สัญญาเลขที่ RDG5710022

รายงานวิจัยฉบับสมบูรณ์

โครงการ ปัจจัยสำคัญที่ทำให้การลงทุนโดยตรงจากต่างประเทศ มีผลเกื้อกูลต่อการเพิ่มผลิตภาพการผลิต

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ชุดโครงการเศรษฐกิจมหภาคและนโยบายทางเศรษฐกิจของประเทศไทย

สนับสนุนโดยสำนักงานกองทุนสนับสนุนการวิจัย (สกว.)

22 พฤษภาคม 2558

สัญญาเลขที่ RDG5710022

โครงการ ปัจจัยสำคัญที่ทำให้การลงทุนโดยตรงจากต่างประเทศมีผลเกื้อกูลต่อการเพิ่มผลิตภาพการผลิต[1]

สรุปรายงานวิจัยฉบับสมบูรณ์

ส่วนที่ 1 ข้อมูลโครงการ

ชื่อหัวหน้าโครงการวิจัยผู้รับทุน ผศ.ดร.สันติ ชัยศรีสวัสดิ์สุข

โครงการเริ่มเมื่อวันที่ 20 ธันวาคม 2556 **รวมเวลาที่ทำวิจัยทั้งสิ้น** _____ **เดือน**

รายงานวิจัยฉบับสมบูรณ์ ส่ง ณ วันที่ 22 พฤษภาคม 2558

ส่วนที่ 2 รายงานเนื้อหา

ในรายงานวิจัยฉบับสมบูรณ์นี้ คณะผู้วิจัยได้ดำเนินงานวิจัยตามข้อเสนอ โดยภายหลังจากการทบทวนวรรณกรรมอย่างละเอียดถี่ถ้วนมากขึ้นพบว่า ปัจจัยทางด้านทรัพย์สินทางปัญญาเป็นกลุ่มของปัจจัยที่ได้รับการกล่าวถึงทั้งในทางทฤษฎีและในการศึกษาเชิงประจักษ์ถึงบทบาทและความสำคัญต่อการพัฒนาผลิตภาพการผลิต ดังนั้น จึงได้ทำการวิเคราะห์ความสัมพันธ์ของปัจจัยทางด้านทรัพย์สินทางปัญญาและความเชื่อมโยงกับการลงทุนโดยตรงจากต่างประเทศที่มีต่อการเปลี่ยนแปลงของผลิตภาพการผลิต โดยอาศัยแบบจำลองที่กำหนดไว้ในข้อเสนอ และการศึกษาใช้ข้อมูลของ 57 ประเทศ ในช่วงระหว่างปี ค.ศ. 1995-2012 ทั้งนี้คณะผู้วิจัยได้แบ่งปัจจัยทางด้านทรัพย์สินทางปัญญาออกเป็น 3 ช่วง คือ **หนึ่ง** ในช่วงหรือกระบวนการผลิตนวัตกรรม (Innovation process) **สอง** ในช่วงหรือกระบวนการถ่ายทอดเทคโนโลยีที่ทำให้นวัตกรรมไปสู่ตลาดเพื่อการค้าได้ (Commercialisation process) และ **สาม** ในช่วงหรือกระบวนการปกป้องทรัพย์สินทางปัญญา (Protection process)

ผลการศึกษาที่ได้พบว่า กระบวนการปกป้องทรัพย์สินทางปัญญาส่งผลบวกโดยตรงต่อการเพิ่มผลิตภาพการผลิตเฉพาะสำหรับกลุ่มประเทศที่พัฒนาแล้ว นอกจากนั้น ปัจจัยทางด้านทรัพย์สินทางปัญญาสามารถส่งผลโดยอ้อมต่อการลงทุนโดยตรงจากต่างประเทศที่มีผลเกื้อหนุนต่อการเพิ่มผลิตภาพการผลิตได้ แต่ในขอบเขตที่จำกัด กล่าวคือ การไหลเข้าของการลงทุนโดยตรงจากต่างประเทศที่นำไปสู่การเพิ่มขีดความสามารถในการสร้างนวัตกรรมจะนำไปสู่การเพิ่มผลิตภาพการผลิตของประเทศในกลุ่มที่พัฒนาแล้วได้ สำหรับการไหลออกของการลงทุนโดยตรงจากต่างประเทศ การเพิ่มขึ้นของกระบวนการถ่ายทอดเทคโนโลยีที่ทำให้นวัตกรรมไปสู่ตลาดเพื่อการค้าได้และกระบวนการปกป้องทรัพย์สินทางปัญญาจะมีส่วนสำคัญต่อการเพิ่มผลิตภาพการผลิต โดยเฉพาะในกรณีที่ประเทศกำลังพัฒนาเหล่านี้เป็นประเทศผู้ลงทุนโดยตรง

[1] จากการทบทวนวรรณกรรมในรายละเอียดที่เกี่ยวข้องกับการพัฒนาผลิตภาพการผลิตที่เชื่อมโยงกับการลงทุนโดยตรงจากต่างประเทศบ่งชี้ว่า ประเด็นทางด้านทรัพย์สินทางปัญญาเป็นเงื่อนไขสำคัญที่มีความสัมพันธ์ในกระบวนการถ่ายทอดเทคโนโลยีการผลิตที่ทันสมัยมากขึ้น และการเปลี่ยนแปลงของผลิตภาพการผลิต จึงเป็นกลุ่มของตัวแปรปัจจัยที่น่าจะได้ให้ความสำคัญในการวิเคราะห์ปัจจัยที่ทำให้การลงทุนโดยตรงจากต่างประเทศมีผลเป็นการเกื้อหนุนต่อการเพิ่มผลิตภาพการผลิต ดังนั้น เพื่อให้สอดคล้องกับประเด็นข้อคำถามวิจัยได้ดีขึ้น จึงได้เสนอปรับปรุงหัวข้อวิจัยเป็น "การลงทุนโดยตรงจากต่างประเทศ ทรัพย์สินทางปัญญา และการเติบโตของผลิตภาพการผลิต(Foreign Direct Investment, Intellectual Property and Productivity Improvement)"

ส่วนที่ 3 การผลักดันผลงานวิจัยให้เกิดการใช้ประโยชน์ (การใช้ประโยชน์ด้านวิชาการ)

งานวิจัยชิ้นนี้ได้มีการนำเสนอในการสัมมนาวิชาการระดับนานาชาติเพื่อรับฟังข้อคิดเห็น ปรับปรุงรายงาน จนสุดท้ายได้รับการตอบรับตีพิมพ์ในวารสารวิชาการระดับนานาชาติ ซึ่งต่อมาทางวารสารได้คัดเลือกให้ลงเป็นบทหนึ่งในหนังสือวิชาการต่างประเทศ ดังต่อไปนี้

Sudsawasd, Sasatra and Chaisrisawatsuk, Santi, 2015, "Foreign Direct Investment, Intellectual Property Rights, and Productivity Growth," in *Foreign Direct Investment and Small and Medium Enterprises: Productivity and Access to Finance*, Edited by Tan, Khee Giap and Tan, Kong Yam, Singapore: World Scientific Publishing.

Sudsawasd, Sasatra and Chaisrisawatsuk, Santi, 2014, "Foreign Direct Investment, Intellectual Property Rights, and Productivity Growth," *Journal of International Commerce, Economics and Policy*, Vol. 5 (3) pp. 1440009-1-19.

Sudsawasd, Sasatra and Chaisrisawatsuk, Santi, 2014, "FDI Inflows and Outflows, Intellectual Property Rights, and Productivity Growth," IDE Discussion Papers no. 444, available at http://www.ide.go.jp/English/Publish/Download/Dp/444.html

ซึ่งคณะผู้วิจัยได้แนบหลักฐานของการได้ลงตีพิมพ์ ดังนี้

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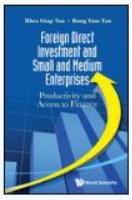

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Foreign Direct Investment and Small and Medium Enterprises

Productivity and Access to Finance

Edited by: **Khee Giap Tan** (*Lee Kuan Yew School of Public Policy, NUS, Singapore*), **Kong Yam Tan** (*Lee Kuan Yew School of Public Policy, NUS, Singapore*)

About This Book | About the Author(s) | E-Book | Supplementary

There is a large literature dealing with the spillover effects of foreign direct investment (FDI) flows to emerging and developing economies at the aggregate level. Beyond the aggregate impacts, a growing number of studies also examine the impact of FDI spillovers on firms of different sizes, especially small and medium enterprises (SME). This book is dedicated to exploring issues relating to the various interactions between FDI flows, productivity spillovers and SMEs in Asia and beyond. It studies globalization, FDI, and regional innovation in China, and trade and investment liberalization in India. It analyses how to promote SMEs and enhance labor productivity in Singapore. It investigates the impact of intellectual property rights processes on productivity growth. It documents the use of finance and financing patterns of informal firms. It uses empirical analysis to point out the limitations of traditional banks lending to SMEs and suggests possible policy approaches facilitating them to access growth capital. It also provides an empirical investigation of the main determinants of entrepreneurial activities.

Sample Chapter(s)

Introduction: Foreign Direct Investment (FDI), Productivity Spillovers and the Role of Small and Medium Enterprises (SMEs) Financing (65 KB)

Contents:

Readership: Academics, policy-makers, professionals, undergraduate and graduate students interested in foreign direct investment, globalization, financing of small and medium enterprises, and labor productivity.

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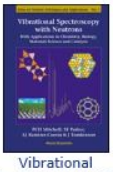
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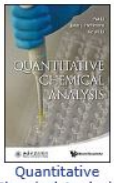
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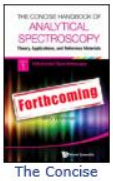

The Concise Handbook of Analytical Spectroscopy: Theory, Applications, and Reference Materials

Journal of International Commerce, Economics and Policy
Vol. 5, No. 3 (2014) 1440009 (19 pages)

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Foreign Direct Investment, Intellectual Property Rights, and Productivity Growth

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Published 12 September 2014

Using panel data for 57 countries over the period of 1995–2012, this paper investigates the impact of intellectual property rights (IPR) processes on productivity growth. The IPR processes are decomposed into three stages — innovation process, commercialization process, and protection process. The paper finds that better IPR protection is directly associated with productivity improvements only in developed economies. In addition, the contribution of IPR processes on growth through foreign direct investment (FDI) appears to be quite limited. Only inward FDI in developed countries which creates better innovative capability leads to higher growth. In connection with outward FDI, only the increase in IPR protection and commercialization are proven to improve productivity in the case of developing countries, particularly when the country acts as the investing country.

Keywords: Foreign direct investment; intellectual property rights; productivity growth.

JEL Classifications: F23, O34.

1. Introduction

Foreign direct investment (FDI) has been a critical component of the economic development process in most economies. Fundamentally, it points to the fact that FDI not only develops and utilizes idle resources, but also uses all the available resources more efficiently. Contributions by FDI to the growth of national output and economic efficiency improvements have been the focal points of most previous studies (see Hansen and Rand, 2006; Basu *et al.*, 2003). It has been widely argued that FDI is complementary to growth in the host countries. Influx of FDI is empirically found to be a major factor supporting job creation and efficiency improvements in the host economies (see Chowdhury and Mavrotas, 2005; De Mello, 1999; Alguacil *et al.*, 2011). Providing the capital needed for economic development is another primary role of FDI. Many countries also look for greater economic benefits in terms of technology transfers to domestically owned firms — i.e., the so called "spillover effects" — so as to help them move up the value chain.

