Executive Summary

1. Subject of the Project

Study for providing future visions and policy recommendations to ASEAN Member States (AMS) to deal with the increased number of industrial property applications and backlogs based on the economic growth outlook and number of industrial property applications for AMS.

2. Background and Objectives of the Project

The number of industrial property applications in AMS has been increasing in recent years due to the rapid economic growth in the region. This increase is expected to continue in the future. Accordingly, the workload of the examination process in Intellectual Property Offices (IPOs) is also expected to continue to increase. Therefore, unless each IPO takes measures against the increasing workload, it could result in an increase in backlogs and delays in the responses from IPOs (office actions). Delays in the responses from IPOs would be detrimental to the progress of technological innovation and would probably not be welcomed by domestic or international companies. In this context, the IPOs of AMS should take appropriate measures to improve the delivery of Intellectual Property (IP) services and prevent any increase in backlogs. Quantitative analysis through the 'IPO outlook approach' is needed to examine the potential for workload reduction for each IPO.

The objective of the study is to clarify the outlook for AMS by presenting the economic growth outlook and number of industrial property applications of AMS based on current economic data; to calculate how the examination period and the backlog situation will change; and to identify the similarities and differences in measures and practices among AMS. This study will also suggest measures and the practices to be taken to improve the delivery of IP services, including the backlog situation at each IPO in AMS. Moreover, it will provide helpful information for companies that are in, or will be in, AMS.

Another objective of this study is related to the number of residential patent applications in AMS. We will focus on the factors that have positive impacts on increasing the number of patent applications by local applicants, which promote local innovations and technological improvements together with the development of local industries. There must be certain

drivers that increase the number of residential patent applications. We will clarify these driving factors and propose necessary actions together with future estimates of resident patent applications.

3.   Countries surveyed:

ASEAN Member States and Japan

4.   Survey Items:

1)   Economic data that are available in AMS

2)   Statistical data that are available in AMS

3)   Economic growth outlook of each AMS

4)   Outlook on the number of industrial property applications in each IPO in AMS

5)   Outlook on the examination period and the backlog situation

6)   Measures (legal systems, fee schedules, human resources, information technology (IT), operations management, and outsourcing of operations, etc.) and practices taken in the past at each IPO in AMS

7)   Measures (legal systems, fee schedules, human resources, IT, operations management, and outsourcing of operations, etc.) and practices to be taken to improve the delivery of IP services, including the backlog situation at each IPO in AMS

8)   Driving factors to increase the number of resident patent applications

9)   Measures for increasing the number of resident patent applications in AMS

5.   Initial Methodologies of the Project

Economic data from all possible countries, including from Europe, the United States (US), Japan, China, the Republic of Korea, and other ASEAN countries, to carry out statistical analysis to extract the influential factors on gross domestic product (GDP) and its growth rate. The influential factors are defined for a group of developed countries and a group of developing countries, which can be used for the estimation of industrial property applications. Based on the estimates, collaboration with IP experts in targeting countries will be conducted to analyse the number of industrial property applications and the backlog situation, etc. by collecting domestic data.

6. Approaches

In economics, total factor productivity (TFP) is used to measure economic efficiency. Thus, as a first step, the Working Group decided to verify whether TFP can become an influential factor. Unfortunately, since there was no significant correlation found in terms of applications in IPs and TFP in Japan (please see the details in Chapter 6 of the final report), this parameter could not be applied to the ASEAN countries. In addition, there are not sufficient data available in public databases to calculate the TFP. Labour productivity is publicly available for OECD countries in the OECD's database, including Indonesia but excluding the other ASEAN countries. Moreover, ASEAN countries are not capable of providing their own internal data within the designated period. Therefore, it is not possible to validate the correlation between TFP (even labour productivity) and IP applications in ASEAN countries.

It is not necessary to set common variables for all the ASEAN countries in the analysis since each country's economy is different. In order to find the different sets of variables for each country, data were extracted from the World Bank database based on categories, i.e. economy and growth; education; energy and mining; science and technology; and trade.

7. Actual Methodologies

The number of industrial property applications in the future can be estimated by multiple-regression analysis as below.

$$\text{Growth rate (IP applications by residents)} = a_1 X_1 + a_2 X_2 + a_3 X_3 + \ldots + \text{constant}$$

$$\text{Growth rate (IP applications by non-residents)} = b_1 X_1 + b_3 X_3 + b_5 X_5 \ldots + \text{constant}$$

X_1, X_2… are the factors (e.g. R&D expenditure, foreign direct investment (FDI), GDP, and education) that show significance for the number of applications. The applied factors are different from country to country, but the factors are within the following categories.

- ✓ Economy and growth
- ✓ Education
- ✓ Energy and mining
- ✓ Science and technology
- ✓ Trade

In the selection of the relevant factors X_1, X_2, …, for countries with too many variables to run the multi-regression analysis, resulting in errors due to exceeding the software (SPSS) limit, correlation analysis was performed using World Bank data (e.g. R&D expenditure, FDI, GDP, and education) and the number of applications in each country. The factors that show sufficient correlation has been selected.

Coefficients a_1, b_1, … are calculated by using multiple regression analysis with a stepwise method. X_1, X_2, … are the driving factors that have positive impacts on increasing the number of IP applications, and the number of applications is calculated by using these results with linear approximation.

8.   Comparative Analysis for ASEAN Member States, Except Myanmar

Based on their number of IP applications, the ASEAN states were divided into two groups: Group A, the group with relatively lower IP applications (Brunei Darussalam, Lao PDR, and Cambodia), and Group B, the rest of the countries (excluding Myanmar).

In Group A, Brunei's ratio of patent applications by residents will increase in the future, while the Lao PDR and Cambodia's ratios will remain very low. All of the countries in Group A will maintain similar ratios for design applications by residents in the future. Cambodia will keep its relatively higher ratio (around 40%) compared to the Lao PDR and Brunei (between 5% and 10%). However, all three Group A countries will have similar ratios of trademark applications by residents in the future.

In Group B, the ratio of patent applications by residents for all countries remains low (less than 25%) over the forecasting period. The ratio of design applications by residents remains similar and is located between 30% and 75%. Indonesia, the Philippines, Malaysia, and Viet Nam are above 50%, while Thailand and Singapore are below 40%. The ratio of trademark applications by residents remains similar at above 40%, except for Singapore at nearly 30%. The ratio of utility model applications by residents remains above 60%. Although Viet Nam's ratio will reach 100% in 2029, Indonesia's will gradually decrease from 2017. (Please see the details in Chapter 11 of the final report.)

The variables for which the coefficients are positive in the multi-regression for IP applications by residents were compared. Most of the AMS have unique sets, but the similarities are the following (please see the details in Chapter 11 of the final report).

