WIPO-ASEAN STUDY

The Strategic Use of Intellectual Property to Enhance Competitiveness in Select Industries in ASEAN

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The present publication is the result of a WIPO-ASEAN “Study on the Strategic Use of Intellectual Property to Enhance Competitiveness in Select Industries in ASEAN”.

The project was implemented by Professor Albert Hu, National University of Singapore, who conducted the survey with the assistance of national consultants in each of the 11 countries covered by the project, and subsequently analyzed the results.

The project was coordinated, within WIPO, by Pushpendra Rai and Candra Darusman, who supervised the publication; managed the process through the AWGIPC through its various stages; interacted closely with the member states, Regional Consultant and the national consultants; and authored the Introduction.

Introduction

In 2005, the World Intellectual Property Organization (WIPO), with the assistance of the Association of Southeast Asian Nations (ASEAN) completed a study on a compilation of manuals, guidelines and directories in the area of intellectual property portfolio management, for ASEAN Member States. The study serves as a guide for the use of intellectual property as a corporate business strategy in various ASEAN countries.

Subsequently the ASEAN Working Group on Intellectual Property Cooperation (AWGIPC) requested WIPO to initiate steps to take up another comprehensive project to assess the impact of IP on different sectors in ASEAN Member States. WIPO had a series of discussions with the AWGIPC to determine the objectives and methodology of the study. Following these discussions, and the submission of a detailed outline elaborating the objectives, scope and methodology of the proposed study, AWGIPC approved the project and requested WIPO to implement it.

It was decided that the WIPO-ASEAN Study on the Strategic Use of Intellectual Property to Enhance Competitiveness in Select Industries in ASEAN would comprehensively assess the manner in which companies in different sectors had been making use of the IP system as a strategic tool for economic development. The study would attempt to gauge the impact of IP on different sectors in the ASEAN Member States, and the manner in which companies in these sectors had been making use of the different elements of IP to leverage their competitiveness, promote trade and create jobs. In order to learn from the experience of some non-ASEAN countries in the selected areas of technology, it was decided that countries like India and the Republic of Korea would also be covered by the study.

Professor Albert Hu, National University of Singapore, was selected as the Regional Consultant for conducting the study. The Regional Consultant was to be supported by national consultants in each of the countries covered by the study. The national consultants were identified by WIPO, in consultation with the respective IP Offices and the Regional Consultant.

The study is based on a detailed survey carried out in all the countries. In order to have a comprehensive and representative sample of the companies, the following industries were selected: agricultural chemicals, pharmaceuticals, music, manufacturing industry (textiles and garments) and one more industry of the country's choice. In each country, twenty companies were to be surveyed in each one of the five industries, making a sample size of one hundred companies per country. However, if it was not possible to have the required number of companies for each of the selected sectors in a particular country, there was an in-built flexibility to enable adjustments for specific industries and countries. It was also decided that a diverse set of companies would be identified in each country, with variations according to size (small, medium or large) and type of operations (manufacturing, research and development, retail or whole sale trade).

The national consultants were required to be familiar with intellectual property issues in general, and the specific situation in their respective countries. They were also required to have a good work relationship with the government and the private sector.

The draft questionnaire and the guidelines for the national consultants were presented by WIPO at the meeting of AWGIPC in Siem Reap, Cambodia in November 2009. The members of the AWGIPC provided their comments on the draft questionnaire, which were suitably incorporated and used by the project to elicit responses from the companies.

The national consultants obtained the responses to the survey, and forwarded the information to the Regional Consultant, Professor Albert Hu, who collected, collated and analyzed the results. The report of the Regional Consultant is contained in this publication.

Acknowledgements:

We are grateful to Professor Albert Hu, who was the Regional Consultant for this project. He was responsible for preparing the background documents, briefing the national consultants, collecting the survey reports and writing the analytical part of the study.

We appreciate the work done by the national consultants, who have devoted a considerable amount of time in obtaining the responses from the companies.

We would thank the intellectual property offices of the countries concerned, which provided support for the project. They assisted us in determining the parameters for the study; identifying the national consultants and also guiding them in conducting the survey.

We would also thank the AWGIPC for coordinating the process among the ASEAN member states, soliciting their views at the appropriate stages and assisting us in preparing the documents.

Regional Consultant :

Mr. Albert Guangzhou Hu
Associate Professor
Department of Economics
National University of Singapore

National Consultants:

Brunei Darussalam
Dr. Tan Kha Sheng
Associate Professor
Dean of Postgraduate Studies & Research
Universiti Brunei Darussalam

Cambodia
Mr. Ngeth Vibol
Director
Department of Industrial Property
Ministry of Industry, Mines and Energy
Phnom Penh

Indonesia
Mr. Andi Muhammad Sadat
Senior Consultant
Search & Solve Consulting
Depok

India
Mr. K. Subodh Kumar
Head IPR & APTDC
Confederation of Indian Industry
Andhra Pradesh Technology Development & Promotion Centre
Hyderabad

Lao PDR
Mr. Mouane Simoungkhot
General Director/Senior Consultant/Trademark and Patent Attorney
Lao International Co., Ltd. (LICO)
Vientiane

Malaysia
Dr. Rokiah Alavi (Ms.)
Associate Professor
Department of Economics
International Islamic University
Kuala Lumpur

Myanmar
Dr. Seint Thanda Tun, Ph.D (Mechanical)
Assistant Director, IP Section
Ministry of Science & Technology
Yangoon

Singapore
Mr. Ho Cheng Huat
Director
IP Academy

Republic of Korea
Ms. Boo-young Eom
Associate Research Fellow
Korea Institute for Intellectual Property
Seoul

Thailand
Mr. Piset Chiyasak
Managing Director / General Manager
TECA / Phonorights (Thailand) Ltd.
Bangkok

Viet Nam
Mr. Tran Huu Nam
Partner
Tran H. N. & Associates
Hanoi

Regional Consultant's Report[1]

Albert Guangzhou Hu[2]
Associate Professor
Department of Economics
National University of Singapore

1. Background

Sixteen years after the conclusion of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) during the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) negotiations of trade liberalization in 1994, both policy makers and academic researchers have surprisingly little understanding of whether and how the implementation of TRIPS has altered the behavior and performance of developing country firms.

There is little ambiguity about the impact of TRIPS on developed country firms, which have been responsible for most of the technological innovations in the world. By setting minimum standards for intellectual property (IP) protection, which generally conformed to the level that existed in the most technologically advanced nations, TRIPS served to boost the profits of developed country firms. However, there has been no conclusive evidence that the higher profitability has led to more innovation.

For developing country firms, the impact of TRIPS can take place, at least conceptually, through multiple channels. It should reduce imitation and raise the costs of technology diffusion. Firms that were previously engaging in imitation related activities may see their business models rendered inoperable. Intermediate goods, including capital equipment, may become more expensive thereby raising the costs of production. On the other hand, those firms that have the capability to innovate, even in an incremental way, may find their intellectual property more valuable than before, as a result of the implementation of TRIPS. For both types of firms, IP has assumed much greater importance than before. How to manage the challenges brought by the higher IP protection standards becomes a pressing issue for both business leaders and policy makers.

[1] Mr. Pushpendra Rai, Director, Singapore Office, World Intellectual Property Organization, initiated and provided extremely valuable guidance throughout the project. Mr. Candra Darusman, Deputy Director, Singapore Office, World Intellectual Property Organization, provided helpful support in faciliating the timely return of the survey data. The national consultants, Madam. Rokiah Alavi (Malaysia), Eom Boo-Young (Republic of Korea), Rose Ramli (Singapore) and Seint Thandar Tun (Myanmar) and Messrs. Piset Chiyasak (Thailand), Andi Emsadat (Indonesia), Subodh Kumar (India), Mouane Simoungkhot (Lao PDR), Tan Kha Sheng (Brunei), Tran Huu Nam (Viet Nam) and Ngeth Vibol (Cambodia), did the hard ground work of implementing the survey for their respective countries and therefore were instrumental in bringing the survey to successful completion. An earlier draft of this report benefited from the insightful comments of Messrs. Rai and Darusman. The views expressed in the report are my own and do not represent those of the World Intellectual Property Organization or the National University of Singapore. I am responsible for any remaining errors in the report.

[2] Department of Economics, National University of Singapore, 1 Arts Link, Singapore 117568. Telephone: (65) 65163957. Fax: (65) 67752646. Email: ecshua@nus.edu.sg.

This study set out to undertake what we understand to be the first systematic firm-level survey of how developing country firms have made use of intellectual property to enhance their competitiveness. The survey was carried out in nine member states of the ASEAN. India and the Republic of Korea were also selected to provide additional reference points and enrich the sample information given the two countries' close ties with ASEAN and their different levels of economic development and natural endowments.

Various studies have demonstrated that IP protection is correlated with the level of economic development (Maskus, 2000; Chen and Puttitanun, 2005). The innovation-inducing effect of stronger IP protection may only be observed in countries where economic development has reached a certain stage and where firms have acquired the technological capability to innovate. Our survey sample spans countries on a wide spectrum of economic development, from low-income to high-income, according to the classification by the World Bank. This variation in the level of economic development in the countries covered by the survey gives us a good opportunity to identify the impact of stronger IP on the competitiveness and the strategic response of developing country firms.

Earlier surveys have focused on fewer elements of IP, most often patents and copyrights. While this may be appropriate for developed country firms, the narrow focus is misplaced for our study. The firms in our survey may react to and value a wide range of IP, including patents, utility models, trademarks, industrial designs, copyrights and geographical indications. For example, in developing countries, products may be differentiated more by trademarks and geographical origins than by technological differences. Another open question that we would like to investigate is the extent to which incremental rewards to innovation (e.g., utility models) may have benefited developing country firms in the process of technology catch-up.

The rest of this report is organized as follows. Section 2 sketches the background of the countries included in the survey in terms of their level of economic development and IP protection. We then discuss the objective and the design of the survey questionnaire in Section 3. A detailed analysis of the survey data can be found in Sections 4 and 5. Section 6 concludes with observations about the policy lessons we draw from the survey.

2. Economic development, IP and IP protection in ASEAN countries

2.1 Economic development in ASEAN countries

ASEAN was founded in 1967 by five countries in Southeast Asia – Indonesia, Malaysia, the Philippines, Singapore and Thailand – to promote cooperation between members and to maintain peace and stability in the region. Over the years, membership has been expanded to include Brunei, Cambodia, Laos, Myanmar and Vietnam. The survey was conducted in nine of the ten ASEAN countries – the Philippines did not participate in the survey –India and Republic of Korea. Table 2.1 provides statistics that parameterize the economic and technological development of these countries.

The first notable feature of the survey is the highly heterogeneous level of economic development among the countries and the sheer size differences. Column 1 of Table 2.1 reports average GDP per capita in US dollar at year 2000 prices.[3] To smooth out year-to-year fluctuation, we report the three-year averages from 2006 to 2008. The countries fall into four income groups based on World Bank classification, from low-income, lower-middle income, middle-income to high-income. At one end, Cambodia, had a GDP per capita of 482 dollars, whereas at the other, Singapore, had a GDP per capita of 28,470 dollars, which was close to the high-income OECD average. The populations of the countries range from India's 1.1 billion to less than half a million for Brunei.

The countries in our sample have been experiencing rapid economic growth. In the 15 years from 1993 to 2008, all countries in the region except Brunei had seen their GDP per capita growing at a higher rate than the high-income OECD countries. Economic growth had been particularly robust for countries in the low-income group, resulting in catching up both within the region and between the region and the world frontier. The region had also seen robust population growth, which promises a demographic dividend in the years to come.

The region is closely integrated with the global economy. All countries except Laos are members of the World Trade Organization (WTO). With the exception of India, all countries in the sample had a higher trade to GDP ratio than the average high-income OECD countries, and they had become even more open from the mid 1990s to 2008. In recent years, international trade accounted for 141, 161, 206 and 141 percent of GDP for Cambodia, Vietnam, Malaysia and Thailand respectively. Close integration with the global economy increases the stake of fulfilling these countries TRIPS commitments that came with their WTO membership.

Statistics on research and development (R&D) are only available for some of the countries in this group. Still there seems to be three tiers: at the top tier, Republic of Korea and Singapore invest as much, if not more, on R&D, relative to their sizes, as the high-income OECD countries; in the next tier, India, Malaysia and Thailand invest between a quarter to 0.8 percent of their GDP on R&D, compared to 2.46 for the high-income OECD countries; finally, at the lowest tier, while statistics are not available, the countries likely invest minimal resources in R&D.

2.2 IP: aggregate statistics[4]

We investigate the cross-country differences in acquiring IP among the ASEAN countries, India and Republic of Korea by comparing and contrasting national statistics on applications for patents, utility models, industrial designs and trademarks. This analysis will serve as a useful backdrop and perspective for the discussion of the survey results.

[3] These numbers are based on the Atlas method that the World Bank uses to convert GDP in national currencies to that in U.S. dollar while accounting for different rates of inflation in the countries.
[4] Data used to draw Figures 1 and 2 came from the website of USPTO: www.uspto.gov. Data used to draw Figures 3 to 13 came from the website of WIPO and those of the national IP offices.

Table 2.1 Key statistics for ASEAN member countries, India and Republic of Korea

	GDP per capita (constant 2000 US$)	Growth rate	Population (million)	Population growth	Trade/GDP		R&D/GDP
	2006-08	1993-2008	2006-08	1993-2008	1993-95	2006-08	2006-08
Low-income							
Cambodia	482	6.15	14.3	1.99	64	141	
Lao PDR	450	4.35	6.1	2.02	59	86	
Myanmar			49.1	0.98			
Vietnam	613	5.9	85.2	1.33	73	161	
Lower-middle income							
India	661	4.82	1,117.30	1.53	21	47	0.8
Indonesia	1,038	2.17	224.7	1.34	52	56	
Philippines	1,190	2.37	88.7	2	75	90	
Thailand	2,574	2.54	67	0.9	84	141	0.25
Upper-middle-income							
Malaysia	4,984	2.99	26.6	2.15	177	206	0.64
High-income							
Brunei Darussalam	18,271	-0.22	0.38	2.18	107	96	
Republic of Korea	15,024	4.04	48.5	0.65	55	80	3.35
Singapore	28,470	3.4	4.6	2.3		443	2.46
OECD – high income	29,631	1.86	965.3	0.62	36	50	2.46

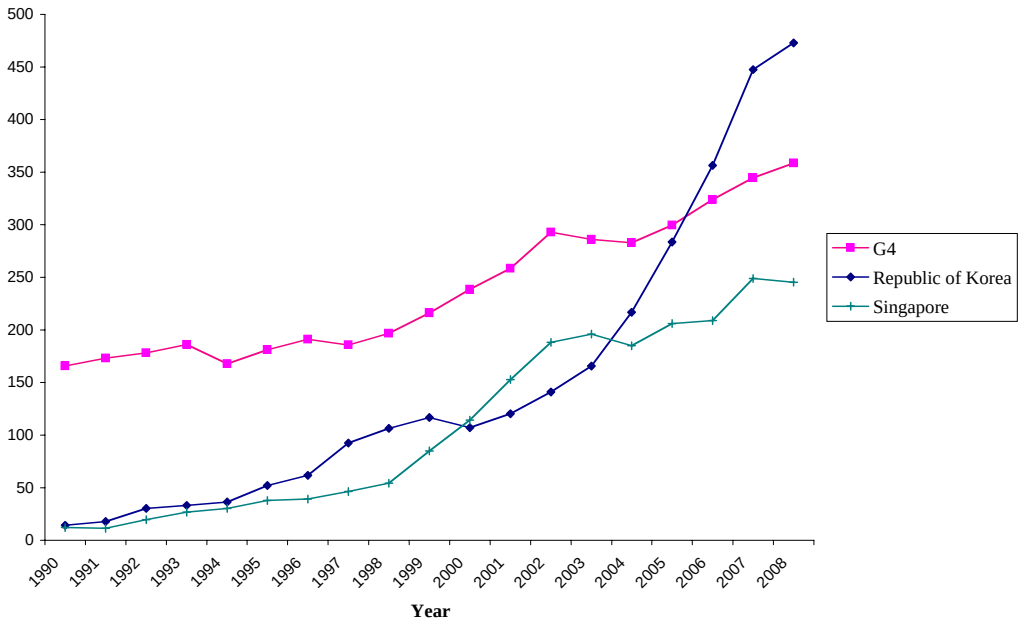
Source: World Development Indicators

Some caveats are in order before we proceed with the analysis. First, IP is the product both of innovation and the effort to seek the legal protection and the two are closely related. Large quantities of these IPs can therefore reflect high incidences of technological innovation, or more effective means to protect the innovation or both. Second, to the extent that these metrics are interpreted as indicators of technological innovation, it should be emphasized that the underlying values, economic and technological, of these innovations are likely to be immensely heterogeneous with highly skewed distributions. In places where we compare statistics reported by the respective national authorities, the numbers are likely influenced by nation-specific, idiosyncratic institutions, practices and policies. It is beyond the scope of this report to try to tease out such confounding influences that may have shaped the national statistics.

