Part II

10. Individual Analysis for ASEAN Member States

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March 2020

This chapter should be cited as
Tanaka, Y., M. Goto, Y. Tou and S. Yoshida (2020), *Future Visions and Policy Recommendations for ASEAN Member States (AMSs) based on Estimation of Industrial Property Applications.* ERIA Research Project Report FY2018 no.23, Jakarta: ERIA

Part II

10. Individual Analysis for ASEAN Member States

10.1. Malaysia

a) Correlation coefficients

Total of 148 factors of historical data during 2005–2015 extracted from World Bank database.

Note the definitions of the variables in the Appendix. Numbers are the actual coefficients.

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

For patent resident applications, here is the list of significant variables.

1. Industry, value added (% of GDP) -.953**
2. Manufacturing, value added (% of GDP) -.954**
3. Services, etc. value added (% of GDP) .962**
4. Adjusted net savings, excluding particulate emission damage (% of gross national income (GNI)) -.839**
5. Adjusted savings: education expenditure (% of GNI) .746**
6. Adjusted savings: energy depletion (% of GNI) -.736**
7. Adjusted savings: natural resources depletion (% of GNI) -.718*
8. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) -.751**
9. Aquaculture production (metric tons) .905**
10. Armed forces personnel (% of total labour force) -.843**
11. Birth rate, crude (per 1,000 people) -.916**
12. CO_2 emissions (kilogrammes (kg) per PPP US$ of GDP) -.644*
13. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .859**
14. CO_2 emissions from manufacturing industries and construction (% of total fuel combustion) -.923**

15. Compensation of employees (% of expense) .783**
16. Consumer price index (2010 = 100) .881**
17. Cost of business start-up procedures (% of GNI per capita) -.893**
18. Cost to import (US$ per container) .821**
19. Customs and other import duties (% of tax revenue) -.868**
20. Electric power consumption (kilowatt hours (kWh) per capita) .954**
21. Employers, total (% of total employment) .603*
22. Employment in industry (% of total employment) -.874**
23. Employment in services (% of total employment) .943**
24. Exports of goods and services (% of GDP) -.932**
25. Final consumption expenditure, etc. (% of GDP) .902**
26. Food exports (% of merchandise exports) .738**
27. Food imports (% of merchandise imports) .898**
28. GDP per person employed (constant 2011 PPP US$) .808**
29. General government final consumption expenditure (% of GDP) .870**
30. Gross domestic savings (% of GDP) -.902**
31. Gross national expenditure (% of GDP) .763**
32. High-technology exports (% of manufactured exports) -.752**
33. Imports of goods and services (% of GDP) -.967**
34. Labour force, total .808**
35. Listed domestic companies, total -.908**
36. Merchandise exports (current US$) .662*
37. Merchandise trade (% of GDP) -.967**
38. Military expenditure (% of GDP) -.830**
39. Mobile cellular subscriptions .897**
40. Net foreign assets (current local currency units (LCU)) .723*
41. Net official development assistance (ODA) received per capita (current US$) -.638*
42. Net ODA and official aid received (current US$) -.622*
43. New businesses registered (number) .828**
44. Population growth (annual %) -.625*
45. Renewable energy consumption (% of total final energy consumption) -.650*
46. Research and development expenditure (% of GDP) .958**

47. Researchers in R&D (per million people) .891**
48. Scientific and technical journal articles .870**
49. Start-up procedures to register a business (number) -.680*
50. Technicians in R&D (per million people) .792**
51. Time required to start a business (days) -.911**
52. Adjusted net enrolment rate, lower-secondary, both sexes (%) -.687*
53. Current expenditure other than staff compensation as % of total expenditure in tertiary public institutions (%)-.894**
54. Effective transition rate from primary to lower-secondary general education, both sexes (%) -.810**
55. Enrolment in early childhood education, both sexes (number) .921**
56. Enrolment in pre-primary education, both sexes (number) .916**
57. Enrolment in secondary education, both sexes (number) .730*
58. Enrolment in tertiary education per 100,000 inhabitants, both sexes .693*
59. Enrolment in upper-secondary education, both sexes (number) .655*
60. GDP per capita (constant 2005 US$) .788**
61. Net flow of internationally mobile students (inbound - outbound), both sexes (number) .960**
62. Percentage of graduates from agriculture programmes in tertiary education who are female (%) -.812**
63. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) -.819**
64. Percentage of male graduates from tertiary education graduating from science programmes, male (%) -.833**
65. Percentage of male graduates from tertiary education graduating from social sciences, business, and law programmes, male (%) .621*
66. Percentage of students in tertiary education enrolled in science programmes, both sexes (%) -.934**
67. Percentage of students in upper-secondary education enrolled in vocational programmes, both sexes (%) .676*
68. Percentage of teachers in secondary education who are female (%) .623*
69. Personal computers (per 100 people) .882**

70. Pupil/trained teacher ratio in primary education (headcount basis) -.916**
71. Pupil-teacher ratio in primary education (headcount basis) -.948**
72. Pupil-teacher ratio in secondary education (headcount basis) -.927**
73. Teachers in tertiary education programmes, both sexes (number) .908**

For patent non-resident applications, here is the list of significant variables.

1. Adjusted net savings, excluding particulate emission damage (% of GNI) -.715*
2. Adjusted savings: education expenditure (% of GNI) .841**
3. Armed forces personnel (% of total labour force) -.649*
4. Bank capital to assets ratio (%) .849*
5. CO_2 emissions from manufacturing industries and construction (% of total fuel combustion) -.730*
6. Communications, computer, etc. (% of service exports, BoP) .829**
7. Computer, communications and other services (% of commercial service exports) .831**
8. Consumer price index (2010 = 100) .620*
9. Cost of business start-up procedures (% of GNI per capita) -.607*
10. Cost to import (US$ per container) .605*
11. Employment-to-population ratio, 15+, total (%) (modelled ILO[2] estimate) .637*
12. Exports of goods and services (% of GDP) -.640*
13. Final consumption expenditure, etc. (% of GDP) .649*
14. General government final consumption expenditure (% of GDP) .603*
15. Gross domestic savings (% of GDP) -.649*
16. Gross national expenditure (% of GDP) .643*
17. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .652*
18. Labour force, total .668*
19. Military expenditure (% of GDP) -.620*
20. Mobile cellular subscriptions .654*
21. Net ODA received per capita (current US$) -.772**
22. Net ODA and official aid received (current US$) -.766**

[2] International Labor Organization.

23. R&D expenditure (% of GDP) .637*
24. Researchers in R&D (per million people) .703*
25. Scientific and technical journal articles .690*
26. Start-up procedures to register a business (number) -.675*
27. Technicians in R&D (per million people) .649*
28. Capital expenditure as % of total expenditure in tertiary public institutions (%) -.628*
29. Effective transition rate from primary to lower-secondary general education, both sexes (%) -.685*
30. Enrolment in early childhood education, both sexes (number) .701*
31. Enrolment in pre-primary education, both sexes (number) .701*
32. Enrolment in secondary education, both sexes (number) .665*
33. Enrolment in upper-secondary education, both sexes (number) .659*
34. Expenditure on education as % of total government expenditure (%) .670*
35. Percentage of graduates from engineering, manufacturing, and construction programmes in tertiary education who are female (%) .752**
36. Percentage of graduates from tertiary education graduating from engineering, manufacturing, and construction programmes, both sexes (%) -.662*
37. Percentage of male graduates from tertiary education graduating from agriculture programmes, male (%) .703*
38. Percentage of students in tertiary education enrolled in engineering, manufacturing, and construction programmes, both sexes (%) -.603*
39. Personal computers (per 100 people) .641*
40. Teachers in tertiary education programmes, both sexes (number) .626*

For design resident applications, here is the list of significant variables.

1. Chemicals (% of value added in manufacturing) -.620*
2. Price level ratio of PPP conversion factor (GDP) to market exchange rate .613*
3. Percentage of graduates from science programmes in tertiary education who are female (%) .708*

For design non-resident applications, here is the list of significant variables.

1. Adjusted savings: consumption of fixed capital (% of GNI) -.787**

2. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .626*
3. Government expenditure per student, tertiary (% of GDP per capita) -.622*
4. Gross capital formation (% of GDP) .815**
5. Gross national expenditure (% of GDP) .620*
6. Manufactures imports (% of merchandise imports) -.629*
7. Merchandise exports (current US$) .680*
8. Start-up procedures to register a business (number) -.660*
9. Tertiary education, academic staff (% female) .663*
10. Unemployment, total (% of total labour force) (modelled ILO estimate) -.740**
11. Government expenditure per tertiary student as % of GDP per capita (%) -.622*
12. Percentage of students in upper-secondary education enrolled in vocational programmes, both sexes (%) .635*
13. Percentage of teachers in tertiary education who are female (%) .663*

For trademark resident applications, here is the list of significant variables.

1. Industry, value added (% of GDP) -.860**
2. Manufacturing, value added (% of GDP) -.874**
3. Services, etc. value added (% of GDP) .913**
4. Adjusted net savings, excluding particulate emission damage (% of GNI) -.786**
5. Adjusted savings: education expenditure (% of GNI) .803**
6. Adjusted savings: energy depletion (% of GNI) -.827**
7. Adjusted savings: natural resources depletion (% of GNI) -.811**
8. Agricultural methane emissions (thousand metric tons of CO2 equivalent) -.856**
9. Alternative and nuclear energy (% of total energy use) .730*
10. Aquaculture production (metric tons) .752**
11. Armed forces personnel (% of total labour force) -.970**
12. Bank capital to assets ratio (%) .932**
13. Birth rate, crude (per 1,000 people) -.897**
14. CO_2 emissions (kg per PPP US$ of GDP) -.902**

15. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .720*
16. CO_2 emissions from manufacturing industries and construction (% of total fuel combustion) -.818**
17. Compensation of employees (% of expense) .841**
18. Consumer price index (2010 = 100) .979**
19. Cost of business start-up procedures (% of GNI per capita) -.968**
20. Cost to import (US$ per container) .873**
21. Customs and other import duties (% of tax revenue) -.821**
22. Electric power consumption (kWh per capita) .928**
23. Employers, total (% of total employment) .703*
24. Employment in industry (% of total employment) -.732*
25. Employment in services (% of total employment) .869**
26. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .738**
27. Expenditure on tertiary education (% of government expenditure on education) -.816**
28. Exports of goods and services (% of GDP) -.955**
29. Final consumption expenditure, etc. (% of GDP) .940**
30. Food imports (% of merchandise imports) .784**
31. GDP per person employed (constant 2011 PPP US$) .965**
32. General government final consumption expenditure (% of GDP) .783**
33. Government expenditure per student, tertiary (% of GDP per capita) -.626*
34. Gross domestic savings (% of GDP) -.940**
35. Gross national expenditure (% of GDP) .921**
36. High-technology exports (% of manufactured exports) -.716*
37. Imports of goods and services (% of GDP) -.911**
38. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .725*
39. Labour force, total .965**
40. Listed domestic companies, total -.960**
41. Machinery and transport equipment (% of value added in manufacturing) .651*
42. Manufactures imports (% of merchandise imports) -.730*