For patents, most variables differ for each country, except 1) 'government expenditure on education, total (% of GDP)', 2) 'net official development assistance received (current US$)', and 3) 'trade (% of GDP)', which are common in more than two countries: 1) Viet Nam, the Lao PDR, and Brunei; 2) Thailand and the Lao PDR; and 3) Indonesia and the Lao PDR, respectively. For design, the common variables for more than two countries are 'armed forces personnel, total' and 'Internet users (per 100 people)' in Indonesia and Singapore, and in Singapore and the Lao PDR, respectively.

For trademarks, most variables differ for each country, except 1) 'ICT service exports (BoP, current US$)', 2) 'Internet users (per 100 people)', and 3) 'percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%)', which are common in more than two countries, 1) Indonesia and Thailand, 2) Lao PDR and Cambodia, and 3) Malaysia and Viet Nam.

The common variable for the utility model in more than two countries is 'scientific and technical journal articles', in Indonesia and Thailand.

9.   Backlog Analysis

The Working Group has requested each IPO in the AMS to provide the historical data necessary to perform the backlog analysis. However, it was difficult for the AMS to provide the data. In particular, some countries' IPOs indicated that they would not be participating in the backlog analysis. Therefore, measures and practices taken in the past in each AMS were not available, either.

10.   Conclusion

Using WIPO and World Bank data, forecasting of the number of IP applications for each ASEAN country has been performed in terms of patents, design, trademarks, and the utility model. In practice, the number of industrial property applications in the future was estimated by multiple-regression analysis using historical data provided by public or government sources. The fluctuations seen in the historical number of IP applications extracted from the WIPO database may be the result of system revisions in each country or participation in international treaties, such as the Patent Cooperation Treaty (PCT), the Hague Protocol, and the Madrid Protocol.

In addition, Indonesia has periods without data on IP applications reported to WIPO. Thus, some years were substituted using values from linear interpolation, i.e. design (2010–2012).

Overall, the forecast shows that patent applications by residents will remain at low rates (10%–20%), although the total number of the four IP applications will increase in each AMS. As long as this forecast is unchanged, most of the patent rights holders will be with companies owned by non-residents. Therefore, the competitiveness that domestic companies usually have against foreign companies cannot be fostered in the future. This will lead to the situation where each AMS is exposed to highly significant risk.

Historically, industrial property applications by residents in most AMS have been lower compared to those by non-residents. However, the outlook for the number of industrial property applications of AMS clarified in this study shows steady growth in most AMS. The multi-regression analysis has also shown that the driving factors that contribute to increasing the number of IP applications by residents differ from country to country. Therefore, the individual driving factors and necessary actions should be presented or proposed to each government. This study is significant since it enables discovery of the relevant driving factors to increase the resident applications for each country.

Having said that, the case of Viet Nam can be illustrated as an example according to the multi-regression analysis performed earlier. The findings by IP category are (1) 'high-technology exports (current US$)' should be increased to increase the resident patent applications. (2) In the area of education, 'percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%)' and 'primary completion rate, both sexes (%)' should be increased to increase the resident design applications. (3) Similarly, 'percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%)' should be increased to increase the resident trademark applications. (4) 'Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate)' should be increased to increase the resident utility model applications. The forecast shows that except for patent applications, all the other IP applications in Viet Nam by residents will increase in the future, while applications by non-residents will decrease. This indicates that these driving factors for design, trademarks, and the utility model have already made effective contributions for increasing the number of IP applications by residents in Viet Nam, but still the number of patent applications by residents

is very low and should be improved in the future. To improve this situation, 'high-technology exports' in Viet Nam will become an effective driving factor for increasing the ratio by residents in the future. Keeping with this trend, 'high-technology export' can become a next targeted factor for Viet Nam to strengthen patents by residents. This cannot be achieved with only educational vehicles but should be promoted with political vehicles, such as new related measures and policies from local governments, including experts in the high-tech industry along with IP education.

In the next phase of this study, if possible, specific actions to increase the positive driving factors in each AMS can be discussed among experts nationwide not only from IP-related fields but also other fields, such as education, science and technology, politics, economics, environment, and energy. Then, ideally each AMS can share a common goal and some actions in the future so that all ASEAN Member States can pursue economic growth.

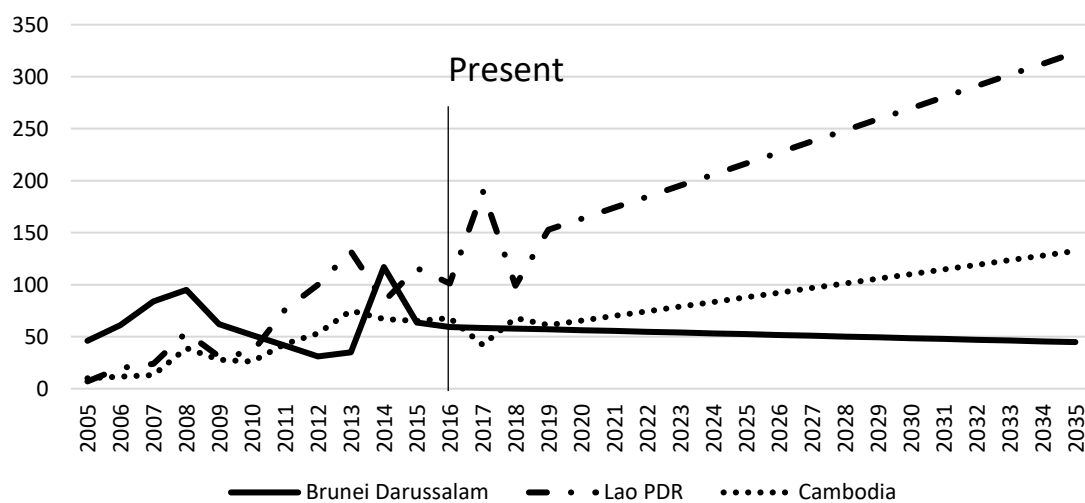**Overseas Activities (Presentations of Project Progress)**

1.	11 August 2017, Brunei Darussalam Intellectual Property Office

2.	18 November 2017, National Office of Intellectual Property of Viet Nam

3.	26 February 2018, Department of Intellectual Property, Vientiane, Lao PDR

4.	16 March 2018, Intellectual Property Corporation of Malaysia

5.	26 March 2018, ASEAN Working Group on Intellectual Property Cooperation (AWGIPC) in Brunei Darussalam