Patents

Figures 1 and 2 plot the number of applications for U.S. Patent and Trademark Office (USPTO) granted patents per million people. As with the R&D statistics, there are clearly three groups here too: Republic of Korea had been narrowing the gap in patent intensity with France, Germany, Japan and UK (hereinafter referred to as G4 for short)[5] in 2004. While still significantly below that of G4, Singapore's patents-to-population ratio had grown from 12 USPTO patents per million people in 1990 to around 250 in 2008. The other countries were far behind Republic of Korea and Singapore on this measure of patent intensity. Among these countries, Malaysia leads, with around 12 patents per million people, followed by India, Philippines and Thailand; the rest of the countries have minimal USPTO patent applications.

Figure 1. USPTO patent applications per million population (1)



[5] We excluded the United States from this comparison using USPTO data due to the distortion that may arise from the national bias of the inventors of seeking patents from their home patent offices.

Figure 2. USPTO patent applications per million population (2)

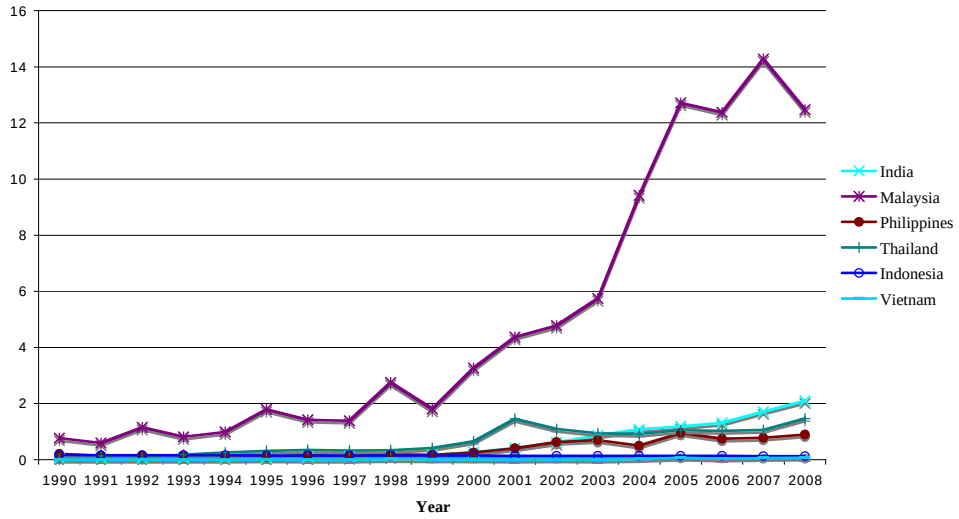


Figure 3. National patent office patent applications per million population (1)

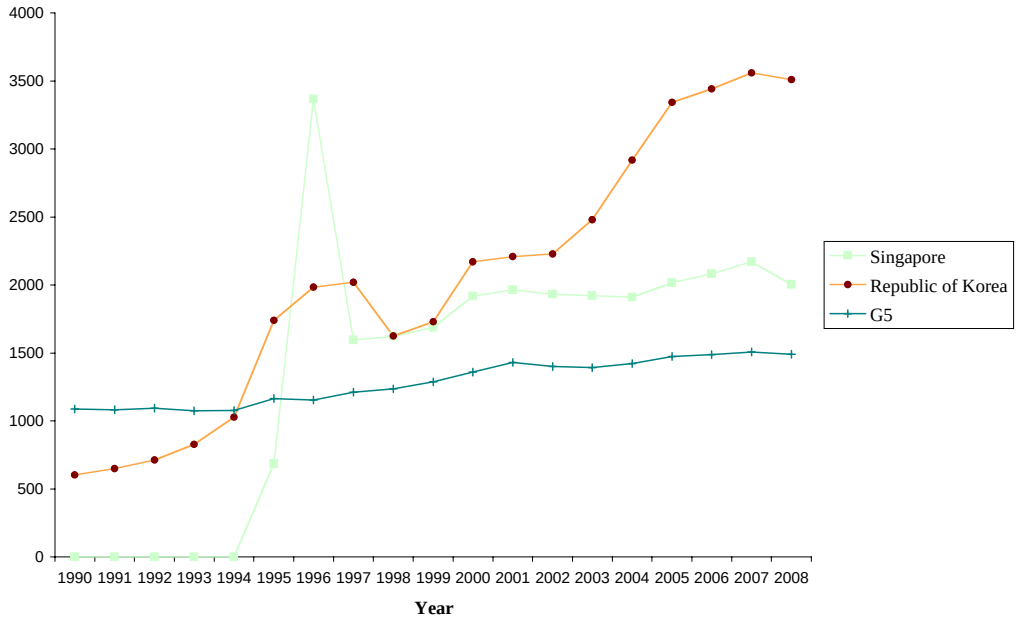


Figure 4. National patent office patent applications per million population (2)

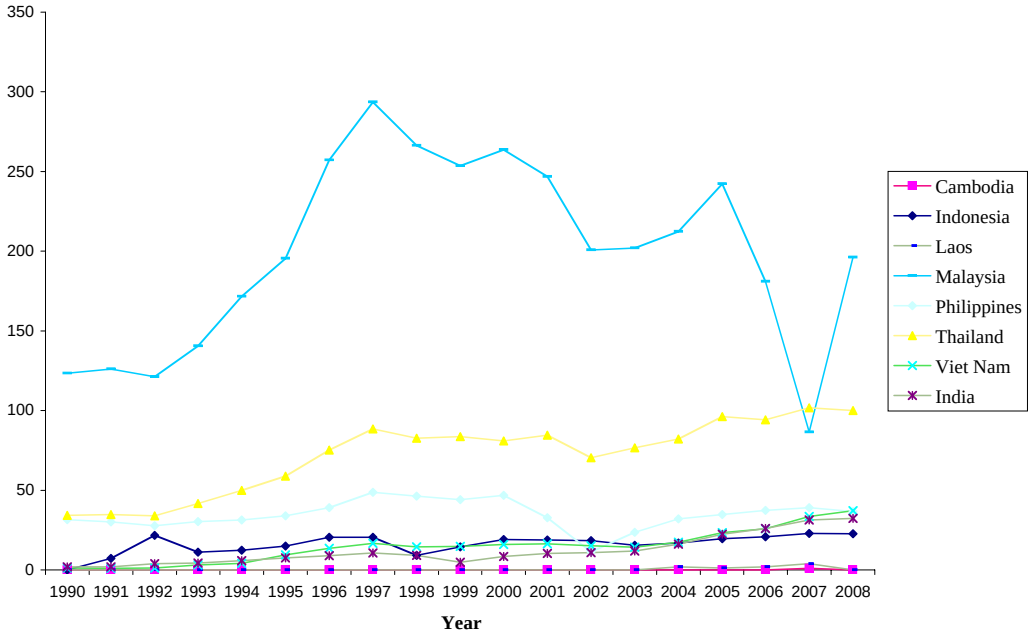
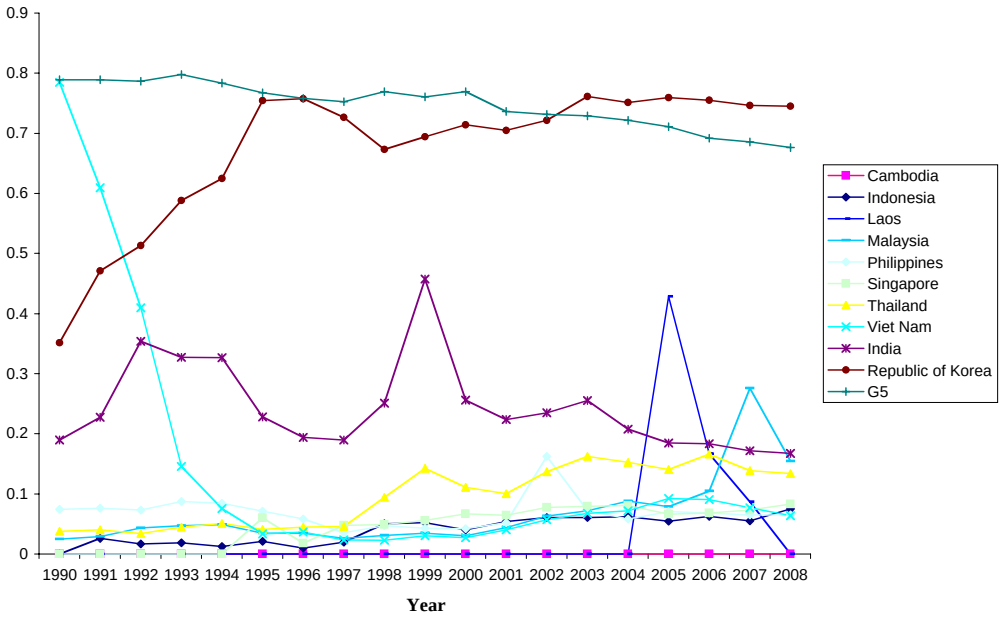


Figure 5. Residents' share of applications for national patents



Turning to patent applications filed with national patent offices, we plot in Figures 3 and 4 the patent intensity similarly measured as above but using national patent counts. The numbers are all on a much larger scale, which reflects the preference of inventors seeking patent protection at home - usually their primary market, but the three-tier pattern is similar to what was observed earlier using the USPTO patents.

Many of the patent applications at developing country patent offices are filed by foreign multinational corporations and thus represent foreign ownership of IP. Figure 5 shows the share of residents in patent applications with national patent offices. Compared with France, Germany, Japan, UK and US (hereinafter referred to as G5 for short), only Republic of Korea had a similarly high residents' share of total patent applications. Even in India, residents only accounted for 20 per cent of patent applications. Most of the other countries saw their residents' share of patent applications hovering around 10 percent of the total for most of the years.

Utility models

Utility models, also referred to as petty patents, are less stringent in the inventive step requirements compared with patents, and generally reward small, incremental innovations. Utility models are usually justified on the ground that they are useful to small and medium-sized enterprises that may not have the same capacity as large firms in securing patents. Figures 6 and 7 plot the number of utility models per million people. Utility model applications in Republic of Korea exceeded those in Japan by a wide margin. In 2008 Republic of Korea's utility model applications reached 358 per million people but Japan's were only 70 per million people. Interestingly both countries' utility model applications followed a similar pattern over the years: increasing since the early 1990s, reaching a peak around 1996 and then declining. Germany's utility model applications had been stable at around 200 applications per million people over the years.

Among the utility model-granting ASEAN countries, Thailand had seen a dramatic increase in utility model applications in the last decade, reaching a peak of 31 applications per million people in 2006. The number of utility model applications per million people had been in the single digits for Philippines, Thailand and Vietnam.

Figure 8 plots the residents' share of utility model applications. With rare exceptions and in sharp contrast with the patterns revealed by the patent applications data, over 80 percent of the applications for utility models had come from the residents in the last decade. Since utility models protect small, incremental innovations, the costs of serving foreign markets and protecting IP there may not make it worthwhile to seek utility models granted by a foreign jurisdiction.

Figure 6 Utility model applications per million population (1)

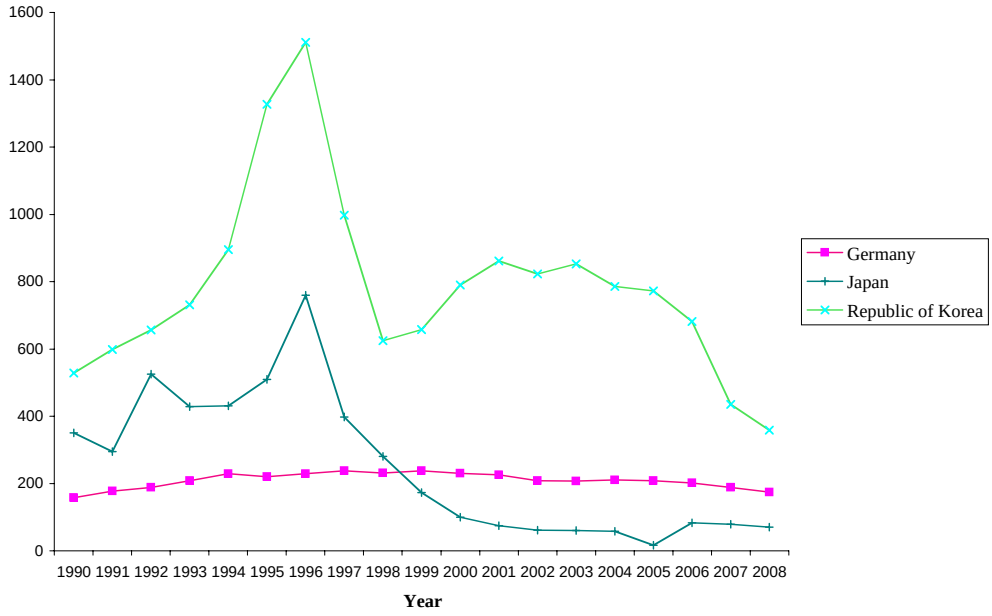


Figure 7. Utility model applications per million population (2)