43. Merchandise exports (current US$) .750**
44. Merchandise trade (% of GDP) -.908**
45. Military expenditure (% of GDP) -.838**
46. Mobile cellular subscriptions .950**
47. Net foreign assets (current LCU) .828**
48. New businesses registered (number) .962**
49. Population growth (annual %) -.811**
50. R&D expenditure (% of GDP) .949**
51. Researchers in R&D (per million people) .923**
52. Scientific and technical journal articles .941**
53. Start-up procedures to register a business (number) -.814**
54. Technical cooperation grants (BoP[3], current US$) -.719*
55. Technicians in R&D (per million people) .803**
56. Tertiary education, academic staff (% female) .672*
57. Time required to start a business (days) -.888**
58. Unemployment, total (% of total labour force) (modelled ILO estimate) -.653*
59. Adjusted net enrolment rate, lower-secondary, both sexes (%) -.731*
60. Current expenditure other than staff compensation as % of total expenditure in tertiary public institutions (%)-.906**
61. Effective transition rate from primary to lower-secondary general education, both sexes (%) -.966**
62. Enrolment in early childhood education, both sexes (number) .921**
63. Enrolment in pre-primary education, both sexes (number) .924**
64. Enrolment in secondary education, both sexes (number) .918**
65. Enrolment in upper-secondary education, both sexes (number) .831**
66. Expenditure on tertiary education as % of government expenditure on education (%) -.816**
67. GDP per capita (constant 2005 US$) .979**
68. Government expenditure per tertiary student as % of GDP per capita (%) -.626*
69. Net flow of internationally mobile students (inbound - outbound), both sexes (number) .806*

[3] Balance of payment

70. Percentage of graduates from agriculture programmes in tertiary education who are female (%) -.871**
71. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) -.878**
72. Percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%) .615*
73. Percentage of male graduates from tertiary education graduating from science programmes, male (%) -.875**
74. Percentage of students in tertiary education enrolled in science programmes, both sexes (%) -.850**
75. Percentage of students in upper-secondary education enrolled in vocational programmes, both sexes (%) .895**
76. Percentage of teachers in tertiary education who are female (%) .672*
77. Personal computers (per 100 people) .977**
78. Pupil/trained teacher ratio in primary education (headcount basis) -.954**
79. Pupil-teacher ratio in primary education (headcount basis) -.921**
80. Pupil-teacher ratio in secondary education (headcount basis) -.942**
81. Teachers in tertiary education programmes, both sexes (number) .800**

For trademark non-resident applications, here is the list of significant variables.

1. Industry, value added (% of GDP) -.681*
2. Manufacturing, value added (% of GDP) -.682*
3. Services, etc. value added (% of GDP) .730*
4. Adjusted net savings, excluding particulate emission damage (% of GNI) -.632*
5. Adjusted savings: education expenditure (% of GNI) .845**
6. Adjusted savings: energy depletion (% of GNI) -.648*
7. Adjusted savings: natural resources depletion (% of GNI) -.629*
8. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) -.763**
9. Alternative and nuclear energy (% of total energy use) .743**
10. Aquaculture production (metric tons) .604*
11. Armed forces personnel (% of total labour force) -.930**

12. Birth rate, crude (per 1,000 people) -.728*
13. CO_2 emissions (kg per PPP US$ of GDP) -.922**
14. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .604*
15. CO_2 emissions from manufacturing industries and construction (% of total fuel combustion) -.704*
16. Communications, computer, etc. (% of service exports, BoP) .705*
17. Compensation of employees (% of expense) .732*
18. Computer, communications, and other services (% of commercial service exports) .713*
19. Consumer price index (2010 = 100) .896**
20. Cost of business start-up procedures (% of GNI per capita) -.825**
21. Cost to import (US$ per container) .717*
22. Customs and other import duties (% of tax revenue) -.654*
23. Electric power consumption (kWh per capita) .789**
24. Employers, total (% of total employment) .637*
25. Employment in services (% of total employment) .687*
26. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .885**
27. Expenditure on tertiary education (% of government expenditure on education) -.861**
28. Exports of goods and services (% of GDP) -.840**
29. Final consumption expenditure, etc. (% of GDP) .823**
30. Food imports (% of merchandise imports) .623*
31. GDP per person employed (constant 2011 PPP US$) .890**
32. General government final consumption expenditure (% of GDP) .686*
33. Gross capital formation (% of GDP) .800**
34. Gross domestic savings (% of GDP) -.823**
35. Gross national expenditure (% of GDP) .931**
36. Imports of goods and services (% of GDP) -.733*
37. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .859**
38. Labour force, total .942**

39. Listed domestic companies, total -.857**
40. Machinery and transport equipment (% of value added in manufacturing) .712*
41. Manufactures imports (% of merchandise imports) -.713*
42. Merchandise exports (current US$) .792**
43. Merchandise trade (% of GDP) -.719*
44. Military expenditure (% of GDP) -.809**
45. Mobile cellular subscriptions .878**
46. Net foreign assets (current LCU) .833**
47. New businesses registered (number) .896**
48. Population growth (annual %) -.664*
49. R&D expenditure (% of GDP) .801**
50. Researchers in R&D (per million people) .862**
51. Scientific and technical journal articles .897**
52. Start-up procedures to register a business (number) -.916**
53. Technical cooperation grants (BoP, current US$) -.679*
54. Technicians in R&D (per million people) .808**
55. Tertiary education, academic staff (% female) .747**
56. Time required to start a business (days) -.775**
57. Unemployment, total (% of total labour force) (modelled ILO estimate) -.878**
58. Adjusted net enrolment rate, lower-secondary, both sexes (%) -.625*
59. Current expenditure other than staff compensation as % of total expenditure in tertiary public institutions (%)-.801**
60. Effective transition rate from primary to lower-secondary general education, both sexes (%) -.941**
61. Enrolment in early childhood education, both sexes (number) .786**
62. Enrolment in pre-primary education, both sexes (number) .791**
63. Enrolment in secondary education, both sexes (number) .922**
64. Enrolment in upper-secondary education, both sexes (number) .876**
65. Expenditure on tertiary education as % of government expenditure on education (%) -.861**
66. GDP per capita (constant 2005 US$) .958**

67. Percentage of graduates from agriculture programmes in tertiary education who are female (%) -.745**
68. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) -.756**
69. Percentage of male graduates from tertiary education graduating from agriculture programmes, male (%) .687*
70. Percentage of male graduates from tertiary education graduating from science programmes, male (%) -.819**
71. Percentage of students in tertiary education enrolled in science programmes, both sexes (%) -.667*
72. Percentage of students in upper-secondary education enrolled in vocational programmes, both sexes (%) .923**
73. Percentage of teachers in tertiary education who are female (%) .747**
74. Personal computers (per 100 people) .905**
75. Pupil/trained teacher ratio in primary education (headcount basis) -.830**
76. Pupil-teacher ratio in primary education (headcount basis) -.776**
77. Pupil-teacher ratio in secondary education (headcount basis) -.762**

For utility model resident applications, here is the list of significant variables.

1. Industry, value added (% of GDP) -.698*
2. Manufacturing, value added (% of GDP) -.678*
3. Services, etc. value added (% of GDP) .772**
4. Adjusted net savings, excluding particulate emission damage (% of GNI) -.690*
5. Adjusted savings: education expenditure (% of GNI) .825**
6. Adjusted savings: energy depletion (% of GNI) -.819**
7. Adjusted savings: natural resources depletion (% of GNI) -.807**
8. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) -.735**
9. Alternative and nuclear energy (% of total energy use) .633*
10. Armed forces personnel (% of total labour force) -.916**
11. Bank capital to assets ratio (%) .833*
12. Birth rate, crude (per 1,000 people) -.699*

13. CO_2 emissions (kg per PPP US$ of GDP) -.823**
14. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .622*
15. CO_2 emissions from manufacturing industries and construction (% of total fuel combustion) -.764**
16. Communications, computer, etc. (% of service exports, BoP) .622*
17. Compensation of employees (% of expense) .809**
18. Computer, communications, and other services (% of commercial service exports) .630*
19. Consumer price index (2010 = 100) .898**
20. Cost of business start-up procedures (% of GNI per capita) -.870**
21. Cost to import (US$ per container) .836**
22. Electric power consumption (kWh per capita) .795**
23. Employers, total (% of total employment) .685*
24. Employment in services (% of total employment) .725*
25. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .845**
26. Expenditure on tertiary education (% of government expenditure on education) -.745**
27. Exports of goods and services (% of GDP) -.836**
28. Final consumption expenditure, etc. (% of GDP) .852**
29. Food imports (% of merchandise imports) .627*
30. GDP per person employed (constant 2011 PPP US$) .884**
31. General government final consumption expenditure (% of GDP) .621*
32. Gross capital formation (% of GDP) .634*
33. Gross domestic savings (% of GDP) -.852**
34. Gross national expenditure (% of GDP) .887**
35. Imports of goods and services (% of GDP) -.752**
36. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .836**
37. Labour force, total .938**
38. Listed domestic companies, total -.829**
39. Machinery and transport equipment (% of value added in manufacturing) .812**

40. Merchandise exports (current US$) .644*
41. Merchandise trade (% of GDP) -.730*
42. Military expenditure (% of GDP) -.734*
43. Mobile cellular subscriptions .842**
44. Net foreign assets (current LCU) .763**
45. Net ODA received per capita (current US$) -.603*
46. New businesses registered (number) .891**
47. Population growth (annual %) -.816**
48. Research and development expenditure (% of GDP) .837**
49. Researchers in R&D (per million people) .872**
50. Scientific and technical journal articles .891**
51. Start-up procedures to register a business (number) -.831**
52. Technical cooperation grants (BoP, current US$) -.712*
53. Technicians in R&D (per million people) .742**
54. Time required to start a business (days) -.748**
55. Unemployment, total (% of total labour force) (modelled ILO estimate) -.692*
56. Current expenditure other than staff compensation as % of total expenditure in tertiary public institutions (%)-.810**
57. Effective transition rate from primary to lower-secondary general education, both sexes (%) -.932**
58. Enrolment in early childhood education, both sexes (number) .819**
59. Enrolment in pre-primary education, both sexes (number) .830**
60. Enrolment in primary education, both sexes (number) -.657*
61. Enrolment in secondary education, both sexes (number) .932**
62. Enrolment in upper-secondary education, both sexes (number) .844**
63. Expenditure on tertiary education as % of government expenditure on education (%) -.745**
64. GDP per capita (constant 2005 US$) .946**
65. Net flow of internationally mobile students (inbound - outbound), both sexes (number) .721*
66. Percentage of graduates from agriculture programmes in tertiary education who are female (%) -.693*

