of the country, many developing countries are still reluctant to adopt IPR. Based on the empirical results in Schneider (2005), this seems to be because the impact of IPR on innovation and growth can differ between developed and developing countries. This phenomenon is confirmed by Maskus (2000), Primo Braga et al (2000), and Chen and Puttitanun (2005). They find a U-shaped relationship between the adopted IPR level and development level of the country.

This paper aims to offer an alternative perspective using a very simple signaling model to show why two groups of countries would choose different level of IPR.

## **2. Signaling Model**

In this section, I use a simple signaling model to capture the results of adopting an intellectual property rights.

The environment consists of two types of developing countries: strong institution country and weak institution country denoted by  $\theta_s$  and  $\theta_w$ , respectively, where  $\theta_s > \theta_w$  and let  $\lambda = \text{prob}(\theta = \theta_s) \in (0,1)$ . A firm from a developed country decides where to

invest, assuming that investment is in the amount of  $K$ . However, the firm does not know which country is of which type (strong or weak institution country). The firm's main objective is to maximize its lifetime profit.

$$\max \sum_{t=0}^{\infty} \theta \delta^{t-1} \pi_t \quad \text{where } \pi_t \text{ is a monopoly profit in period } t$$

$\delta$  is a discount factor

$\theta$  is the type of a country that this firm invests in

Therefore, if there is no imitation,  $\theta$  is equal to 1. If there is imitation in country that the firm invests in, then  $0 < \theta < 1$ .

Comparing profit in a strong institution country with profit in a weak institution country,

$$\sum_{t=0}^{\infty} \theta_s \delta^{t-1} \pi_t > \sum_{t=0}^{\infty} \theta_w \delta^{t-1} \pi_t$$

Thus, the firm will want to invest in a strong institution country rather than a weak institution country.

To attract investment, a developing country will want to signal to the firm that it has a strong institution, assuming that the goal of a country is to increase investment level from abroad. The country can use IPR to do so; however, it does so at a cost.

Intellectual Property Rights can be used as a tool to signal the imitation rate because once it is adopted, a country has a limited level of imitation. However, I have to assume that to impose IPR, it incurs some cost. Moreover, a strong institution country should have less cost in imposing IPR than a weak institution country.

The cost of IPR could be in terms of the cost to reduce imitation rate. The cost of imposing IPR level  $i$  for a type  $\theta$  country is  $c(i, \theta)$  with  $c(0, \theta) = 0$ ,  $c_i(i, \theta) > 0$  (cost is

an increasing function of level of IPR),  $c_{ii}(i, \theta) > 0$ ,  $c_{i\theta}(i, \theta) < 0$  for  $\forall i > 0$ , and  $c_{i\theta}(i, \theta) < 0$  (marginal cost of imposing IPR is also higher for a weak institution country). The benefit to the country choosing IPR level  $i$  is that it receives foreign investment of  $K(i | \theta)$ . We will assume that as a WTO membership, it is required that a country must impose a minimum level of IPR,  $\underline{i}$ .

The net benefit that each country will receive from imposing IPR level  $i$  is as follows:

$$K(i) - c(i, \theta_w) \text{ if weak types choose } i > \underline{i}$$

$$K(\underline{i}) - c(\underline{i}, \theta_w) \text{ if weak types choose } i = \underline{i}$$

$$K(i) - c(i, \theta_s) \text{ if strong types choose } i > \underline{i}$$

$$K(\underline{i}) - c(\underline{i}, \theta_s) \text{ if strong types choose } i = \underline{i}$$

Two types of equilibrium exist here:

### **2.1 Separating equilibrium:**

1. A weak institution country chooses IPR level =  $\underline{i}$ , and gets minimum investment  $K(\underline{i})$  from abroad.
2. A strong institution country chooses IPR level  $> \underline{i}$ , and gets more than a minimum investment.

In order to get the results above, the condition below must be satisfied:

$$K(i) - c(i, \theta_w) \leq K(\underline{i}) - c(\underline{i}, \theta_w) \text{ and } K(i) - c(i, \theta_s) \geq K(\underline{i}) - c(\underline{i}, \theta_s) \text{ or}$$

$c(i, \theta_w) - c(\underline{i}, \theta_w) \geq c(i, \theta_s) - c(\underline{i}, \theta_s)$ . In other words, in order to have a separating equilibrium, the difference in the cost for a weak type must be larger than the difference in cost for a strong type in imposing the IPR at a level higher than WTO regulates.

## **2.2 Pooling equilibrium:**

Both types of countries choose the same level of IPR ( $\tilde{i}$ ), and then the investment received from abroad will be  $K(\tilde{i})$  where  $\tilde{i} > \underline{i}$  and  $K(\tilde{i}) > K(\underline{i})$ .

To support  $\tilde{i}$  as a pooling outcome,  $K(\tilde{i}) - c(\tilde{i}, \theta_w) \geq K(\underline{i}) - c(\underline{i}, \theta_w)$  must be satisfied since the weak type country is the most tempted to deviate from  $i > \underline{i}$ . In other words, the constraint is  $K(\tilde{i}) - K(\underline{i}) \geq c(\tilde{i}, \theta_w) - c(\underline{i}, \theta_w)$  or the net benefit from imposing the  $\tilde{i}$  level of IPR must be larger than the net costs of imposing it.

## **3. Conclusion**

While both theoretical and empirical literature show that IPR can be used to attract foreign direct investment, create incentives to innovation, and increase the growth for the country adopting it, countries still adopt different levels of IPR. Typically, developing countries adopt a lower level of IPR protection than developed countries. This paper uses a very simple signaling model to show that each country will set its own IPR level to maximize its welfare. Under a certain circumstance, both developed and developing countries will choose the same level of IPR protection. Otherwise, developing countries will choose a lower level of IPR protection than developed countries.

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