



# International intellectual property rights: Effects on growth, welfare and income inequality

Angus C. Chu <sup>a,\*</sup>, Shin-Kun Peng <sup>b,c</sup>

<sup>a</sup> School of Economics, Shanghai University of Finance and Economics, Shanghai, China

<sup>b</sup> Institute of Economics, Academia Sinica, Taipei, Taiwan

<sup>c</sup> Department of Economics, National Taiwan University, Taipei, Taiwan

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## ABSTRACT

What are the effects of strengthening developing countries' protection for intellectual property rights on economic growth and income inequality in the global economy? To analyze this question, we develop a two-country R&D-based growth model with wealth heterogeneity. In this growth-theoretic framework, we show that strengthening patent protection in either country increases economic growth and income inequality in both countries. Furthermore, we derive the Nash equilibrium level of patent breadth and find that it is sub-optimally low relative to globally optimal patent breadth due to the positive externality effects that are captured by a spillover parameter.

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## 1. Introduction

To analyze the effects of strengthening developing countries' protection for intellectual property rights (IPR) on economic growth and income inequality in the global economy, this study develops a two-country R&D-based growth model with wealth heterogeneity among households. In the model, both the North and the South invest in R&D, but the North has a higher degree of innovative capability than the South. Within this growth-theoretic framework, we derive the following results. Firstly, increasing patent breadth in either country raises both countries' (a) economic growth by increasing R&D and (b) income inequality by increasing the rate of return on assets. Secondly, we derive the Nash equilibrium level of patent breadth. In the Nash equilibrium, the North chooses larger patent breadth than the South. Finally, we find that the Nash equilibrium level of patent breadth is sub-optimally low relative to globally optimal patent breadth due to the positive externality effects that are captured by a spillover parameter.

As an example of the North (the South), we consider the US (China). Table 1 presents an index of patent rights from Park (2008) for the US and China.<sup>1</sup> It shows that the level of patent protection in China increases substantially while the level of patent protection in the US remains almost unchanged.<sup>2</sup> Given the importance of international intellectual property rights,

\* Corresponding author.

E-mail addresses: [angusccc@gmail.com](mailto:angusccc@gmail.com) (A.C. Chu), [speng@econ.sinica.edu.tw](mailto:speng@econ.sinica.edu.tw) (S.-K. Peng).

<sup>1</sup> The index is a scale of 0–5, and a larger number indicates stronger patent protection. See Park (2008) for details.

<sup>2</sup> In 1992, China extended the patent length from 15 to 20 years. In 2000, China reformed its patent system again. In this reform, the policy changes include (a) providing patent holders with the right to obtain a preliminary injunction against the infringing party before filing a lawsuit, (b) stipulating standards to compute statutory damages, (c) affirming that state and non-state enterprises enjoy equal patent rights, and (d) simplifying the patent application process, examination and transfer procedures and unifying the appeal system.

**Table 1**  
Index of patent rights from Park (2008).

	Year				
	1985	1990	1995	2000	2005
China	1.33	1.33	2.12	3.09	4.08
United States	4.68	4.68	4.88	4.88	4.88

we apply our theoretical results to analyze the macroeconomic implications on the global economy. In addition to analyzing the growth effects of international patent policy, the present study differs from previous studies by developing a growth–theoretic model with heterogeneous households to analyze the effects of international patent policy on income inequality in addition to economic growth. We find that strengthening patent protection in either country increases economic growth and income inequality in both countries. This result suggests that it is important to take into account how intellectual property rights affect the income distribution within a country given that rising inequality can be an important social concern.