6.	25 April 2018, Department of Intellectual Property, Vientiane, Lao PDR

7.	31 July 2018, Intellectual Property Corporation of Malaysia

8.	2 August 2018, National Office of Intellectual Property of Viet Nam

9.	27 August 2018, Intellectual Property Office of the Philippines

10.	4 September 2018, The Eighth Meeting of ASEAN–Japan Heads of Intellectual Property Offices, Singapore

11.	21 February 2019, Director of General, Intellectual Property, Jakarta, Indonesia

12.	25 June 2019, Department of Intellectual Property, Bangkok, Thailand

13.	6 August 2019, The Ninth Meeting of ASEAN–Japan Heads of Intellectual Property Offices, Tokyo, Japan
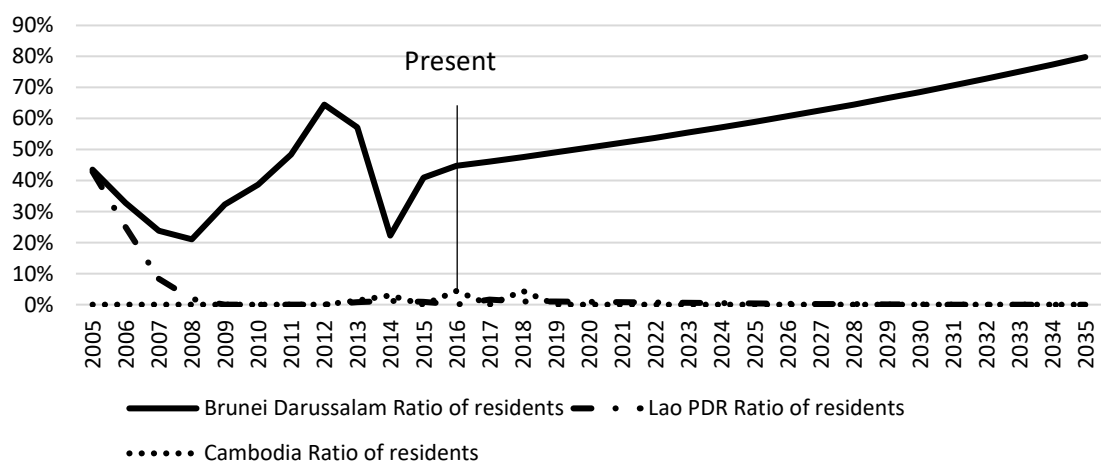
Appendix

