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Horizontal inventive step and international protection of intellectual property

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ABSTRACT

This paper studies the intellectual property protection in a global setting where the protection is based on the patentability requirement. When two countries with similar research efficiencies open trade with each other, the world patentability requirement will rise above the autarky levels of both countries. When two countries with sufficiently different research efficiencies open trade with each other, they will both lower their patentability requirements from their respective autarky levels. The model shows that there is under-protection for patents in the second case, which suggests that these countries may want to strengthen their coordination in patentability requirement.

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1. Introduction

A general trend of the global economy is that the value of products lies increasingly in the embodied creativity, and less in the materials. Consequently, firms' profit is becoming more sensitive to the protection of intellectual property rights (IPR). As economies become more integrated through trade, firms' profit becomes increasingly sensitive to the IPR protection in other countries as well. As a result, the differences between countries' IPR protection become a source of tension in international relations. To reconcile the conflicts, WTO members signed the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) in 1994.

The TRIPs harmonizes some aspects of the IPR protection. As for the scope of IPR protection, the TRIPs identifies copyrights, trademarks, geographical indications, industrial designs, patents, etc. As for the duration of IPR protection, the TRIPs requires signatory countries to provide a minimum of 20 years of protection for most innovations, and to extend copyright protection to 50 years after the death of the author, etc. The TRIPs also harmonizes the policies on national treatment, and border control.

The TRIPs, however, remains vague on the patentability requirement in stipulating that any inventions that are "new, involve an inventive step and are capable of industrial application" should be granted patents (Article 27, Section 5, Part II), since it does not give an unequivocal definition for the inventive step. The patentability requirement, nevertheless, is an essential element of an IPR regime since it shields patent holders from trivial modifications that may dilute or even seize their profits. Therefore it is important to know how countries would behave in a non-cooperative game of patentability setting, and whether Pareto improvement is possible through coordination.

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There has been sporadic research on the patentability-setting game between developed countries (e.g., Bond & Zissimos, 2010; Chor & Lai, 2009), but to the best of our knowledge, no one has investigated the patentability-setting game between developed and developing countries. Since the disputes on patent protection are mainly between developed and developing countries, it is important to study the patentability requirement in such a setting. This paper is an attempt to fill this gap in the literature.

It turns out to be difficult to analyze the patent policy setting game in a dynamic setting with decentralized research decisions. For example, Chor and Lai's (2009) model, which is based on quality improvement model, is tractable only when two countries have the same size and research technology. Since the parameterization of Chor and Lai's (2009) research production function has been known for its convenience, we feel that maybe we need to change course and investigate the question with a different type of setup. In this work, we show that if we make a few stylized assumptions, we can use a product expansion model to analyze cases where countries have different sizes and research technologies.

In a product expansion setting, the patentability policy is a requirement for the substitutability between the new good and existing goods. In a realistic setup, the patent examiner would be assumed to measure this substitutability and to grant patents to new goods with sufficiently low degree of substitutability with existing goods. There are three families of product differentiation models (Anderson, 2008): discrete choice models, spatial models, and CES models. The first two families of frameworks can incorporate different degrees of differentiation in a model and thus allow the patent examiner base her decisions on the substitutability between the new good and existing goods. However, these two models both involve some technical difficulties in a non-cooperative game between two countries. The demand functions of discrete choice models (e.g., multinomial logit) can easily make the model intractable. The structure of the product space of spatial models is complicated since the space must be expanding while new products can be as close to a consumer as existing ones. We are left with the CES model, but it features exogenous elasticity of substitution that precludes the choice of the substitutability between the new good and existing goods, or patenting procedures based on this information. As we show below, however, if we focus on the ex ante effect as opposed the *actual* effect that a new good will have on existing products, we can use a CES framework to investigate issues concerning patentability.

In our CES framework, a "product" refers to an industry (e.g., the telephone); a "variety" refers to a variety within an industry (e.g., Panasonic KX-TS105B Telephone). We assume that a research project uses the first variety of a product as the prototype to come up with the blueprint of a new good. For example, a research team may try to use the phone invented by Alexander Bell as their prototype to invent a new telecommunication device. After granted a license (i.e., patent), upon its production, a good either turns out to be a new product that does not compete with its prototype directly, or it turns out to be a spinoff of its prototype that engages in head-on competition with the incumbent producers. For example, the good of the aforementioned research team may turn out to be a cell phone (a new product), or just another variety of telephone (e.g., Panasonic KX-TS105B Telephone).

Our stylized assumption about patenting is that the patent examiner can only observe the probability that a blueprint will result in a new product, and that she uses this information alone to make patent granting decisions. This assumption is unrealistic, but it is innocuous in that patent granting is based on the expected effect that a new good will have on the profitability of existing goods. It captures the essential feature of patenting in a product-expansion setting: patents are only granted to inventions that cause small expected business-stealing effects to incumbent patent holders.

We focus on two special cases in a two-country open economy. The first case is called the North–North case, where the research technologies of two countries are similar. Firms in both countries find it optimal to adopt the patentability requirement of the leading country so that they can sell in both markets. The model shows that the leading country would like the world patentability requirement to be higher than its autarky level. This is because the leading country has comparative advantage for large projects, so a stricter world patentability requirement will shove research activities toward it. Since the leading country's patentability requirement prevails, the open economy patentability is above the optimal autarky level of the leading country. In other words, our model predicts a trend of tightening the patent protection as countries with similar research capacities open trade with each other.

The second open-economy case studied in this paper is the North–South case, where the North has a significant advantage in research and adopts a patentability requirement that is too costly for Southern firms to follow. In this case, both countries lower their patentability requirement from their respective optimal autarky levels when opening to trade. Most importantly, we show that there is under-protection for patent in this case since patent protection of both countries exhibits positive externality on the other country. The possibility for Pareto improvement suggests that countries may want to strengthen their coordination in patentability requirement in a North–South setting.

This paper belongs to the rich literature on IPR protection. In his seminal work, Nordhaus (1969) analyzes the static and the dynamic effects of patent length. Gilbert and Shapiro (1990) analyze the optimal combination of patent length and breadth. Li (2001) and O'Donoghue and Zweimuller (2004) study the optimal IPR protection policy in a dynamic general equilibrium. Furukawa (2007, 2010) and others provide theoretical arguments on how excessive protection of intellectual property could depress innovation.[1] Boldrin and Levine (2009) study how the optimal IPR protection strength varies with the market size.[2] Fershtman and Markovich (2010) study the optimal patent design in the presence of asymmetry in firm's research abilities. Acemoglua, Ganciab, and Zilibottic (2012) study how IPR protection affects R&D through its effect on standardization. Chu, Cozzi, and Galli (2012) point out that it is important to consider patent policies' compositional effects on vertical and horizontal innovation when we discuss whether patent protection stimulates or stifles innovation.

[1] Other theoretical works in line include Bessen and Maskin (2009), and Gangopadhyay and Mondal (2012). The arguments of these theoretical papers are consistent with the findings in Murray and Stern (2007) and Lerner (2009) empirical works.

[2] Eicher and Garcia-Penalosa (2008) study a similar question.

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