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IDE DISCUSSION PAPER No. 444

FDI Inflows and Outflows, Intellectual Property Rights, and Productivity Growth

Sasatra Sudsawasd* and Santi Chaisrisawatsuk

February 2014

Abstract: Using panel data of 57 countries during the period of 1995-2012, this study investigates the impact of intellectual property rights (IPR) processes on productivity growth. The IPR processes are decomposed into three stages, innovation process, commercialization process, and IPR protection process. Our results suggest that better IPR protection is directly associated with productivity improvement only in developed economies. In addition, the contribution of IPR processes on growth through foreign direct investment (FDI) appears to be very limited. Only FDI inflows in developed countries which help to create a better innovative capability lead to a higher growth. And in connection with FDI outflows, only IPR protection and commercialization processes are proven to improve productivity in the case of developing countries, particularly when the country acts as the investing country.

Keywords: Foreign direct investment, Intellectual property rights, Productivity growth
JEL classification: F23, O34

* Associate Professor, National Institute of Development Administration (sasatra@nida.ac.th)

ส่วนที่ 4 ตารางแผนงาน

รายงานสรุปความคืบหน้า

กิจกรรม\เดือนที่		1	2	3	4	5	6	7	8	9	10	11	12	เป้าหมาย (%) (ผลสำเร็จ (%))	สรุปความคืบหน้า
1. รวบรวมงานวิจัยที่เกี่ยวข้องทั้งในและต่างประเทศ	Plan													100	ตามแผนงาน
	Actual													(100)	
2. เขียนรายงานการวิเคราะห์จากเอกสารที่รวบรวมได้	Plan													100	ตามแผนงาน
	Actual													(100)	
3. จัดเก็บรวบรวมข้อมูลทุติยภูมิ	Plan													100	ตามแผนงาน
	Actual													(100)	
4. พัฒนาแบบจำลองเพื่อหาความสัมพันธ์ระหว่างผลิตภาพการผลิตและการลงทุนจากต่างประเทศ	Plan													100	ตามแผนงาน
	Actual													(100)	
5. ประมวลผลที่ได้รับ วิเคราะห์ และเขียนรายงาน	Plan													100	ตามแผนงาน
	Actual													(100)	
7. ปรับแก้ไข เพิ่มเติมให้ร่างรายงานสมบูรณ์ยิ่งขึ้น	Plan													100	ตามแผนงาน
	Actual													(100)	
8. จัดทำและส่งรายงานฉบับสมบูรณ์	Plan													100	ตามแผนงาน
	Actual													(100)	

ลงนาม _____

(หัวหน้าโครงการวิจัยผู้รับทุน)

วันที่ 22 พฤษภาคม 2558

Foreign Direct Investment, Intellectual Property Rights, and Productivity Growth

Sasatra Sudsawasd and Santi Chaisrisawatsuk[2]

Abstract

Using panel data for 57 countries over the period of 1995-2012, this paper investigates the impact of intellectual property rights (IPR) processes on productivity growth. The IPR processes are decomposed into three stages - innovation process, commercialisation process, and protection process. The paper finds that better IPR protection is directly associated with productivity improvements only in developed economies. In addition, the contribution of IPR processes on growth through foreign direct investment (FDI) appears to be quite limited. Only inward FDI in developed countries which creates better innovative capability leads to higher growth. In connection with outward FDI, only the increase in IPR protection and commercialisation are proven to improve productivity in the case of developing countries, particularly when the country acts as the investing country.

Keywords: Foreign direct investment, Intellectual property rights, Productivity growth

JEL Classification: F23, O34

[2] School of Development Economics, National Institute of Development Administration, Bangkok, Thailand. This research was conducted as part of a project "Macroeconomy and Economic Policy Research for Thailand," which was funded by the Thailand Research Fund under the contract number RDG5710022. We would like to thank Dr. Somprawin Manprasert for his support, Dr. Kazunobu Hayakawa and other seminar participants at Institute of Developing Economies (IDE), Japan, for their invaluable comments, and Siam Sakaew for his research assistance.

1. Introduction

Foreign direct investment (FDI) has been a critical component of the economic development process in most economies. Fundamentally, it points to the fact that FDI not only develops and utilises idle resources, but also uses all the available resources more efficiently. Contributions by FDI to the growth of national output and economic efficiency improvements have been the focal points of most previous studies (see, for example, Hansen and Rand, 2006; Basu et al. 2003). It has been widely argued that FDI is complementary to growth in the host countries. Influx of FDI is empirically found to be a major factor supporting job creation and efficiency improvements in the host economies (Chowdhury and Mavrotas, 2005; De Mello, 1999; Alguacil et al. 2011). Providing the supply of capital needed for economic development is another primary role of FDI. Many countries also look for greater economic benefits in terms of technology transfers to domestically owned firms – i.e., the so called "spillover effects" – so as to help them move up the value chain.

In this connection, intellectual property rights (IPR) protection has received a great deal of attention (Furukawa, 2010; Acemoglu and Akcigit, 2011). It has been argued that the positive contribution of FDI on growth depends on the stage of IPR development. For instance, Chang (2001) provides a summary of how IPR contributes to economic development via some historical experiences and identifies various circumstances where IPR regimes can supplement economic development. In part, those differences in the IPR environment particularly for the host economy are related to activities involving technological transfers through FDI. A better IPR regime is argued to

be more conducive to technology spillovers and hence stimulates productivity enhancements in the host economies.

Generally, there are two channels through which IPR leads to productivity enhancements through FDI. First there is a direct channel wherein a tightening of IPR would create a better investment environment for a technology-intensive or knowledge-intensive sector such that it helps accelerate output growth. In one sense, this implies a greater vertical FDI type where different products in the production chain are manufactured in the home and host economy[3]. Branstetter and Saggi (2009) empirically show that there is a net benefit of FDI to the recipient economy by strengthening IPR protection schemes as the declining rate of imitation will be more than offset by an increasing flow of FDI. The second possibility involves simply changing the IPR regulations to attract greater FDI inflows. An increase in FDI in a host country creates more opportunities for economies of scale and also encourages a more efficient allocation and utilisation of resources, thus creating a higher output growth potential (see, for example, Borensztein et al. 1998, Choe, 2003, and Alguacil et al. 2011).

In this context, this paper is interested in identifying some of the crucial IPR aspects together with both inward and outward FDI that help promote productivity growth. In addition, the paper is also interested in investigating how the interaction between FDI and IPR may impact productivity growth. For instance, is it true that the greater innovative capability of a country will attract more FDI and thus promote growth

[3] A "forward vertical FDI" refers to the type of FDI that bring in intermediate goods from the home country to produce finished goods in the host country. A "backward vertical FDI" refers to the type of FDI that produces intermediate goods in the host country to be used in the host country for the production of finish goods. Horizontal FDI, on the other hand, refers to the type of FDI that invests and produces similar products as those manufactured at home and thus, it benefits from better knowledge and technology of production the firms have experienced.

in output? Or, considering the case of outward FDI, does investing in a country with better innovative capability lead to productivity improvements in the home economy from where FDI originates? If that is the case, the destination of outward FDI ought to be concentrated more toward highly technologically advanced economies.

While most of the previous studies focussed mainly on IPR protection (Chin and Grossman, 1988; Deardorff, 1992; Helpman, 1993), this paper considers the differences in the stages of the IPR process consisting of the innovation process, commercialisation process, and protection process. In each of these processes, it is hypothesised that there will be a differential impact on productivity enhancement through FDI inflows and outflows. Ambiguous effects have been discovered in earlier studies. For instance, Kashcheeva (2013) reported that while positive impacts of IPR on productivity improvement in the host economy are confirmed, providing a stricter IPR environment in the host country does not guarantee productivity enhancement via FDI. In fact, it was pointed out that the level of FDI in the host economy was essential. A general equilibrium analysis has indicated a possibility that a stricter IPR environment might have an adverse effect on output growth.[4] Raising rate of unemployment and the cost of IPR usage are the two factors cited as the major factors for the possibility of such a negative effect.

In this paper, three IPR related indicators are introduced to illustrate the impact of each stage of the IPR processes on the host and home country's productivity growth. First, the number of patents per resident is used to represent the degree of innovative capability of the host country as the first stage of the IPR process. If a country has a greater IPR innovative capability – "IPR producer" measured as an increase in the

[4] For a more detailed discussion, see Helpman (1993) and Fisch and Speyer (1995).

number of innovations, then it is expected to have a positive impact on output growth. Thus an increase in the number of innovations should have a positive effect (or at least will not produce a harmful effect) on economic growth. However, there is also the possibility of a diminishing factor setting in as more innovations are introduced. This could imply that the marginal benefit obtained from innovation activities in terms of output growth may decrease as the earlier innovations appear to achieve a greater leap in value creation.

Second, the degree to which innovations translate into greater production in the economy (and also economic value added) as well as the IPR commercialisation process are represented by the ease of knowledge transfer (or the amount of activities) between universities and the private sector. Better links between the two entities indicate successful communication and a healthy IPR development that is expected to promote productivity growth.

Finally, the IPR protection is the stage of IPR development widely considered in literature as the key element that is essential to improve a nation's competitiveness in the long-run. Basically, it is argued that a stricter protection scheme supports the growth in output. However, the empirical evidence has not shown solid support for this argument.[5] For example, it is argued that for a user of new technology, a tighter IPR protection means that it is more costly to obtain access to advanced and up to date production technology and this makes it more difficult to use existing innovations as a basis for further creative activities.

[5] For instance, see Ferrantino (1993), Braga and Fink (1997), and Charlton and Davis (2007).

The remainder of the paper is organised as follows. Section 2 outlines the methodology used in the paper. Section 3 discusses the data and empirical issues and empirical findings are presented in Section 4. The final section concludes the paper.

2. Methodology

This paper employs a variation of the Alfaro et al. (2009) model that was originally used to examine the role of FDI on growth in financial markets. The model is modified in a way that can capture the effects of the IPR process on total factor productivity (TFP) growth via two main channels. First, the IPR may have a direct relationship with TFP growth, as IPR development on its own is a productivity enhancement activity. Greater innovation achievements, smoother transfer of knowledge (or better links between IPR producers and IPR users), and a tighter IPR protection scheme are expected to improve national output growth. Under various circumstances, IPR development is expected to act as a mechanism for developing economies to pull themselves out of the so-called “middle income trap” by building up more economic value added activities and moving up the global value chain.

For the second channel, the IPR may have an indirect effect on growth through interactions with FDI. This perhaps rests on the fact that a more suitable IPR environment might be able to attract more inward FDI, which may lead to a higher growth rate of output by realising the benefits of economies of scale and more efficient utilisation of production resources. In addition, with a better IPR environment, the types of FDI that is attracted possibly generate higher economic value added and greater positive FDI

spillovers, which will help improving the country's competitiveness and stimulating economic growth.