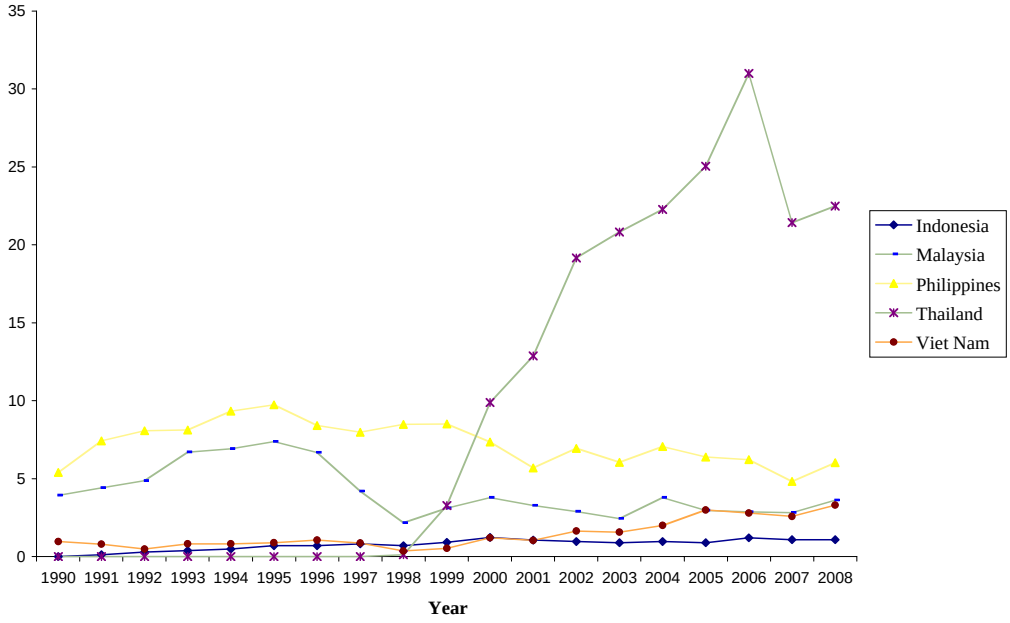
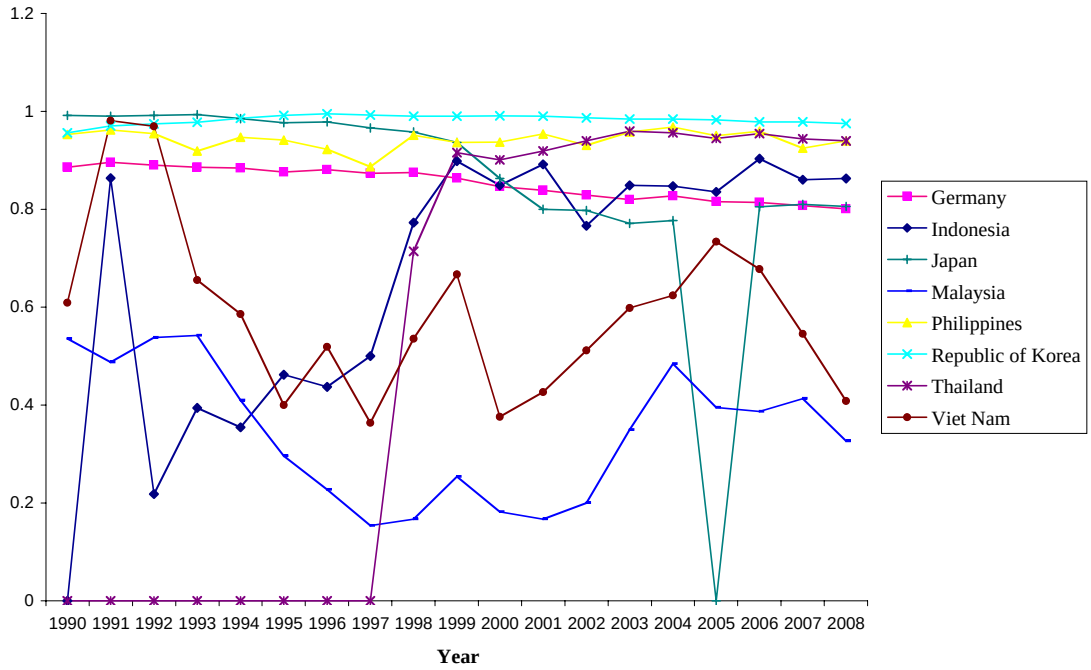


Figure 8. Residents' share of utility model applications



Industrial Designs

A somewhat different picture appears with Figures 9 and 10 where the number of industrial designs per million people is plotted for the countries. Averages of the G5 countries are used as a benchmark of the world frontier. The gap between ASEAN countries and the world frontier in industrial designs is much smaller compared than that for patents. Figure 9 shows that Republic of Korea had over ten times as many industrial design applications in 2008 as G5 countries on a per capita basis. Singapore also overtook G5 in 2001 in this regard and reported nearly three times as many industrial design applications as G5. The two economies next on the technology ladder, Thailand and Malaysia, while starting from a low base, had been catching up. At the end of the sample period, both countries received industrial design applications that were 60 percent the average level in G5 countries, again on a per capita basis. In the next tier of countries, as Figure 10 indicates, Indonesia, Philippines, Vietnam and India had fewer industrial designs, but they had also seen increasing industrial design applications in recent years.

A sharp contrast with the patent applications is also revealed in Figure 11, where the residents' share of industrial design applications is plotted. Unlike in the patents case where for most ASEAN countries, residents account for less than 20 percent of patent applications, residents in ASEAN account for a much higher proportion of industrial design applications. All ASEAN countries except Malaysia and Singapore had at least half of their industrial design applications coming from residents. While Republic of Korea dominated G5 on this

Figure 9. Industrial design applications per million population

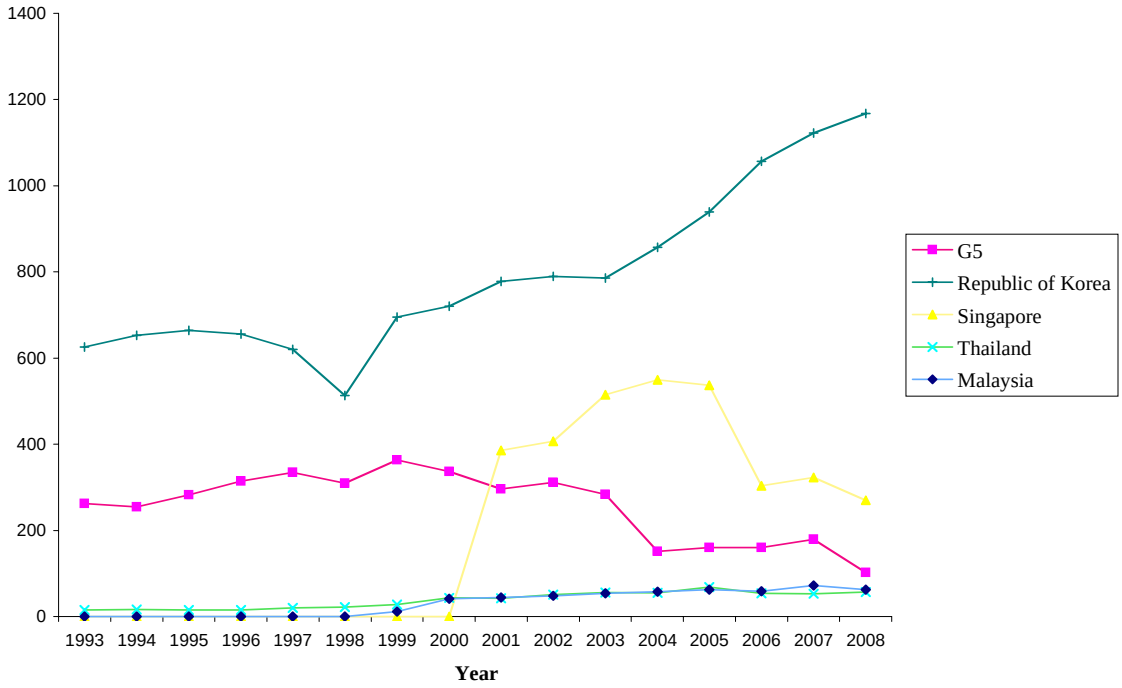


Figure 10. Industrial design applications per million population

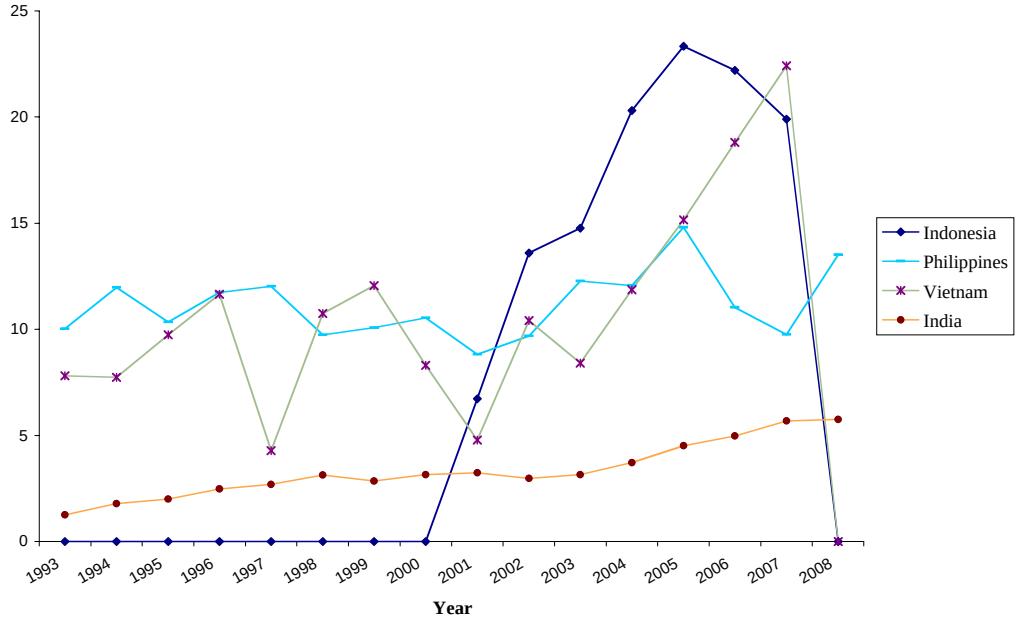
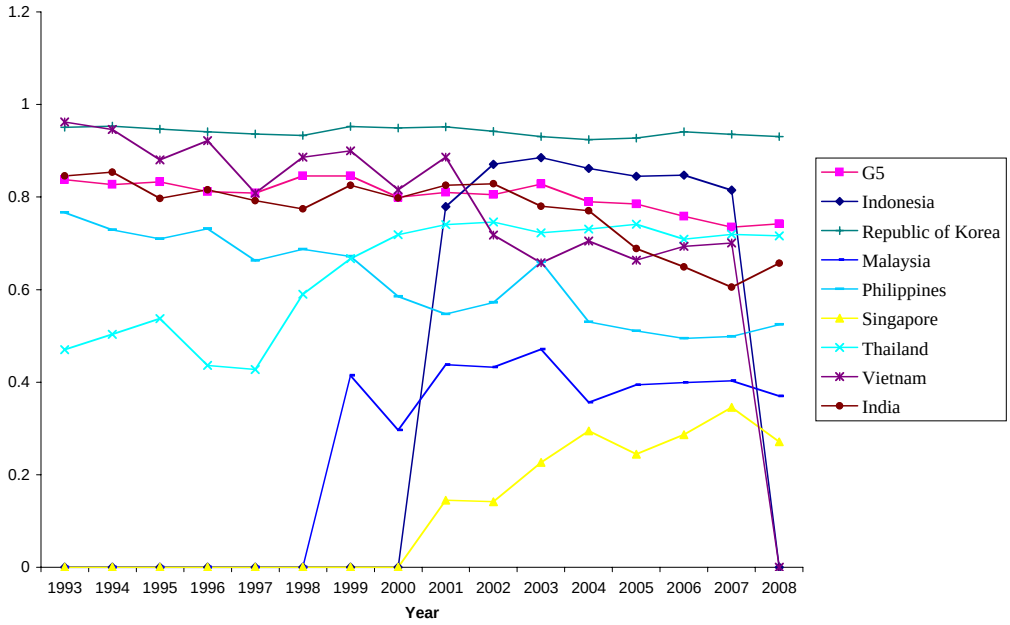


Figure 11. Residents' share of industrial design applications



measure, a number of ASEAN countries were not far behind. In 2007, for which we have more complete data, residents' share of industrial design application was 70 percent for Vietnam, 72 percent for Thailand, and 82 for Indonesia. In the same year, the average G5 countries received 73 percent of industrial design applications from their residents.

Trademarks

Trademark statistics, which are used to generate Figures 12 and 13, also show that the gap between ASEAN countries and G5 is smaller as compared to the case of patent statistics. Singapore's extremely high numbers of trademark applications per capita shown in Figure 12 is not surprising given the country's advanced stage of development and its role of a regional trade and financial center. Both Republic of Korea and Malaysia also dominate G5 in this regard with 2631 and 964 trademark applications per million people respectively in 2008, compared with 601 applications in an average G5 country. Thailand and Vietnam were not far behind with 525 and 321 applications respectively. India seemed to lag behind with 114 trademark applications per million people, trailing Indonesia and Philippines.

Figure 13 shows that the proportion of trademark applications filed by residents is related to the size of the country. Larger countries tend to have a larger fraction of residents' trademark applications. Indian residents, for example, consistently contributed to between 80 and 100 percent of trademark applications in India, even though on a per capita basis, they were served by one of the smallest numbers of brands. On the other hand, in smaller countries such

Figure 12. Trademark applications per million population

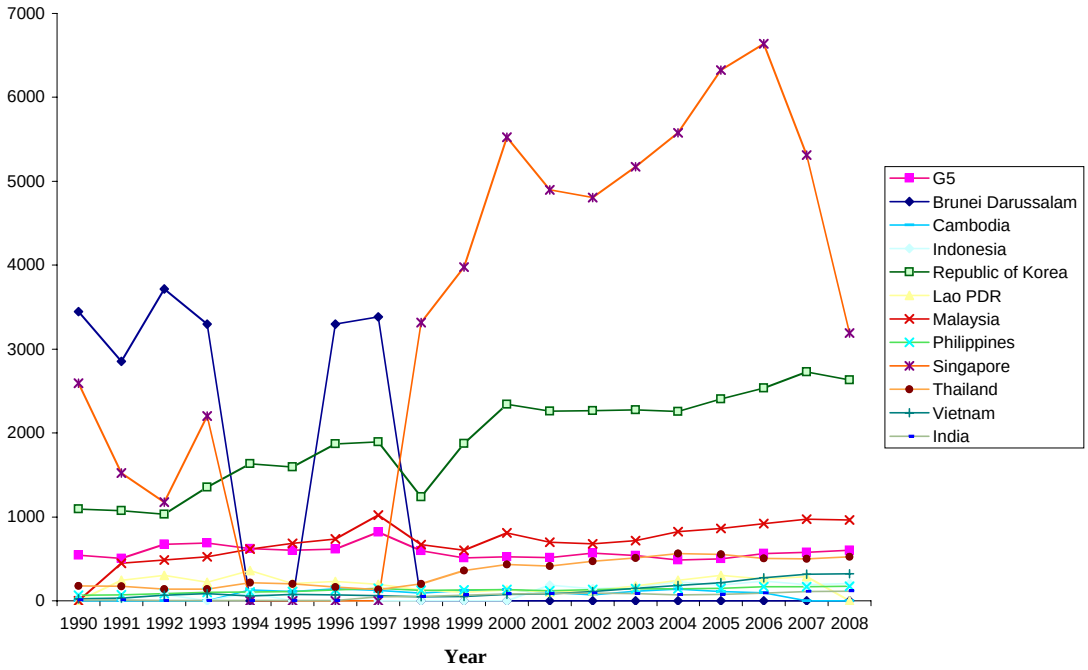
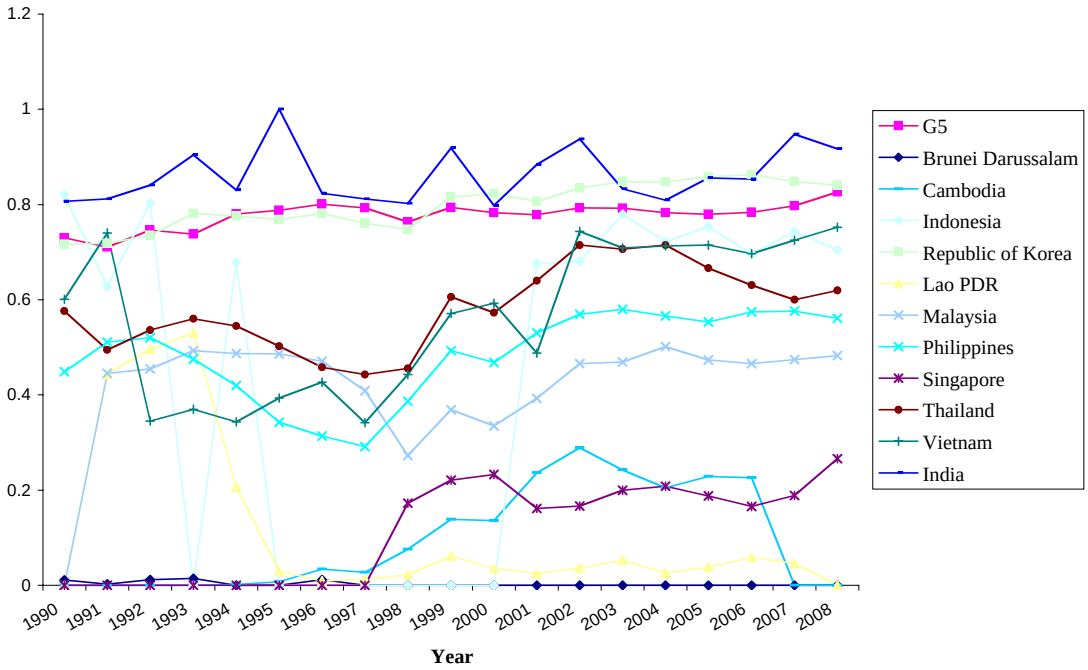


Figure 13. Residents' share of trademark applications



as Singapore, Brunei, Cambodia and Lao PDR, less than a quarter of trademark applications came from the residents. One possible explanation is that small domestic market made it hard for domestic firms to recoup the sunk cost associated with establishing a brand.