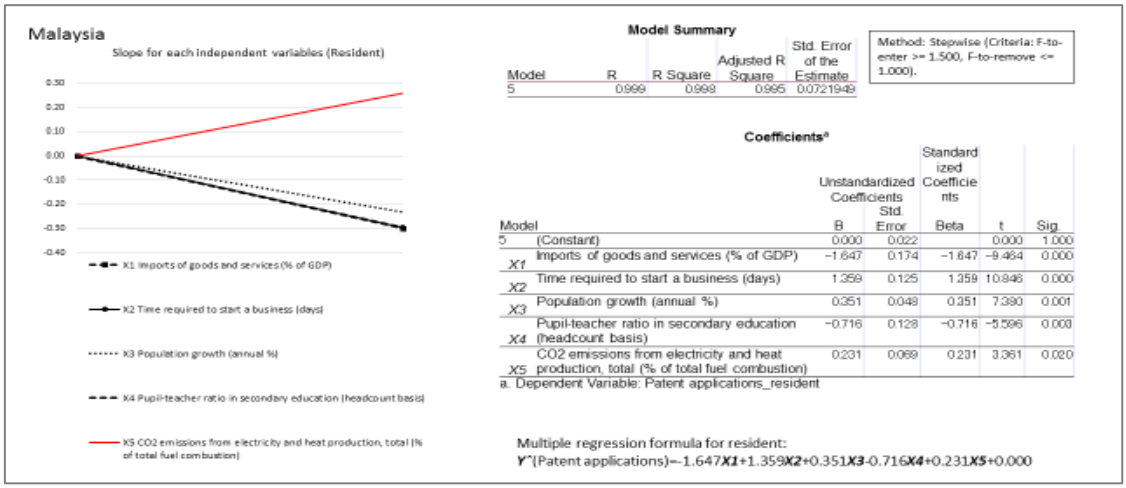
67. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) -.692*
68. Percentage of male graduates from tertiary education graduating from agriculture programmes, male (%) .622*
69. Percentage of male graduates from tertiary education graduating from science programmes, male (%) -.743**
70. Percentage of students in tertiary education enrolled in science programmes, both sexes (%) -.711*
71. Percentage of students in upper-secondary education enrolled in vocational programmes, both sexes (%) .773**
72. Personal computers (per 100 people) .907**
73. Pupil/trained teacher ratio in primary education (headcount basis) -.848**
74. Pupil-teacher ratio in primary education (headcount basis) -.764**
75. Pupil-teacher ratio in secondary education (headcount basis) -.834**
76. Pupil-teacher ratio in tertiary education (headcount basis) -.671*
77. Teachers in tertiary education programmes, both sexes (number) .757**

For utility model non-resident applications, here is the list of significant variables.

1. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .644*
2. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .645*
3. Machinery and transport equipment (% of value added in manufacturing) .639*
4. Technical cooperation grants (BoP, current US$) -.897**
5. Capital expenditure as % of total expenditure in tertiary public institutions (%) -.672*
6. Percentage of male graduates from tertiary education graduating from agriculture programmes, male (%) .619*

b) Multi-regression analysis

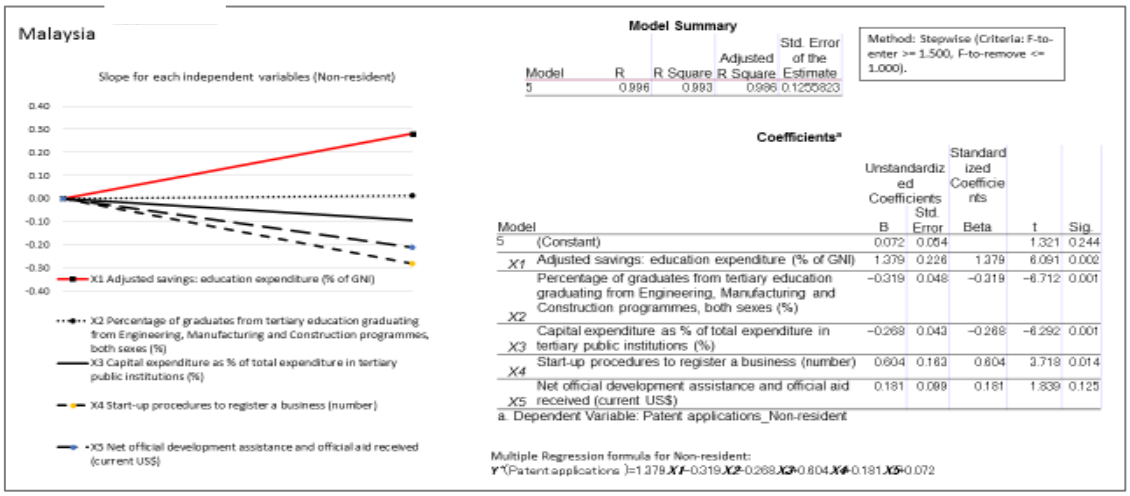
Figure 16. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Patent Applications



Source: Authors' calculation.

According to Figure 16, in order to increase resident patent applications in Malaysia, X3 'population growth' should be increased. However, X1 'imports of goods and services (% of GDP)' and X4 'pupil-teacher ratio in secondary education' should be decreased. That is, Malaysia should not rely on imports from abroad; instead, they should export their goods and services, and the number of teachers in secondary school should be increased.

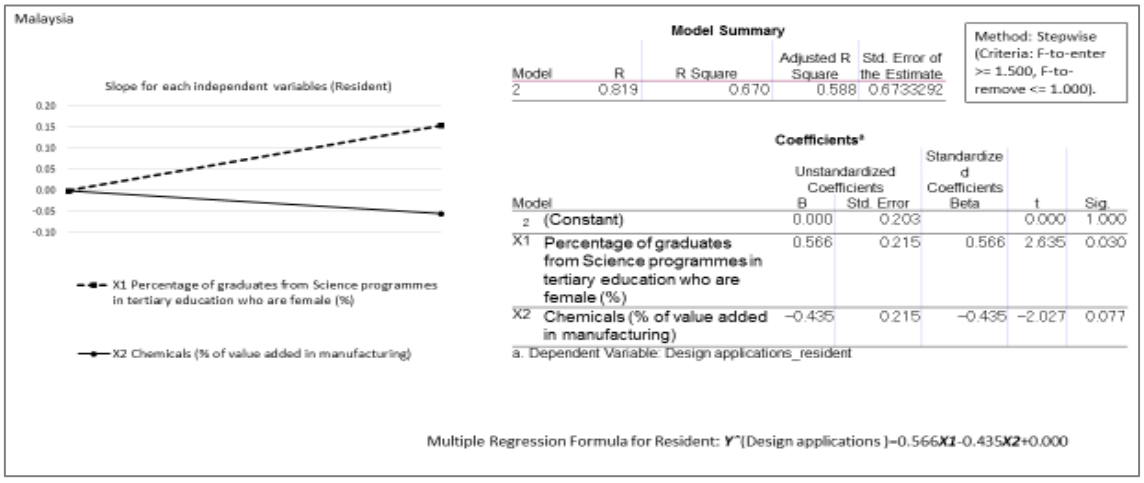
Figure 17. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Patent



Source: Authors' calculation.

According to Figure 17, in order to decrease non-resident patent applications in Malaysia, which would lead to an increase in resident patent applications, X2 'percentage of graduates from tertiary education graduating from engineering, manufacturing, and construction programmes, both sexes (%)' and X3 'capital expenditure as % of total expenditure in tertiary public institutions (%)' should be increased. That is, Malaysia should increase expenditure on tertiary education and especially encourage tertiary education in engineering, manufacturing, and construction to increase resident patent applications.

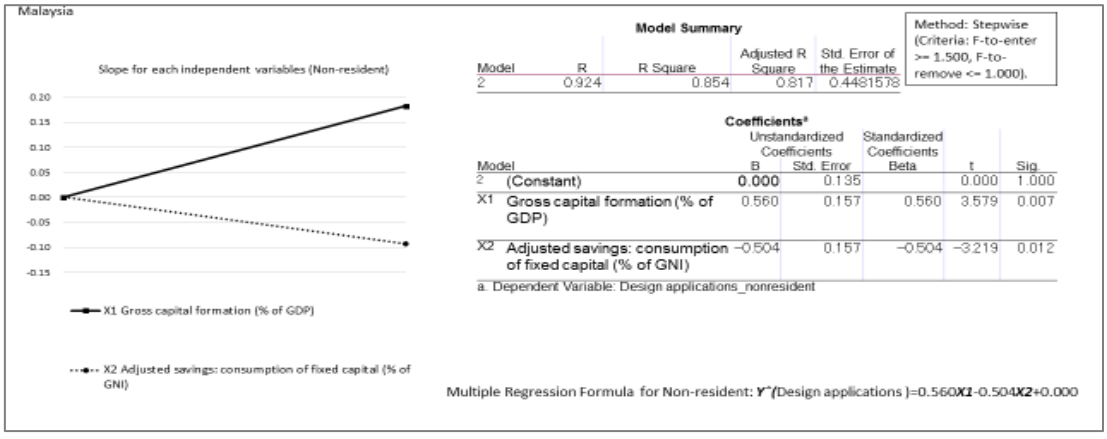
Figure 18. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Design Application



Source: Authors' calculation.

From Figure 18, X1 'percentage of graduates from science programmes in tertiary education who are female (%)' should be increased for resident design applications in Malaysia.

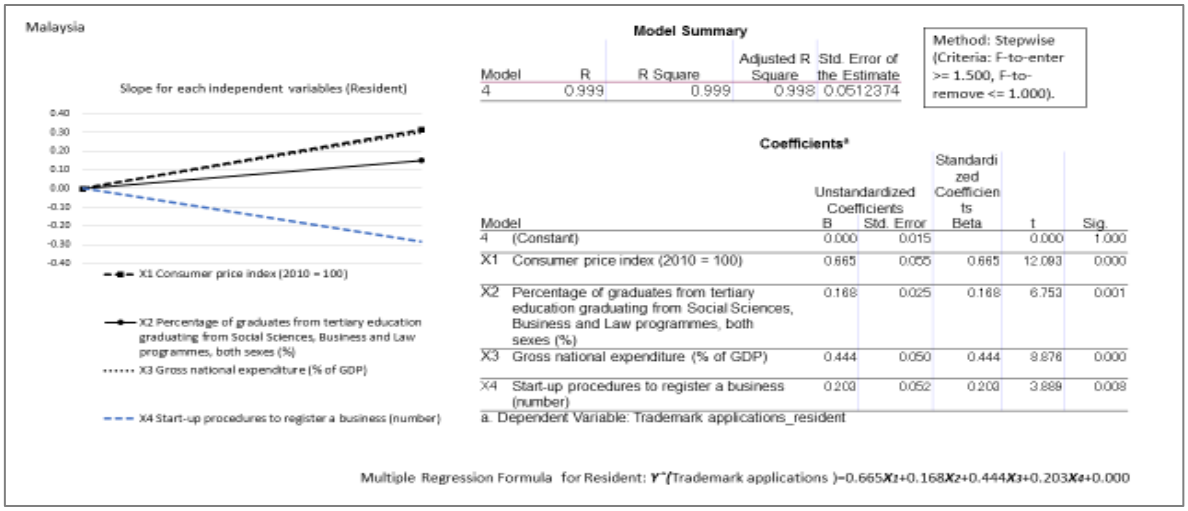
Figure 19. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Design Applications



Source: Authors' calculation.

From Figure 19, X2 'adjusted savings: consumption of fixed capital (% of GNI)' should be increased to decrease the non-resident design applications in Malaysia, which would lead to an increase in resident design applications.