The fluctuations seen in the historical number of IP applications extracted from the WIPO database may be the result of system revisions in each country or participation in international treaties, such as the PCT, the Hague Protocol, and the Madrid Protocol.
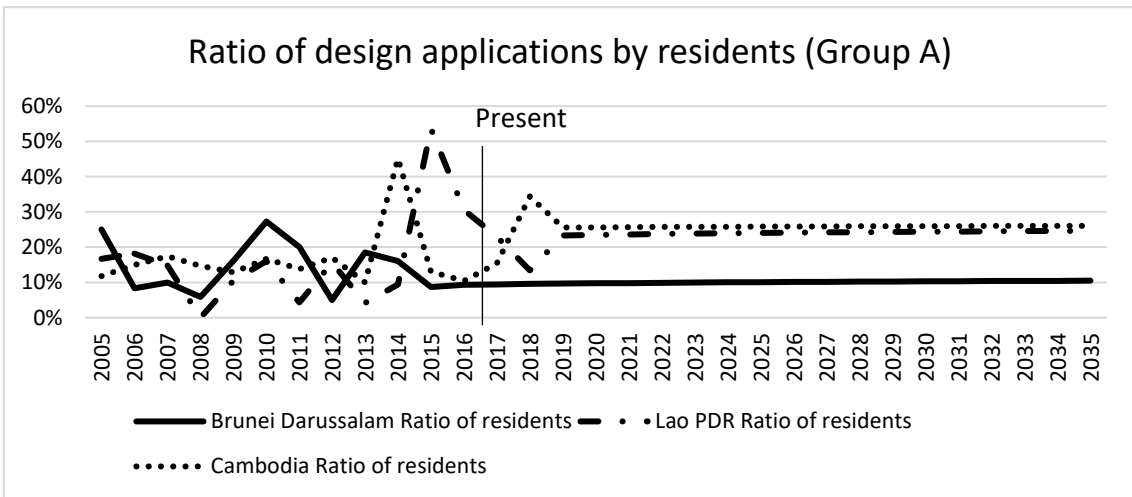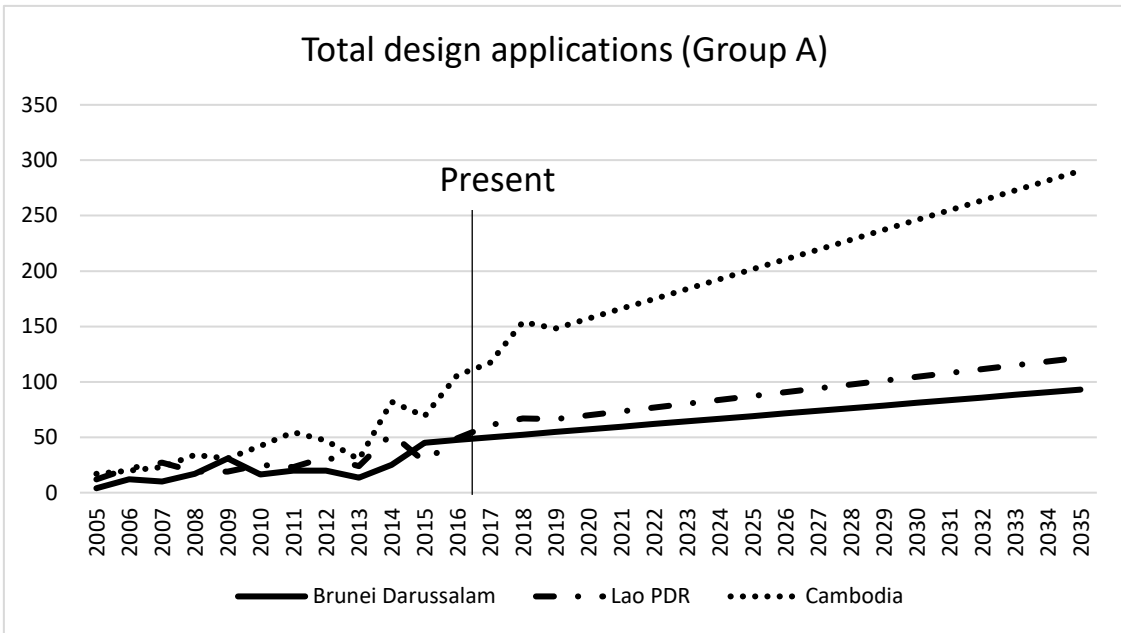
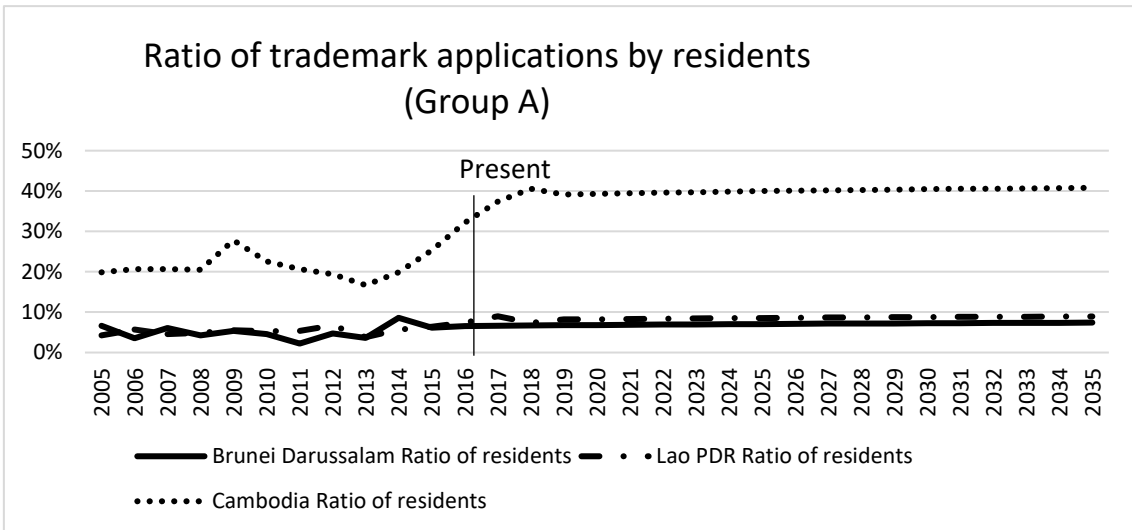In addition, Indonesia has periods without data on IP applications reported to WIPO. Thus, some years were substituted using values from linear interpolation, i.e. design (2010–2012).
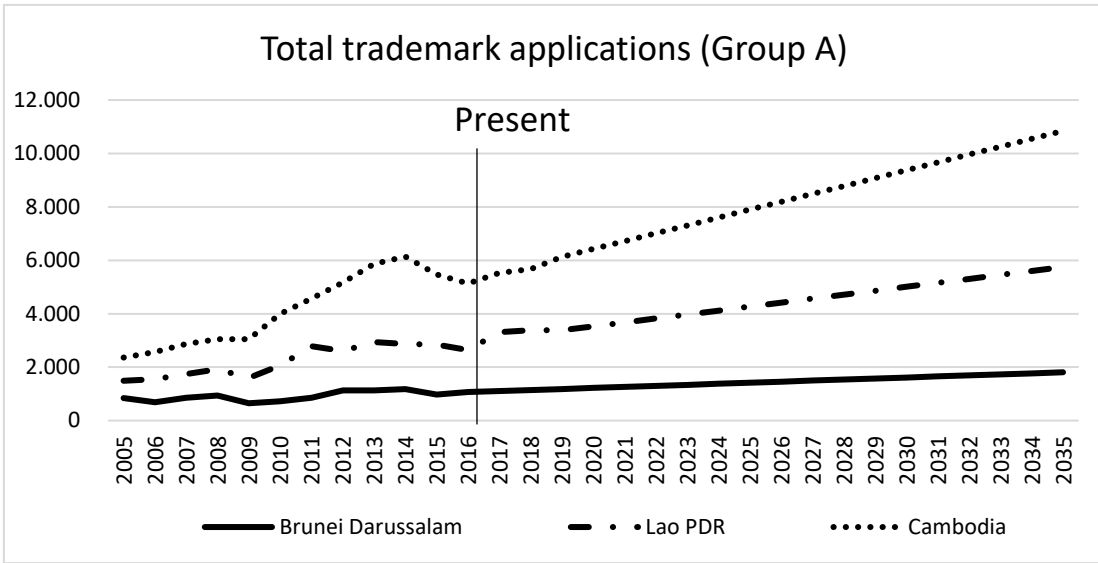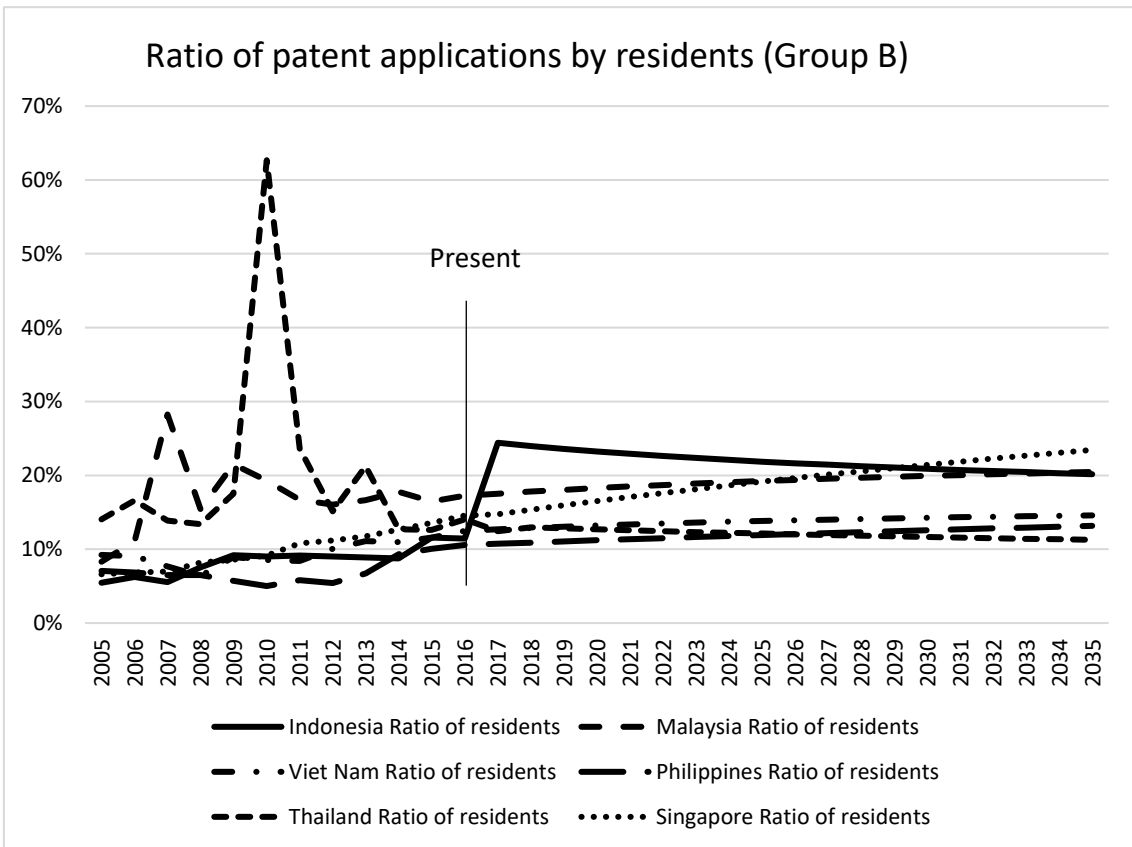