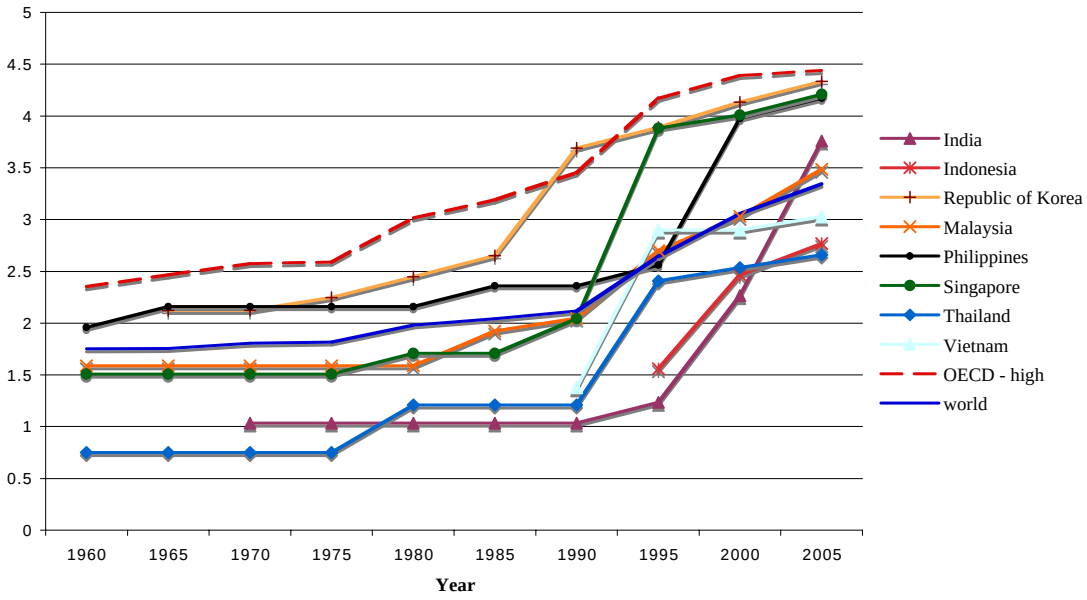
We can draw some general observations about IP, innovation and economic development in ASEAN, India and Korea based on the statistics we have presented in this section. First, there is a great deal of heterogeneity in all three dimensions: IP, innovation and economic development. The countries except Brunei sort roughly into three groups: Korea and Singapore are within close proximity of high-income OECD countries; a good distance behind are India, Indonesia, Malaysia and Thailand; Cambodia, Lao PDR, Myanmar and Vietnam. Brunei is hard to pigeonhole into any of the groups given its resource-rich, high-income but low innovation activity status.

Secondly, the gap between these economies and the world frontier that is defined by G5 varies depending on which indicator of IP we use. To the extent that patents reflect perhaps the most technologically sophisticated technological innovation among all the IPs we discuss here, the gap between the latter two groups and the world frontier is the widest in this kind of technological innovation. This is true with the more stringent test of subjecting all countries to the benchmark of the USPTO or with the less stringent one of allowing for some national latitude by using national patent office-granted patents. It is also true whether we examine the absolute quantity on a per capita basis or by the nationality of the patents. The gap becomes smaller when viewed through the prism of less drastic innovations such as those represented by utility models and industrial designs. When measured using trademarks, the gap almost disappeared with the size of domestic market playing a more important role than the level of economic and technological development.

2.3 IP protection in ASEAN countries

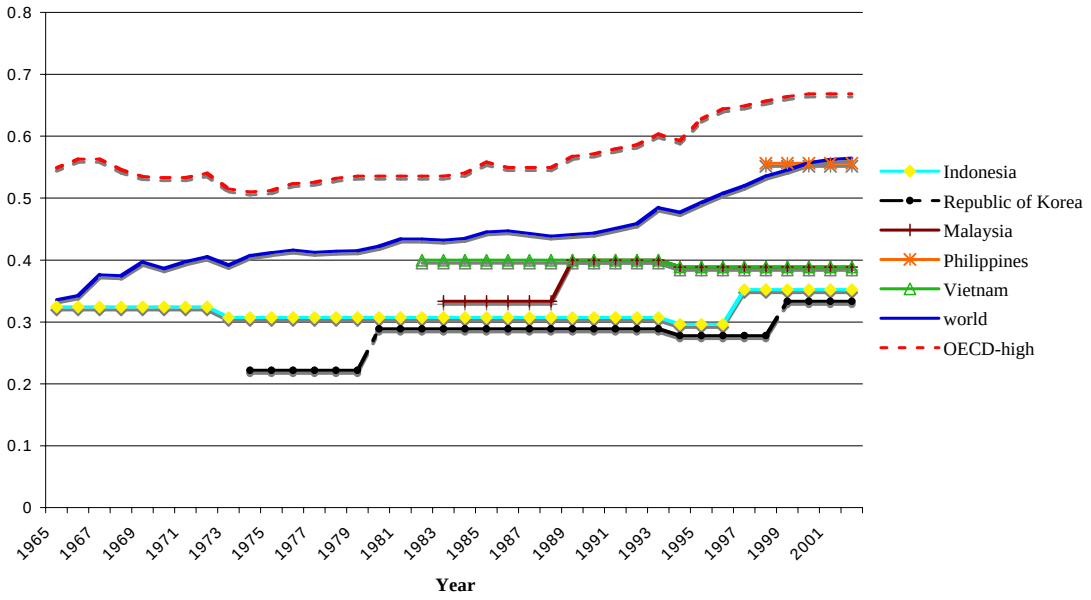
It is difficult to compare IP protection in different countries as there is generally a gap between the legislation and the enforcement. In the absence of metrics that can be used to compare IP enforcement across countries, we plot the Ginarte-Park index (Ginarte and Park, 1997; Park, 2008) in Figure 14 to compare IP protection in ASEAN countries with that in the rest of the world. It is clear from the figure that the world has moved towards more rigorous protection of patent rights over time and particularly since 1994 that saw the conclusion of the TRIPS Agreement. Republic of Korea and Singapore have brought their patent rights protection to a level that is close to that in high-income OECD countries since the mid 1990s. The Philippines followed in the 2000s. Malaysia, India and Vietnam have seen their patent rights protection converging to the world average. On the other hand, Indonesia and Thailand remained substantially below the world average at the end of the sample period.

Figure 14. Ginarte-Park Patent Rights Index



Reynolds (2003) constructed an index of the strength of the enforcement of trademarks laws for a number of countries. This index for Republic of Korea, Indonesia, Malaysia, Philippines and Vietnam is plotted in Figure 15 alongside the averages for high-income OECD countries and the world. As compared to the Ginarte-Park patent rights index, this one is available for a smaller number of countries and years. Nevertheless, Figure 15 shows that the ASEAN countries, for which the index is available, and Republic of Korea have consistently scored significantly below the average high-income OECD countries and the average countries in the world, in protecting trademarks. This is somewhat puzzling since our earlier analysis of IP statistics shows that despite their limited invention activities, as indicated by low patent application numbers, the ASEAN countries have been actively seeking protection of trademarks. It seems that trademark applications in our sample of countries had been growing rapidly despite the relatively weaker protection of trademarks in these countries than in the rest of the world.

Figure 15. Trademark index



3. ASEAN-WIPO survey design

Survey objective

The objective of the survey is to assess the impact of IP on selected industries and how companies have used IP to enhance competitiveness, promote trade and create jobs in ASEAN countries, India and Republic of Korea. In particular, we are interested in the firms' response to the following general questions:

- How much and what kind of IP do the firms own?
- What motivates the firms to seek IP?
- How would the firms react to changes in IP protection? What would be the consequences?
- How does a country's IP infrastructure affect its firms' incentive to seek IP?
- Has IP ownership helped the firms penetrate into the export market and generate employment?
- Do the answers to these questions depend on the countries' level of economic development and industry-specific characteristics?

International comparison

One of the best-known IP surveys was conducted by a group of economists then affiliated with Yale University in the U.S. in the 1980s (Levin et al, 1987).[6] Some of our survey questions are modeled after the Yale survey so that we can compare the results of our survey with those of theirs. When respondents are asked to rate the importance or relevance of a particular choice, they provide an answer on a scale of 1 to 7. This has also been used by other surveys.

[6] Cohen et al (2000) conducted a follow-up survey in 1994.

Manufacturing vs. creative industries

In consultation with the ASEAN Member States, WIPO identified four industries to be surveyed – agricultural chemicals, pharmaceuticals, music and textiles and garments. The national consultants were asked to identify, in consultation with their respective IP offices and WIPO, a fifth industry to be surveyed. In the actual implementation of the survey, the "music" industry was interpreted broadly so that it also includes publishing, broadcasting, and other media-related business, which we label "creative industries". The other industries mostly fall into the category of manufacturing industries. IP issues relevant to the two kinds of industries are obviously quite different, with, for example, copyrights playing a much more important role in the creative industries than in the manufacturing industries. In the end, we designed two questionnaires for the two types of industries respectively, taking into account the different nature of IP issues involved.

Sample selection

Each national consultant was requested to obtain response from twenty firms for each of the five industries to be covered in their survey: the four designated by WIPO and one of their own choice. The relatively small sample size reflects concern for the cost of implementing the survey. When identifying potential respondent firms, the national consultants were encouraged to use stratified sampling. However, given the multiple layers of stratifications, the small sample size, and the vastly different level of economic development in the countries, no strict rule of sample stratification has been imposed. The national consultants were to select a mixed sample of firms of different size, technological sophistication, nature of operations, geographical location, and ownership structure. In the end, the diversity of the firms included in the final sample varies from country to country due to the constraints faced by the national consultants.

4. Survey results: manufacturing industries

In summarizing and discussing the survey results, we will discuss variation in the firms' response along two dimensions: between countries and industries. Therefore, for each survey question, we will tabulate the mean responses to each option by country and by industry.

The firms' response to the survey reflects their subjective assessment of the issues concerned and may be subject to country and industry- specific considerations. It will also be useful to obtain a sense of whether the patterns emerge from tabulating the country and industry-averages are substantive in the statistical sense. Therefore, in the last step of analysis, we will use a simple regression framework to ascertain the statistical significance of the observed patterns in the survey response while accounting for country and industry-specific factors that may influence the scores the firms assigned to the options of each survey question. The specific statistical framework used to achieve this objective will be made clear when we start discussing the results.

4.1 Sample composition

Data was received from 408 firms in eleven countries. The overall sample size of 408 is smaller than what we anticipated. It reflects the difficulty the national consultants met in soliciting response from the firms. Ten industrial sectors were covered in the survey. Besides the four industries suggested by WIPO, the national consultants included the following industries in their survey: automotive, food manufacturing and processing, information and communications technology, mining, plastics, and wood products. Table 4.1.1 cross-tabulates the distribution of firms in the sample by country and industry. The textiles and garments industry's 141 firms makes it the largest industry represented, accounting for more than one third of the total number of firms. They are followed by pharmaceuticals (97) and agrochemicals (60). We will exclude animal feeds, mining and plastics industries from our analysis below given their small numbers in the sample. By country, India has the largest representation in the sample with 82 firms, followed by Laos with 66 firms. Malaysia, Republic of Korea and Vietnam are all represented by over 40 firms. All of Singapore's eight firms came from the ICT sector.

Table 4.1.2 shows that most of the firms participating in the survey are private firms. Foreign-owned firms are less than one per cent of the sample. State-owned enterprises account for five percent of the sample with the rest coming from joint stock companies. About four percent or 16 of the firms did not report their ownership information.

4.2 Innovation activity and IP ownership of sample firms

The firms in the sample appeared to be active in R&D, but with relatively little innovation output. Tables 4.2.1 and 4.2.2 report information on the R&D activities and IP ownership of the sample firms, by nationality and the industrial affiliation of the firms respectively. The proportion of firms with an independent R&D unit is large. Even countries on the lowest rung of the technology ladder saw a large proportion of their firms having set up an independent R&D unit. For example, nearly 40 percent Lao firms reported having such a unit. Three quarters of Vietnamese firms had a R&D unit. The corresponding share for Indian and Republic of Korea firms was 66 and 90 percent respectively.

The number of R&D personnel and R&D to sales ratio also indicate active innovation activity. Singapore firms reported an unusually high R&D to sales ratio of 56.7%. Three firms, all from the ICT sector, reported R&D to sales ratio of 50, 40 and 80 percent respectively. The average Indian firm employed 178 R&D personnel, twice the R&D workforce of a Republic of Korea firm. The Republic of Korea firms, on the other hand, led in R&D to sales ratio, spending the equivalent of 4 percent of sales on R&D. Brunei and India trailed Republic of Korea with R&D-sales ratios of 3.2 and 1.8 percent respectively. All the others spent a fraction of a percent of sales on R&D. The numbers for IP ownership were low for all but the firms in the Republic of Korea, which reported significant numbers of patents, utility models, trademarks and industrial designs. Indian and Malaysian firms had much smaller numbers of these IPs. The IPs acquired by the firms from the other countries were largely limited to trademarks. The seeming paradox between the active innovation activities and the limited

ownership of IP reported by the sample firms can be explained by a) the innovation undertaken was mostly adaptive in nature and thus did not lead to IP and b) the firms had not fully recognized the value of IP. The firms' response to our survey questions will help us unravel this paradox.

Table 4.2.2 reveals sharp inter-industry differences in IP acquisitions. Automotive and ICT had obtained all types of IPs except geographical indications which is quite understandable. Pharmaceutical firms relied more heavily on patents than other types of IP, whereas automotive firms had acquired a large number of trademarks. Agrochemicals and Textiles and Garments had acquired much less IPs than automotive and ICT. The Food sector virtually sought no form of IP protection.

4.3 The relative importance of domestic and foreign markets for IP protection

The firms were asked to compare the importance of protecting four types of IP – patent, trademark, GI and industrial design – at home with that in foreign markets, the importance being rated on a scale of 1 to 7 with 7 being most important.

Firms in almost all the countries – except Brunei, Singapore and one case for Myanmar – attached greater importance to protecting IP at home than in foreign markets, particularly for larger countries such as Republic of Korea, India, Thailand, and Vietnam, where the home market tends to account for a larger share of a firm's sales. The same pattern – home market assuming greater importance in protecting firms' IP than foreign markets – also applies when we examine it industry by industry. The only exception is the food industry when it comes to protecting trademarks. The pattern was also reversed for the ICT industry for GI, but GI was inconsequential for firms in this industry.

The fact that the home market was more important for protecting the firms' IP is confirmed by the regression results reported in Table 4.3.3. For each type of IP, we pooled the firms' responses to the importance of home and foreign markets and regressed the response score against an indicator variable, Home, and all the country and industry-fixed effects. The home advantage is statistically significant in all four cases, and particularly large for trademark protection.