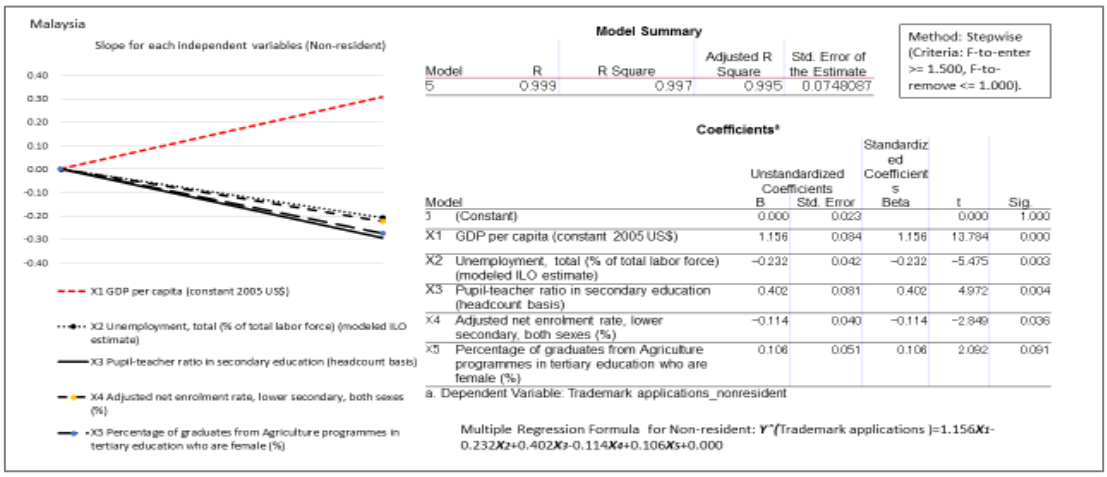
Figure 20. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Trademark Applications



Source: Authors' calculation.

From Figure 20, X1 'consumer price index (2010 = 100)', X2 'percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%)' and X3 'gross national expenditure (% of GDP)' should be increased for resident trademark applications in Malaysia.

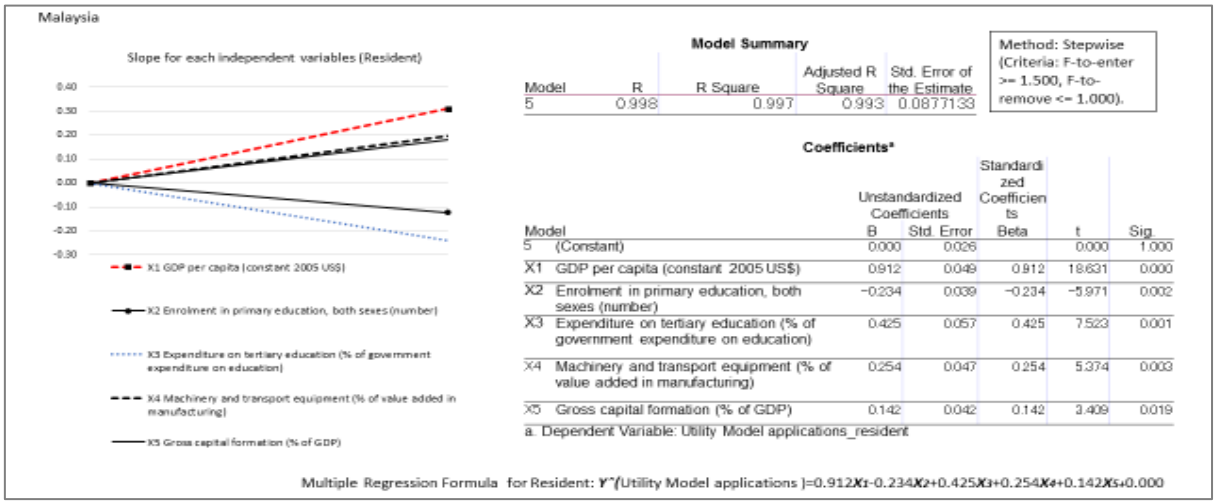
Figure 21. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Trademark Applications



Source: Authors' calculation.

From Figure 21, X4 ‘adjusted net enrolment rate, lower-secondary, both sexes (%)’ should be increased to decrease non-resident trademark applications in Malaysia, which would lead to an increase in resident trademark applications.

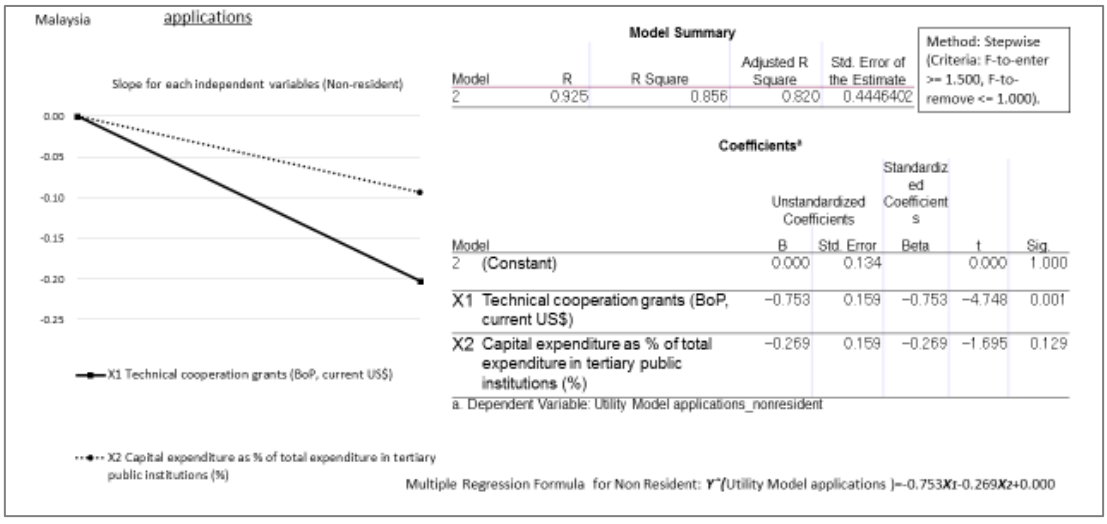
Figure 22. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Utility Model Applications



Source: Authors’ calculation.

From Figure 22, X1 ‘GDP per capita (constant 2005 US$)’ and X3 ‘expenditure on tertiary education (% of government expenditure on education)’ should be increased to increase resident utility model applications in Malaysia.

Figure 23. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Utility Model

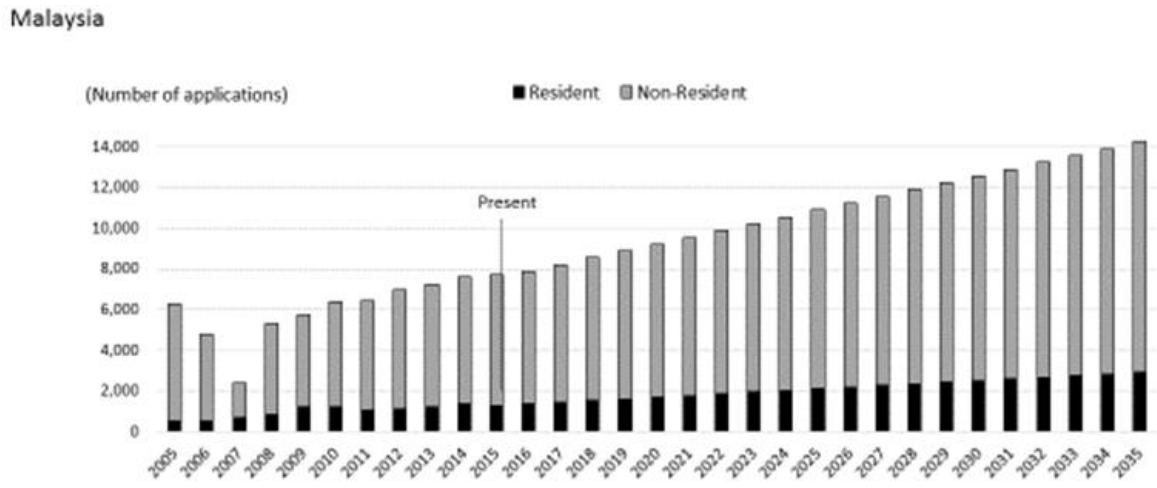


Source: Authors’ calculation.

From Figure 23, X1 ‘technical cooperation grants (BoP, current US$)’ and X2 ‘capital expenditure as % of total expenditure in tertiary public institutions (%)’ should be increased to decrease non-resident utility model applications in Malaysia, which would lead to an increase in resident applications.

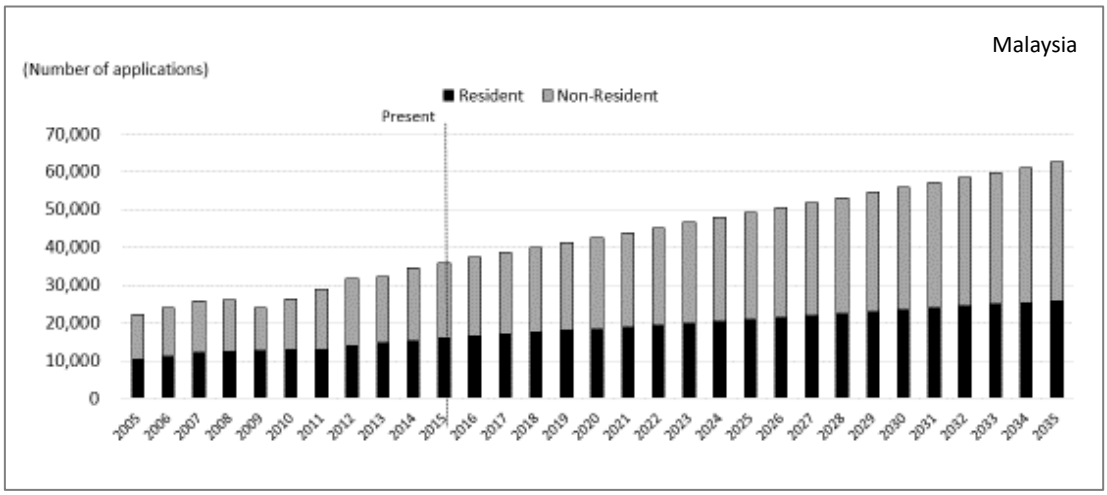
c) Forecast

Figure 24. Forecast of Patent Applications by Using Multiple Regression Formula



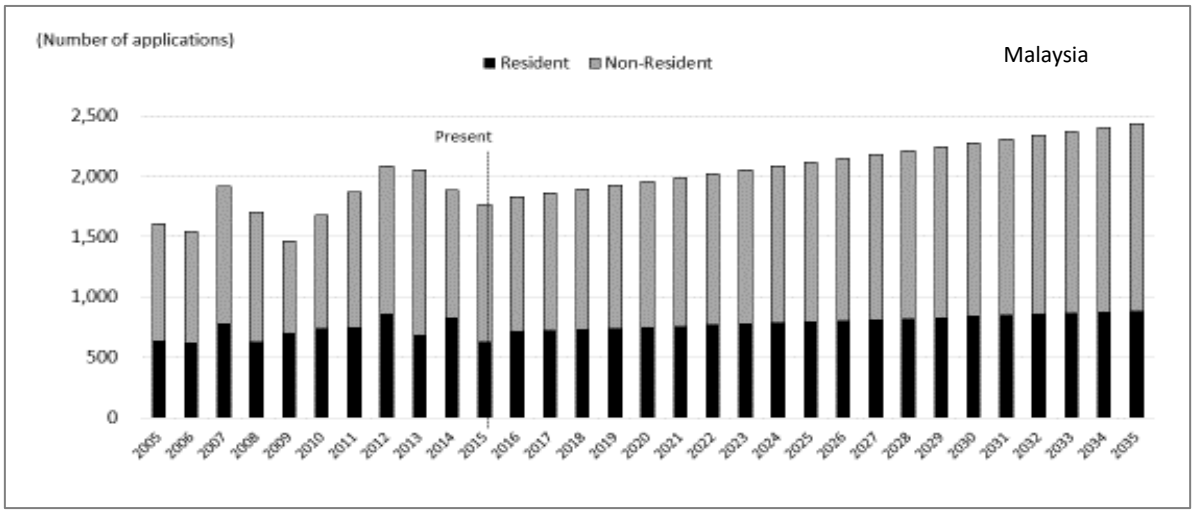
Source: Authors’ calculation.

