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# Intellectual property rights protection and endogenous economic growth

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## Abstract

The main purpose of the paper is to examine the impact of intellectual property rights (IPR) protection on economic growth and welfare. To achieve this aim, we make use of an expanding-variety-type R&D-based endogenous growth model. We work out the transitional dynamics of a shock in IPR protection and account fully for the loss in current consumption and gain in consumption growth due to a tightening IPR protection. We find that there exists an optimal degree of IPR protection in our model. We then calibrate our model by US data, and found that under-protection of IPR is much more likely than over-protection. Moreover, in the case of over-protection, the welfare losses are trivial; whereas in the case of under-protection, the welfare losses can be substantial. © 2002 Elsevier Science B.V. All rights reserved.

*JEL classification:* O31; O34; O4

*Keywords:* Intellectual property rights; Innovation; Growth

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## 1. Introduction

The main purpose of the paper is to examine the impact of intellectual property rights (IPR) protection on economic growth and welfare. To achieve this aim, we make use of an expanding-variety-type R&D-based endogenous growth model a la Romer (1990). The simplest way to model IPR protection is to assume that imitation is costless, and that stronger IPR protection lowers the rate of imitation. This is the approach we adopt here.<sup>1</sup>

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<sup>1</sup> If we assumed that imitation is costly, then tightening IPR protection amounts to increasing the cost of imitation. In that case, we believe similar results would obtain.

The conventional wisdom in the literature about strengthening IPR protection is that it encourages investment in R&D, yet depresses current consumption. Since there is a tradeoff between current loss in consumption and future gain in growth rate, there is a possibility of the existence of an optimal degree of IPR protection. The existence and properties of such an optimum, however, have not been confirmed before in the endogenous growth literature, partly because it involves a full characterization of the transitional dynamics of the rate of innovation and fraction of goods imitated in the economy. If transitional dynamics are not considered, and one focuses only on the steady state, then the welfare analysis is misleading. In fact, steady state welfare is maximized when growth rate of consumption is maximized. This will be achieved by protecting IPR fully and forever. Obviously, such a corner solution is intuitively unappealing and also counter-factual, since the transitional welfare gains and losses are not taken into account. This paper shows that once transitional dynamics are taken into account, there exists a finite optimal degree of IPR protection.

One contribution of our paper is that we compute the optimal IPR by working out the transitional dynamics of a shock in IPR protection and accounting fully for the loss in current consumption and gain in consumption growth due to a tightening of IPR protection. Specifically, we find that when the government announces an immediate increase in IPR protection, there is an immediate drop in current consumption and an immediate increase in the rate of growth of consumption, as well as overshooting of the rate of innovation. The instantaneous fall in consumption is caused by an expansion of the R&D sector, which bids up interest rate and induces more saving. On the other hand, higher investment in R&D leads to higher growth of consumption following the initial level drop. At the optimal level of IPR, the marginal cost due to current consumption loss is equal to the marginal gain due to consumption growth. We are able to compute this optimal level of IPR, the existence and significance of which has not been established in the literature.

Another contribution of our paper is that it estimates the welfare loss due to deviation of the current IPR protection in the US from the optimal level. We conclude that under-protection of IPR is potentially a very important reason for under-investment of R&D. This is complementary to other work in the literature (e.g. Jones and Williams, 1998, 2000). To assess quantitatively the welfare significance of optimal IPR protection, we calibrate our model by US data on long-term growth rate, mark-up factor in manufacturing industries, time rate of preference and intertemporal elasticity of substitution. The calibration results indicate that there is under-protection of IPR (relative to the optimal level) within plausible range of parameter values, and that under-protection of IPR is much more likely than over-protection. More complete computation indicates that in the case of over-protection, the welfare losses are trivial; whereas in the case of under-protection, the welfare losses can be substantial. One interpretation of this result is that the US should protect IPR much more than it currently does.

Our specification of R&D draws from the “laboratory equipment” model used in Rivera-Batiz and Romer (1991). The dynamic analysis is similar to that of Helpman (1993). Helpman studied the effect of IPR protection in the South on the welfare of the North and the South in a two-region global economy. Contrary to our main objective,

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