Table 4.1.1 Distribution of firms by country and sector

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam	Total
Agrochemicals	6	0	20	3	7	1	4	0	0	10	9	60
Animal feeds	0	2	0	0	0	0	0	0	0	0	0	2
Automotive	0	0	20	0	0	0	16	0	0	0	0	36
Food	0	0	0	7	0	0	0	0	0	0	14	21
ICT	6	0	0	1	15	14	0	0	8	0	0	44
Mining	0	0	0	1	0	0	0	0	0	0	0	1
Pharmaceuticals	7	5	20	1	15	7	9	7	0	9	17	97
Plastics	0	0	0	1	0	0	0	0	0	0	0	1
Textiles and garments	6	5	22	3	12	44	17	5	0	14	13	141
Wood	0	0	0	0	0	0	0	5	0	0	0	5
Total	25	12	82	17	49	66	46	17	8	33	53	408

Table 4.1.2 Distribution of firms by ownership

	Number of firms	Percent
Foreign	2	0.5
Joint stock	32	8
Private	338	82.5
state-owned	20	5
Unclassified	16	4
Total	408	100

Table 4.2.1 Key summary statistics: by country

	Brunei	Cambodia	India	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Independent R&D Unit (share)	0.12	0.17	0.66	0.90	0.39	0.59	0.24	0.63	0.58	0.75
R&D personnel	0	1	226	87	2	19	10	13	10	7
R&D/sales ratio (%)	3.2	0.0	1.8	4.0	0.4	0.4	0.1	56.7	0.1	0.1
Patent applications	0.0	0.0	56.1	494.8	0.0	4.3	0.0	0.4	1.6	0.4
Patent grants	0.0	0.0	19.8	455.9	0.0	0.9	0.0	0.0	0.4	0.0
Utility model applications	0.0	0.0	0.0	2.6	0.0	0.3	0.0	0.0	2.8	1.4
Utility model grants	0.0	0.0		1.1	0.0	0.2	0.0	0.0	1.9	0.0
Trademarks (home)	0.1	0.6	38.7	79.5	0.1	51.4	0.8	1.0	14.7	35.0
Trademarks (foreign)	0.0	0.0	5.7	39.8	0.1	31.5	0.2	0.0	1.7	1.3
Geographical Indications (home)	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Geographical Indications (foreign)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.1	0.0
Industrial designs (home)	0.0	0.0	8.8	46.1	0.0	1.7	0.0	0.0	0.1	3.1
Industrial designs (foreign)	0.0	0.0		41.1	0.0	1.4	0.0	0.0	0.1	0.0

Table 4.2.2 Key summary statistics: by sector

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Independent R&D Unit (share)	0.69	0.64	0.48	0.61	0.76	0.35
R&D personnel	28	168	6	73	65	8
R&D/sales ratio (%)	0.26	0.64	0.01	9.71	1.46	0.23
Patent applications	7.9	14.2	0.2	571.6	18.2	11.4
Patent grants	4.2	1.1	0.0	530.5	4.7	9.3
Utility model applications	1.1	0.0	0.0	2.5	0.7	0.7
Utility model grants	0.8	0.0	0.0	0.4	0.4	0.2
Trademarks (home)	50.5	76.7	37.4	34.3	38.3	7.4
Trademarks (foreign)	1.7	79.1	4.1	33.6	3.0	5.8
Geographical Indications (home)	0.0	0.1	0.0	0.0	0.0	0.1
Geographical Indications (foreign)	0.0	0.0	0.0	0.0	0.0	0.0
Industrial designs (home)	0.4	6.3	3.3	55.5	0.9	1.4
Industrial designs (foreign)	0.0	4.1	0.0	51.6	0.0	0.0

Table 4.3.1 The importance of the jurisdiction of IP protection: by country

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Patents (home)	3.8	2.6	4.6	6.0	6.1	5.3	4.7	6.8	4.4	4.9	6.6
Patents (foreign)	4.2	2.4	4.0		5.5	4.2	4.6	6.9	4.4	3.9	6.1
Trademarks (home)	4.0	4.8	5.8	5.1	5.6	5.5	5.3	6.8	4.1	5.2	6.7
Trademarks (foreign)	4.3	3.6	3.6	5.0	4.8	4.7	4.5	6.8	4.0	3.3	6.3
GI (home)	3.7	1.6	5.8	5.0	2.4	3.7	3.4	6.5	1.5	3.6	6.2
GI (foreign)	3.8	1.4	2.2		1.8	3.8	3.2	5.6	1.5	2.4	6.1
Industrial designs (home)	3.7	3.8	4.4	3.5	4.0	4.9	4.2	5.4	1.8	3.7	6.5
Industrial designs (foreign)	4.0	3.1	3.8		3.5	4.3	4.2	4.4	1.8	2.5	6.1

Table 4.3.2 The importance of the jurisdiction of IP protection: by sector

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Patents (home)	5.3	5.2	6.4	5.0	5.6	4.7
Patents (foreign)	4.4	4.6	6.7	4.4	5.2	4.1
Trademarks (home)	5.9	5.3	6.1	4.5	6.1	5.4
Trademarks (foreign)	4.8	4.5	6.3	3.9	5.1	4.4
GI (home)	4.8	3.7	6.5	2.0	4.1	4.7
GI (foreign)	4.1	3.4	6.2	2.0	3.9	3.5
Industrial designs (home)	4.3	4.6	6.8	3.2	5.3	4.7
Industrial designs (foreign)	4.3	4.3	6.3	2.9	4.7	4.2

Table 4.3.3 The importance of the jurisdiction of IP protection: statistical significance

	Patents	Trademark	Geographical indication	Industrial design
Home	0.540***	0.926***	0.594***	0.446**
	(0.159)	(0.149)	(0.179)	(0.197)
Observations	575	656	373	438
R^2	0.265	0.237	0.479	0.249

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
All regressions include country and sector fixed effects.

Table 4.4.1 The relative importance of different types of IP: by country

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Copyright	4.5	4.9	2.9	5.0	3.7	6.6	3.2	2.1	3.7	3.7	6.0
Patent	4.3	4.0	4.4	5.5	6.2	6.2	3.4	6.9	4.8	4.3	6.3
Trademark	4.5	5.3	5.4	5.2	5.5	6.8	5.1	6.9	4.6	5.1	6.6
GI	4.2	3.3	4.3	5.0	2.6	5.0	1.6	6.4	1.7	2.4	5.5
Industrial design	4.2	4.4	3.8	4.0	3.6	6.1	2.4	5.4	2.0	2.8	5.7

Table 4.4.2 The relative importance of different types of IP: by sector

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Copyright	4.4	2.9	6.5	5.0	4.4	4.3
Patent	5.1	4.8	6.2	6.1	6.0	4.4
Trademark	5.7	5.2	6.0	5.6	6.1	5.6
GI	3.6	2.3	6.3	2.8	3.6	4.4
Industrial design	3.6	4.4	6.2	4.1	4.4	4.6

4.4 Relative importance of different types of IP

The relative importance of different types of IP may be dependent on the level of economic development and differences in the nature of technologies of different industries. We asked firms to rate the importance of five kinds of IP: copyright, patent, trademark, GI, and industrial design. Cross-country differences are reported in Table 4.4.1.

Trademarks received the highest importance rating for firms from all countries except Indonesia, Republic of Korea and Singapore where firms considered patents the most important means to protect their IP. In Malaysia and India, trademarks led by a wide margin as the most important type of IP, whereas in Brunei, Cambodia, Laos, Myanmar and Vietnam the difference was not large. GI and copyright are the two types of IP that received lower significance scores. This is expected as these are manufacturing industries where little if any innovation can be protected by GI or copyright.

Importance scores of the IP by industry are reported in Table 4.4.2. Trademark was considered the most important IP by firms from all industries except the ICT and food industries. The ICT firms were from Republic of Korea, Laos and Singapore and patent was regarded as the most important form of protection. In the pharmaceutical industry, patents and trademarks were both highly valued. Again copyright and GI, understandably, received the lowest importance ratings.

Table 4.4.3 Relative importance of IP: statistical significance

Patent	0.837***
	(0.154)
Trademark	1.328***
	(0.146)
Geographical indication	-0.486***
	(0.170)
Industrial design	-0.0668
	(0.165)
Observations	1579
R^2	0.328

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses
The regression includes country and sector fixed effects.
The reference group is “copyright”.

The regression results reported in Table 4.4.3 confirm that trademark was the most important means of IP protection for the firms and produce a clear ranking of the relative importance of the five types of IP: trademark was followed by patent with geographical indication being the third. Copyright and industrial design were considered to be least important among the five. [7]

[7] Our discussion here about the relative importance of the different types of IP is based on pair-wise test of the statistical significance of the differences between them. For the purpose of saving space, these test statistics are not reproduced here, but they are available from the author upon request. This too applies to the rest of the analysis of the report.

4.5 IP and alternative means of protection

As was found in the IP surveys conducted in OECD countries (e.g., Levin et al, 1984), formal IP rights are often not the most effective way to protect proprietary knowledge. Patents for example, require a long application process and public disclosure of the technological content of the innovation. It is also costly to enforce patents after they are granted. In contrast, trade secrecy is cost efficient and highly effective when the underlying innovations cannot be easily reverse engineered. Other non-IP ways of ensuring a high return to an innovation include having the capability of bringing the product to the market place well ahead of competition so that substantial rents can be captured before copycats are introduced, providing superior marketing and after-sale services that enhance the value of the product and being able to reduce the cost of production rapidly as the production is scaled up. All these will give the innovator an edge over her competitors in profiting from her innovation. These non-IP means can be more effective than formal IPs in industries where product life cycle is short and enforcement cumbersome.

The relative importance of these alternative means of IP protection may be dependent on the nature of innovation. For example, under certain circumstances, it may be easier to reverse engineer a product innovation, since the competition will have an opportunity to observe and dissect the product, whereas exposure to a process innovation is limited to those within the confines of the innovator's facility. Thus when we asked the firms to rank the importance of these alternative means of IP protection, we solicited their separate responses for product and process innovations. The results are reported in Tables 4.5.1 – 4.5.6.

The results for product innovation are summarized in Tables 4.5.1 and 4.5.2. The firms in all countries had ranked the non-IP instruments at least as important as the formal IPs, i.e., patents and utility models. The exceptions were Republic of Korea and Singapore, where patents were ranked the highest, and Myanmar, where all six means of IP protection were valued equally high. Examining it industry by industry, the pharmaceutical, ICT and food industries firms ranked patents as the most important means of protecting IP. In the ICT industry, trade secrecy, manufacturing and marketing capabilities were ranked just as important. In textiles and garments, clearly non-IP instruments were valued higher than IP protection.

Table 4.5.1 Alternative means of protecting production innovation: by country

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Invention patent	4.2	3.9	4.2	5.0	5.9	6.0	4.3	6.7	4.8	4.2	5.9
Utility model	4.1	3.9	2.0	5.0	4.2	5.3	3.9	6.5	1.7	4.2	5.4
Trade secret	4.4	3.4	3.3	5.3	4.8	6.4	5.1	6.1	2.4	4.5	6.0
Fast to market	4.2	4.8	5.0	5.4	5.5	6.1	5.0	6.7	4.3	4.6	5.9
Superior services	4.2	4.8	4.8	5.5	5.1	6.4	4.9	6.6	3.7	4.9	6.1
Quickly moving down the learning curve	4.3	4.2	4.9	5.3	5.0	5.8	4.3	6.4	4.2	4.8	5.8

Table 4.5.2 Alternative means of protecting production innovation: by sector

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Invention patent	4.6	4.4	6.4	5.7	5.9	4.6
Utility model	4.4	2.8	5.6	4.0	4.7	4.3
Trade secret	5.0	3.6	6.2	5.4	4.9	5.2
Fast to market	5.5	4.5	5.6	5.5	5.3	5.5
Superior services	5.6	4.0	5.8	5.3	5.3	5.6
Quickly moving down the learning curve	5.2	3.8	5.6	4.9	5.2	5.4

Table 4.5.3 Alternative means of protecting process innovation: by country

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Invention patents	4.1	3.7	4.2	5.0	5.4	5.9	4.3	6.7	4.4	4.4	6.0
Utility models	4.2	3.7	2.5	5.0	4.2	5.3	4.5	6.5	1.6	4.3	5.9
Trade secret	4.3	3.3	3.9	5.3	4.9	6.3	5.2	6.1	1.6	4.5	6.0
Fast to market	4.1	4.4	4.9	5.4	5.2	6.1	5.1	6.6	4.2	4.7	6.1
Superior services	4.2	4.6	4.6	5.6	4.9	6.4	4.9	6.5	3.6	4.9	6.0
Quickly moving down the learning curve	4.2	4.2	4.8	5.5	5.0	5.8	4.3	6.4	3.8	4.9	6.0

Table 4.5.4 Alternative means of protecting process innovation: by sector

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Invention patents	4.9	4.3	6.3	5.6	5.6	4.6
Utility models	4.9	2.9	6.1	4.1	5.0	4.3
Trade secret	4.9	3.8	5.9	5.2	4.9	5.3
Fast to market	5.5	4.4	5.4	5.2	5.5	5.4
Superior services	5.4	4.4	5.6	5.2	5.3	5.5
Quickly moving down the learning curve	5.2	3.6	5.8	4.8	5.3	5.3

Repeating the exercise for process innovation yields similar results, which are reported in Tables 4.5.3 and 4.5.4. One caveat about the low importance score received by utility model is that some of the countries included in the survey did not provide such protection.

Table 4.5.5 Means of protecting product innovation: statistical significance

	Product innovation	Process innovation
Utility model	-0.838***	-0.598***
	(0.137)	(0.134)
Trade secret	-0.144	-0.0327
	(0.133)	(0.133)
Fast to market	0.230*	0.238**
	(0.123)	(0.120)
Superior services	0.231*	0.210*
	(0.122)	(0.122)
Quickly moving down the learning curve	0.0117	0.0785
	(0.127)	(0.126)
Observations	1946	1921
R^2	0.253	0.261

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The regression includes country and sector fixed effects.
The reference group is “patent”.

-The statistical results in the second column of Table 4.5.5 confirm that “fast to market” and “superior services” were considered much more important than IP such as patent, utility model and trade secrecy in protecting product innovation. Utility models were the least effective. Results of the process innovation regression show very similar patterns and magnitudes of the relative importance of the various means of protecting innovation as in the case of product innovation.

4.6 Motivations for obtaining patents and utility models

Firms seek patents for more than the conventional purpose of preventing copying and generating licensing revenue. There has been evidence (Hall and Ziedonis, 2001) that firms acquire patents for strategic gains, such as inhibiting the entry of competition to product and technology areas and enhancing bargaining position in cross-licensing negotiations. Such strategic patenting deviates from the traditional function of patents and results in rent seeking activities that may slow down the innovation process.

While it has caught the attention of policy makers and researchers in the OECD countries, strategic patenting remains relatively under studied in developing countries. Here we distinguish between product and process innovations as the strategic patenting motive can assume different intensity in the two types of innovation given the nature of technological innovation involved. We also distinguish between invention patents and utility models. The latter are not subject to substantive examination

and can be more susceptible to strategic patenting.[8] The results are summarized in Tables 4.6.1 and 4.6.2 for patents and product innovation and Tables 4.6.3 and 4.6.4 for utility models and product innovation. Tables 4.6.5 – 4.6.8 contain results from the same exercise conducted for process innovation.

The firms have been asked to rate the relevance of seven potential motivations for seeking patents and utility models: prevent copying, generate licensing revenue, use in negotiations, prevent infringement suits, measure performance, block entry of competition and enhance reputation.

Brunei is the only country for which none of the explanations were relevant. While the firms from Cambodia in our sample did not own any patents, they seemed to think all seven motivations were somewhat relevant (the importance scores being around 4). This is also the case with India and Malaysia, although for the latter "prevent copying" was ranked as more important than the other explanations. Firms in Indonesia and Myanmar regarded all seven motivations much relevant. For firms in Republic of Korea, "prevent copying", "prevent infringement suits", and "block entry of competition" were more relevant in explaining why they seek patents. Most of the firms regarded as not important the possibility of generating licensing revenue from the patented technology. Therefore the variation largely arises from cross-country differences: countries tended to either recognize the importance of all seven motivations or that of none.

The firms in the pharmaceutical, ICT and food industries generally considered that these seven explanations were more relevant in explaining why they obtained patents as compared to firms from the other industries. Other than that, there is no clear pattern as to how the relative importance of the seven explanations systematically differed across industries.

Comparing utility model and patents for product innovations, the explanations were considered more relevant for patents than for utility models by firms in the ICT industry, as was also the case with the automotive industry. But the latter may be explained by the fact that the automotive firms were all Indian firms and India did not grant utility models. On the other hand, Singapore ICT firms did not consider utility model useful as the country did not provide utility model protection.

[8] For example, firms might take advantage of the registration nature of utility model application and build up a portfolio of utility models that cover a segment of the technology space before the entry of foreign multinationals.