The growth impact of IPR via outward FDI rests more heavily on resource-seeking and efficiency-seeking FDI. For a home country to benefit, potential gains from specific type of resources such as knowledge, innovation technology and special skills are expected. This opens a door for developing economies to place more emphasis on the role of outward FDI on growth. An outward FDI that focusses on improving efficiency is another channel for growth stimulating activities in the home country. Sound IPR schemes tend to encourage such types of FDI movement. For instance, a better IPR protection environment supports FDI abroad to capture a more advanced production technology. Likewise, it also gives greater confidence for research and development (R&D) cooperation in the private sector so that more efficient production technology can be realised.

In terms of the relationship between inward FDI and growth, it is widely believed that multinational enterprises (MNEs) not only bring new investment to the economy but also generate "positive spillovers" to domestic firms, resulting in productivity growth (see Görg and Greenaway, 2004). In the view of Moran (2007), the positive spillovers may come in various forms. For instance, workers employed by MNEs after having acquired skills and knowledge may leave foreign firms and become available to domestic firms which will raise the productivity level of the domestic firms. Likewise, domestic firms may observe and learn from MNEs about their production techniques, management practices, or quality-control practices. In addition, MNEs may provide advice and direct production assistance to domestic suppliers which may raise quality as well as

productivity of domestically owned firms. Moreover, entry of MNEs may bring in more competition putting pressure on domestic firms to be more efficient and more productive (Görg and Greenaway, 2004).

The relationship between outward FDI and economic growth is less clear. On the one hand, the decision to invest abroad reduces the likelihood of investment at home due to the scarcity of available resources. Hence, outward FDI may substitute domestic investment, which inevitably reduces employment, productivity, and thereby economic growth of the home country (Herzer, 2010; Stevens and Lipsey, 1992). On the other hand, outward FDI may allow firms to enter new markets, to produce intermediate goods in the host countries at lower costs and to acquire new technology, which may encourage technology transfer back to the home country. In turn, these promote economic growth of the home country (Herzer, 2010; Desai et al. 2005)

The model presented in this paper has TFP growth as a dependent variable, and the variables of interest are the IPR related indicators (*Policy*) and their corresponding interaction with FDI (*FDI*Policy*) as regressors. In particular, it is presented in the form:

$$TFPgrowth_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 FDI_{it} + \beta_3 Policy_{it} + \beta_4 FDI_{it} * Policy_{it} + \varepsilon_{it}$$

where *i* represents a country and *t* is a time period. β s are the estimated coefficients; and ε_{it} is the error term.

The $TFPgrowth$ variable corresponds to the growth rate of TFP. *X* is the set of control variables including the share of the non-agricultural sector as a percentage of GDP ($NonAgri$), level of development measured by real GDP per capita ($GDPPC$), size of population (in millions) (POP), domestic credit in the private sector as a

percentage of GDP (*Credit*), inflation rate (*Inflation*), share of government consumption as a percentage of GDP (*GOV*), trade openness measured by the sum of export and import as a percentage of GDP (*Openness*), and local institutional quality in which the rule of law index (*RuleofLaw*) is used as a proxy.

FDI is the FDI stock as a percentage of GDP. Both FDI inflows (*FDIin*) and FDI outflows (*FDIout*) are investigated since they may have different effects on productivity growth. Although economic theory can give several possible channels for positive spillovers from inward FDI as described above, existing empirical studies generally found mixed evidence on the role of FDI in generating productivity growth (through technology spillovers to domestic firms). Further, the positive effects of FDI on productivity growth are found to be conditional on local conditions and policies (such as, the policy environment, human capital, local financial markets, market strictness, etc.).

Görg and Greenaway (2004) concluded that the empirical evidence on spillover effects from inward FDI is mixed at best. Lipsey (2002) came to the conclusion that there is no confirmed correlation between FDI and output growth. Besides, several studies even found negative effects of MNEs on domestic firms. For instance, Konings (2001) found negative FDI spillovers to domestic firms in Bulgaria and Romania. Aitken and Harrison (1999) used panel data on Venezuela firms to measure the effects of foreign ownership to domestically owned firms and found that productivity of domestic firms declined when FDI increased, suggesting a negative spillover effect. Konings (2001) and Aitken and Harrison (1999) argued that there can be a negative effect of inward FDI on the productivity of domestically owned firms, particularly in the short run because the competition as a result of the entry of MNEs could force the domestic firms to reduce

production and move back up their average cost curves. If this demand effect is large enough, net domestic productivity can decline even if there are some positive spillover effects from MNEs to domestic firms.

Likewise, findings from previous empirical studies on how outward FDI affects domestic economy are also not unambiguous. Using data for the US MNEs, Stevens and Lipsey (1992) suggested that outward FDI and domestic investment are substitutes. In contrast, a paper by Desai et al. (2005) found that greater FDI is associated with higher levels of domestic investment. Moreover, Herzer (2010), using cross country regressions for a sample of 50 countries, found that outward FDI is positively associated with growth; whereas, Braconier et al. (2001) found no evidence that outward FDI transmitted international technological spillovers and productivity improvements in Sweden.

To investigate the impact of IPR process on productivity enhancement, a set of IPR related indicators (*Policy*) is introduced, such that the role of each IPR process in stimulating production growth in an economy can be monitored. The three IPR related indicators are: 1) Intellectual property rights (*IPRprotect*) as a proxy of the IPR protection process, 2) The number of patents granted to residents (*PATENT*) as a proxy of the IPR innovation process, and 3) Knowledge transfer (*KTRANSER*) as a proxy of the IPR commercialisation process. All are drawn from the IMD's World Competitiveness Yearbook 2013. The *IPRprotect* and *KTRANSER* indicators are based on the executive opinion survey response to the questions, "Are IPRs adequately enforced?" and "Is knowledge transfer highly developed between companies and universities?". As stated, the existing empirical findings on the relationship between IPR process and productivity growth are not entirely unambiguous. Hence, one of the objectives of the paper is to

explore this relationship for both the direct and indirect channels (through the interaction with inward and outward FDI).

3. Data and Empirical Issues

Since unbalanced panel data from 57 countries during the period of 1995-2012 is used, this paper performed the Im et al. (2003) panel unit roots test. The test results rejected the null hypothesis that all series contain a unit root. In addition, the Hausman (1978) specification test was employed to test whether a fixed effect or random effect model specification is more appropriate. The result from the Hausman test rejected the null hypothesis, in which the estimated coefficients between the two estimators were statistically indifferent, which suggested the use of a fixed effect model estimator. In order to control for potential serial correlation and heteroskedasticity problems, a fixed effect model with a robust covariance matrix is selected as the main estimator. Since estimation results for developed and developing countries could vary substantially, the TFP growth model is estimated for both developed- and developing-country datasets separately for the purpose of comparative analysis.

In summary, this paper estimates the TFP growth model by using a fixed effects regression with a robust covariance matrix estimator employing three datasets: the "all-country", "developing-country", and "developed-country" datasets.[6] The estimation results are reported in Tables 1 to 6. Tables 1 to 3 focus on the effects of FDI inflows; whereas, the effects of FDI outflows are shown in Tables 4 through 6. The estimation results are discussed and presented in the section below.

[6] The list of 57 countries and data sources for all variables is reported in Appendix A.

4. Empirical Findings

For the set of control variables, the baseline estimation results (column 1 in Tables 1 to 6) show that the share of the non-agricultural sector, level of development, domestic credit, inflation, government consumption, and trade openness have some impact on TFP growth. While trade openness appears to have a robust positive impact, the coefficient of inflation is negative and significant, suggesting that a higher inflation rate would result in a lower TFP growth rate. It is useful to note that the coefficients of the share of the non-agricultural sector, level of development, domestic credit, and government consumption emerge significant in some regressions, while they are insignificant in others. The coefficient varies on the basis of the dataset in use and/or the choice of explanatory variables (FDI inflows or outflows) included in the model. Finally, the coefficients of population size and local institutional quality are found to be insignificant.

4.1 Effects of FDI Inflows

Based on the estimation results in Tables 1 to 3, inward FDI turns out to have a negative effect on TFP growth. The finding once again suggests that the benefits obtained by the host country in terms of productivity growth depend on the level of FDI inflows. However, this negative relationship is not robust and significant in all regressions. This non-robust relationship between inward FDI and growth corresponds with the findings from Alfaro et al. (2009) and Lipsey (2002), in which the relationship is ambiguous depending on the influence of other factors, such as the level of human capital (Borensztein et al. 1998) and the development of the domestic financial markets (Alfaro et al. 2009).

When the IPR related indicators are added without the interaction term (columns 2, 4, and 6), the IPR protection and commercialisation indicators appear to have a positive and significant effect on TFP growth according to the all-country dataset, but only the effects of the IPR protection indicator remain significant when using the developed-country dataset. This finding indicates that providing more IPR protection environment for investors can significantly induce growth in developed countries. This is perhaps because better IPR protection creates more suitable conditions for technological transfer and technology development that would enhance growth. Developed economies are considered to have a higher innovative capability, in which investment may be used to finance high technology activities. Hence, the relationship between IPR protection and growth appears stronger in developed countries. On the contrary, none of the IPR related indicators seem to have significant impact on TFP growth in developing countries. As an IPR user, not a main producer, developing countries tend to have less incentive to provide IPR protection. Although improving IPR protection helps increase the value of input used (as it enhances technology transfers), it may also increase the cost of accessing or utilising such updated innovative knowledge.

Next, after the inclusion of the interaction terms of the FDI and IPR related indicators (columns 3, 5, and 7), only the interaction of inward FDI with the number of patent indicators is significant and positive at 10 percent level of significance in the all-country and developed country datasets. This suggests that a developed country with a higher number of patents granted is in a better position to seize the benefits from FDI promoting positive spillovers which, in turn, stimulates productivity growth. However, none of the interaction terms appear significant in developing countries.

4.2 Effects of FDI Outflows

Column 1 in Tables 4 to 6 illustrates that the estimated coefficient of outward FDI is significant and negative. However, after the IPR related indicators (without interaction term) are added, the negative coefficient of outward FDI appears to be non-robustly significant, as shown in column 4 in Table 6. For the coefficient on the IPR related indicators, only the IPR protection indicator (column 2) is shown to have a positive and significant effect on TFP growth in the all-country and developed-country datasets. This finding strengthens the important role of IPR protection environment for enhancing productivity in developed countries.

When considering the interaction of outward FDI with IPR related indicators (columns 3, 5, and 7), these interactions appear to have no significant impact on TFP growth according to the developed-country dataset. Rather, the interaction of outward FDI with the IPR protection and knowledge transfer indicators have a significant positive effect on growth when the dataset of the developing countries is employed. It suggests that better levels of IPR protection and commercialisation between companies and universities benefit developing countries through positive FDI spillover enhancing productivity growth.

A summary of the estimated impact of the IPR processes directly on TFP growth is presented in Table 7. Better IPR protection environment contributes positively to productivity improvement in developed economies. While innovative capability and knowledge transfers are found to have a modest impact on growth, the relationships do not appear to be robustly significant. The effects of all three IPR related indicators

directly affecting growth are rated weak and ambiguous in developing countries. The results suggest that improving the IPR protection environment in a developing country does not guarantee greater productivity growth, as the increasing cost of accessing the available technology and know-how eliminates the positive gains from IPR protection.