Total patent applications (Group A)

Ratio of patent applications by residents (Group A)

Total design applications (Group A)

Ratio of design applications by residents (Group A)

Total trademark applications (Group A)

Present

Legend: —— Brunei Darussalam   — · Lao PDR   ······ Cambodia

(Y-axis: 0 to 12.000; X-axis: 2005 to 2035)

Ratio of trademark applications by residents (Group A)

Present

Legend: —— Brunei Darussalam Ratio of residents   — · Lao PDR Ratio of residents   ······ Cambodia Ratio of residents

(Y-axis: 0% to 50%; X-axis: 2005 to 2035)

Total patent applications (Group B)

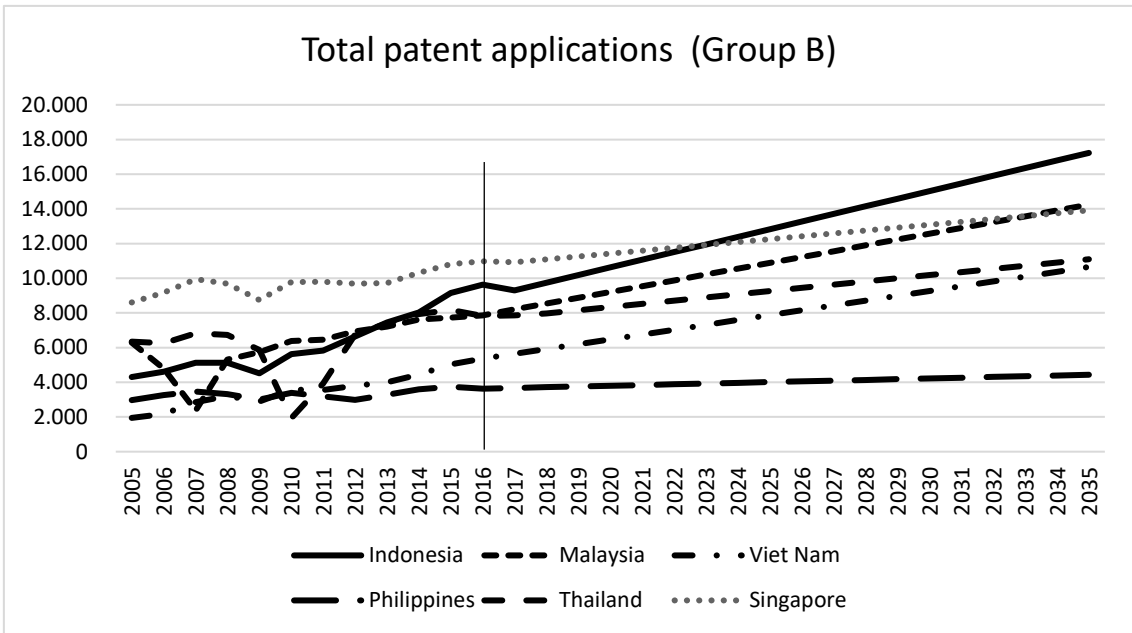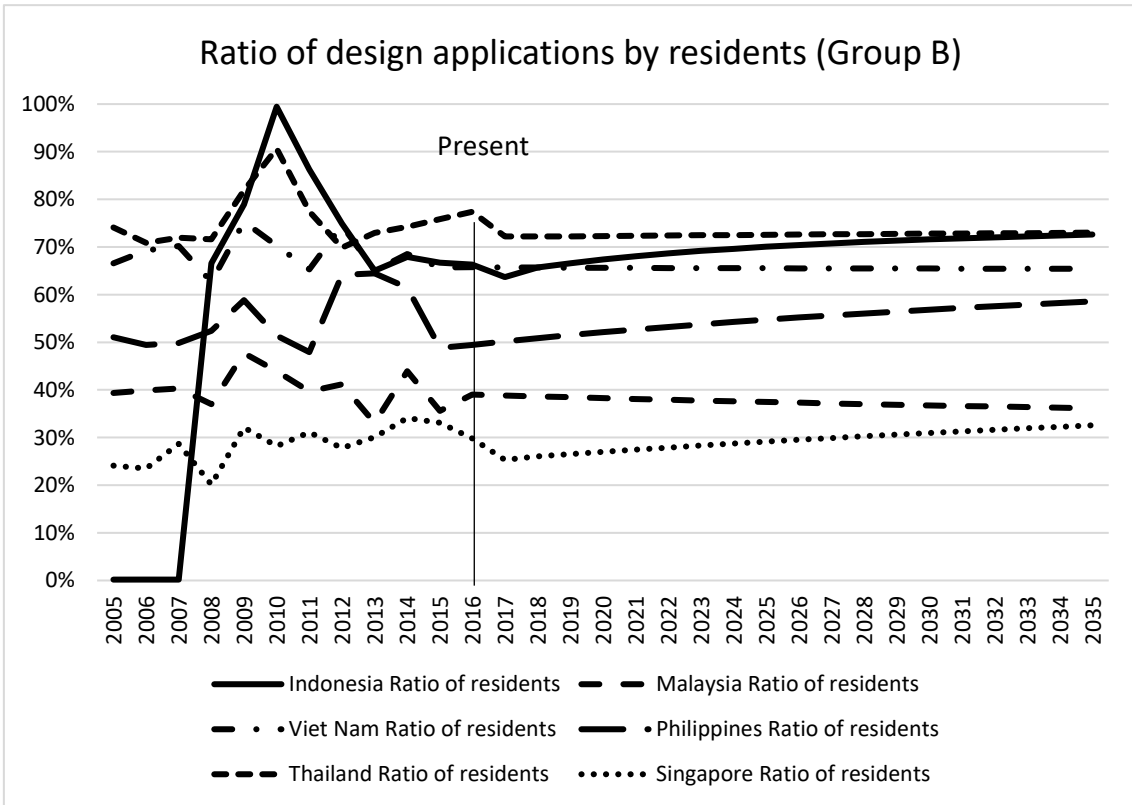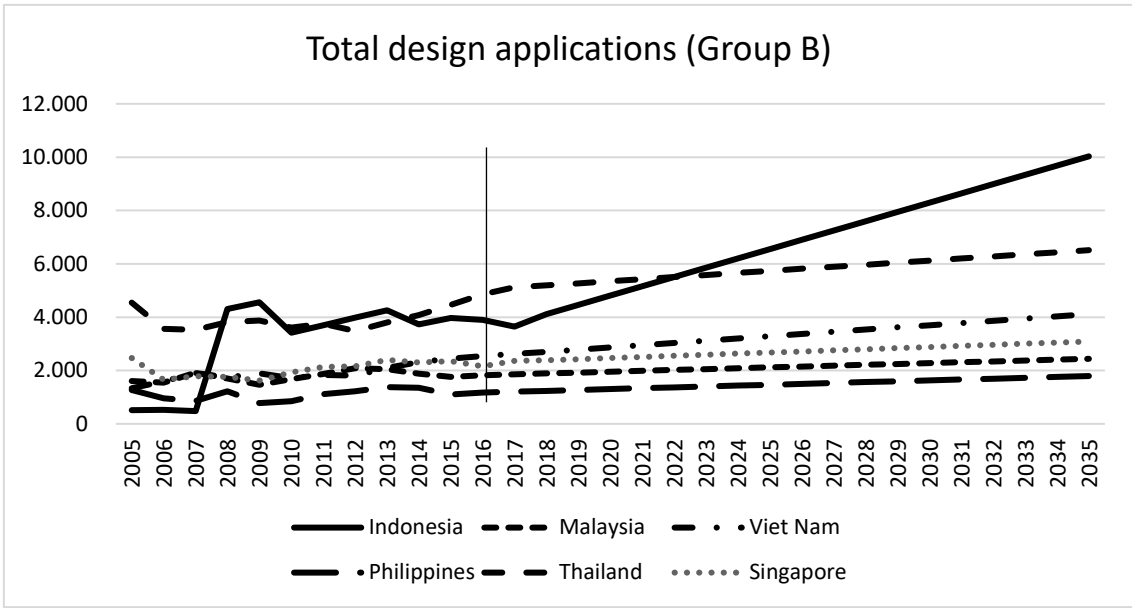Legend: Indonesia — Malaysia — Viet Nam — Philippines — Thailand — Singapore
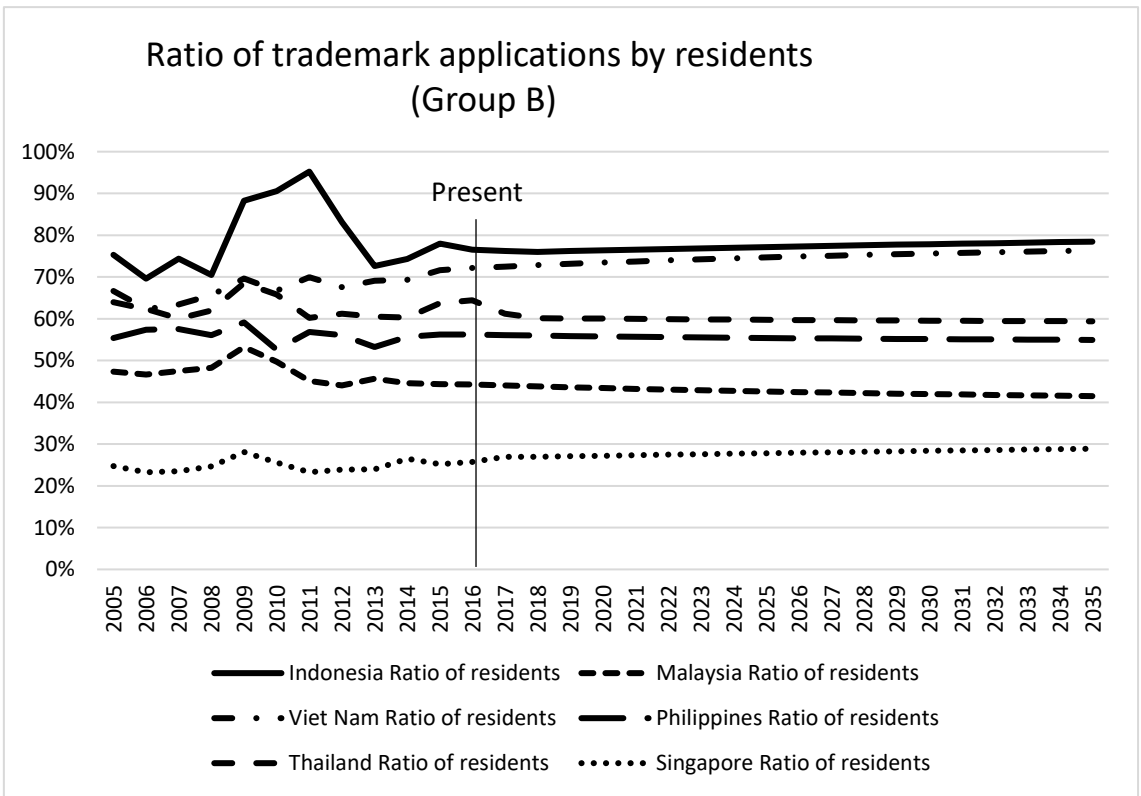

Ratio of patent applications by residents (Group B)

Present

Legend: Indonesia Ratio of residents — Malaysia Ratio of residents — Viet Nam Ratio of residents — Philippines Ratio of residents — Thailand Ratio of residents — Singapore Ratio of residents

Total design applications (Group B)

Legend: Indonesia, Malaysia, Viet Nam, Philippines, Thailand, Singapore

Ratio of design applications by residents (Group B)

Present

Legend: Indonesia Ratio of residents, Malaysia Ratio of residents, Viet Nam Ratio of residents, Philippines Ratio of residents, Thailand Ratio of residents, Singapore Ratio of residents

Total trademark applications (Group B)

Legend: Indonesia, Malaysia, Viet Nam, Philippines, Thailand, Singapore

Ratio of trademark applications by residents (Group B)

Present

Legend: Indonesia Ratio of residents, Malaysia Ratio of residents, Viet Nam Ratio of residents, Philippines Ratio of residents, Thailand Ratio of residents, Singapore Ratio of residents

Total utility model applications (Group B)

Legend: Indonesia — Malaysia — • Viet Nam — •Philippines — Thailand

Ratio of utility model applications by residents   (Group B)