Figure 25. Forecast of Trademark Applications by Using Multiple Regression Formula (Stepwise Method)



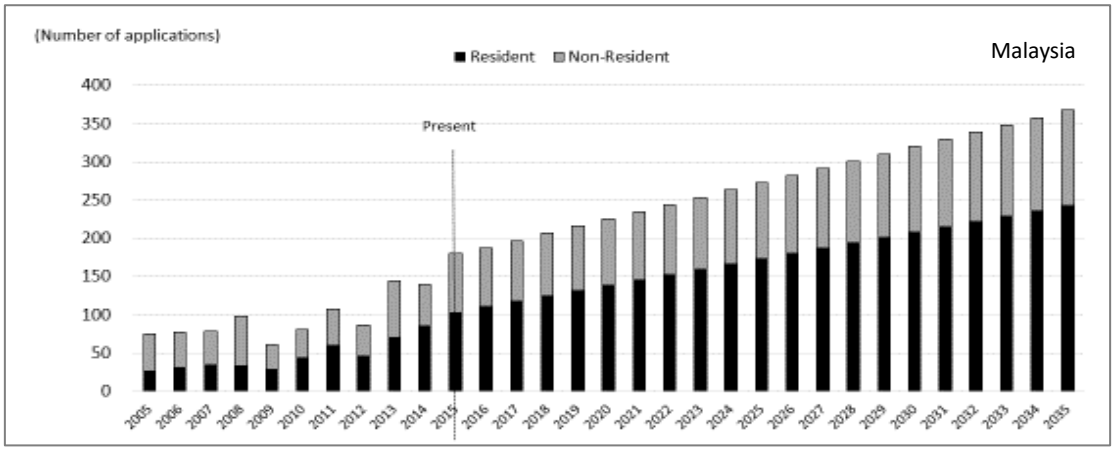
Source: Authors’ calculation.

Figure 26. Forecast of Design Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

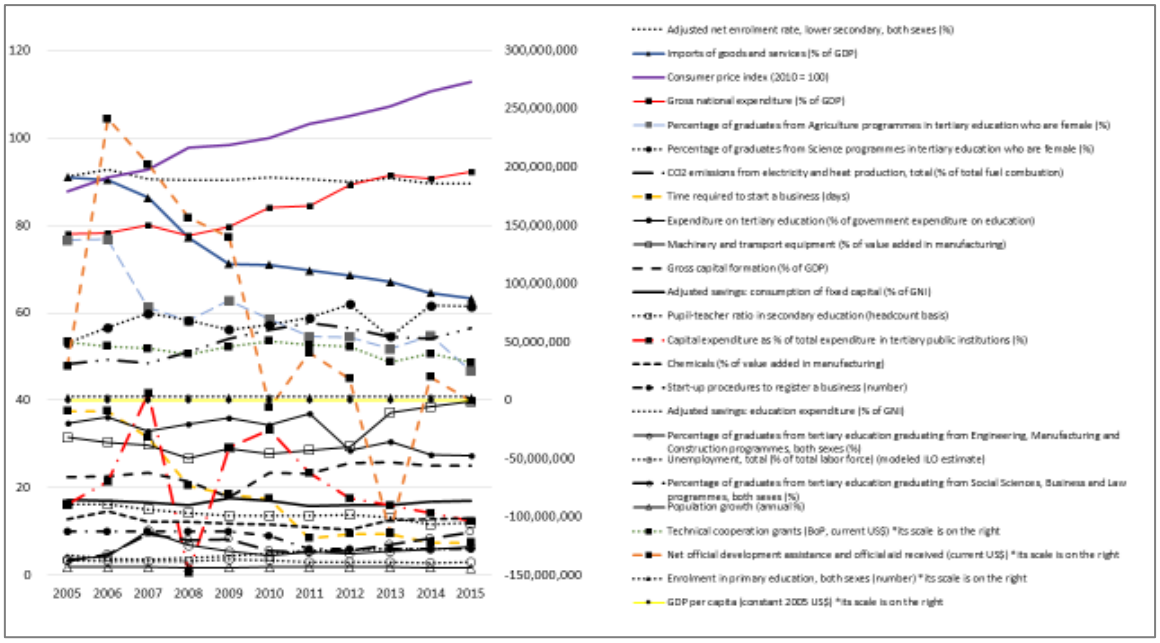
Figure 27. Forecast of Utility Model Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

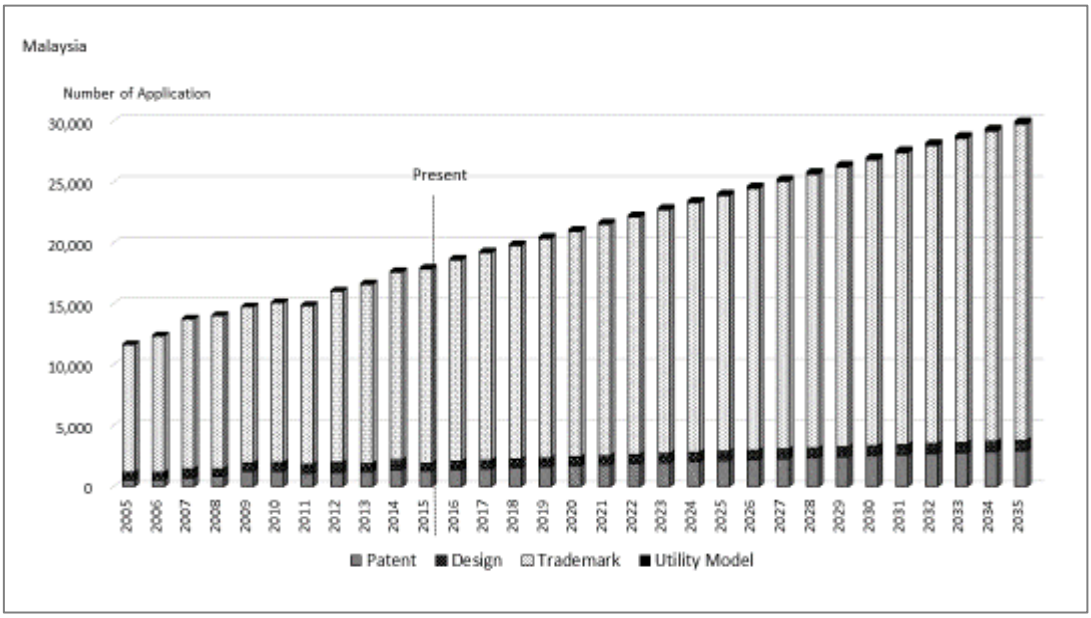
In Malaysia, Figures 24–27 show that applications for all IPs are expected to increase in the future, with the number of applications in 2035 almost twice as much as the current (2015) number, except for design.

Figure 28. The Actual WB Data Applicable to All IPs Regression Formulas (Malaysia)



Source: Authors' calculation.

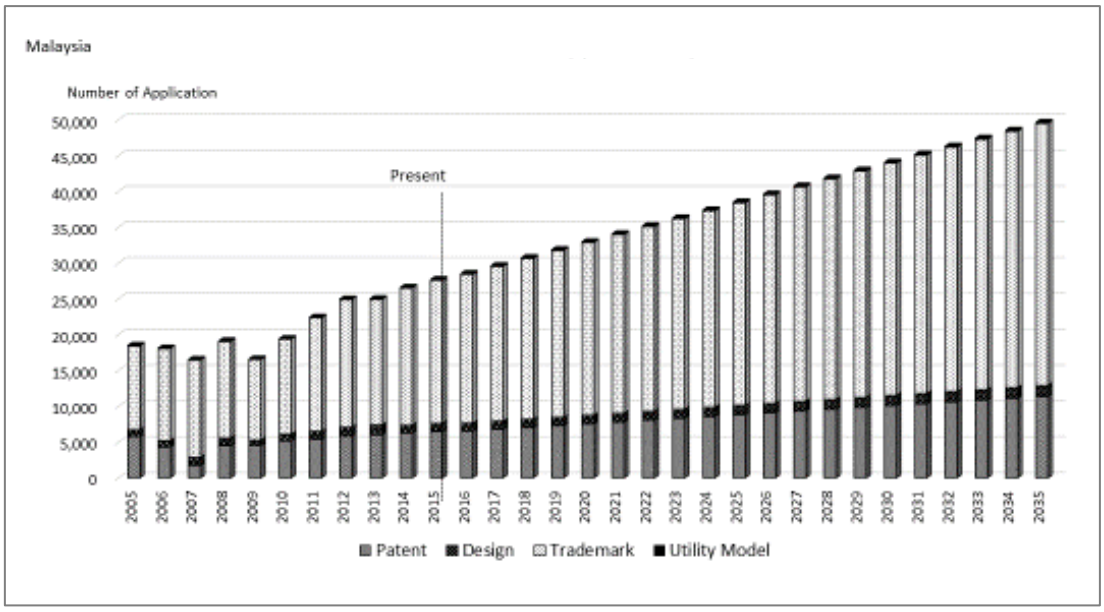
Figure 29. Forecast of Each Application by Residents



Source: Authors' calculation.

In Malaysia, the number of trademark applications by residents dominates all IPs and this will continue in the future.

Figure 30. Forecast of Each Application by Non-Residents



Source: Authors' calculation.

10.2. Viet Nam

a) Correlation coefficients

Total of 111 factors of historical data during 2005–2015 extracted from World Bank database.

Note the definitions of the variables are in the Appendix. Numbers are the actual coefficients;

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

For patent resident applications, here is the list of significant variables.