The effects of IPR activities through commercialisation and innovative capability are also found to be limited in developing economies. These raise the question about the effectiveness of how innovation can be translated into marketable products and how developing economies should conduct their IPR policies. In addition, IPR innovative capability has not been proven to be beneficial for productivity enhancement, which could be linked to the fact that most developing countries have not been able to generate new technology consistent with their comparative advantages. More convincing evidence is seen for developed economies where IPR protection activities are shown to stimulate growth.

The contribution of IPR processes on growth through inward and outward FDI, summarised and presented in Table 8, appears rather ambiguous. The possibility of productivity enhancement in the host country through inward FDI is quite limited, as the results suggest that better innovative capability can help generating positive spillover effects from inward FDI only in developed countries. As far as outward FDI is concerned, IPR protection and commercialisation (through outward FDI) are proven to improve productivity in the case of developing countries, particularly when the country acts as the investing country.

5. Concluding Remarks

The paper has examined the impact of IPR processes on productivity growth. Better IPR protection environment is found to have the direct and positive impact on productivity growth in developed countries. In addition, the contribution of IPR processes on growth through inward and outward FDI appears to be very limited and is shown to be different in developed and developing economies. Innovative capability has important implications for spillover effects from inward FDI only in the case of developed countries; whereas, IPR protection and commercialisation are shown to boost productivity spillovers from outward FDI in developing countries.

Based on the findings, IPR protection acts as a policy for stimulating growth in developed countries and innovative capability remains a key driver to productivity enhancement in these economies. This is perhaps because inward FDI in developed economies appears to be more of a vertical FDI type.

In contrast, IPR policy implications related to inward FDI for developing countries are less obvious. Inward FDI in developing economies tends to be of the horizontal type where the flows of such FDI rely more on the benefits of economies of scale and getting access to cheap resources. Moreover, there is the possibility that inward FDI might bring in production technology that is inconsistent with the host country's comparative advantage, and it may furthermore have a negative spillover effect on the productivity of domestically owned firms. Rather than building innovative capability in the host economies, dependence on greater inflows of FDI could lead the country to inherit a so called "buying technology" habit or mentality which may hinder future productivity improvements.

Interestingly, it appears that developing countries are empirically shown to benefit from IPR conditions through outward FDI. Instead of passively waiting for inward FDI spillover effects for growth creating economic activities, using IPR schemes to facilitate outward FDI seems to be an encouraging investment policy.

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Tables

Table 1. Regression results, FDI inflows, all countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy= IPRprotect*	(3) *Policy= IPRprotect*	(4) *Policy= Patent*	(5) *Policy= Patent*	(6) *Policy= KTransfer*	(7) *Policy= KTransfer*
NonAgri	-0.1992	-0.1518	-0.1496	-0.2753	-0.2662	-0.1748	-0.1702
	(0.1089)*	(0.1167)	(0.1157)	(0.1987)	(0.1958)	(0.1156)	(0.1164)
ln*GDPPC*	-1.7667	-0.2526	-0.0220	-3.5427	-3.5704	-0.2476	-0.1855
	(1.7127)	(1.5300)	(1.5916)	(2.1836)	(2.1722)	(1.4862)	(1.5594)
ln*POP*	2.5680	3.1066	2.4593	-1.1413	-1.2542	1.6999	1.5405
	(2.3568)	(3.1241)	(3.0766)	(2.3198)	(2.2824)	(3.0943)	(3.1391)
Credit	-0.0266	-0.0238	-0.0233	-0.0256	-0.0263	-0.0256	-0.0255
	(0.0099)***	(0.0084)***	(0.0084)***	(0.0159)	(0.0160)	(0.0083)***	(0.0083)***
Inflation	-0.1180	-0.1013	-0.1069	-0.2239	-0.2229	-0.0998	-0.1017
	(0.0343)***	(0.0633)	(0.0648)	(0.0684)***	(0.0683)***	(0.0639)	(0.0660)
GOV	-0.1687	-0.2635	-0.2705	-0.3521	-0.3577	-0.2463	-0.2479
	(0.0573)***	(0.0851)***	(0.0831)***	(0.0963)***	(0.0959)***	(0.0795)***	(0.0788)***
Openness	0.0647	0.0545	0.0524	0.0724	0.0729	0.0545	0.0537
	(0.0118)***	(0.0112)***	(0.0115)***	(0.0223)***	(0.0222)***	(0.0114)***	(0.0122)***
RuleofLaw	-0.9144	0.0889	-0.0379	-0.2485	-0.2511	0.3349	0.2418
	(1.0978)	(1.0009)	(0.9826)	(1.6248)	(1.6158)	(1.0133)	(1.0790)
FDIin	-0.0163	-0.0158	-0.0550	-0.0236	-0.0265	-0.0160	-0.0250
	(0.0065)*	(0.0058)***	(0.0576)	(0.0081)***	(0.0091)***	(0.0060)*	(0.0500)
Policy		0.4812	0.3202	0.0000	-0.0000	0.3604	0.3097
		(0.2185)*	(0.3108)	(0.0000)	(0.0000)*	(0.1884)*	(0.2675)
*FDIin*Policy*			0.0055		0.0000		0.0015
			(0.0074)		(0.0000)*		(0.0076)
Constant	29.7331	7.5129	8.6251	67.5114	67.3059	14.9034	14.8422
	(13.3336)*	(10.1405)	(9.3756)	(21.9102)***	(21.8595)***	(9.9966)	(9.9287)
R^2	0.20	0.17	0.18	0.19	0.20	0.17	0.17
Observation	671	608	608	481	481	608	608

No. of countries	57	57	57	57	57	57	57

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table 2. Regression results, FDI inflows, developed countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy*= *IPRprotect*	(3) *Policy*= *IPRprotect*	(4) *Policy*= *Patent*	(5) *Policy*= *Patent*	(6) *Policy*= *KTransfer*	(7) *Policy*= *KTransfer*
NonAgri	-0.0759	0.0405	0.0415	-0.6868	-0.6749	-0.0211	-0.0397
	(0.1868)	(0.1827)	(0.1817)	(0.6958)	(0.6912)	(0.1903)	(0.1903)
ln*GDPPC*	-4.6870	-3.4059	-3.4727	-6.1888	-6.6289	-3.1968	-3.7037
	(2.4071)*	(2.5872)	(2.7118)	(4.6818)	(4.6208)	(2.5209)	(2.7959)
ln*POP*	0.1755	-0.0405	0.2545	-4.0377	-4.1562	-1.1333	-0.1594
	(1.2686)	(2.8120)	(3.1733)	(1.9045)*	(1.9285)*	(2.9705)	(3.3040)
Credit	-0.0166	-0.0154	-0.0155	-0.0110	-0.0114	-0.0174	-0.0176
	(0.0091)*	(0.0082)*	(0.0082)*	(0.0101)	(0.0102)	(0.0084)*	(0.0086)*
Inflation	-0.1985	-0.1485	-0.1416	-0.3110	-0.3060	-0.1574	-0.1328
	(0.0592)***	(0.0764)*	(0.0709)*	(0.0565)***	(0.0580)***	(0.0797)*	(0.0772)*
GOV	-0.1396	-0.2798	-0.2788	-0.5123	-0.5248	-0.2423	-0.2490
	(0.1253)	(0.1320)*	(0.1312)*	(0.1623)***	(0.1616)***	(0.1289)*	(0.1327)*
Openness	0.0697	0.0655	0.0661	0.0642	0.0653	0.0650	0.0689
	(0.0145)***	(0.0148)***	(0.0155)***	(0.0290)*	(0.0289)*	(0.0150)***	(0.0171)***
RuleofLaw	-0.3556	-0.1960	-0.1861	0.0015	0.0782	0.2226	0.6834
	(1.7157)	(1.6733)	(1.6670)	(2.4964)	(2.4900)	(1.6811)	(1.6507)
FDIin	-0.0115	-0.0125	-0.0022	-0.0159	-0.0185	-0.0122	0.0236
	(0.0048)*	(0.0045)***	(0.0443)	(0.0056)***	(0.0068)*	(0.0047)*	(0.0357)
Policy		0.6559	0.7094	0.0000	-0.0000	0.2881	0.5031
		(0.2336)***	(0.3264)*	(0.0000)	(0.0000)	(0.1858)	(0.2776)*
*FDIin*Policy*			-0.0014		0.0000		-0.0059
			(0.0061)		(0.0000)*		(0.0060)
Constant	53.5260	27.8707	27.2430	145.2400	148.7843	36.5843	38.8450
	(26.7213)*	(26.9476)	(26.2563)	(66.5196)*	(65.7850)*	(27.1287)	(28.9745)

R^2	0.17	0.18	0.18	0.19	0.19	0.17	0.17
Observation	437	410	410	312	312	410	410
No. of countries	-0.0759	0.0405	0.0415	-0.6868	-0.6749	-0.0211	-0.0397

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table 3. Regression results, FDI inflows, developing countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy= IPRprotect*	(3) *Policy= IPRprotect*	(4) *Policy= Patent*	(5) *Policy= Patent*	(6) *Policy= KTransfer*	(7) *Policy= KTransfer*
NonAgri	-0.0760	-0.1688	-0.1700	-0.0244	-0.0146	-0.1644	-0.1069
	(0.0930)	(0.1052)	(0.1073)	(0.1412)	(0.1392)	(0.1018)	(0.1100)
ln*GDPPC*	-0.0039	2.2555	2.0875	-1.4239	-2.2419	2.2002	1.4959
	(2.1196)	(2.7594)	(2.9326)	(4.4319)	(3.7980)	(3.0844)	(3.1685)
ln*POP*	3.2605	3.7750	5.6523	7.9370	9.4222	4.3526	6.6509
	(5.4442)	(6.4311)	(6.2753)	(8.1581)	(7.9548)	(7.4388)	(6.7837)
Credit	-0.1051	-0.0853	-0.0861	-0.1024	-0.0992	-0.0896	-0.0856
	(0.0274)***	(0.0255)***	(0.0235)***	(0.0339)***	(0.0319)***	(0.0244)***	(0.0242)***
Inflation	-0.1052	-0.1067	-0.1055	-0.1968	-0.2001	-0.1075	-0.1149
	(0.0358)***	(0.0638)	(0.0593)*	(0.0929)*	(0.0986)*	(0.0654)	(0.0630)*
GOV	-0.2847	-0.3327	-0.3105	-0.4260	-0.4257	-0.3211	-0.3428
	(0.0595)***	(0.1041)***	(0.0906)***	(0.0779)***	(0.0803)***	(0.0949)***	(0.0942)***
Openness	0.0749	0.0595	0.0558	0.1095	0.1074	0.0635	0.0677
	(0.0255)***	(0.0257)*	(0.0261)*	(0.0306)***	(0.0283)***	(0.0249)*	(0.0244)*
RuleofLaw	1.2843	1.9703	1.8139	0.9589	0.9838	2.4540	2.2783
	(1.4146)	(1.2517)	(1.1491)	(2.0970)	(2.0199)	(1.0145)*	(0.9332)*
FDIin	-0.0515	-0.0962	-0.2462	-0.0648	-0.0574	-0.0883	-0.2149
	(0.0225)*	(0.0354)*	(0.1110)*	(0.0264)*	(0.0217)*	(0.0323)*	(0.1097)*
Policy		0.4110	-0.3354	-0.0000	0.0001	-0.0703	-0.9968
		(0.4324)	(0.6475)	(0.0000)	(0.0002)	(0.4820)	(0.8291)
*FDIin*Policy*			0.0290		-0.0000		0.0304
			(0.0197)		(0.0000)		(0.0254)
Constant	2.3878	-10.1737	-12.9808	-9.2555	-9.5344	-10.7721	-16.3875