Present

Legend: Indonesia Ratio of residents — Malaysia Ratio of residents — • Viet Nam Ratio of residents — •Philippines Ratio of residents — Thailand Ratio of residents
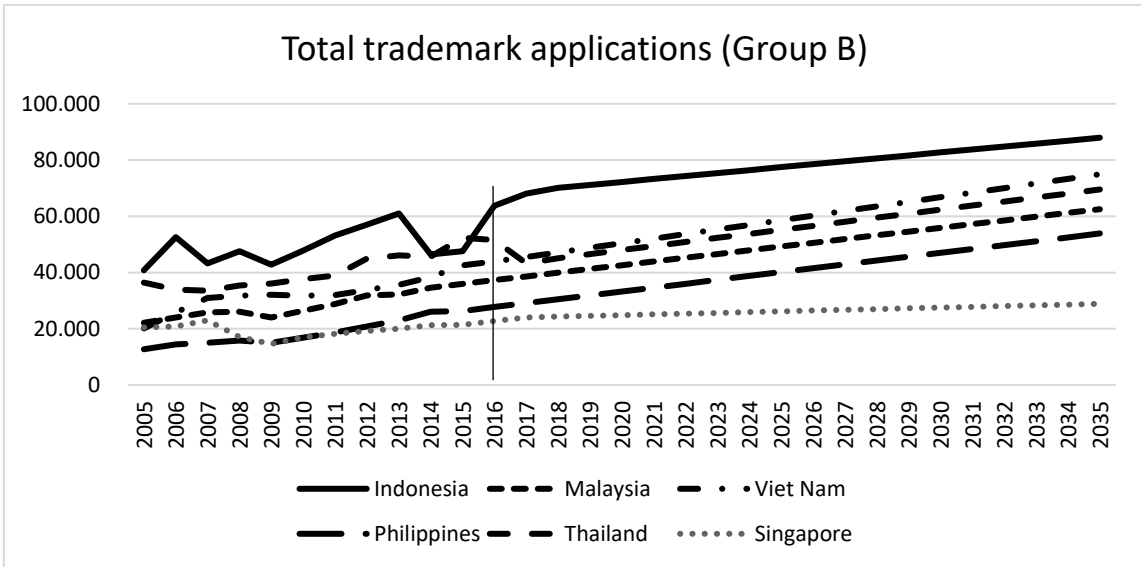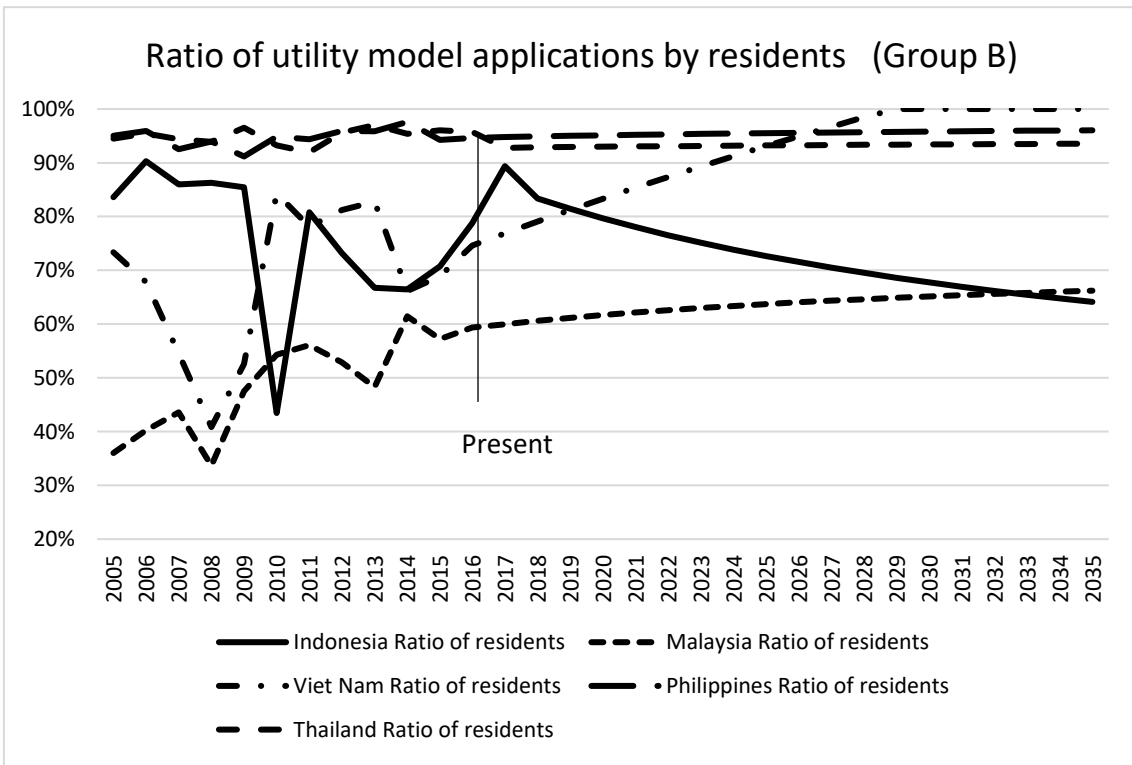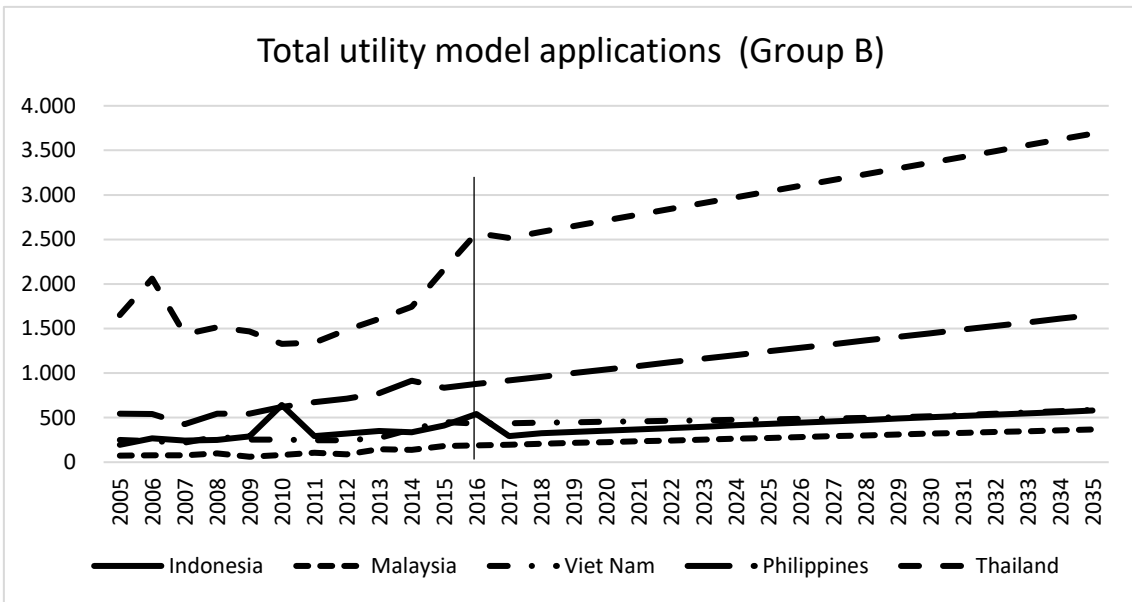
Variables for which the coefficients are positive in the multi-regression for <u>patent</u> applications by residents

