International Review of Economics and Finance 37 (2015) 203–207

Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

Does intellectual property right promote innovations when pirates are innovators?☆

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ARTICLE INFO

Article history:
Received 8 July 2014
Received in revised form 26 November 2014
Accepted 26 November 2014
Available online 11 December 2014

JEL classification:
F14
L13
O1
O34

Keywords:
Intellectual Property Rights
R&D incentive of imitators

ABSTRACT

We identify two new channels through which Intellectual Property Rights (IPRs) may affect R&D incentives that are in stark contrast to conventional wisdom. First, in a model with a simple technology we find that IPRs may deter innovations when pirates are potential innovators. Second, in a model with a complex technology we find that IPR, even in a static situation, increases consumer surplus. We show that strong IPRs lead not only to the decrease in the "competition effect", but also the increase in the "innovation effect" in the current period when there exists international specialization in R&D. When "innovation effect" dominates "competition effect", the strengthening of patent protection promotes both innovation and consumer surplus.

1. Introduction

The conventional wisdom holds that in the static case IPR generates monopoly and reduces consumers' surplus because patent protection leads to the decrease of the current "competition effect" due to the market exclusivity conferred by patent protection. Hence patent protection could only promote innovation when dynamic and general equilibrium factors are accounted for where the monopoly profit from production market provides incentives for innovators to introduce new products (Maskus, 2000). However, one fact that has been ignored by previous literature is that imitators could be potential innovators. While developed countries have long been seen as the main R&D engine of the world, many emerging economies are now gearing up to play a more important role in this sector. Firms who were used to be pure imitators tend to focus more in innovative activities.

This paper investigates the relationship between IPR and R&D incentives when imitators can be potential innovators. We find that allowing such possibility can generate new insights that are in contrast to the conventional wisdom. We investigate the fundamental relationship between IPR and incentives for R&D when imitators can be potential innovators with a simple technology and complex technology respectively. In our paper a simple technology is defined as the technology used in the production process where only one component is required to produce one unit of final good, while the complex technology is the technology used in the production process where it requires two or more components to produce one unit of final good.

☆ We acknowledge the financial support from the Hong Kong Polytechnic University AF Internal Competitive Research Grant (G-U954).
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http://dx.doi.org/10.1016/j.iref.2014.11.023
1059-0560/

We have the following findings. First, in a model with a simple technology we show that IPR can deter R&D by forcing excessive competition in the R&D race because excessive competition in the R&D race pins down firms' profit under innovations. Second, in a model with a complex technology we find that strong patent protection, even in a static situation, leads not only to the decrease in the "competition effect", but also the increase in the "innovation effect" in the current period when there is international specialization in R&D. When "innovation effect" dominates "competition effect", the strengthening of patent protection promotes both innovation activities and consumer surplus.

Our study builds on the line of literature concerning the role of IPR on innovations. The early studies find that strong IPR promotes innovation as it increases the profits of the innovator while reducing the profits of imitators (Gallini, 1992; Gilbert & Shapiro, 1990) for a single innovation. Chen, Pan, and Zhang (2014) investigate the relationship between IPR and innovation when innovation is cumulative. They show that innovation could have an inverted-U relationship with patent strength because greater patent strength not only expands an innovating firm's profits against imitation but also shifts profit from current to past innovators.

The link between IPR, innovations, outsourcing and technology transfer has also attracted research attention. See, for example, Chen and Puttitanun (2005), Yang and Maskus (2009), Mukherjee and Bagchi (2014), Beladi, Marjit, and Yang (2012), and Mathew and Mukherjee (2014), among others. In particular, Chen and Puttitanun (2005) suggest that strong IPR may encourage Southern innovations. Yang and Maskus (2009) find that stronger IPR would enhance technology transfer through licensing, thereby increasing its exports. Mathew and Mukherjee (2014) suggest that stronger IPR in the host country may reduce inward FDI if imitation occurs under both export and FDI.

Our paper is also closely related to the strand of literature on intellectual property protection, and R&D competition. Chowdhury (2005) argues that if patent protection makes the R&D competition into a tournament, it could reduce R&D investment and welfare if the tournament effect is negative. Mukherjee (2006) finds that the effect of either imitation or technology licensing may always dominate the tournament effect and create higher R&D investment under patent protection.

The rest of the paper is organized as follows. We analyze the equilibrium results when pirates are non-innovators in Section 2. We demonstrate how these equilibrium outcomes will change when pirates are potential innovators in Section 3. We further examine the impact of Intellectual Property Rights in a model with a complex technology in Section 4. Concluding remarks are contained in Section 5.

2. The model with a simple technology when pirates are non-innovators

In this section we lay out a model which captures the impact of strong IPR held by the conventional wisdom. Consider a market with two firms, one N firm (the multinational) and one S firm (the local), producing a homogeneous product and competing in Cournot fashion.

First we consider the scenario where pirates are non-innovators. This implies that the probability of success in innovation for the S firm is close to zero due to the weak innovation capacity although conducting R&D is still a strategy for the S firm. Hence only the N firm is able to get a successful process innovation when conducting R&D. Both firms can engage in imitation depending on the strength of intellectual property protection. Let R denote both firms' R&D costs. Denote by I both firms' imitation cost, including the costs of product inspection, reverse engineering and simple trial and error.

The time sequence of the game is as follows. In the first stage, two firms simultaneously choose between undertaking R&D or imitation. Both firms compete in quantities in a Cournot setting and profits are realized in stage 2.

2.1. Under no patent protection

In this section we assume that the S firm is not an innovator, thus the S firm produces with the old technology even it undertakes process innovation. Let π_0 denote the duopoly production profit when both firms produce with the old technology. Denote by π_R and $\underline{\pi}_S$ the production profit of the N firm and the S firm respectively when the N firm produces with the new technology while the S firm produces with the old technology. Let $\overline{\pi}_N$ and π_S denote the production profit of the N firm and the S firm when the N firm produces with the new technology while the S firm produces with the imitated technology. The payoff matrix under no patent protection is presented in Table 1.

Table 1
No IPR. (The pirate is not an innovator.)

N \ S	R	I
R	$\pi_R - R, \underline{\pi}_S - R$	$\overline{\pi}_N - R, \pi_S - I$
I	$\pi_0 - I, \pi_0 - R$	$\pi_0 - I, \pi_0 - I$