	(14.9290)	(13.0249)	(13.3738)	(25.1099)	(24.8619)	(18.4963)	(15.1561)
R^2	0.36	0.31	0.33	0.32	0.32	0.30	0.32
Observation	234	198	198	169	169	198	198
No. of countries	20	20	20	20	20	20	20

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table 4. Regression results, FDI outflows, all countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy= IPRprotect*	(3) *Policy= IPRprotect*	(4) *Policy= Patent*	(5) *Policy= Patent*	(6) *Policy= KTransfer*	(7) *Policy= KTransfer*
NonAgri	-0.2143	-0.1598	-0.1583	-0.2899	-0.2899	-0.1830	-0.1813
	(0.1178)*	(0.1213)	(0.1217)	(0.2122)	(0.2126)	(0.1206)	(0.1215)
ln*GDPPC*	-1.8953	-0.2797	-0.2406	-4.1593	-4.0771	-0.3132	-0.2954
	(1.7923)	(1.6418)	(1.6729)	(2.3112)*	(2.3226)*	(1.5891)	(1.6132)
ln*POP*	2.4255	2.8743	2.7272	-1.1605	-1.1958	1.5428	1.5248
	(2.3127)	(3.1819)	(3.2626)	(2.4725)	(2.4712)	(3.1660)	(3.1807)
Credit	-0.0255	-0.0219	-0.0219	-0.0213	-0.0214	-0.0236	-0.0236
	(0.0101)*	(0.0084)*	(0.0084)*	(0.0166)	(0.0166)	(0.0084)***	(0.0083)***
Inflation	-0.1129	-0.0969	-0.0977	-0.2188	-0.2188	-0.0957	-0.0963
	(0.0332)***	(0.0613)	(0.0621)	(0.0680)***	(0.0684)***	(0.0625)	(0.0631)
GOV	-0.1529	-0.2625	-0.2639	-0.3542	-0.3578	-0.2450	-0.2454
	(0.0553)***	(0.0859)***	(0.0852)***	(0.1038)***	(0.1046)***	(0.0803)***	(0.0802)***
Openness	0.0566	0.0488	0.0482	0.0710	0.0707	0.0495	0.0493
	(0.0118)***	(0.0122)***	(0.0125)***	(0.0215)***	(0.0216)***	(0.0122)***	(0.0125)***
RuleofLaw	-0.9717	0.2060	0.1962	0.0218	0.0158	0.4617	0.4354
	(1.1201)	(0.9762)	(0.9730)	(1.6774)	(1.6768)	(0.9973)	(1.0092)
FDIout	-0.0089	-0.0109	-0.0219	-0.0194	-0.0201	-0.0118	-0.0158
	(0.0051)*	(0.0051)*	(0.0422)	(0.0060)***	(0.0060)***	(0.0051)*	(0.0386)
Policy		0.4977	0.4672	0.0000	-0.0000	0.3666	0.3481
		(0.2277)*	(0.2609)*	(0.0000)	(0.0000)	(0.1886)*	(0.2339)
*FDIout*Policy*			0.0015		0.0000		0.0007
			(0.0057)		(0.0000)		(0.0060)

Constant	32.8276	9.0454	9.2594	73.8657	73.2997	16.5756	16.4564
	(14.1110)*	(10.4467)	(10.2513)	(23.3737)***	(23.4387)***	(10.1536)	(10.2563)
R^2	0.19	0.17	0.17	0.18	0.18	0.16	0.16
Observation	663	604	604	474	474	604	604
No. of countries	57	57	57	57	57	57	57

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table 5. Regression results, FDI outflows, developed countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy= IPRprotect*	(3) *Policy= IPRprotect*	(4) *Policy= Patent*	(5) *Policy= Patent*	(6) *Policy= KTransfer*	(7) *Policy= KTransfer*
NonAgri	-0.0866	0.0335	0.0310	-0.7065	-0.6847	-0.0278	-0.0324
	(0.1894)	(0.1839)	(0.1855)	(0.7064)	(0.7108)	(0.1919)	(0.1943)
ln*GDPPC*	-5.4560	-4.2113	-4.2368	-7.3172	-7.5928	-4.0118	-4.0680
	(2.4767)*	(2.6208)	(2.6867)	(4.7055)	(4.7519)	(2.5567)	(2.6555)
ln*POP*	0.3383	0.5803	0.7395	-3.8566	-3.8922	-0.4515	-0.3877
	(1.3444)	(2.9371)	(3.1570)	(1.9164)*	(1.9162)*	(3.0147)	(3.0923)
Credit	-0.0129	-0.0114	-0.0114	-0.0052	-0.0051	-0.0134	-0.0135
	(0.0091)	(0.0082)	(0.0083)	(0.0096)	(0.0096)	(0.0083)	(0.0084)
Inflation	-0.2019	-0.1571	-0.1536	-0.3131	-0.3102	-0.1663	-0.1627
	(0.0619)***	(0.0815)*	(0.0762)*	(0.0530)***	(0.0543)***	(0.0848)*	(0.0806)*
GOV	-0.1448	-0.2909	-0.2903	-0.5261	-0.5378	-0.2553	-0.2565
	(0.1255)	(0.1330)*	(0.1327)*	(0.1611)***	(0.1627)***	(0.1301)*	(0.1314)*
Openness	0.0737	0.0708	0.0713	0.0714	0.0717	0.0708	0.0715
	(0.0141)***	(0.0148)***	(0.0152)***	(0.0308)*	(0.0309)*	(0.0151)***	(0.0157)***
RuleofLaw	-0.2415	0.1210	0.1063	0.1987	0.2710	0.5384	0.5992
	(1.7267)	(1.6429)	(1.6638)	(2.5061)	(2.5093)	(1.6470)	(1.6262)
FDIout	-0.0132	-0.0152	-0.0071	-0.0190	-0.0202	-0.0155	-0.0079
	(0.0054)*	(0.0055)***	(0.0450)	(0.0068)***	(0.0072)***	(0.0056)***	(0.0409)
Policy		0.6313	0.6678	0.0000	-0.0000	0.2945	0.3447
		(0.2315)***	(0.3054)*	(0.0000)	(0.0000)	(0.1854)	(0.2821)
*FDIout*Policy*			-0.0011		0.0000		-0.0013

			(0.0061)		(0.0000)		(0.0064)
Constant	61.1085	34.2222	34.0227	156.7924	157.6776	42.6449	43.1050
	(26.8414)*	(26.1870)	(26.0139)	(65.8823)*	(65.5544)*	(26.3013)	(27.1765)
R^2	0.17	0.18	0.18	0.19	0.20	0.17	0.17
Observation	437	410	410	312	312	410	410
No. of countries	37	37	37	37	37	37	37

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table 6. Regression results, FDI outflows, developing countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy= IPRprotect*	(3) *Policy= IPRprotect*	(4) *Policy= Patent*	(5) *Policy= Patent*	(6) *Policy= KTransfer*	(7) *Policy= KTransfer*
NonAgri	-0.1322	-0.1936	-0.1829	-0.0522	-0.0511	-0.1865	-0.1062
	(0.1000)	(0.1210)	(0.1240)	(0.1425)	(0.1415)	(0.1153)	(0.1189)
Ln*GDPPC*	1.5370	4.3506	4.1249	-1.2116	-1.4902	4.0458	3.0751
	(2.2061)	(2.8308)	(2.6190)	(4.7124)	(4.7913)	(3.1647)	(3.1495)
Ln*POP*	3.9947	1.8358	2.9967	8.8732	8.7661	2.1751	3.3603
	(5.0110)	(6.5344)	(6.2726)	(9.9467)	(10.2555)	(7.6117)	(7.3593)
Credit	-0.1178	-0.1098	-0.1049	-0.1223	-0.1166	-0.1119	-0.0965
	(0.0271)***	(0.0291)***	(0.0261)***	(0.0400)***	(0.0391)***	(0.0295)***	(0.0286)***
Inflation	-0.0838	-0.0855	-0.0854	-0.1671	-0.1578	-0.0881	-0.0945
	(0.0282)***	(0.0569)	(0.0545)	(0.0814)*	(0.0781)*	(0.0589)	(0.0593)
GOV	-0.2034	-0.2749	-0.2779	-0.3696	-0.3858	-0.2656	-0.2898
	(0.0488)***	(0.0949)***	(0.0835)***	(0.0966)***	(0.0874)***	(0.0900)***	(0.0868)***
Openness	0.0582	0.0386	0.0458	0.0969	0.0933	0.0447	0.0635
	(0.0244)*	(0.0254)	(0.0239)*	(0.0278)***	(0.0263)***	(0.0249)*	(0.0268)*
RuleofLaw	1.4915	2.2191	1.9802	1.2262	1.1207	2.6797	2.2305
	(1.2594)	(1.0315)*	(1.1700)	(1.8000)	(1.7049)	(1.0000)*	(1.1366)*
FDIout	-0.1351	-0.1434	-0.7360	-0.0711	-0.0587	-0.1268	-0.6131
	(0.0525)*	(0.0326)***	(0.2804)*	(0.0612)	(0.0662)	(0.0386)***	(0.2449)*
Policy		0.4970	0.0900	-0.0000	0.0001	-0.0089	-0.5649
		(0.4671)	(0.5070)	(0.0000)	(0.0002)	(0.5196)	(0.5928)

*FDIout*Policy*			0.0943		-0.0000		0.0862
			(0.0413)*		(0.0000)		(0.0408)*
Constant	-8.1150	-17.0188	-19.3378	-12.8559	-10.2673	-14.7729	-18.2611
	(17.2276)	(14.8282)	(15.6639)	(31.7052)	(31.4872)	(20.0683)	(19.1155)
R^2	0.36	0.30	0.31	0.29	0.29	0.29	0.31
Observation	226	194	194	162	162	194	194
No. of countries	20	20	20	20	20	20	20

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table 7. A summary of the direct impact of IPR processes on TFP growth

Stage of Economic Development	The impact of IPR Processes		
	Innovation	Commercialisation	Protection
Developed Economy	X	X	(+)
Developing Economy	X	X	X

Note: X = It indicates a non-robust or insignificant impact of IPR process on TFP growth; (+) = It indicates a robust positive impact of IPR process on TFP growth. (-) = It indicates a robust negative impact of IPR process on TFP growth.

Table 8. A summary of the indirect impact of IPR processes on TFP growth (through FDI)

Stage of Economic Development	The impact of IPR processes through inward FDI		
	Innovation	Commercialisation	Protection
Developed Economy	(+)	X	X
Developing Economy	X	X	X

Stage of Economic Development	The impact of IPR processes through outward FDI		
	Innovation	Commercialisation	Protection
Developed Economy	X	X	X
Developing Economy	X	(+)	(+)

Note: X = It indicates a non-robust or insignificant impact of IPR process on TFP growth; (+) = It indicates a robust positive impact of IPR process on TFP growth. (-) = It indicates a robust negative impact of IPR process on TFP growth.

APPENDIX A: DATA APPENDIX

Country Lists

Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Korea, Lithuania, Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Norway, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, United Kingdom, USA, Venezuela.