	Indonesia	Singapore	Malaysia	Philippines	Viet Nam	Thailand	Lao PDR	Cambodia	Brunei Darussalam
Aquaculture production (metric tons)									0.153
CO2 emissions from electricity and heat production, total (% of total fuel combustion)			0.231						
Compulsory education, duration (years)				0.490					
Cost to import (US$ per container)				0.324					
Current health expenditure (% of GDP)							0.385		
Employment in industry (% of total employment)				0.598					
Food exports (% of merchandise exports)									0.169
GDP per capita (constant 2005 US$)				0.214					
Government expenditure on education, total (% of GDP)					0.149		0.522		0.178
Graduates from tertiary education, both sexes (number)									0.780
High-technology exports (current US$)					0.676				
ICT goods imports (% total goods imports)		0.142							
ICT service exports (% of service exports, BoP)		0.427							
Net foreign assets (current LCU)	4.559								
Net official development assistance received (current US$)							0.214	0.356	
Population growth (annual %)			0.351						
Primary completion rate, both sexes (%)					0.109				
School enrollment, tertiary (% gross)	0.633								
Self-employed, total (% of total employment) (modeled ILO estimate)						1.119			
Time required to start a business (days)			1.359						
Total natural resources rents (% of GDP)						0.873			
Trade (% of GDP)	0.216						0.857		

Variables for which the coefficients are positive in the multi-regression for <u>design</u> applications by residents

	Indonesia	Singapore	Malaysia	Philippines	Viet Nam	Thailand	Lao PDR	Cambodia	Brunei Darussalam
Adjusted savings: energy depletion (% of GNI)					1.055				
Armed forces personnel, total	0.370	0.461							
Government expenditure on education, total (% of GDP)								0.696	
ICT goods imports (% total goods imports)	1.199								
ICT service exports (% of service exports, BoP)	0.281								
ICT service exports (BoP, current US$)								0.319	
Internet users (per 100 people)		1.331					1.259		
Market capitalization of listed domestic companies (current US$)						0.318			
Merchandise trade (% of GDP)							0.242		
Net foreign assets (current LCU)								0.918	
Net official development assistance received (current US$)	0.333								
New businesses registered (number)				0.468					
Percentage of graduates from Science programmes in tertiary education who are female (%)			0.566						
Percentage of graduates from tertiary education graduating from Social Sciences, Business and Law programmes, both sexes (%)					0.723				
Percentage of students in tertiary education enrolled in Engineering, Manufacturing and Construction programmes, both sexes (%)									1.758
Primary completion rate, both sexes (%)					0.394				
Pupil-teacher ratio in lower secondary education (headcount basis)								0.625	
School enrollment, tertiary (% gross)						0.534			
Services, value added per worker (constant 2010 US$)								0.460	
Unemployment, total (% of total labor force) (modeled ILO estimate)		0.619							

Variables for which the coefficients are positive in the multi-regression for <u>trademark</u> applications by residents

	Indonesia	Singapore	Malaysia	Philippines	Viet Nam	Thailand	Lao PDR	Cambodia	Brunei Darussalam
Adjusted savings: consumption of fixed capital (% of GNI)				0.114					
Adjusted savings: education expenditure (% of GNI)					0.229				
Armed forces personnel, total	1.421								
Consumer price index (2010 = 100)			0.665						
GDP per person employed (constant 2011 PPP $)				0.601					
Graduates from ISCED 5 programmes in tertiary education, both sexes (number)									0.313
Gross national expenditure (% of GDP)			0.444						
ICT service exports (% of service exports, BoP)						0.155			
ICT service exports (BoP, current US$)	1.003					1.291			
Imports of goods and services (% of GDP)					0.135				
Internet users (per 100 people)							1.173	0.190	
Labor force, total						0.308			
Manufactures exports (% of merchandise exports)									0.271
Market capitalization of listed domestic companies (current US$)		1.102							
Merchandise trade (% of GDP)							0.243		
Military expenditure (% of GDP)		1.703							
Net foreign assets (current LCU)								0.493	
Ores and metals exports (% of merchandise exports)	2.285								
Percentage of graduates from tertiary education graduating from Social Sciences, Business and Law programmes, both sexes (%)			0.168		0.267				
Percentage of male graduates from tertiary education graduating from Social Sciences, Business and Law programmes, male (%)									0.282
Population, total								0.742	
Pupil-teacher ratio in tertiary education (headcount basis)							0.364		
Scientific and technical journal articles	0.483								
Services, value added per worker (constant 2010 US$)		0.792							
Start-up procedures to register a business (number)				0.203					
Technicians in R&D (per million people)				0.202					
Unemployment, total (% of total labor force) (modeled ILO estimate)	0.956								

Variables for which the coefficients are positive in the multi-regression for <u>utility model</u> applications by residents

	Indonesia	Malaysia	Philippines	Viet Nam	Thailand
Adjusted savings: natural resources depletion (% of GNI)				0.478	
Birth rate, crude (per 1,000 people)					2.966
Expenditure on tertiary education (% of government expenditure on education)		0.425			
GDP per capita (constant 2005 US$)		0.912			
Gross capital formation (% of GDP)		0.142			
Industry, value added (% of GDP)			0.586		
Labor force participation rate, total (% of total population ages 15+) (modeled ILO estimate)				2.912	
Listed domestic companies, total					2.259
Machinery and transport equipment (% of value added in manufacturing)		0.254			
Mobile cellular subscriptions					1.106
Ores and metals exports (% of merchandise exports)	0.918				
Percentage of students in tertiary education enrolled in Social Sciences, Business and Law programmes, both sexes (%)				0.309	
Scientific and technical journal articles	1.756				3.947
Total fisheries production (metric tons)					1.769

*No data available in Singapore, Lao PDR, Cambodia, and Brunei Darussalam.