For example, China amended its patent law in 2000 prior to joining the World Trade Organization in 2001. Since this amendment, the annual growth rate of applications for invention patents in China has increased to 23% (compared to less than 10% before 2000). Hu and Jefferson (2009) provide empirical evidence to show that the patent-law amendment in 2000 is a major factor for China's recent surge in patenting activities. Also, R&D as a share of GDP in China increases from an average of about 0.7% in the 1990s to 1.49% in 2007.<sup>3</sup> At the same time, the rising income inequality in China poses the country a serious challenge on domestic stability. In 2007, China's Gini coefficient rises to 0.47 that is above the threshold of 0.45 indicating potential social unrest. Our theoretical analysis suggests that strengthening patent protection in China could have worsened its income inequality. In a panel regression, Adams (2008) finds that strengthening patent protection indeed has a positive and statistically significant effect on income inequality. His estimates imply that increasing Park's (2008) index by one (on a scale of 0–5) is associated with an increase in the Gini coefficient of 0.01–0.02 (on a scale of 0–1) in developing countries. We should emphasize that there are also other important factors contributing to the rising income inequality in China, and patent policy is only one of them.

Our study relates to the literature on IPR protection and North–South trade. Early studies in this literature focus on the effects of IPR in reducing imitation from the South and encouraging technology transfer from the North through licensing or foreign direct investment. In these studies, innovative activities are usually assumed to take place only in the North.<sup>4</sup> However, two other important reasons for strengthening IPR in the South are (a) to provide incentives for the North to develop technologies that are also used by the South,<sup>5</sup> and (b) to provide incentives for the South to invest in innovative activities.<sup>6</sup> To fill in this gap in the literature, recent theoretical studies, such as Lai and Qiu (2003) and Grossman and Lai (2004), consider the important role of international intellectual property rights in providing sufficient incentives for innovation in both the North and the South. Our paper follows this branch of studies to focus on this aspect of international patent policy. Lai and Qiu (2003) and Grossman and Lai (2004) derive the Nash equilibrium patent length in an open-economy variety-expanding model, in which both the North and the South invest in R&D, and analyze the welfare effects of harmonizing IPR protection. We complement these interesting studies by deriving the Nash equilibrium level of patent breadth and analyzing the effects of raising patent breadth on the growth–inequality tradeoff using a quality-ladder model with heterogeneous households. To our knowledge, our study is the first to analyze the effects of international patent policy on social welfare, economic growth and income inequality simultaneously.

Since the seminal study of Kuznets (1955), the tradeoff between growth and inequality has been an important issue in economics. On one hand, early theoretical and empirical studies tend to find a negative growth–inequality relationship.<sup>7</sup> On the other hand, the more recent studies tend to find a positive relationship.<sup>8</sup> Forbes (2000) finds a positive empirical growth–inequality relationship and argues that the different results in previous studies are due to omitted-variable bias and measurement error. García-Peñalosa and Turnovsky (2006, 2007) argue that the theoretical growth–inequality relationship should be ambiguous and should depend on the underlying structural changes. Incorporating wealth heterogeneity into an AK growth model, they show that a positive relationship is more likely to emerge. Although the capital-accumulation-driven growth models are useful frameworks for analyzing many macroeconomic issues, they are not suitable for evaluating innovation policies. Therefore, this study incorporates wealth heterogeneity into an open-economy R&D growth model to

<sup>3</sup> These data are obtained from China Statistical Yearbook.

<sup>4</sup> See Grossman and Helpman (1991b), Helpman (1993), Lai (1998), Yang and Maskus (2001) and Glass and Saggi (2002b). While Glass and Saggi (2002a) consider a model with two symmetric innovating countries, Dinopoulos and Segerstrom (2010) consider a model in which Northern firms invest in innovative R&D and their Southern affiliates invest in adaptive R&D for technology transfer from the North.

<sup>5</sup> See, for example, Diwan and Rodrik (1991).

<sup>6</sup> For example, in a panel regression, Chen and Puttitanun (2005) find that strengthening IPR in developing countries indeed has a positive and significant effect on their innovations.

<sup>7</sup> See Galor and Zeira (1993), Alesina and Rodrik (1994), Persson and Tabellini (1994) and Perotti (1996).

<sup>8</sup> See Saint-Paul and Verdier (1993), Benabou (1996), Galor and Tsiddon (1997), Li and Zou (1998) and Forbes (2000). Barro (2000) finds a positive (negative) growth–inequality relationship in developed (developing) countries.

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