Variable and Source

Variable	Definition and Source
TFPgrowth	Growth rate of TFP at constant national prices (2005=1). (Source: Penn World Table (PWT) 8.)
NonAgri	Share of non-agriculture sector as a percentage of GDP (Source: IMD's *World Competitiveness Yearbook*, 2013.)
GDPPC	Real GDP per capita (constant 2005 US$). (Source: World Bank's World Development Indicators (WDI).)
POP	Population (in millions). (Source: Penn World Table (PWT) 8.)
Credit	Domestic credit to private sector as a percentage of GDP. (Source: World Bank's World Development Indicators (WDI).)
Inflation	Inflation rate, consumer prices (annual percent). (Source: World Bank's World Development Indicators (WDI).)
GOV	Share of government consumption as a percentage of GDP. (Source: Penn World Table (PWT) 8.)
Openness	Trade openness, measured by the sum of export and import as a percentage of GDP. (Source: World Bank's World Development Indicators (WDI).)
RuleofLaw	Rule of law indicator. (Source: Worldwide Governance Indicators (WGI).)
FDIin	FDI stock (inflow) as a percentage of GDP. (Source: UNCTAD.)

FDIout	FDI stock (outflow) as a percentage of GDP. (Source: UNCTAD.)
IPRprotect	Intellectual property rights indicator. (Source: IMD's *World Competitiveness Yearbook*, 2013.)
PATENT	Number of patents granted to residents indicators. (Source: IMD's *World Competitiveness Yearbook*, 2013.)
KTRANSER	Knowledge transfer indicator. (Source: IMD's *World Competitiveness Yearbook*, 2013.)

รายงานการวิเคราะห์ตามข้อคิดเห็นและข้อเสนอแนะ

จากการนำเสนอผลงานวิจัยฉบับสมบูรณ์ที่ได้รับการตีพิมพ์ในวารสารนานาชาติตามที่ปรากฏในเอกสารข้างต้นแล้ว ผู้วิจัยได้รับข้อคิดเห็น และข้อเสนอแนะที่เป็นประโยชน์ จึงได้รับข้อเสนอแนะเหล่านั้นมาประกอบการวิเคราะห์เพิ่มเติมเพื่อให้รายงานการวิจัยมีความครบถ้วนสมบูรณ์มากขึ้น คือ ข้อคิดเห็นในประเด็นปัญหาเรื่อง Endogeneity ของตัวแปร ซึ่งอาจจะมีผลกระทบต่อผลการวิเคราะห์ของแบบจำลอง โดยผู้ให้ข้อคิดเห็นเสนอแนะส่าอาจจะลองพิจารณาเพิ่มเติมตัวแปรล่าช้า (Lag variables) เข้าไปในแบบจำลอง หรืออาจพิจารณาประมาณการแบบจำลองด้วยวิธี Two-Stage Least Squares (2SLS) แทน ซึ่งผู้วิจัยคิดว่าแบบจำลองอาจจะมีผลกระทบจากปัญหา endogeneity บ้าง เพราะความสัมพันธ์ระหว่างผลิตภาพการผลิต (TFP) การลงทุนโดยตรงจากต่างประเทศ (Foreign Direct Investment: FDI) กับประเด็นด้านทรัพย์สินทางปัญญาใน 3 มิติ (การสร้างนวัตกรรม (Innovation) การแปลงทรัพย์สินทางปัญญาไปสู่กิจกรรมเชิงพาณิชย์ (Commercialization) และการให้การคุ้มครองทรัพย์สินทางปัญญา (Protection) นั้นอาจจะมีลักษณะมีความเป็นเหตุเป็นผลซึ่งกันและกัน (Feedback effects) เช่น การมีระบบการให้การคุ้มครองทรัพย์สินทางปัญญาที่ดีและเข้มงวด ย่อมมีผลสนับสนุนต่อการตัดสินใจของนักลงทุนจากต่างประเทศให้เข้ามาลงทุนในประเทศผู้รับการลงทุน และทำให้เกิดการพัฒนาผลิตภาพการผลิต ในขณะเดียวกัน ประเทศผู้รับการลงทุนจากต่างประเทศมากขึ้น เมื่อมีระดับผลิตภาพการผลิตที่สูงขึ้น ย่อมมีแรงกดดันให้ต้องปรับปรุงระบบการให้การคุ้มครองทรัพย์สินทางปัญญาให้มีประสิทธิภาพดียิ่งขึ้น สำหรับมุมมองของผู้วิจัยที่มองจากสถานะของการเป็นประเทศผู้รับการลงทุนที่เป็นประเทศกำลังพัฒนา (อยู่ในฐานะของการเป็นผู้ใช้นวัตกรรม หรือผู้พัฒนาต่อยอดนวัตกรรมมากกว่าการเป็นประเทศผู้พัฒนานวัตกรรม) ซึ่งเป็นส่วนใหญ่ของฐานข้อมูลที่นำมาใช้ในการวิเคราะห์ในงานศึกษาชิ้นนี้ จึงคิดว่าผลกระทบของปัญหา Endogeneity ไม่น่าจะมีผลต่อการประมาณการและผลการวิเคราะห์จากการศึกษา (ที่มีความสอดคล้องกับงานศึกษาหลายชิ้นในอดีตด้วย)

อย่างไรก็ตาม ข้อเสนอแนะในส่วนของการพิจารณาปรับใช้ตัวแปรล่าช้าเข้าไปในแบบจำลองเพื่อให้เกิดความแน่ใจกับปัญหา endogeneity และยังจะเป็นการปรับปรุงแบบจำลองให้มีความเป็นพลวัตร (Dynamic) มากขึ้น เป็นข้อเสนอแนะที่น่าสนใจ แม้ว่าจะไม่ได้ครอบคลุมอยู่ในกรอบการศึกษาสำหรับการวิจัยที่ได้กำหนดไว้ เพราะความเชื่อมโยงระหว่างการพัฒนาผลิตภาพการผลิต (TFP growth) กับกิจกรรมทางด้านทรัพย์สินทางปัญญาที่โดยปกติมักจะมีผลต่อเนื่องเป็นระยะเวลาหนึ่ง เช่น การพัฒนาระบบการให้การคุ้มครองทรัพย์สินทางปัญญาให้ดีขึ้นอาจไม่ได้ส่งผลให้เกิดการเพิ่มขึ้นของผลิตภาพการใช้ปัจจัยการผลิต และการลงทุนโดยตรงจากต่างประเทศในช่วงเวลาเดียวกันในทันที แต่อาจใช้เวลาช่วงหนึ่งจึงจะเห็นการยกระดับผลิตภาพการผลิตของประเทศ และการเพิ่มขึ้นของการลงทุนโดยตรงจากต่างประเทศ และเมื่อมีการใช้ปัจจัยการผลิตอย่างมีประสิทธิภาพมากขึ้น มีการลงทุนเพิ่มมากขึ้นก็อาจจะเป็นปัจจัยสำคัญผลักดันให้เกิดการพัฒนานวัตกรรมใหม่ๆ มากขึ้นจากการรับถ่ายทอด และประยุกต์ใช้เทคโนโลยีการผลิตที่ทันสมัยมากขึ้น ผู้วิจัยจึงได้ปรับปรุงแบบจำลองโดยใช้ตัวแปร Lags เข้าไปในแบบจำลองและได้ผลการประมาณการตามที่ปรากฏในตาราง A1 - A8 ต่อไปนี้

Table A1. Regression results, FDI inflows, all countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy= IPRprotect*	(3) *Policy= IPRprotect*	(4) *Policy= Patent*	(5) *Policy= Patent*	(6) *Policy= KTransfer*	(7) *Policy= KTransfer*
NonAgri	-0.2028	-0.1625	-0.1644	-0.2142	-0.1945	-0.1621	-0.1917
	(0.1127)*	(0.1128)	(0.1132)	(0.1949)	(0.1899)	(0.1134)	(0.1189)
ln*GDPPC*	-1.7763	-1.1633	-1.3852	-3.1748	-3.3250	-1.1710	-1.7210
	(1.6843)	(1.4475)	(1.4720)	(2.2216)	(2.2233)	(1.4486)	(1.5257)
ln*POP*	2.3744	6.8596	7.5427	1.6236	1.4039	6.1014	7.3226
	(2.2426)	(3.7098)*	(3.8279)*	(2.8125)	(2.8184)	(3.8820)	(3.8444)*
Credit	-0.0268	-0.0246	-0.0251	-0.0274	-0.0285	-0.0254	-0.0278
	(0.0097)***	(0.0076)***	(0.0077)***	(0.0184)	(0.0182)	(0.0079)***	(0.0079)***
Inflation	-0.1158	-0.1062	-0.1012	-0.2331	-0.2383	-0.1080	-0.0958
	(0.0337)***	(0.0700)	(0.0721)	(0.0653)***	(0.0645)***	(0.0696)	(0.0714)
GOV	-0.1657	-0.2644	-0.2569	-0.4829	-0.4970	-0.2595	-0.2413
	(0.0556)***	(0.0875)***	(0.0886)***	(0.1275)***	(0.1279)***	(0.0859)***	(0.0904)***
Openness	0.0586	0.0528	0.0531	0.0781	0.0788	0.0526	0.0559
	(0.0124)***	(0.0122)***	(0.0124)***	(0.0260)***	(0.0254)***	(0.0124)***	(0.0142)***
RuleofLaw	-1.1555	0.4814	0.5486	1.2177	1.2387	0.6550	1.2361
	(1.1155)	(0.9399)	(0.9564)	(1.7417)	(1.7425)	(0.9522)	(1.0098)
$FDIin_{(t-1)}$	-0.0094	-0.0109	0.0193	-0.0133	-0.0190	-0.0105	0.0553
	(0.0061)	(0.0058)*	(0.0262)	(0.0077)*	(0.0069)***	(0.0057)*	(0.0251)*
$Policy_{(t-1)}$		0.3000	0.4240	-0.0000	-0.0000	0.1098	0.4763
		(0.2592)	(0.3374)	(0.0000)	(0.0000)***	(0.2236)	(0.2968)
$FDIin^{*}Policy_{(t-1)}$			-0.0043		0.0000		-0.0109
			(0.0039)		(0.0000)*		(0.0043)*
Constant	31.1044	6.3125	5.4584	50.2707	50.6297	9.8831	11.0138
	(13.1134)*	(8.3232)	(9.0025)	(22.7086)*	(22.6289)*	(9.4752)	(11.0877)
R^2	0.19	0.17	0.18	0.19	0.20	0.17	0.18
Observation	670	598	598	427	427	598	598
No. of countries	57	57	57	57	57	57	57