1. Services, etc. value added (% of GDP) .886*
2. Adjusted savings: education expenditure (% of GNI) .749**
3. Adjusted savings: energy depletion (% of GNI) -.836**
4. Adjusted savings: natural resources depletion (% of GNI) -.885**
5. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) .934**
6. Alternative and nuclear energy (% of total energy use) .711*
7. Aquaculture production (metric tons) .888**
8. Armed forces personnel (% of total labour force) -.895**

9. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .857**
10. Compulsory education, duration (years) .642*
11. Consumer price index (2010 = 100) .932**
12. Cost of business start-up procedures (% of GNI per capita) -.879**
13. Electric power consumption (kWh per capita) .918**
14. Employment in industry (% of total employment) .910**
15. Employment in services (% of total employment) .944**
16. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .895**
17. Exports of goods and services (% of GDP) .923**
18. Food exports (% of merchandise exports) -.941**
19. Food imports (% of merchandise imports) .794**
20. Foreign direct investment, net outflows (% of GDP) .619*
21. GDP per person employed (constant 2011 PPP US$) .969**
22. General government final consumption expenditure (% of GDP) .959**
23. Gross capital formation (% of GDP) -.805**
24. Gross national expenditure (% of GDP) -.699*
25. High-technology exports (% of manufactured exports) .877**
26. High-technology exports (current US$) .976**
27. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .939**
28. Labour force, total .947**
29. Listed domestic companies, total .782*
30. Machinery and transport equipment (% of value added in manufacturing) .797*
31. Manufactures exports (% of merchandise exports).934**
32. Manufactures imports (% of merchandise imports) .672*
33. Merchandise exports (current US$) .974**
34. Merchandise trade (% of GDP) .829**
35. Mobile cellular subscriptions .760**
36. Net foreign assets (current LCU) .886**
37. Net ODA received per capita (current US$) .613*
38. Net ODA and official aid received (current US$) .673*

39. Physicians (per 1,000 people) .730*
40. Price-level ratio of PPP conversion factor (GDP) to market exchange rate .850**
41. Renewable energy consumption (% of total final energy consumption) -.815**
42. Scientific and technical journal articles .923**
43. Start-up procedures to register a business (number) -.802**
44. Tertiary education, academic staff (% female) .810**
45. Time required to start a business (days) -.849**
46. Unemployment, total (% of total labour force) (modelled ILO estimate) -.616*
47. Government expenditure on education as % of GDP (%) .905*
48. Primary completion rate, both sexes (%) .764**
49. Cumulative drop-out rate to the last grade of lower-secondary general education, both sexes (%) -.638*
50. Duration of compulsory education (years) .642*
51. Enrolment in early childhood education, both sexes (number) .913**
52. Enrolment in pre-primary education, both sexes (number) .974**
53. Enrolment in tertiary education per 100,000 inhabitants, both sexes .919**
54. GDP per capita (constant 2005 US$) .969**
55. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .937**
56. Graduates from tertiary education, both sexes (number) .962**
57. Gross enrolment ratio, tertiary, both sexes (%) .933**
58. Percentage of enrolment in tertiary education in private institutions (%) .613*
59. Percentage of graduates from agriculture programmes in tertiary education who are female (%) .686*
60. Percentage of graduates from engineering, manufacturing, and construction programmes in tertiary education who are female (%) .915**
61. Percentage of graduates from science and technology programmes in tertiary education who are female (%) .915**
62. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) .884**

63. Percentage of graduates from tertiary education graduating from engineering, manufacturing and construction programmes, both sexes (%) .884**
64. Percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%) .711*
65. Percentage of male graduates from tertiary education graduating from social sciences, business, and law programmes, male (%) .728*
66. Percentage of students in tertiary education enrolled in engineering, manufacturing, and construction programmes, both sexes (%) .682*
67. Percentage of students in tertiary education enrolled in health and welfare programmes, both sexes (%) .870**
68. Percentage of students in tertiary education enrolled in social sciences, business and Law programmes, both sexes (%) -.893**
69. Percentage of teachers in tertiary education who are female (%) .810**
70. Personal computers (per 100 people) .966**
71. Pupil/trained teacher ratio in primary education (headcount basis) -.846**
72. Pupil-teacher ratio in primary education (headcount basis) -.771**
73. Teachers in tertiary education programmes, both sexes (number) .948**

For patent non-resident applications, here is the list of significant variables.

1. Services, etc. value added (% of GDP) .885*
2. Adjusted savings: consumption of fixed capital (% of GNI) .644*
3. Adjusted savings: education expenditure (% of GNI) .877**
4. Adjusted savings: energy depletion (% of GNI) -.857**
5. Adjusted savings: natural resources depletion (% of GNI) -.857**
6. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) .984**
7. Alternative and nuclear energy (% of total energy use) .683*
8. Aquaculture production (metric tons) .963**
9. Armed forces personnel (% of total labour force) -.920**
10. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .732*
11. Consumer price index (2010 = 100) .932**
12. Contributing family workers, total (% of total employment) -.745**
13. Cost of business start-up procedures (% of GNI per capita) -.950**

14. Electric power consumption (kWh per capita) .927**
15. Employment in industry (% of total employment) .961**
16. Employment in services (% of total employment) .957**
17. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .765**
18. Exports of goods and services (% of GDP) .910**
19. Food exports (% of merchandise exports) -.820**
20. Food imports (% of merchandise imports) .854**
21. Foreign direct investment, net outflows (% of GDP) .651*
22. GDP per person employed (constant 2011 PPP US$) .971**
23. General government final consumption expenditure (% of GDP) .937**
24. Gross capital formation (% of GDP) -.666*
25. High-technology exports (% of manufactured exports) .775**
26. High-technology exports (current US$) .860**
27. Imports of goods and services (% of GDP) .815**
28. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .789**
29. Labour force, total .958**
30. Listed domestic companies, total .744*
31. Manufactures exports (% of merchandise exports) .913**
32. Merchandise exports (current US$) .940**
33. Merchandise trade (% of GDP) .898**
34. Military expenditure (% of GDP) .699*
35. Mobile cellular subscriptions .873**
36. Net foreign assets (current LCU) .819**
37. Net ODA received per capita (current US$) .654*
38. Net ODA and official aid received (current US$) .704*
39. Physicians (per 1,000 people) .646*
40. Population growth (annual %) -.618*
41. Price level ratio of PPP conversion factor (GDP) to market exchange rate .910**
42. Renewable energy consumption (% of total final energy consumption) -.902**
43. Scientific and technical journal articles .908**

44. Start-up procedures to register a business (number) -.816**
45. Tertiary education, academic staff (% female) .894**
46. Time required to start a business (days) -.875**
47. Primary completion rate, both sexes (%) .881**
48. Enrolment in early childhood education, both sexes (number) .848**
49. Enrolment in pre-primary education, both sexes (number) .940**
50. Enrolment in tertiary education per 100,000 inhabitants, both sexes .943**
51. Expenditure on education as % of total government expenditure (%) .850*
52. GDP per capita (constant 2005 US$) .967**
53. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .876**
54. Graduates from tertiary education, both sexes (number) .917**
55. Gross enrolment ratio, tertiary, both sexes (%) .940**
56. Percentage of enrolment in tertiary education in private institutions (%) .714*
57. Percentage of graduates from agriculture programmes in tertiary education who are female (%) .799**
58. Percentage of graduates from engineering, manufacturing, and construction programmes in tertiary education who are female (%) .837**
59. Percentage of graduates from science and technology programmes in tertiary education who are female (%) .837**
60. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) .761**
61. Percentage of graduates from tertiary education graduating from engineering, manufacturing, and construction programmes, both sexes (%) .761**
62. Percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%) .609*
63. Percentage of students in tertiary education enrolled in health and welfare programmes, both sexes (%) .841**
64. Percentage of students in tertiary education enrolled in social sciences, business, and law programmes, both sexes (%) -.872**
65. Percentage of teachers in tertiary education who are female (%) .894**
66. Personal computers (per 100 people) .938**

67. Pupil/trained teacher ratio in primary education (headcount basis) -.863**
68. Pupil-teacher ratio in primary education (headcount basis) -.856**
69. Teachers in tertiary education programmes, both sexes (number) .927**

For design resident applications, here is the list of significant variables.

1. Services, etc. value added (% of GDP) .820*
2. Adjusted savings: consumption of fixed capital (% of GNI) .753**
3. Adjusted savings: education expenditure (% of GNI) .704*
4. Adjusted savings: energy depletion (% of GNI) -.885**
5. Adjusted savings: natural resources depletion (% of GNI) -.898**
6. Agricultural methane emissions (thousand metric tons of CO2 equivalent) .818**
7. Aquaculture production (metric tons) .806**
8. Armed forces personnel (% of total labour force) -.889**
9. CO2 emissions from electricity and heat production, total (% of total fuel combustion) .611*
10. Consumer price index (2010 = 100) .756**
11. Contributing family workers, total (% of total employment) -.657*
12. Cost of business start-up procedures (% of GNI per capita) -.822**
13. Electric power consumption (kWh per capita) .787**
14. Employment in industry (% of total employment) .785**
15. Employment in services (% of total employment) .800**
16. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .603*
17. Exports of goods and services (% of GDP) .690*
18. Food exports (% of merchandise exports) -.687*
19. Food imports (% of merchandise imports) .642*
20. GDP per person employed (constant 2011 PPP US$) .831**
21. General government final consumption expenditure (% of GDP) .791**
22. High-technology exports (% of manufactured exports) .686*
23. High-technology exports (current US$) .763**
24. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .650*
25. Labour force, total .803**
26. Manufactures exports (% of merchandise exports) .786**

27. Manufactures imports (% of merchandise imports) .663*
28. Merchandise exports (current US$) .779**
29. Merchandise trade (% of GDP) .663*
30. Military expenditure (% of GDP) .812**
31. Mobile cellular subscriptions .699*
32. Net foreign assets (current LCU) .809**
33. Net ODA received per capita (current US$) .674*
34. Net ODA and official aid received (current US$) .705*
35. Physicians (per 1,000 people) .602*
36. Price level ratio of PPP conversion factor (GDP) to market exchange rate .724*
37. Renewable energy consumption (% of total final energy consumption) -.721*
38. Scientific and technical journal articles .716*
39. Tertiary education, academic staff (% female) .826**
40. Time required to start a business (days) -.720*
41. Primary completion rate, both sexes (%) .805**
42. Enrolment in early childhood education, both sexes (number) .764**
43. Enrolment in pre-primary education, both sexes (number) .820**
44. Enrolment in tertiary education per 100,000 inhabitants, both sexes .784**
45. GDP per capita (constant 2005 US$) .821**
46. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .702*
47. Graduates from tertiary education, both sexes (number) .753**
48. Gross enrolment ratio, tertiary, both sexes (%) .795**
49. Percentage of graduates from agriculture programmes in tertiary education who are female (%) .646*
50. Percentage of graduates from engineering, manufacturing, and construction programmes in tertiary education who are female (%) .860**
51. Percentage of graduates from science and technology programmes in tertiary education who are female (%) .860**
52. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) .726*

53. Percentage of graduates from tertiary education graduating from engineering, manufacturing, and construction programmes, both sexes (%) .726*
54. Percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%) .852**
55. Percentage of students in tertiary education enrolled in health and welfare programmes, both sexes (%) .620*
56. Percentage of students in tertiary education enrolled in social sciences, business, and law programmes, both sexes (%) -.798**
57. Percentage of teachers in tertiary education who are female (%) .826**
58. Personal computers (per 100 people) .807**
59. Pupil/trained teacher ratio in primary education (headcount basis) -.786**
60. Pupil-teacher ratio in primary education (headcount basis) -.793**
61. Teachers in tertiary education programmes, both sexes (number) .767**

For design non-resident applications, here is the list of significant variables.