Table 4.6.1 Motivations for applying for patents for product innovation: by country

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Prevent copying	2.0	4.2	4.1	6.0	6.0	6.0	5.5	6.9	4.5	4.7	6.5
Generate licensing revenue	2.0	4.1	3.5	6.0	4.8	5.3	3.6	6.0	3.2	4.3	5.5
For use in negotiations	2.0	4.1	3.5	5.0	4.9	5.5	4.7	5.6	2.2	4.2	5.6
Prevent infringement suits	1.8	4.7	3.6	6.0	5.9	6.3	4.8	6.5	3.8	4.2	6.2
Measure performance	1.9	4.8	3.5	5.0	4.4	5.9	4.0	6.0	1.5	4.1	5.5
Block entry of competition	2.0	4.5	3.7	6.0	5.7	5.4	5.0	5.2	3.8	4.6	6.2
Enhance reputation	2.0	4.9	3.7	6.0	5.3	6.2	4.8	6.0	4.7	4.4	6.3

Table 4.6.2 Motivations for applying for patents for product innovation: by sector

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Prevent copying	5.2	5.2	6.5	5.7	5.7	4.6
Generate licensing revenue	4.0	4.1	5.3	4.8	4.9	4.0
For use in negotiations	3.9	4.5	5.7	5.2	4.9	4.1
Prevent infringement suits	4.9	4.5	5.9	5.7	5.3	4.7
Measure performance	3.9	4.7	5.6	4.6	4.7	4.3
Block entry of competition	4.8	4.7	6.3	5.0	5.4	4.4
Enhance reputation	4.7	4.5	5.8	5.6	5.4	4.7

Table 4.6.3 Motivations for applying for utility models for product innovation: by country

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Prevent copying	1.8	4.5	4.0	6.0	4.7	5.7	4.6	6.6	1.5	4.6	6.3
Generate licensing revenue	1.8	4.4	3.8	6.0	3.9	4.8	3.7	5.8	2.0	4.3	5.6
For use in negotiations	1.6	4.4	3.7	5.0	4.1	5.2	3.3	5.6	1.5	4.4	5.6
Prevent infringement suits	1.6	4.8	3.6	6.0	4.7	5.9	3.1	6.3	1.5	4.1	6.2
Measure performance	1.7	4.9	3.8	5.0	3.9	5.5	3.2	6.0	1.3	3.9	5.6
Block entry of competition	1.7	4.4	3.5	6.0	4.6	5.0	3.6	4.9	1.3	4.4	6.2
Enhance reputation	1.8	4.9	4.0	6.0	4.3	5.8	3.3	5.9	2.0	4.2	6.2

Table 4.6.4 Motivations for applying for utility models for product innovation: by sector

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Prevent copying	5.1	4.5	6.5	4.0	5.0	4.9
Generate licensing revenue	3.8	3.9	5.3	3.9	4.5	4.5
For use in negotiations	3.9	3.5	5.6	4.0	4.6	4.5
Prevent infringement suits	4.7	3.4	6.0	4.1	4.7	5.0
Measure performance	4.1	3.5	5.3	3.7	4.7	4.7
Block entry of competition	4.7	3.5	6.3	3.4	4.8	4.7
Enhance reputation	4.6	3.4	5.7	4.1	5.0	5.0

Table 4.6.5 Motivations for applying for patents for process innovation: by country

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Prevent copying	2.0	3.9	3.8	5.0	5.8	5.9	5.0	6.8	3.2	4.4	6.4
Generate licensing revenue	2.0	4.0	3.3	5.0	4.9	5.2	4.2	5.9	3	4.4	5.6
For use in negotiations	1.8	4.0	3.2	5.0	4.9	5.4	4.2	5.8	2.2	4.4	5.4
Prevent infringement suits	1.9	4.3	3.4	5.0	5.7	6.0	3.9	6.2	3.6	4.4	6.1
Measure performance	1.9	4.4	3.3	5.0	4.5	5.8	3.4	6.2	1.8	4.3	5.4
Block entry of competition	2.0	4.3	3.4	5.0	5.3	5.3	4.1	4.9	3.6	4.4	6.1
Enhance reputation	2.0	4.3	3.4	5.0	4.9	6.0	3.9	5.9	4.2	4.4	6.1

Table 4.6.6 Motivations for applying for patents for process innovation: by sector

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Prevent copying	4.8	4.7	6.5	5.2	5.5	4.6
Generate licensing revenue	3.9	4.0	5.4	4.9	4.9	4.1
For use in negotiations	3.9	4.0	5.5	5.0	4.9	4.0
Prevent infringement suits	4.7	3.7	5.8	5.4	5.2	4.5
Measure performance	4.1	3.7	5.1	4.6	4.9	4.2
Block entry of competition	4.6	3.7	6.2	4.6	5.2	4.3
Enhance reputation	4.6	3.8	5.6	5.1	5.1	4.5

Table 4.6.7 Motivations for applying for utility models for process innovation: by country

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Prevent copying	1.8	3.9	3.4	5.0	4.3	5.5	4.6	6.8	1.5	4.4	6.3
Generate licensing revenue	1.6	4.0	3.4	5.0	3.5	4.7	3.4	5.9	1.75	4.2	5.6
For use in negotiations	1.7	4.0	3.3	5.0	3.7	5.2	3.4	5.6	1.75	4.2	5.5
Prevent infringement suits	1.6	4.3	3.0	5.0	4.3	5.7	3.4	6.4	1.5	4.2	6.0
Measure performance	1.7	4.4	3.3	5.0	3.7	5.6	3.2	6.1	1.25	4.1	5.5
Block entry of competition	1.7	4.3	3.2	5.0	4.2	5.2	3.6	4.9	1.5	4.2	6.0
Enhance reputation	1.7	4.4	3.4	5.0	4.0	5.7	3.4	5.9	1.5	4.1	6.2

Table 4.6.8 Motivations for applying for utility models for process innovation: by sector

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Prevent copying	4.8	4.3	6.5	3.9	4.9	4.8
Generate licensing revenue	3.8	3.1	5.5	3.5	4.5	4.4
For use in negotiations	3.9	2.9	5.5	3.8	4.7	4.4
Prevent infringement suits	4.6	2.9	6.0	3.7	4.7	4.9
Measure performance	4.1	3.0	5.4	3.7	4.7	4.7
Block entry of competition	4.6	3.1	5.9	3.4	4.8	4.6
Enhance reputation	4.5	3.0	5.6	3.8	5.0	4.8

Table 4.6.9 Motivations for obtaining patents and utility models: statistical significance

	Product Patent	Product Utility model	Process Patent	Process Utility model
Generate licensing revenue	-0.799***	-0.579***	-0.561***	-0.567***
	(0.138)	(0.166)	(0.141)	(0.168)
For use in negotiations	-0.704***	-0.513***	-0.580***	-0.458***
	(0.132)	(0.159)	(0.135)	(0.163)
Prevent infringement suits	-0.200	-0.169	-0.195	-0.144
	(0.129)	(0.154)	(0.135)	(0.160)
Measure performance	-0.747***	-0.458***	-0.574***	-0.353**
	(0.131)	(0.155)	(0.133)	(0.159)
Block entry of competition	-0.420***	-0.440***	-0.423***	-0.349**
	(0.135)	(0.159)	(0.140)	(0.164)
Enhance reputation	-0.250*	-0.190	-0.287**	-0.163
	(0.130)	(0.156)	(0.136)	(0.162)
Observations	2169	1743	2078	1703
R^2	0.392	0.363	0.388	0.376

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
All the regressions include country and sector fixed effects.
The reference group is “prevent copying” for all the regressions.

We subjected the patterns of response to statistical tests and reported the results in the second and third columns in Table 4.6.9. The reference explanation is “prevent copying”. Clearly this is the most important explanation why these firms sought patent or utility model protection. Thus the conventional motivation for seeking patents explains these firms’ patenting behavior. The least important motivation was “generate licensing revenue”.

Comparing the above with the results reported in Tables 4.6.5 – 4.6.8 shows no notable difference between the roles these seven explanations play in product and process innovations.

4.7 What encourages or discourages firms from seeking IP?

A multitude of factors could explain the difference in firms’ IP ownership between countries and industries. IP is an indicator of innovation output; a firm needs to be able to innovate in order to acquire the IP that protects the innovation. So innovative capability is clearly a driving force behind the differences in IP ownership. However, not all innovations will be manifested in IP, as our earlier discussion suggests, and the extent to which firms seek IP for their innovations may be influenced by their access to the IP system in their countries. A cumbersome and costly process of obtaining IP will discourage innovators from seeking it.

Weak enforcement of IP certainly diminishes the value of IP and will render it ineffective and unattractive. We identified seven factors that may influence the firms’ decision of whether to seek IP and asked them to rate their relative importance. Some of these relate to the adequacy of the IP infrastructure, e.g., application fees and procedure, inventor’s access to prior art, and the availability of IP attorneys. We also asked firms to rate the importance of the effectiveness of IP enforcement in

their countries. Both the judicial means of enforcement and the administrative means of enforcement were considered. Finally, innovative capability was also included as a determining factor.

We summarize and report the results for patents in Tables 4.7.1 and 4.7.2. With a few exceptions, the firms from different countries generally did not find any factor more important than others. Unlike the firms from Malaysia and Laos who did not consider patent application fees a barrier for them to access their patent systems, Singapore firms listed application fees the most important barrier followed by the ease with which they could search for prior art. The firms from Republic of Korea and Malaysia listed innovation capability as a more important determinant of their effort to acquire patents. Across countries, the firms from Brunei, Cambodia, India, Indonesia, Malaysia and Thailand found these factors to be not so relevant – most of the values hover around 4 – and less important than the firms from Republic of Korea, Laos, Myanmar and Vietnam did.

The finding that these seven factors carry similar importance carries over when the results are reported by industries. However, food industry and pharmaceutical firms tended to regard these factors as more relevant than firms from the other industries. Pharmaceutical firms generally considered R&D capability as a constraint on their effort to seek more patents, whereas food industry firms were put off by potentially weak enforcement of IP, whether by legal or administrative means.

We observe the same cross-country patterns of the relative importance of the factors influencing firms' propensity to seek trademarks and industrial designs as we did with patents. All factors were assigned equal importance; differences largely come from inter-country differences. In the case of industrial designs, there was also less inter-country variation.

The inter-industry patterns in the relative importance of the factors are also similar in the cases of trademarks and industrial designs as with the case of patents. These results are reported in Tables 4.7.3 – 4.7.6.

Table 4.7.1 What would make firms apply for more patents?: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Application and enforcement fees are reduced	3.8	4.1	3.8	3.7	5.2	4.1	3.0	7.0	6.0	4.2	5.8
Administrative procedure of patent application is streamlined	3.8	4.1	3.7	3.7	5.1	4.9	4.1	6.6	4.7	4.2	6.1
Easier to search for prior art	3.8	4.2	3.4	3.7	5.6	5.0	4.1	6.5	5.7	4.0	6.0
More IP attorneys available	3.8	4.0	3.1	3.7	4.6	4.9	3.8	6.6	4.0	3.8	5.2
More expeditious enforcement of court rulings on infringement	3.8	4.3	3.6	3.7	5.1	5.3	4.3	6.6	5.2	4.0	6.0
More effective administrative means to stop infringement	3.8	4.3	3.6	3.7	5.5	5.6	4.6	6.5	5.2	3.9	6.2
Stronger R&D capabilities	3.7	4.2	3.5	3.7	5.7	5.5	5.3	6.7	5.0	3.5	6.1

Table 4.7.2 What would make firms apply for more patents?: inter-sector comparison

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Application and enforcement fees are reduced	4.8	4.0	6.0	5.0	4.9	3.8
Administrative procedure of patent application is streamlined	5.1	4.0	6.1	4.9	5.1	4.1
Easier to search for prior art	4.8	4.0	6.2	5.5	5.0	4.2
More IP attorneys available	4.4	3.8	5.3	4.8	4.7	3.8
More expeditious enforcement of court rulings on infringement	5.0	4.2	6.4	5.3	5.1	4.1
More effective administrative means to stop infringement	4.9	4.6	6.4	5.5	5.2	4.3
Stronger R&D capabilities	5.1	4.5	5.9	5.4	5.5	4.5

Table 4.7.3 What would make firms apply for more trademarks?: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Application and enforcement fees are reduced	3.9	5.2	4.9	3.5	5.0	4.4	2.3	6.8	4.7	4.6	6.0
Administrative procedure of trademark application is streamlined	3.8	5.3	4.6	3.5	4.9	4.9	3.7	6.4	5.0	4.8	6.1
More IP attorneys available	3.8	5.0	3.5	3.4	4.7	5.1	1.7	6.4	3.1	4.3	5.7
More expeditious enforcement of court rulings on infringement	3.7	5.3	4.1	3.4	4.9	5.5	4.4	6.3	4.1	4.5	6.2
More effective administrative means to stop infringement	3.8	5.3	3.9	3.9	5.0	5.7	4.5	6.4	3.6	4.5	6.3

Table 4.7.4 What would make firms apply for more trademarks?: inter-sector comparison

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Application and enforcement fees are reduced	4.7	3.3	5.3	4.8	5.1	4.2
Administrative procedure of trademark application is streamlined	5.0	4.1	5.4	4.9	5.4	4.4
More IP attorneys available	4.4	3.0	5.3	4.7	4.8	3.8
More expeditious enforcement of court rulings on infringement	4.9	4.3	5.3	5.0	5.5	4.5
More effective administrative means to stop infringement	5.0	4.6	5.5	5.0	5.7	4.5

Table 4.7.5 What would make firms apply for more industrial designs?: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Industrial designs application and enforcement costs (including attorney fees) are reduced	3.9	4.6	4.0	3.0	4.3	4.3	3.6	6.9	4.0	3.8	5.8
The administrative procedure of applying for industrial designs is streamlined and made more efficient	3.8	4.5	3.9	3.3	4.4	4.8	3.7	6.6	4.2	4.0	5.9
More IP attorneys are available	3.9	4.1	3.5	3.0	4.0	5.0	3.3	6.5	3.8	3.6	5.3
More expeditious enforcement of court rulings on infringement	3.8	4.6	3.8	3.0	4.2	5.2	3.6	6.5	4.0	4.0	6.0
More effective administrative means to stop infringement	3.8	4.6	3.7	4.0	4.5	5.4	3.8	6.5	4.0	4.0	5.8

Table 4.7.6 What would make firms apply for more industrial designs?: inter-sector comparison

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Industrial designs application and enforcement costs (including attorney fees) are reduced	4.2	4.2	6.4	4.4	5.1	4.1
The administrative procedure of applying for industrial designs is streamlined and made more efficient	4.3	4.3	6.3	4.4	5.3	4.3
More IP attorneys are available	4.0	4.0	5.6	4.3	4.8	4.2
More expeditious enforcement of court rulings on infringement	4.5	4.1	6.7	4.4	5.3	4.4
More effective administrative means to stop infringement	4.4	4.0	6.4	4.5	5.4	4.6

While not many clear patterns emerged from the descriptive analysis, the regression results reported in Table 4.7.7 clear up some of the ambiguities.[9] After the country and industry-specific confounding factors were accounted for, the most important determinants of patenting were the firms' R&D capabilities and more effective administrative means to stop infringement. The effectiveness of legal protection and the ease with which searches for prior art could be taken were given less importance than the previous two concerns. However, they were considered more important than application fees, procedures and the availability of IP attorneys.

In the case of trademark, understandably IP attorneys were considered least important as it is just a registration system. But enforcement means, legal and administrative, were considered to be more important. For industrial designs, the administrative means to stop infringement was considered to be somewhat important.

Table 4.7.7 What would make firms apply for more IP?: statistical significance

	Patent	Trademark	Industrial design
Application procedure streamlined and made more efficient	0.194	0.230*	0.164
	(0.130)	(0.128)	(0.154)
More IP attorneys are available	-0.155	-0.297**	-0.0932
	(0.133)	(0.129)	(0.154)
More expeditious enforcement of court rulings on infringement	0.265**	0.291**	0.220
	(0.129)	(0.132)	(0.153)
More effective administrative means to stop infringement	0.405***	0.373***	0.286*
	(0.128)	(0.132)	(0.155)
Easier to search for prior art	0.232*		
	(0.130)		
Stronger R&D capabilities	0.472***		
	(0.130)		
Observations	2258	1765	1364
R^2	0.305	0.268	0.240

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
All the regressions include country and sector fixed effects.
The reference group is "applications and enforcement costs are reduced" for all the regressions.

