



Intellectual property rights and foreign direct investment: A welfare analysis



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ABSTRACT

This paper examines how intellectual property rights (IPR) protection affects innovation and foreign direct investment (FDI) using a North–South quality-ladder model incorporating the exogenous and costless imitation of technology and subsidy policies for both R&D and FDI. We show that for the interior steady state to be stable, either R&D or FDI subsidy rates must be positive. Our findings also indicate that strengthening IPR protection promotes both innovation and FDI. Moreover, a strengthening of IPR protection can also improve welfare if the initial IPR protection in the South is weak and the R&D subsidy rate is not too high.

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1. Introduction

Since the agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) was signed in the Uruguay Round, developing countries that are members of the World Trade Organization (WTO) have been under pressure to adopt a set of minimum standards on intellectual property rights (IPR). To comply with these international agreements, some developing countries have recently strengthened their IPR protection. For example, according to the indexes in [Park \(2008\)](#), patent protection in Brazil, China, and India generally strengthened between 1990 and 2005 compared with that before 1990.

This change toward strengthening IPR protection in developing countries is likely to have a great impact on innovation and foreign direct investment (FDI) in these countries for several reasons. For example, strengthening IPR protection in a developing country makes it difficult for local firms to copy products developed by other firms and decreases the risk of technology imitation in that country. Thus, strengthening IPR protection is likely to influence the decision of a firm with advanced technology on whether to transfer production to a developing country. In addition, a decrease in imitation changes the monopolistic rent that the inventor of a good can earn, which is likely to influence R&D activities by firms in developed countries.

The present paper theoretically investigates the impact of strengthening IPR protection in developing countries using a dynamic general equilibrium model with two countries: the North, where new technology is invented, and the South, where

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new technology cannot be invented but can be transferred from the North through FDI. From this analysis, we derive three results. First, strengthening IPR protection in the South increases the wage in the South relative to that in the North. Second, strengthening IPR protection increases innovation in the North and the flow of FDI from the North to the South in both the long and the short run. Third, strengthening IPR protection can improve the welfare of both Southern and Northern households if the initial IPR protection in the South is sufficiently weak and the R&D subsidy rate is not too high.

A number of theoretical studies on technology transfer have examined the influence of strengthening IPR protection using North–South dynamic general equilibrium models where the chosen channel for technology transfer is FDI. However, these studies are divided based on the results. For example, two of the most important studies in this field, [Lai \(1998\)](#) and [Glass and Saggi \(2002\)](#), obtained contrasting results. [Lai \(1998\)](#), using a model of variety-expanding-type innovation, concluded that strengthening IPR protection promotes both innovation and FDI, whereas [Glass and Saggi \(2002\)](#), using a model of quality-improvement-type innovation, suggested the opposite. In related work, [Glass and Wu \(2007\)](#) (hereafter G–W) introduced costless imitation, as did [Lai \(1998\)](#), into a quality-improvement-type R&D model similar to that of [Glass and Saggi \(2002\)](#), and examined how increasing the probability of imitation affects innovation and FDI. Their results showed that strengthening IPR protection impedes both innovation and FDI. This finding lies contrary to [Lai \(1998\)](#) but is similar to that in [Glass and Saggi \(2002\)](#). By comparing the settings and results in these papers, [G–W \(2007\)](#) surmised that we could attribute the different results in [Lai \(1998\)](#) and [Glass and Saggi \(2002\)](#) to whether innovation is variety expanding or quality improving.

In this paper, we show that this presumption is *not* correct using a quality-ladder-type model. More specifically, the present paper extends [G–W's \(2007\)](#) model by introducing selected industrial policies into the model, i.e., subsidies for R&D and FDI, in order to reexamine the effect of strengthening IPR protection. Our model also includes the case of “inefficient followers” from their paper as a particular case where both of these subsidies are zero. In terms of results, our model shows that the unique interior steady state is necessarily unstable if both subsidies are zero. Hence, there is no equilibrium path converging to the interior steady state in the case of zero subsidies. In that case, following a policy change, the economy must move toward a “corner-solution equilibrium” in which some endogenous variables are zero. This result implies that the conclusion on IPR protection in [G–W's \(2007\)](#) inefficient followers' case needs to be reexamined because we cannot apply comparative statics of the steady state to the evaluation of a policy change. To address this issue, we prove that the unique steady state can be stable and comparative statics are applicable if the subsidy rates are higher than some critical level. Our model shows that if the interior steady state is stable, strengthening IPR protection necessarily *promotes* both innovation and FDI. This central conclusion is the opposite of the result in [G–W \(2007\)](#) and the same as that of the variety-expanding-type model in [Lai \(1998\)](#). Thus, our result proposes a counterexample to [G–W's \(2007\)](#) conjecture that whether strengthening IPR protection promotes innovation and FDI depends on the type of innovation.

As a more important topic, we also explore the welfare effects of strengthening IPR protection. Many earlier studies in this area, including [Lai \(1998\)](#), [Glass and Saggi \(2002\)](#), and [G–W \(2007\)](#), did not analyze the welfare effects because they focused on the effects on innovation and FDI. However, we cannot draw conclusions about the desirability of IPR policies based only on their effects on innovation and FDI. Our welfare analysis shows that strengthening IPR protection in the South entails simultaneous dynamic and static effects on welfare. The former dynamic effect arises from promoting innovation. An increase in innovation then enables households to consume higher-quality goods over time and increases their welfare. But strengthening IPR protection also accounts for static effects through changing the number of imitated goods and the income of households. As the imitator firms produce the imitated goods competitively, they sell at a lower price than the other goods produced monopolistically under the patents. Therefore, strengthening IPR protection may reduce welfare through decreasing imitation and the number of cheaper goods. In addition, it may affect welfare through changing the wages and the values of shares owned by households. To evaluate the desirability of IPR policies, we then need to compare the sizes of the dynamic effects with those of the static effects. In this paper, we show that the dynamic effects outweigh the static effects if the initial IPR protection is sufficiently weak and the rate of R&D subsidy is not too high. This implies that stronger protection of IPR can improve the welfare of the South and the North.

The remainder of the paper is structured as follows. [Section 2](#) describes the model. In [Section 3](#), we derive the equilibrium path of this model. In [Sections 4](#) and [5](#), we show that strengthening IPR protection promotes both innovation and FDI. [Section 6](#) shows that strengthening IPR protection can improve welfare. In [Section 7](#), we discuss the welfare effects of subsidy policies and the welfare effects in the model where imitation and FDI are costly processes. [Section 8](#) provides some concluding remarks.

2. The model

Our model has the same basic structure as that of [G–W \(2007\)](#), which is a version of the North–South quality-ladder model developed by [Grossman and Helpman \(1991, Chapter 12\)](#).¹ The main difference between our model and [G–W \(2007\)](#)

¹ Our model is based on the “fully endogenous” rather than the “semi-endogenous” theory of growth. The fully endogenous growth model has often been criticized because of the “problem” of scale effects. However, [Ha and Howitt \(2007\)](#), for example, have argued that fully endogenous theory is more consistent than semi-endogenous theory with the long-run data. Further, [Aghion and Howitt \(2006, p. 98\)](#) stated that “... there is no evidence pointing to the absence of a scale effect at the world level or in small closed economies”. Because debate remains as to whether endogenous or semi-endogenous theory is more appropriate, we adopt an endogenous growth model. This generally has the benefit of a simpler dynamic structure than the semi-endogenous growth model, so we can obtain clearer results, particularly for welfare analysis.

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