Table A2. Regression results, FDI inflows, developed countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy*= *IPRprotect*	(3) *Policy*= *IPRprotect*	(4) *Policy*= *Patent*	(5) *Policy*= *Patent*	(6) *Policy*= *KTransfer*	(7) *Policy*= *KTransfer*
NonAgri	-0.0785	-0.0005	0.0005	-0.6206	-0.6256	0.0317	-0.0129
	(0.1862)	(0.1792)	(0.1769)	(0.7105)	(0.7052)	(0.1826)	(0.1795)
ln*GDPPC*	-4.6777	-4.8502	-5.1406	-6.3639	-7.7821	-4.8975	-5.9605
	(2.1884)*	(2.2602)*	(2.2888)*	(4.1663)	(4.2964)*	(2.3011)*	(2.4038)*
ln*POP*	0.1604	6.5104	8.2918	-0.9313	-1.2907	6.2089	8.8125
	(1.2544)	(3.9743)	(4.4196)*	(3.2236)	(3.2343)	(4.0649)	(3.9829)*
Credit	-0.0162	-0.0172	-0.0184	-0.0129	-0.0132	-0.0175	-0.0202
	(0.0086)*	(0.0068)*	(0.0074)*	(0.0117)	(0.0113)	(0.0073)*	(0.0077)*
Inflation	-0.1879	-0.2046	-0.1800	-0.2534	-0.2580	-0.2237	-0.1864
	(0.0583)***	(0.0788)*	(0.0793)*	(0.0675)***	(0.0658)***	(0.0749)***	(0.0726)*
GOV	-0.1468	-0.2555	-0.2397	-0.6637	-0.7019	-0.2412	-0.2287
	(0.1236)	(0.1227)*	(0.1202)*	(0.1932)***	(0.1977)***	(0.1240)*	(0.1263)*
Openness	0.0677	0.0680	0.0682	0.0653	0.0678	0.0691	0.0750
	(0.0153)***	(0.0154)***	(0.0159)***	(0.0339)*	(0.0338)*	(0.0159)***	(0.0185)***
RuleofLaw	-0.5419	0.5742	0.5701	3.9321	4.2165	0.8524	1.6421
	(1.7353)	(1.6678)	(1.6827)	(2.5111)	(2.4902)*	(1.6780)	(1.5689)
$FDIin_{(t-1)}$	-0.0088	-0.0126	0.0294	-0.0089	-0.0144	-0.0110	0.0665
	(0.0062)	(0.0060)*	(0.0208)	(0.0075)	(0.0065)*	(0.0060)*	(0.0243)***
$Policy_{(t-1)}$		0.6017	0.8342	-0.0000	-0.0000	-0.1492	0.3000
		(0.3043)*	(0.3740)*	(0.0000)	(0.0000)*	(0.2954)	(0.3355)
$FDIin^{*}Policy_{(t-1)}$			-0.0060		0.0000		-0.0128
			(0.0031)*		(0.0000)*		(0.0040)***
Constant	54.0593	28.9950	25.5116	130.4870	146.1236	31.1990	35.3302
	(24.6359)*	(21.0763)	(23.1580)	(65.3160)*	(65.8690)*	(21.7983)	(23.9393)
R^2	0.17	0.20	0.21	0.19	0.20	0.19	0.21
Observation	436	406	406	277	277	406	406
No. of countries	37	37	37	37	37	37	37

Table A3. Regression results, FDI inflows, developing countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy*= *IPRprotect*	(3) *Policy*= *IPRprotect*	(4) *Policy*= *Patent*	(5) *Policy*= *Patent*	(6) *Policy*= *KTransfer*	(7) *Policy*= *KTransfer*
NonAgri	-0.0998	-0.0512	-0.0452	0.0525	0.0076	-0.0691	-0.0676
	(0.0973)	(0.1534)	(0.1519)	(0.1697)	(0.1694)	(0.1423)	(0.1454)
ln*GDPPC*	0.6432	3.5040	3.4249	0.9431	2.3678	3.4383	3.4235
	(1.8685)	(2.4788)	(2.5266)	(5.3427)	(5.3456)	(2.2710)	(2.3545)
ln*POP*	0.1003	-8.8072	-8.2800	0.8385	-2.3098	-9.3288	-9.2742
	(5.0466)	(7.9525)	(7.7188)	(11.4278)	(10.2502)	(8.2097)	(8.4785)
Credit	-0.1296	-0.1325	-0.1336	-0.1580	-0.1498	-0.1306	-0.1305
	(0.0296)***	(0.0357)***	(0.0353)***	(0.0457)***	(0.0458)***	(0.0359)***	(0.0364)***
Inflation	-0.0817	-0.0899	-0.0914	-0.2325	-0.2115	-0.0884	-0.0886
	(0.0304)*	(0.0607)	(0.0615)	(0.0807)***	(0.0782)*	(0.0616)	(0.0625)
GOV	-0.2021	-0.2896	-0.2825	-0.4582	-0.4680	-0.2892	-0.2897
	(0.0471)***	(0.1200)*	(0.1168)*	(0.1693)*	(0.1662)*	(0.1207)*	(0.1215)*
Openness	0.0554	0.0252	0.0252	0.1121	0.1073	0.0243	0.0244
	(0.0269)*	(0.0330)	(0.0330)	(0.0290)***	(0.0286)***	(0.0328)	(0.0326)
RuleofLaw	1.2702	2.8402	2.8079	-0.3191	-0.2951	2.6290	2.6249
	(1.4754)	(1.2963)*	(1.2728)*	(2.6161)	(2.7475)	(1.3188)*	(1.3589)*
$FDIin_{(t-1)}$	0.0188	0.0781	0.0229	0.0347	0.0134	0.0722	0.0690
	(0.0138)	(0.0281)*	(0.0993)	(0.0173)*	(0.0223)	(0.0282)*	(0.0729)
$Policy_{(t-1)}$		-0.2662	-0.4968	-0.0000	-0.0003	0.2483	0.2255
		(0.3881)	(0.6247)	(0.0000)	(0.0002)	(0.3604)	(0.7210)
$FDIin^{*}Policy_{(t-1)}$			0.0101		0.0000		0.0008
			(0.0151)		(0.0000)*		(0.0143)
Constant	11.2466	25.3933	24.4204	-7.1456	-1.7077	27.6200	27.4667
	(16.4545)	(19.8499)	(19.4087)	(40.7043)	(39.8919)	(20.0047)	(20.4819)
R^2	0.35	0.30	0.30	0.32	0.33	0.30	0.30
Observation	234	192	192	150	150	192	192
No. of countries	20	20	20	20	20	20	20

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table A4. Regression results, FDI outflows, all countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy= IPRprotect*	(3) *Policy= IPRprotect*	(4) *Policy= Patent*	(5) *Policy= Patent*	(6) *Policy= KTransfer*	(7) *Policy= KTransfer*
NonAgri	-0.2233	-0.1891	-0.1928	-0.2372	-0.2321	-0.1876	-0.2026
	(0.1198)*	(0.1167)	(0.1166)	(0.2108)	(0.2121)	(0.1173)	(0.1188)*
ln*GDPPC*	-1.7396	-1.1726	-1.2421	-3.2487	-3.0547	-1.2093	-1.3306
	(1.7785)	(1.6064)	(1.6107)	(2.4735)	(2.4489)	(1.6012)	(1.6210)
ln*POP*	2.3925	7.4680	7.8704	2.1906	2.0288	6.6456	6.8691
	(2.3142)	(3.7524)*	(3.7860)*	(2.6473)	(2.6467)	(3.9252)*	(3.8281)*
Credit	-0.0259	-0.0227	-0.0228	-0.0255	-0.0253	-0.0237	-0.0248
	(0.0099)*	(0.0076)***	(0.0076)***	(0.0184)	(0.0181)	(0.0078)***	(0.0078)***
Inflation	-0.1121	-0.1019	-0.0999	-0.2333	-0.2383	-0.1040	-0.0998
	(0.0332)***	(0.0690)	(0.0698)	(0.0644)***	(0.0645)***	(0.0690)	(0.0695)
GOV	-0.1512	-0.2582	-0.2536	-0.4705	-0.4861	-0.2529	-0.2489
	(0.0549)***	(0.0879)***	(0.0881)***	(0.1336)***	(0.1370)***	(0.0868)***	(0.0876)***
Openness	0.0558	0.0533	0.0538	0.0801	0.0794	0.0536	0.0555
	(0.0123)***	(0.0123)***	(0.0126)***	(0.0248)***	(0.0247)***	(0.0126)***	(0.0135)***
RuleofLaw	-0.9417	0.8153	0.7949	1.6221	1.5472	1.0119	1.1911
	(1.1300)	(0.9315)	(0.9349)	(1.7183)	(1.7235)	(0.9454)	(0.9567)
$FDIout_{(t-1)}$	-0.0077	-0.0123	0.0099	-0.0159	-0.0183	-0.0125	0.0232
	(0.0057)	(0.0054)*	(0.0233)	(0.0072)*	(0.0068)***	(0.0053)*	(0.0210)
$Policy_{(t-1)}$		0.3389	0.3992	-0.0000	-0.0000	0.1370	0.2959
		(0.2538)	(0.2824)	(0.0000)	(0.0000)*	(0.2264)	(0.2680)
$FDIout^{*}Policy_{(t-1)}$			-0.0032		0.0000		-0.0059
			(0.0035)		(0.0000)*		(0.0037)
Constant	32.3142	6.2488	5.5631	50.5228	49.0738	10.2563	10.9934
	(13.7149)*	(8.9864)	(9.1483)	(22.9711)*	(22.7239)*	(9.9500)	(10.2483)
R^2	0.19	0.18	0.18	0.19	0.19	0.17	0.18
Observation	660	593	593	420	420	593	593
No. of countries	57	57	57	57	57	57	57

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table A5. Regression results, FDI outflows, developed countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy= IPRprotect*	(3) *Policy= IPRprotect*	(4) *Policy= Patent*	(5) *Policy= Patent*	(6) *Policy= KTransfer*	(7) *Policy= KTransfer*
NonAgri	-0.0807	0.0067	-0.0031	-0.5865	-0.5313	0.0364	0.0262
	(0.1901)	(0.1828)	(0.1854)	(0.7363)	(0.7462)	(0.1866)	(0.1905)
ln*GDPPC*	-5.2986	-5.7585	-5.7612	-6.8977	-7.6612	-5.7137	-5.7594
	(2.4119)*	(2.3485)*	(2.3503)*	(4.5329)	(4.5654)	(2.3724)*	(2.4146)*
ln*POP*	0.3732	7.6669	8.3742	-0.2544	-0.4039	7.4818	7.7325
	(1.3476)	(3.7684)*	(4.0672)*	(2.9278)	(2.8557)	(3.8709)*	(3.9206)*
Credit	-0.0138	-0.0143	-0.0144	-0.0110	-0.0103	-0.0148	-0.0156
	(0.0086)	(0.0064)*	(0.0066)*	(0.0110)	(0.0103)	(0.0068)*	(0.0069)*
Inflation	-0.1898	-0.2109	-0.1990	-0.2479	-0.2525	-0.2276	-0.2183
	(0.0605)***	(0.0789)*	(0.0774)*	(0.0640)***	(0.0634)***	(0.0761)***	(0.0721)***
GOV	-0.1453	-0.2628	-0.2558	-0.6476	-0.6789	-0.2483	-0.2493
	(0.1248)	(0.1223)*	(0.1219)*	(0.1923)***	(0.1936)***	(0.1240)*	(0.1246)*
Openness	0.0726	0.0749	0.0754	0.0706	0.0716	0.0769	0.0780
	(0.0141)***	(0.0144)***	(0.0145)***	(0.0341)*	(0.0342)*	(0.0152)***	(0.0159)***
RuleofLaw	-0.4181	0.9368	0.8309	3.9458	3.9284	1.2036	1.2888
	(1.7375)	(1.5891)	(1.6347)	(2.5329)	(2.5211)	(1.5975)	(1.5729)
$FDIout_{(t-1)}$	-0.0115	-0.0167	0.0081	-0.0126	-0.0157	-0.0161	0.0027
	(0.0049)*	(0.0048)***	(0.0219)	(0.0073)*	(0.0069)*	(0.0048)***	(0.0211)
$Policy_{(t-1)}$		0.5692	0.6842	-0.0000	-0.0000	-0.1350	-0.0214
		(0.3006)*	(0.3454)*	(0.0000)	(0.0000)*	(0.2938)	(0.3460)
$FDIout^{*}Policy_{(t-1)}$			-0.0035		0.0000		-0.0031
			(0.0033)		(0.0000)*		(0.0037)
Constant	59.1476	33.5403	31.9398	129.9760	133.2224	34.4658	34.5165
	(25.9980)*	(20.8675)	(21.6313)	(66.5761)*	(66.2778)*	(21.5625)	(22.0016)
R^2	0.17	0.21	0.21	0.19	0.20	0.20	0.20
Observation	436	406	406	277	277	406	406
No. of countries	37	37	37	37	37	37	37