4.8 Innovation and IP

In the welfare calculus of the consequence of TRIPS, a least understood issue is the extent to which stronger IP may incentivise developing country firms to innovate as the return to innovation is higher. This hypothesis is premised on developing country firms having the capability to innovate, which many of them lack, and that stronger IP may induce greater technology transfer from the developed to developing countries. We first asked firms to assess what obstacles they faced in technological

[9] The discussion here is based on pair-wise tests of the coefficient estimates the results of which are not reported here but are available upon request.

innovation. Besides IP infringement, we also listed shortage of R&D manpower and imitation as other potential challenges. The results are reported in Tables 4.8.1 and 4.8.2.

For firms from most countries, R&D manpower shortage, rather than IP infringement, was the most important factor impeding technological innovation. This is particularly relevant in the cases of Republic of Korea, Malaysia, Thailand and Vietnam. Firms in India, Laos and Myanmar listed "imitation more profitable" as the most important reason for not innovating. Given the technology gap between developing country firms and their developed country counterparts, it is not surprising that firms from these countries considered imitation to be a more profitable mode of technological change.

Examining inter-industry variation, we find that firms from the agrochemical, automotive, ICT and pharmaceutical industries considered R&D manpower shortage a more critical constraint on their technological innovation than IP infringement and the option of imitation.

Accounting for country and industry-specific factors, the regression results reported in Table 4.8.3 confirm that R&D manpower was the biggest constraint on the firms' innovation efforts.

An important channel of technological change in developing countries is technology diffusion. Instead of reinventing the wheel, firms in these countries naturally find it sensible to adopt existing technologies that have been developed by firms in developed countries. We asked the firms to rate the importance of a number of channels of technology diffusion. These included technology licensing, new capital equipment, R&D personnel turnover and reverse engineering. Through this exercise, we were expecting to assess how IP may affect the rate and direction of technology diffusion. The results are summarized in Tables 4.8.4 and 4.8.5.

In less technologically developed countries, such as Cambodia, Indonesia, Laos, Myanmar and Vietnam, new capital equipment tended to be the most important source of new technology for firms. In more developed countries where there was ongoing technological innovation activity, technology diffusion from other domestic firms became more important. Indian firms considered hiring R&D personnel from other domestic firms to be a more important source of technology than others, as did Singapore firms, whereas domestic licensing was rated most important for Korean firms. For Malaysian firms, both new capital equipment and reverse engineering received higher ratings. There is little evidence of any systemic inter-industry pattern, although new capital equipment continued to be a more important source of technology diffusion for all industries.

Table 4.8.1 Obstacles to innovation: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Lack of R&D manpower	2.4	4.7	3.1	4.0	5.0	5.1	4.7	4.3	5.0	4.6	5.9
IP infringement	1.8	4.6	3.9	3.2	3.6	5.1	4.0	5.1	3.1	3.7	5.5
Imitation more profitable	2.0	3.6	4.4	4.0	4.1	5.2	2.8	6.1	3.3	4.0	4.9

Table 4.8.2 Obstacles to innovation: cross-country comparison

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Lack of R&D manpower	4.8	4.3	5.1	5.4	4.7	3.9
IP infringement	4.1	4.1	5.1	4.5	4.0	4.1
Imitation more profitable	4.2	3.4	4.5	4.7	4.3	4.0

Table 4.8.3 Obstacles to innovation: statistical significance

IP infringement	-0.312**
	(0.137)
Imitation more profitable	-0.313**
	(0.138)
Observations	1156
R^2	0.205

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The regression includes country and sector fixed effects.
The reference group is “lack of R&D manpower”.

Table 4.8.4 Channels of technology diffusion: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Domestic licensing	1.4	3.7	3.0	2.5	4.0	5.3	1.9	5.5	1.3	4.5	4.4
Foreign licensing	2.2	5.3	3.0	2.9	3.6	5.5	3.9	5.8	2.1	4.3	4.8
New capital equipment	2.4	5.8	3.2	4.6	3.5	5.8	5.6	6.5	2.6	4.4	5.7
Hiring R&D manpower from other domestic firms	2.1	5.3	3.7	4.1	3.7	5.3	4.8	5.1	3.7	3.5	4.8
Hiring R&D manpower from foreign multinationals	2.1	5.5	3.3	3.1	2.6	4.5	3.3	3.9	3.6	3.0	5.3
Reverse engineering	1.8	4.3	3.0	3.1	2.9	5.4	6.0	5.0	3.1	3.2	5.0

Table 4.8.5 Channels of technology diffusion: inter-sector comparison

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Domestic licensing	3.6	3.1	3.1	4.6	3.9	3.3
Foreign licensing	3.7	5.0	3.6	4.6	4.5	3.6
New capital equipment	4.7	5.5	5.4	4.6	4.6	4.4
Hiring R&D manpower from other domestic firms	3.7	5.5	5.3	5.1	4.3	3.8
Hiring R&D manpower from foreign multinationals	3.1	4.3	4.8	3.6	3.8	3.3
Reverse engineering	3.6	4.8	4.2	3.9	4.2	4.1

One notable feature of these results is that foreign licensing and personnel turnover generally were considered not very important, whereas new capital equipment, which is likely to come mostly from developed countries, particularly for the less developed countries, tended to consistently receive high ratings. This might reflect the difficulty of developed country firms in appropriating returns to their technologies in the arms-length market and through FDI. Instead capital goods become a more effective appropriating mechanism. This could be due to either weak IP environment in the less developed countries or weak capability in absorbing and adapting technologies acquired through licensing from developed country firms.

Table 4.8.6 Channels of technology diffusion: statistical significance

Foreign licensing	0.422**
	(0.186)
New capital equipment	0.987***
	(0.180)
Hiring R&D manpower from other domestic firms	0.610***
	(0.181)
Hiring R&D manpower from foreign multinationals	-0.00759
	(0.187)
Reverse engineering	0.455**
	(0.185)
Observations	2171
R^2	0.249

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The regression includes country and sector fixed effects.
The reference group is “domestic licensing”.

Regression results reported in Table 4.8.6 reaffirm that new capital equipment was by far the most important source of technology diffusion, whereas domestic licensing and R&D personnel turnover from foreign multinational corporations were considered the least important.

Being able to penetrate into the export market is usually a sign of success for developing country firms since the export market is mostly in developed countries where quality requirements are more stringent than those in domestic markets. We asked the firms to assess the role IP played in their success, or the lack of it, in penetrating into the export market. IP could impede a firm’s entry into the export market when its products are a result of IP infringement, or when weak IP protection at home denies it access to the necessary capital equipment and technologies in order to export. Besides IP, the firms were also asked to consider other export barriers such as tariff and non-tariff barriers, product quality, information about the export market, and cost competitiveness. The results are summarized and reported in Tables 4.8.7 and 4.8.8.

Table 4.8.7 Barriers to penetration into export market: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Tariff barriers	2.2	3.6	4.7	2.6	4.8	4.3	4.1	2.5	3.0	3.7	5.4
Non-tariff barriers	2.0	3.8	4.5	3.0	4.1	4.2	4.9	2.8	2.7	3.5	5.3
Low product quality	2.2	4.7	2.8	3.1	5.4	5.5	3.4	5.7	2.0	3.4	5.4
Lack of information about export market	2.1	3.9	3.0	4.6	4.9	4.5	4.6	6.6	2.6	3.6	5.8
Lack of capital equipment and technology due to weak IP at home	2.1	3.8	2.8	2.6	4.8	4.5	3.1		2.2	3.6	5.5
Potential IP infringement	1.9	2.6	3.4	2.3	4.3	3.5	2.2	6.1	1.7	2.9	3.6
Production costs too high	2.1	4.4	3.3	4.1	4.1	4.8	5.9	5.0	4.3	3.7	5.2

Table 4.8.8 Barriers to penetration into export market: inter-sector comparison

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Tariff barriers	3.9	4.7	4.7	3.8	3.9	4.4
Non-tariff barriers	4.1	4.7	5.1	3.7	4.1	4.0
Low product quality	4.0	3.6	4.8	3.9	4.5	4.1
Lack of information about export market	4.4	3.9	5.1	4.2	4.6	4.0
Lack of capital equipment and technology due to weak IP at home	3.9	4.1	4.8	4.3	3.6	3.6
Potential IP infringement	2.7	2.3	2.9	4.0	3.3	3.3
Production costs too high	4.0	4.4	4.7	4.3	4.2	4.5

IP was generally not considered an important obstacle for the firms to export. Instead trade barriers (India), weak manufacturing capability – low quality and high cost – (Cambodia, Laos, Malaysia, and Republic of Korea), and poor knowledge of the export market (Myanmar and Vietnam) were more debilitating for these firms in accessing the export market. This is not surprising as the comparative advantage of most of these countries is in labor-intensive, low-tech manufacturing. We observe similar patterns across industries. The result that IP was not an important obstacle for the firms to export is confirmed in Table 4.8.9, where we report the regression results.

Table 4.8.9 Barriers to penetration into export market: statistical significance

Non-tariff barriers	-0.0347
	(0.163)
Low product quality	0.0773
	(0.235)
Lack of information about export market	0.166
	(0.156)
Lack of capital equipment and technology due to weak IP at home	-0.255
	(0.162)
Potential IP infringement	-0.832***
	(0.161)
Production costs too high	0.247
	(0.158)
Observations	2426
R^2	0.125

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The regression includes country and sector fixed effects.
The reference group is “tariff barrier”.

4.9 Innovation and growth

One of the objectives of the survey was to investigate whether successful management of IP leads to economic growth and employment. While it is difficult to obtain an answer to the question through the survey, we asked firms to conjecture as to what would happen in the case of a successful innovation. We were interested in finding out whether greater profitability through innovation leads to more investment, employment and/or R&D expenditure. Successful IP protection and management affects growth and employment through technological innovation, which, a priori, might not lead to significant job growth if the innovation is labor-saving rather than labor-using. That is, if the technological innovation is such that it aims to save on labor cost, it might result in a disproportionate increase in the investment in capital equipment and human capital rather than labor force. The firms’ responses are summarized and reported in Tables 4.9.1 and 4.9.2.

Table 4.9.1 Consequence of profitable innovation: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Buy new capital equipment	2.2	4.9	5.1	4.4	5.0	5.1	6.4	6.1	5.0	5.0	6.0
Hire more skilled workers	2.0	5.2	4.8	4.1	5.3	5.6	5.6	6.4	5.7	5.1	6.0
Hire more unskilled workers	1.9	2.8	2.9	4.0	3.0	2.8	4.2	1.3	1.9	2.8	3.8
Increase R&D expenditure	1.9	5.0	4.1	3.6	5.6	5.1	4.8	6.7	6.3	4.8	5.9

Table 4.9.2 Consequence of profitable innovation: inter-sector comparison

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
Buy new capital equipment	5.1	5.6	5.5	5.0	5.1	5.0
Hire more skilled workers	4.9	5.6	5.6	5.5	5.1	4.9
Hire more unskilled workers	2.9	2.3	4.1	2.5	2.6	3.5
Increase R&D expenditure	4.9	5.3	5.1	5.5	5.4	4.1

The most robust pattern that emerges from the tables is that in all countries and industries, following a profitable innovation, firms were least likely to hire more unskilled workers. Instead, the firms tended to buy more capital equipment, hire greater number of skilled workers and increase R&D expenditure. The regression results reported in Table 4.9.3 show that this result is not due to country or industry-specific factors.

Table 4.9.3 Consequences of profitable innovation: statistical significance

Hire more skilled workers	-0.0110
	(0.120)
Hire more unskilled workers	-2.103***
	(0.134)
Increase R&D expenditure	-0.308**
	(0.124)
Observations	1471
R^2	0.325

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
The regression includes country and sector fixed effects.
The reference group is “buy new capital equipment”.

This poses a potential challenge to the developing countries. To the extent that there remains a large unskilled labor force to be absorbed in the modern sectors of the economy, encouraging technological innovation will not necessarily generate the jobs needed. The solution lies in more investment in education to raise the skill level of unemployed workers.

4.10 IP dispute and resolution

We asked the firms to report on whether they had been involved in IP-related disputes and if so how they had been resolved. This should provide us with a sense of the legal and institutional environment in which companies in ASEAN countries managed their IP. Such disputes are resolved not just through the legal system, but also through private negotiations and administrative procedures. The latter two can be much less costly for the parties involved. The firms’ responses to our queries are summarized and reported in Table 4.10.1.

A total of 79 firms, or about 20 percent of the total, reported to have been involved in IP disputes. India, Republic of Korea and Vietnam together accounted for 70 percent of these firms. Of the IP cases, 86 involved the firms as defendants, whereas in 94 cases, they were plaintiffs. About 60 percent of the cases involved domestic counterparties. Most of the cases were related to patents (78) and trademarks (64). Surprisingly the most common means of resolving IP disputes among the firms was court trial, accounting for 43 percent of all the cases. The other means of IP dispute resolution were equally popular.

Table 4.10.1 IP disputes and resolution

	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Singapore	Thailand	Vietnam	Total
Number of firms	2	18	6	17	1	8	1	6	20	79
Number of cases										
Defendant	1	10	1	49	1	3		1	20	86
Plaintiff	3	44	5	22	0	4		1	15	94
By counter-party										
Domestic	2	30	4	34	2	2	1	2	21	98
Foreign	0	18	2	31	0	6	1	0	10	68
By types of IP										
Copyrights	1	11	0	8	1	2		1	2	26
Patents	1	26	0	47	0	1	2	1	0	78
Trademarks	1	15	6	16	1	5		1	19	64
Industrial designs	1	1	0	0	1	1		0	9	13
GIs	0	0	0	0	1	0		0	0	1
By resolution means										
In court	0	14	2	43	0	2		1	4	66
Settlement outside court	2	14	3	2	1	2	2	0	6	32
Private negotiations	0	16	0	7	1	1		1	10	36
Others	0	2	1	13	0	1		0	4	21

4.11 Impact of change in IP regime

A question that is at the heart of the debate regarding the implication of implementing TRIPS for developing countries is how firms in both developed and developing countries would react to changes in IP regime. Would it raise the barrier to technology diffusion for developing country firms? Would it encourage more trade and FDI in developing countries and thus more competition for local firms? Would it incentivise the developing country firms to undertake more innovation given the higher return to innovation? We asked the firms whether they were aware of any major change in the IP regime in their countries. If yes, they were asked to report on the consequences of such changes, for them; if not, they were asked to conjecture on what would be the likely outcomes if the IP regime changes had taken place. The results are summarized and reported in Tables 4.11.1 and 4.11.2.

Firms' responses varied significantly across countries. Firms in Republic of Korea and Malaysia both reported "more competition from foreign multinational corporations" as the most important/likely outcome, as did firms from Cambodia and Laos, although for the latter two, the firms also saw higher profits due to less IP infringement and change in business to avoid IP infringement. Malaysia, Myanmar and Vietnam had their firms reporting higher R&D expenditures as a consequence of IP regime change. In India and Brunei, firms uniformly thought that the IP regime change would be inconsequential.

Tabulating the results by industry, it is more difficult to find any clear pattern in the responses. Firms in three of the six industries regarded IP regime change as having no impact, but at the same time assigned equal importance to outcomes such as more foreign competition, higher profits, higher R&D expenditure and higher costs of technology acquisition. The ICT and pharmaceutical industries generally considered more foreign competition to be a major impact of IP regime change.