1. Services, etc. value added (% of GDP) .866*
2. Adjusted savings: energy depletion (% of GNI) -.606*
3. Adjusted savings: natural resources depletion (% of GNI) -.610*
4. Agricultural methane emissions (thousand metric tons of CO2 equivalent) .780**
5. Aquaculture production (metric tons) .688*
6. Armed forces personnel (% of total labour force) -.741**
7. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .687*
8. Compulsory education, duration (years) .615*
9. Consumer price index (2010 = 100) .694*
10. Cost of business start-up procedures (% of GNI per capita) -.654*
11. Electric power consumption (kWh per capita) .658*
12. Employment in industry (% of total employment) .708*
13. Employment in services (% of total employment) .697*
14. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .688*
15. Exports of goods and services (% of GDP) .814**
16. Food exports (% of merchandise exports) -.793**

17. GDP per person employed (constant 2011 PPP US$) .757**
18. General government final consumption expenditure (% of GDP) .726*
19. High-technology exports (% of manufactured exports) .652*
20. High-technology exports (current US$) .808**
21. Imports of goods and services (% of GDP) .819**
22. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .721*
23. Labour force, total .711*
24. Manufactures exports (% of merchandise exports) .661*
25. Merchandise exports (current US$) .785**
26. Merchandise trade (% of GDP) .888**
27. Net foreign assets (current LCU) .803**
28. Physicians (per 1,000 people) .669*
29. Price level ratio of PPP conversion factor (GDP) to market exchange rate .630*
30. Renewable energy consumption (% of total final energy consumption) -.648*
31. Scientific and technical journal articles .660*
32. Time required to start a business (days) -.690*
33. Cumulative drop-out rate to the last grade of lower-secondary general education, both sexes (%) -.709*
34. Duration of compulsory education (years) .615*
35. Enrolment in early childhood education, both sexes (number) .742**
36. Enrolment in pre-primary education, both sexes (number) .749**
37. Enrolment in tertiary education per 100,000 inhabitants, both sexes .679*
38. GDP per capita (constant 2005 US$) .751**
39. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .715*
40. Graduates from tertiary education, both sexes (number) .759**
41. Gross enrolment ratio, tertiary, both sexes (%) .702*
42. Percentage of graduates from engineering, manufacturing, and construction programmes in tertiary education who are female (%) .798**
43. Percentage of graduates from science and technology programmes in tertiary education who are female (%) .798**

44. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) .834**
45. Percentage of graduates from tertiary education graduating from engineering, manufacturing, and construction programmes, both sexes (%) .834**
46. Percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%) .699*
47. Percentage of students in tertiary education enrolled in social sciences, business, and law programmes, both sexes (%) -.856**
48. Personal computers (per 100 people) .728*
49. Pupil/trained teacher ratio in primary education (headcount basis) -.748**
50. Pupil-teacher ratio in primary education (headcount basis) -.615*
51. Teachers in tertiary education programmes, both sexes (number) .669*

For trademark resident applications, here is the list of significant variables.

1. Services, etc. value added (% of GDP) .879*
2. Adjusted savings: consumption of fixed capital (% of GNI) .769**
3. Adjusted savings: education expenditure (% of GNI) .857**
4. Adjusted savings: energy depletion (% of GNI) -.935**
5. Adjusted savings: natural resources depletion (% of GNI) -.927**
6. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) .963**
7. Alternative and nuclear energy (% of total energy use) .671*
8. Aquaculture production (metric tons) .949**
9. Armed forces personnel (% of total labour force) -.972**
10. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .664*
11. Compulsory education, duration (years) .605*
12. Consumer price index (2010 = 100) .899**
13. Contributing family workers, total (% of total employment) -.804**
14. Cost of business start-up procedures (% of GNI per capita) -.945**
15. Electric power consumption (kWh per capita) .891**
16. Employment in industry (% of total employment) .953**
17. Employment in services (% of total employment) .935**

18. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .698*
19. Exports of goods and services (% of GDP) .838**
20. Food exports (% of merchandise exports) -.775**
21. Food imports (% of merchandise imports) .815**
22. Foreign direct investment, net outflows (% of GDP) .635*
23. GDP per person employed (constant 2011 PPP US$) .957**
24. General government final consumption expenditure (% of GDP) .911**
25. High-technology exports (% of manufactured exports) .729*
26. High-technology exports (current US$) .844**
27. Imports of goods and services (% of GDP) .783**
28. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .735**
29. Labour force, total .935**
30. Manufactures exports (% of merchandise exports) .880**
31. Merchandise exports (current US$) .906**
32. Merchandise trade (% of GDP) .833**
33. Military expenditure (% of GDP) .760**
34. Mobile cellular subscriptions .846**
35. Net foreign assets (current LCU) .827**
36. Net ODA received per capita (current US$) .682*
37. Net ODA and official aid received (current US$) .725*
38. Physicians (per 1,000 people) .623*
39. Population growth (annual %) -.657*
40. Price level ratio of PPP conversion factor (GDP) to market exchange rate .882**
41. Renewable energy consumption (% of total final energy consumption) -.905**
42. Scientific and technical journal articles .867**
43. Start-up procedures to register a business (number) -.694*
44. Tertiary education, academic staff (% female) .913**
45. Time required to start a business (days) -.868**
46. Primary completion rate, both sexes (%) .876**

47. Cumulative drop-out rate to the last grade of lower-secondary general education, both sexes (%) -.616*
48. Duration of compulsory education (years) .605*
49. Enrolment in early childhood education, both sexes (number) .829**
50. Enrolment in pre-primary education, both sexes (number) .925**
51. Enrolment in tertiary education per 100,000 inhabitants, both sexes .897**
52. GDP per capita (constant 2005 US$) .948**
53. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .835**
54. Graduates from tertiary education, both sexes (number) .888**
55. Gross enrolment ratio, tertiary, both sexes (%) .897**
56. Percentage of enrolment in tertiary education in private institutions (%) .648*
57. Percentage of graduates from agriculture programmes in tertiary education who are female (%) .805**
58. Percentage of graduates from engineering, manufacturing, and construction programmes in tertiary education who are female (%) .856**
59. Percentage of graduates from science and technology programmes in tertiary education who are female (%) .856**
60. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) .779**
61. Percentage of graduates from tertiary education graduating from engineering, manufacturing, and construction programmes, both sexes (%) .779**
62. Percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%) .746**
63. Percentage of students in tertiary education enrolled in health and welfare programmes, both sexes (%) .782**
64. Percentage of students in tertiary education enrolled in social sciences, business, and law programmes, both sexes (%) -.885**
65. Percentage of teachers in tertiary education who are female (%) .913**
66. Personal computers (per 100 people) .924**
67. Pupil/trained teacher ratio in primary education (headcount basis) -.918**
68. Pupil-teacher ratio in primary education (headcount basis) -.900**

69. Teachers in tertiary education programmes, both sexes (number) .882**

For trademark non-resident applications, here is the list of significant variables.

1. Services, etc. value added (% of GDP) .833*
2. Adjusted savings: consumption of fixed capital (% of GNI) .712*
3. Adjusted savings: education expenditure (% of GNI) .649*
4. Adjusted savings: energy depletion (% of GNI) -.692*
5. Adjusted savings: natural resources depletion (% of GNI) -.659*
6. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) .778**
7. Aquaculture production (metric tons) .744**
8. Armed forces personnel (% of total labour force) -.762**
9. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .613*
10. Consumer price index (2010 = 100) .640*
11. Contributing family workers, total (% of total employment) -.623*
12. Cost of business start-up procedures (% of GNI per capita) -.728*
13. Electric power consumption (kWh per capita) .668*
14. Employment in industry (% of total employment) .684*
15. Employment in services (% of total employment) .696*
16. Exports of goods and services (% of GDP) .698*
17. Food exports (% of merchandise exports) -.633*
18. GDP per person employed (constant 2011 PPP US$) .720*
19. General government final consumption expenditure (% of GDP) .654*
20. High-technology exports (current US$) .628*
21. Imports of goods and services (% of GDP) .821**
22. Labour force, total .694*
23. Manufactures exports (% of merchandise exports) .654*
24. Merchandise exports (current US$) .682*
25. Merchandise trade (% of GDP) .788**
26. Military expenditure (% of GDP) .859**
27. Mobile cellular subscriptions .608*
28. Net foreign assets (current LCU) .768**
29. Population growth (annual %) -.685*

30. Price-level ratio of PPP conversion factor (GDP) to market exchange rate .653*
31. Renewable energy consumption (% of total final energy consumption) -.617*
32. Scientific and technical journal articles .625*
33. Tertiary education, academic staff (% female) .720*
34. Time required to start a business (days) -.639*
35. Primary completion rate, both sexes (%) .732*
36. Enrolment in early childhood education, both sexes (number) .648*
37. Enrolment in pre-primary education, both sexes (number) .706*
38. Enrolment in tertiary education per 100,000 inhabitants, both sexes .659*
39. GDP per capita (constant 2005 US$) .708*
40. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .619*
41. Graduates from tertiary education, both sexes (number) .675*
42. Gross enrolment ratio, tertiary, both sexes (%) .662*
43. Percentage of graduates from engineering, manufacturing, and construction programmes in tertiary education who are female (%) .714*
44. Percentage of graduates from science and technology programmes in tertiary education who are female (%) .714*
45. Percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%) .678*
46. Percentage of students in tertiary education enrolled in social sciences, business, and law programmes, both sexes (%) -.807**
47. Percentage of teachers in tertiary education who are female (%) .720*
48. Personal computers (per 100 people) .691*
49. Pupil/trained teacher ratio in primary education (headcount basis) -.705*
50. Pupil-teacher ratio in primary education (headcount basis) -.740**
51. Teachers in tertiary education programmes, both sexes (number) .644*

For utility model resident applications, here is the list of significant variables.