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table A6. Regression results, FDI outflows, developing countries, dependent variable: TFP growth

	(1) Baseline	(2) *Policy*= *IPRprotect*	(3) *Policy*= *IPRprotect*	(4) *Policy*= *Patent*	(5) *Policy*= *Patent*	(6) *Policy*= *KTransfer*	(7) *Policy*= *KTransfer*
NonAgri	-0.1097	-0.1274	-0.1366	0.0226	0.0300	-0.1510	-0.1869
	(0.0987)	(0.1285)	(0.1202)	(0.1925)	(0.1888)	(0.1161)	(0.1191)
ln*GDPPC*	0.7841	3.3830	3.4460	3.3954	2.9589	3.3727	3.6918
	(2.0595)	(3.1785)	(3.2593)	(6.2388)	(6.3955)	(3.0222)	(3.0858)
ln*POP*	0.7763	-4.0093	-5.1036	-2.0789	-2.4321	-4.8376	-6.0001
	(4.7779)	(7.5503)	(7.9245)	(11.6879)	(12.3197)	(7.7949)	(8.2433)
Credit	-0.1266	-0.1165	-0.1209	-0.1603	-0.1517	-0.1151	-0.1221
	(0.0284)***	(0.0309)***	(0.0322)***	(0.0472)***	(0.0457)***	(0.0310)***	(0.0338)***
Inflation	-0.0841	-0.0968	-0.0875	-0.2561	-0.2447	-0.0940	-0.0880
	(0.0285)***	(0.0634)	(0.0637)	(0.0858)***	(0.0855)***	(0.0635)	(0.0616)
GOV	-0.2153	-0.2991	-0.2693	-0.4450	-0.4706	-0.2923	-0.2733
	(0.0500)***	(0.1091)*	(0.1146)*	(0.1757)*	(0.1737)*	(0.1132)*	(0.1083)*
Openness	0.0625	0.0466	0.0394	0.1236	0.1197	0.0454	0.0348
	(0.0280)*	(0.0310)	(0.0317)	(0.0348)***	(0.0341)***	(0.0304)	(0.0333)
RuleofLaw	2.0415	3.1191	3.2808	1.0703	0.8289	3.0786	3.2789
	(1.1896)	(1.0254)***	(1.0399)***	(2.4216)	(2.3594)	(1.0083)***	(1.0725)***
$FDIout_{(t-1)}$	0.0303	0.0484	0.8034	0.0746	0.0966	0.0347	0.3477
	(0.0583)	(0.0691)	(0.4949)	(0.0726)	(0.0792)	(0.0710)	(0.2836)
$Policy_{(t-1)}$		-0.0774	0.4442	-0.0000	0.0002	0.3339	0.7452
		(0.3997)	(0.4749)	(0.0000)	(0.0003)	(0.3616)	(0.4880)
$FDIout^{*}Policy_{(t-1)}$			-0.1209		-0.0000		-0.0564
			(0.0744)		(0.0000)		(0.0443)
Constant	8.2985	11.2701	13.3427	-12.6219	-8.4466	15.2882	19.7430
	(16.7797)	(17.8739)	(17.6137)	(40.0287)	(38.2430)	(18.9370)	(20.5842)
R^2	0.34	0.28	0.30	0.32	0.32	0.28	0.29
Observation	224	187	187	143	143	187	187
No. of countries	20	20	20	20	20	20	20

Notes: Figures in parentheses are robust standard errors. ***, **, * indicate significance levels at 1 percent, 5 percent, 10 percent, respectively.

Table A7. A summary of the direct impact of IPR processes on TFP growth

Stage of Economic Development	The impact of IPR Processes		
	Innovation	Commercialisation	Protection
Developed Economy	X	X	(+)
Developing Economy	X	X	X

Note: X = It indicates a non-robust or insignificant impact of IPR process on TFP growth; (+) = It indicates a robust positive impact of IPR process on TFP growth. (-) = It indicates a robust negative impact of IPR process on TFP growth.

Table A8. A summary of the indirect impact of IPR processes on TFP growth (through FDI)

Stage of Economic Development	The impact of IPR processes through inward FDI		
	Innovation	Commercialisation	Protection
Developed Economy	(+)	(-)	(-)
Developing Economy	(+)	X	X

Stage of Economic Development	The impact of IPR processes through outward FDI		
	Innovation	Commercialisation	Protection
Developed Economy	(+)	X	X
Developing Economy	X	X	X

Note: X = It indicates a non-robust or insignificant impact of IPR process on TFP growth; (+) = It indicates a robust positive impact of IPR process on TFP growth. (-) = It indicates a robust negative impact of IPR process on TFP growth.

จากการศึกษาพบว่า การใช้ตัวแปร Lags เข้าไปในแบบจำลองในหลายกรณีมีนัยสำคัญทางสถิติไม่ได้แตกต่างจากกรณีที่ใช้ตัวแปรในคาบเวลาเดียวกัน แต่ในบางกรณีพบว่า ผลกระทบในเชิงพลวัตรจากตัวแปร Lags มีความแตกต่างจากผลการวิเคราะห์ในกรณีใช้ตัวแปรในคาบเวลาเดียวกัน ผลการศึกษาในตารางที่ A7 แสดงผลกระทบโดยตรง (Direct Impact) ของตัวแปรทางด้านทรัพย์สินทางปัญญาต่อการพัฒนาผลิตภาพการผลิตของประเทศ พบว่า มีข้อสรุปที่เหมือนกัน คือ มีเพียงการให้การคุ้มครองทรัพย์สินทางปัญญาเพียงปัจจัยเดียวที่ทำให้เกิดการพัฒนาผลิตภาพการผลิตสำหรับกรณีของประเทศพัฒนาแล้ว (Developed Economy) ในขณะที่ปัจจัยทางด้านทรัพย์สินทางปัญญายังคงไม่มีผลทำให้เกิดการพัฒนาผลิตภาพการผลิตในประเทศกำลังพัฒนา (Developing Economy) อย่างชัดเจน ในส่วนของการวิเคราะห์ผลของการเปลี่ยนแปลงนโยบายทางด้านทรัพย์สินทางปัญญาผ่านการเคลื่อนย้ายการลงทุนโดยตรงจากต่างประเทศ พบว่า ความสัมพันธ์มีนัยสำคัญมากขึ้นเมื่อเปรียบเทียบกับแบบจำลองในการศึกษาหลักที่พิจารณาจากตัวแปรในปัจจุบัน การเพิ่มขึ้นของกิจกรรมทางด้านการพัฒนานวัตกรรมใหม่มีผลทำให้เกิดการพัฒนายกระดับผลิตภาพการผลิตทั้งในกรณีของประเทศพัฒนาแล้วและประเทศกำลังพัฒนา โดยผลที่ปรากฏนี้แสดงให้เห็นว่า ในฐานะประเทศผู้รับการลงทุน ประโยชน์ที่จะได้รับจากการลงทุนโดยตรงจากต่างประเทศควรจะเป็นการลงทุนที่สามารถก่อให้เกิดการพัฒนานวัตกรรมใหม่ในประเทศผู้รับการลงทุน และต้องมีระยะเวลาช่วงหนึ่งในการพัฒนาจึงจะสามารถเพิ่มผลิตภาพการผลิตของประเทศผู้รับการลงทุนได้ อย่างไรก็ตาม ประโยชน์ของการพัฒนานวัตกรรมต่อการเพิ่มผลิตภาพการผลิตผ่านการลงทุนโดยตรงในต่างประเทศในฐานะที่เป็นประเทศผู้ลงทุนพบเฉพาะในกรณีของประเทศพัฒนาแล้ว การลงทุนในต่างประเทศโดยประเทศกำลังพัฒนาส่วนใหญ่จึงเป็นการลงทุนในแนวนอนเพื่อขยายกำลังการผลิตในผลิตภัณฑ์ประเภทเดียวกันกับที่ผลิตอยู่เดิม ทั้งไม่ไม่ชัดเจนอีกด้วยว่า การออกไปลงทุนในต่างประเทศนั้นจะสามารถได้ประโยชน์จากการประหยัดจากขนาด (Economies of Scale) ด้วยหรือไม่ นอกจากนี้ การวิเคราะห์ในส่วนนี้ยังพบว่า บทบาทของกระบวนการในการแปลงทรัพย์สินทางปัญญาไปสู่กิจกรรมเชิงพาณิชย์ และการให้การคุ้มครองทนัพย์สินทางปัญญาที่เข้มงวดมากขึ้น ไม่ได้มีอิทธิพลอย่างมีนัยสำคัญต่อการสนับสนุนการเพิ่มผลิตภาพการผลิตผ่านการลงทุนโดยตรงในต่างประเทศทั้งในฐานะการเป็นประเทศผู้รับการลงทุน และการเป็นประเทศผู้ลงทุนในกรณีของประเทศกำลังพัฒนา สำหรับกรณีของประเทศพัฒนาแล้วกลับพบว่า การมีระบบในการแปลงนวัตกรรมไปสู่กิจกรรมในเชิงพาณิชย์ และการเพิ่มความเข้มงวดในการให้การคุ้มครองทรัพย์สินทางปัญญาที่จะส่งเสริมให้เกิดการไหลเข้าของเงินลงทุนโดยตรงจากต่างประเทศจะมีผลบั่นทอนผลิตภาพการผลิตในอนาคต จะเห็นได้ว่า เมื่อวิเคราะห์ผลในเชิงพลวัตรโดยอาศัยแบบจำลองที่พัฒนาขึ้นนั้น ทำให้เห็นถึงบทบาทของกิจกรรมในกระบวนการของทรัพย์สินทางปัญญาที่แตกต่างกันบ้าง ซึ่งการวิเคราะห์ในรายละเอียดเพื่อการเปรียบเทียบจะทำให้เห็นถึงแนวทางในการกำหนดนโยบายทางด้านทรัพย์สินทางปัญญาของประเทศเพื่อให้เกิดประโยชน์อย่างยั่งยืนในระยะยาวโดยการยกระดับขีดความสามารถในการแข่งขันจากการพัฒนาผลิตภาพการผลิตได้ดียิ่งขึ้น