Table 4.11.1 Consequences of IP regime change: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
No impact	1.8	4.4	4.8	4.1	3.3	3.5	2.9	2.1	2.0	3.0	5.5
Profits have gone up due to less IP infringement	1.3	5.3	2.3	3.2	2.9	4.7	3.0	5.0	1.8	2.9	5.8
Higher cost to access proprietary technology	1.4	5.0	2.5	3.2	3.3	5.0	3.0	6.2	2.5	3.0	5.4
More limited access to technology as it is no longer possible to imitate	1.3	4.3	2.2	3.1	3.7	4.8	2.6	6.0	2.3	3.1	5.2
R&D expenditures have gone up	1.4	4.6	2.6	2.9	3.9	4.9	4.1	6.4	3.2	3.4	5.8
Moved to new product areas to avoid IP infringement	1.3	4.8	2.6	2.5	3.8	5.3	3.1	4.6	2.3	3.1	5.2
More competition from foreign multinational corporations	1.4	5.3	2.5	4.1	4.4	5.4	4.4	4.6	3.7	4.2	5.7

Table 4.11.2 Consequences of IP regime change: inter-sector comparison

	Agrochemicals	Automotive	Food	ICT	Pharmaceuticals	Textiles and garments
No impact	3.4	4.1	4.9	3.3	3.6	3.7
Profits have gone up due to less IP infringement	3.4	2.5	5.1	3.1	3.6	3.5
Higher cost to access proprietary technology	3.5	2.2	4.5	3.5	4.0	3.5
More limited access to technology as it is no longer possible to imitate	3.6	2.0	4.6	3.4	3.7	3.5
R&D expenditures have gone up	4.0	2.8	4.8	4.1	4.4	3.6
Moved to new product areas to avoid IP infringement	3.6	2.1	4.3	3.8	4.1	3.5
More competition from foreign multinational corporations	4.0	4.1	5.1	4.4	4.5	3.8

Table 4.11.3 Consequences of IP regime change: statistical significance

Profits have gone up due to less IP infringement	-0.104
	(0.164)
Higher cost to access proprietary technology	0.0658
	(0.164)
More limited access to technology as it is no longer possible to imitate	-0.0534
	(0.165)
R&D expenditures have gone up	0.316*
	(0.165)
Moved to new product areas to avoid IP infringement	0.0378
	(0.166)
More competition from foreign multinational corporations	0.547***
	(0.172)
Observations	2010
R^2	0.336

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The regression includes country and sector fixed effects.
The reference group is “no impact”.

The regression results reported in Table 4.11.3 clarify the patterns of response and indicate more foreign competition as the most likely consequence of change in IP regime. There is also a marginally significant effect of increasing R&D expenditures.

5. Survey results: Creative industries

The questionnaire for the creative industries is much shorter and consists of five questions. The country distribution of these firms is tabulated in Table 5.1 and is more skewed than that for the industry sample. Indonesia and Laos account for nearly 60 percent of the sample.

Table 5.1 Country distribution of creative industries firms

Country	Number of firms	Share (%)
Brunei	10	5.9
Cambodia	5	2.9
India	17	9.9
Indonesia	53	31.0
Republic of Korea	10	5.9
Laos	32	18.7
Malaysia	9	5.3
Myanmar	3	1.8
Singapore	6	3.5
Thailand	19	11.1
Vietnam	7	4.1
Total	171	100

Table 5.2 Major challenges faced by creative industries firms: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Foreign competition	3.1	3.4	4.0	2.7	4.2	4.0	6.7	1.0	4.3	4.4	5.6
Domestic competition	4.1	4.4	3.4	5.5	6.1	4.6	6.9	6.7	4.0	5.5	6.1
Traditional piracy	2.5	5.8	3.4	6.1	5.5	4.6	7.0	1.3	4.0	6.2	6.1
Internet piracy	3.5	2.4	3.5	3.7	6.5	3.0	5.0		4.8	5.9	
Small domestic market	4.2	4.0	2.8	4.0	5.8	5.6	7.0	6.3	4.7	5.2	5.0
Lack of domestic artistic talent	4.1	5.6	2.5	4.7	3.7	4.8	5.1	1.3	4.3	5.3	4.0
High costs of marketing and distribution	4.3	5.0	2.7	5.5	4.4	5.1	6.6	1.3	4.8	5.8	5.0
Cost of licensing foreign materials	4.0	4.4	3.5	2.6	3.9	3.2	4.8	1.3	3.8	5.5	5.4
Censorship	5.5	1.4	2.8	2.9	3.5	4.0	4.0	1.3	4.2	5.3	4.1
Language barrier to foreign market	3.1	1.8	2.6	2.6	3.5	4.2	6.9	7.0	2.7	5.3	4.0
Tariff barrier to foreign market	3.2	2.4	2.7	2.6	3.2	2.7	5.2	1.0	3.3	4.6	5.8
Plagiarism	3.8	4.4	3.4	4.5	3.3	4.0	4.3	1.3	4.7	5.7	5.4
Lack of government or industry royalty standard	4.5	4.2	3.6	2.6	4.6	3.2	2.3	3.3	2.8	4.5	3.7

We identified 13 challenges firms in the creative industries may face and asked the firms to evaluate the importance of these challenges, which include market competition, piracy, market size, artistic talent supply, access to foreign market, etc. The results are summarized and reported in Table 5.2.

While the relative importance of the challenges varied by country, some of the often-cited ones – those receiving highest scores – included traditional piracy, domestic competition, small domestic market, and language barriers in accessing foreign markets. An interesting contrast is that between Indonesia, Thailand and Republic of Korea: Indonesian and Thai firms were most worried about traditional piracy, but Republic of Korea firms saw threat coming from internet piracy. Perhaps, this had to do with the high internet penetration rate of Republic of Korea. Another observation is that these firms were creating IP rather than using IP generated by others, since they were worried about their works being pirated, competition from other domestic competitors, and the small size of the domestic market.

Table 5.3 Major challenges faced by creative industries firms: statistical significance

Domestic competition	1.359***
	(0.186)
Traditional piracy	1.451***
	(0.198)
Internet piracy	0.284
	(0.216)
Small domestic market	0.924***
	(0.180)
Lack of domestic artistic talent	0.659***
	(0.190)
High costs of marketing and distribution	1.200***
	(0.177)
Cost of licensing foreign materials	-0.178
	(0.191)
Censorship	-0.106
	(0.194)
Language barrier to foreign market	-0.138
	(0.190)
Tariff barrier to foreign market	-0.590***
	(0.184)
Plagiarism	0.532***
	(0.204)
Lack of government or industry royalty standard	-0.397**
	(0.195)
Observations	2194
R^2	0.226

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The regression includes country fixed effects.
The reference group is “foreign competition”.

Table 5.4 What would make the firms seek more trademarks?: cross-country comparison

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Singapore	Thailand	Vietnam
Application and enforcement fees are reduced	5.2	4.6	4.1	5.1	4.3	4.9	1.2	4.2	5.2	6.4
Administrative procedure of trademark application streamlined	5.2	5.2	3.8	5.0	4.6	5.0	4.3	5.0	4.9	6.6
More IP attorneys available	4.8	4.6	2.9	4.6	4.0	5.2	1.1	4.2	4.9	5.3
More expeditious enforcement of court rulings on infringement	5.3	4.6	3.6	4.8	4.8	5.4	6.3	5.0	5.1	5.6
More effective administrative means to stop infringement	5.4	4.6	3.4	4.9	5.6	5.6	6.9	4.8	5.2	6.0

When we subjected these observations to statistical test in Table 5.3, some of them were clearly borne out by the estimates. Traditional piracy, domestic competitive pressure and costs of marketing and distribution were the three most pressing concerns for these firms, whereas access to foreign markets was not considered important, probably due to the fact that these firms mainly catered to the domestic market.

Since trademarks are the type of IP that creative industry firms have to register to obtain – whereas copyrights are automatically protected – we asked firms to evaluate factors that might encourage or discourage them to acquire more trademarks. The results are summarized and reported in Table 5.4. The policy intervention that would be most welcomed by the firms in Republic of Korea, Laos and Malaysia, as far as encouraging them to seek more trademarks is concerned, was "more effective means to stop infringement". For Indian and Indonesian firms, firms were concerned about fees associated with applying for trademarks. Based on the firms' feedback, administrative procedure for applying for trademarks in Cambodia and Vietnam could be streamlined. Thai firms welcomed all potential changes, with application fees for trademarks and enforcement of trademark law slightly more important than the others.

Table 5.5 What would make the firms seek more trademarks?: statistical significance

Administrative procedure of trademark application streamlined	0.145
	(0.184)
More IP attorneys available	-0.331*
	(0.189)
More expeditious enforcement of court rulings on infringement	0.252
	(0.190)
More effective administrative means to stop infringement	0.391**
	(0.187)
Observations	828
R^2	0.115

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The regression includes country fixed effects.
The reference group is "application and enforcement fees are reduced".

The regression results reported in Table 5.5 confirm that more effective administrative means to stop infringement would be most important in encouraging the firms to acquire more trademarks. More IP attorneys was the last thing on the minds of the firms' managers when it came to obtaining more trademarks, although this effect was only marginally significant in the statistical sense.

Finally, as in the case of the industrial sector survey, we asked the firms to assess the impact of actual changes that strengthen copyrights or hypothetical changes of such kind. We gave seven potential outcomes for the firms to assess. These relate to the price of copyrighted materials, the output and performance of the firms, employment generation, investment and artists' compensation. Stronger copyrights give the rights holders stronger market power. This is expected to give rise to

higher price of copyrighted materials, higher profits of the firms, but an ambiguous effect on the output of creative output as the firms now earn a higher profit margin for each unit of product and may therefore see less need to create new artistic works. Labor force employed in these industries may not necessarily go up, as those previously engaged in activities that are now prohibited under the stronger copyrights will lose their jobs.

The firms' responses are summarized in Table 5.6 and they varied significantly across countries. Indonesian and Malaysian firms thought all outcomes were relevant, but Indian firms thought all were only marginally relevant. Malaysian firms agreed that copyrighted materials had become more expensive as a result of stronger copyright protection and their profits had gone up. The firms in Cambodia and Republic of Korea indicated that artists' compensation had increased. The employment generation effect was only reported to be more significant than others by Indonesian firms. Thai and Cambodian firms reported the most positive outcome of changes in copyright regime: higher output, higher profits, more investment in artistic development and higher compensation for the artists.

Controlling for the country-specific factors with the regression, we found in Table 5.7 that the most significant effects of reforming the copyright regime were higher output, more investment and higher compensation for the artists. There was no statistically significant difference between these three effects. This seems to suggest that the creative industries firms had perceived more positive effects of IP regime change than the manufacturing industries firms.

Table 5.6 Changes in copyright system and their impact

	Brunei	Cambodia	India	Indonesia	Republic of Korea	Laos	Malaysia	Myanmar	Singapore	Thailand	Vietnam
Foreign copyright-protected materials have become more expensive.	3.2	5.6	4.0	5.3	4.4	4.8	6.8	1.0	3.8	4.6	6.6
Domestic copyright-protected materials have become more expensive.	3.2	5.2	3.9	5.5	4.6	4.8	6.9	1.0	4.8	4.6	6.1
We have produced more music/books/movies.	3.7	5.4	3.9	5.7	4.3	5.4	6.6	2.0	5.8	5.8	5.7
Profits of our company have gone up.	3.2	6.6	3.5	5.7	4.0	5.0	6.9	1.0	4.8	5.4	6.1
Employment at our company has increased.	3.1	6.0	3.8	5.7	3.6	5.0	6.7	1.5	4.3	5.6	5.0
More investment to identify and develop new artistic talents.	4.0	6.6	3.7	5.7	4.1	5.4	6.6	1.5	4.5	5.8	5.1
Our artists/authors' compensation has gone up.	4.7	6.6	3.9	5.7	4.6	5.3	6.8	1.5	6.3	5.3	5.3

Table 5.7 Changes in copyright system and their impact: statistical significance

Domestic copyright-protected materials have become more expensive.	0.0536
	(0.156)
We have produced more music/books/movies.	0.381**
	(0.158)
Profits of our company have gone up.	0.190
	(0.155)
Employment at our company has increased.	0.125
	(0.157)
More investment to identify and develop new artistic talents.	0.315**
	(0.157)
Our artists/authors' compensation has gone up.	0.408***
	(0.155)
Observations	1186
R^2	0.307

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The regression includes country fixed effects.
The reference group is "foreign copyrighted materials have become more expensive".

6. Concluding remarks and policy implications

We set out to conduct the first firm-level survey of how firms in ASEAN, India and Republic of Korea interacted with their countries' IP regime. The results we have obtained and discussed provide a valuable window through which we can better understand a wide range of issues related to whether and why these firms seek IP, how IP affects their performance and how their countries' IP regimes regulate their incentives to innovate. A few insights emerge from our analysis and discussion.

First, a theme that resonates through out our discussion is heterogeneity. There is significant heterogeneity in how firms behave in the above areas across countries and industries. Such differences could have been caused by a multitude of social, economic, technological and institutional forces. This is also a key insight from similar surveys conducted in OECD countries (e.g., Levin et al 1987). In our survey of the creative industries firms, for example, Indonesian and Thai firms found traditional piracy threatening, whereas Korean firms worried more about internet piracy. A takeaway for policy makers is that policies related to IP are likely to generate different outcomes depending on the economic and technological contexts in which they are applied. In this connection, one needs to be careful in drawing inference from assessing the outcomes of policy changes.

Second, in sharp contrast with their OECD counterparts and with the exception of firms from Republic of Korea, the majority of the firms participating in our survey owned very little IP. Our results suggest that this is related to both these firms' weak innovation capability and an IP regime that could be changed to provide more effective IP enforcement. The finding that trademarks were regarded as the most important type of IP validates the observation of these firms' weak innovation capability. Perhaps as a result of this, the issue of strategic patenting did not come through as an important issue. And the firms generally reacted in a lukewarm way to the question of whether changes to their respective IP regime might enhance their incentive to innovate. On the other hand, like their developed country counterparts, the firms in our survey did not regard formal IP as the most effective

means to protect their IP. But there might be less similarity here if we consider the limited capability of these firms to create IP in the first place. From the policy perspective, this raises the question of the effectiveness of stronger IP in inducing greater innovation in these developing countries.

To the extent that innovation does take place in these firms, an interesting finding of the survey is that firms tended to hire more skilled workers and to purchase more capital equipment as a consequence of an innovation. In other words, technical change in these countries, if our survey subjects are representative of the underlying population, is skill and capital-biased. With their large endowments of unskilled or semi-skilled labor force, developing countries will need to find creative ways to capitalize on this type of technical change. One natural policy option is to invest in mass education and raise the level of skills.

The inferences drawn are by no means conclusive. Due to the difficulty in obtaining response from potential survey subjects, a perennial difficulty with this type of survey, we had to settle for a sample that was smaller than anticipated. Some of the patterns of response were perhaps influenced by the typical characteristics of the specific industries that we chose to examine. Nevertheless, despite its limitations, the survey had generated some interesting insights; some of them confirmed our priors; some of them challenged our priors. We hope this project will stimulate more interest on this immensely important issue in economic development.

References

Chen, Yongmin and Thitima Puttitanun. “Intellectual property rights and innovation in developing countries.” *Journal of Development Economics*. 78:474-93, 2005.

Cohen, Wesley M., Richard R. Nelson, and John P. Walsh. “Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not).” *NBER Working Paper* No. 7552. 2000.

Ginarte, J.C. and Park, W.G. “Determinants of patent rights: a cross-national study.” *Research Policy*. 26: 283-301, 1997.

Hall, Bronwyn H. and Ziedonis, Rosemarie Ham. “The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995.” *Rand Journal of Economics*. 32(1): 101-128, Spring 2001.

Levin, Richard C., Alvin K. Klevorick, Richard R. Nelson, and Sidney G. Winter, “Appropriating the Returns from Industrial Research and Development,” *Brookings Papers on Economic Activity*, 1987, pp. 783–820.

Maskus, Keith. *Intellectual Property Rights in the Global Economy*. Institute for International Economics, Washington, DC. 2000.

Park, Walter, “International Patent Protection: 1960-2005”, *Research Policy*, Vol. 37 No. 4, May 2008, 761-766.

Reynolds, Taylor William, “Quantifying the Evolution of Copyright and Trademark Law”, PhD dissertation, American University, Washington, D.C. 20012, 2003.

For more information contact WIPO at www.wipo.int

World Intellectual Property Organization
34, chemin des Colombettes
P.O. Box 18
CH-1211 Geneva 20
Switzerland

Telephone:
+41 (0) 22 338 91 11
Fax:
+41 (0) 22 733 54 28

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