1. Services, etc. value added (% of GDP) .922**
2. Adjusted savings: energy depletion (% of GNI) -.627*
3. Adjusted savings: natural resources depletion (% of GNI) -.708*

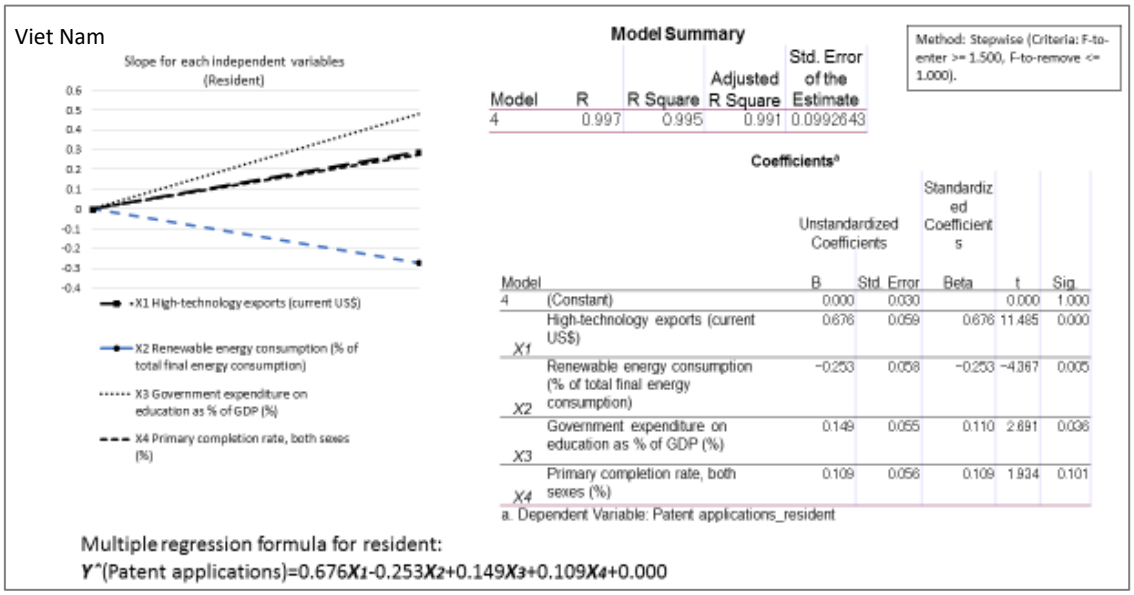
4. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) .724*
5. Aquaculture production (metric tons) .660*
6. Armed forces personnel (% of total labour force) -.618*
7. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .882**
8. Compulsory education, duration (years) .676*
9. Consumer price index (2010 = 100) .768**
10. Cost of business start-up procedures (% of GNI per capita) -.658*
11. Electric power consumption (kWh per capita) .743**
12. Employment in industry (% of total employment) .765**
13. Employment in services (% of total employment) .770**
14. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .823**
15. Exports of goods and services (% of GDP) .812**
16. Food exports (% of merchandise exports) -.854**
17. Food imports (% of merchandise imports) .719*
18. GDP per person employed (constant 2011 PPP US$) .806**
19. General government final consumption expenditure (% of GDP) .851**
20. Gross capital formation (% of GDP) -.792**
21. Gross national expenditure (% of GDP) -.765**
22. High-technology exports (% of manufactured exports) .725*
23. High-technology exports (current US$) .868**
24. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) .890**
25. Labour force, total .776**
26. Listed domestic companies, total .843**
27. Manufactures exports (% of merchandise exports) .773**
28. Merchandise exports (current US$) .828**
29. Merchandise trade (% of GDP) .668*
30. Net foreign assets (current LCU) .674*
31. Physicians (per 1,000 people) .662*
32. Price-level ratio of PPP conversion factor (GDP) to market exchange rate .630*
33. Renewable energy consumption (% of total final energy consumption) -.712*

34. Scientific and technical journal articles .765**
35. Start-up procedures to register a business (number) -.798**
36. Time required to start a business (days) -.720*
37. Duration of compulsory education (years) .676*
38. Enrolment in early childhood education, both sexes (number) .734*
39. Enrolment in pre-primary education, both sexes (number) .802**
40. Enrolment in tertiary education per 100,000 inhabitants, both sexes .780**
41. GDP per capita (constant 2005 US$) .808**
42. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .792**
43. Graduates from tertiary education, both sexes (number) .851**
44. Gross enrolment ratio, tertiary, both sexes (%) .797**
45. Percentage of graduates from engineering, manufacturing, and construction programmes in tertiary education who are female (%) .723*
46. Percentage of graduates from science and technology programmes in tertiary education who are female (%) .723*
47. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) .831**
48. Percentage of graduates from tertiary education graduating from engineering, manufacturing, and construction programmes, both sexes (%) .831**
49. Percentage of male graduates from tertiary education graduating from social sciences, business, and law programmes, male (%) .775**
50. Percentage of students in tertiary education enrolled in engineering, manufacturing, and construction programmes, both sexes (%) .635*
51. Percentage of students in tertiary education enrolled in health and welfare programmes, both sexes (%) .754**
52. Percentage of students in tertiary education enrolled in social sciences, business, and law programmes, both sexes (%) -.649*
53. Personal computers (per 100 people) .821**
54. Pupil/trained teacher ratio in primary education (headcount basis) -.699*
55. Teachers in tertiary education programmes, both sexes (number) .800**

For utility model resident applications, 'technical cooperation grants (BoP, current US$) -.668*' is the only significant variable.

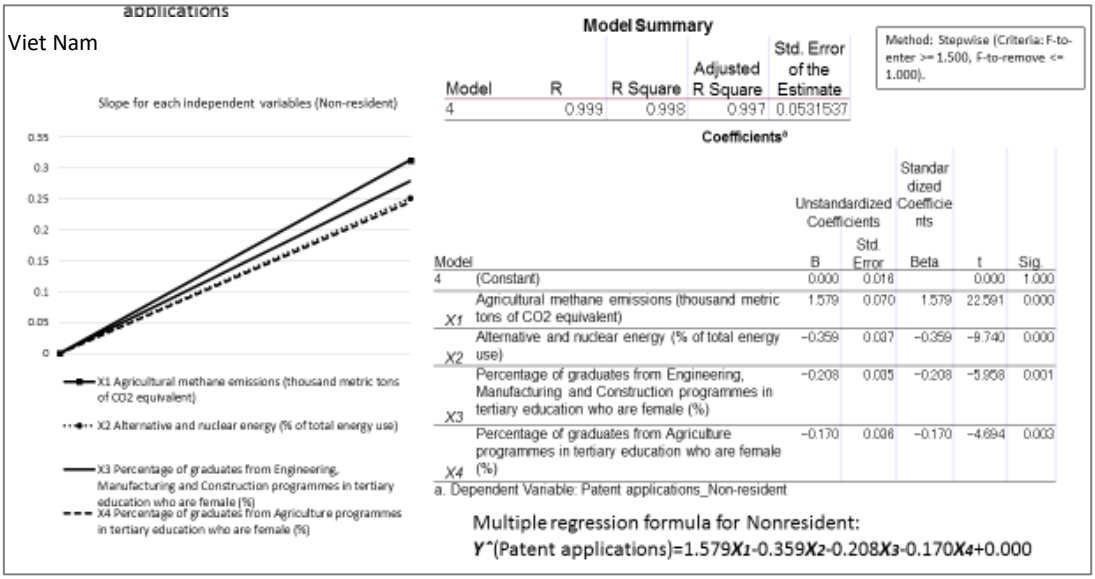
b) Multi-regression analysis

Figure 31. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Patent Applications



From Figure 31, X1 'high-technology exports (current US$)' should be increased to increase the resident patent applications in Viet Nam.

Figure 32. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Patent Applications

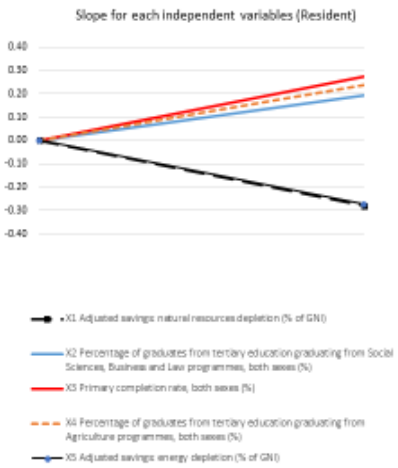


Source: Authors' calculation.

From Figure 32, in the area of education, X3 ‘percentage of graduates from engineering, manufacturing, and construction programmes in tertiary education who are female (%)’ should be increased to decrease the non-resident patent applications in Viet Nam.

Figure 33. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Design Applications

Viet Nam



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
5	0.990	0.982	0.965	0.1970705

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
2	(Constant)	0.000	0.059		0.000	1.000
X1	Adjusted savings: natural resources depletion (% of GNI)	-1.495	0.525	-1.495	-2.845	0.036
X2	Percentage of graduates from tertiary education graduating from Social Sciences, Business and Law programmes, both sexes (%)	0.723	0.112	0.723	6.449	0.001
X3	Primary completion rate, both sexes (%)	0.394	0.103	0.394	3.839	0.012
X4	Percentage of graduates from tertiary education graduating from Agriculture programmes, both sexes (%)	-0.495	0.138	-0.495	-3.597	0.016
X5	Adjusted savings: energy depletion (% of GNI)	1.055	0.505	1.055	2.087	0.091

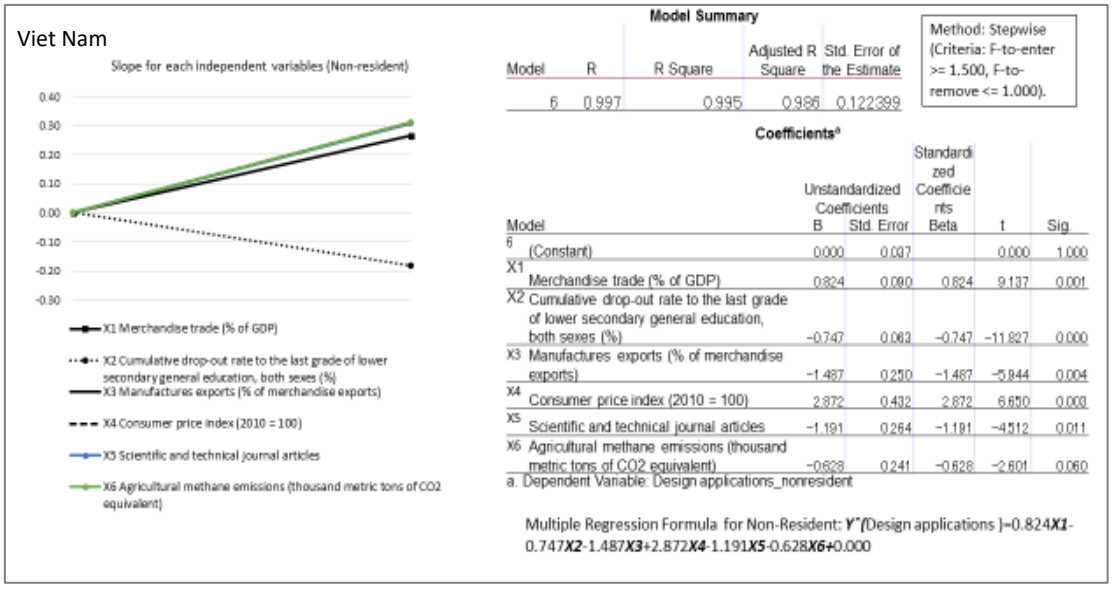
a. Dependent Variable: Design applications_resident

Multiple Regression Formula for Resident: $Y\hat{}$(Design applications)=-1.495***X1***+0.723***X2***+0.394***X3***-0.495***X4***+1.055***X5***+0.000

Source: Authors’ calculation.

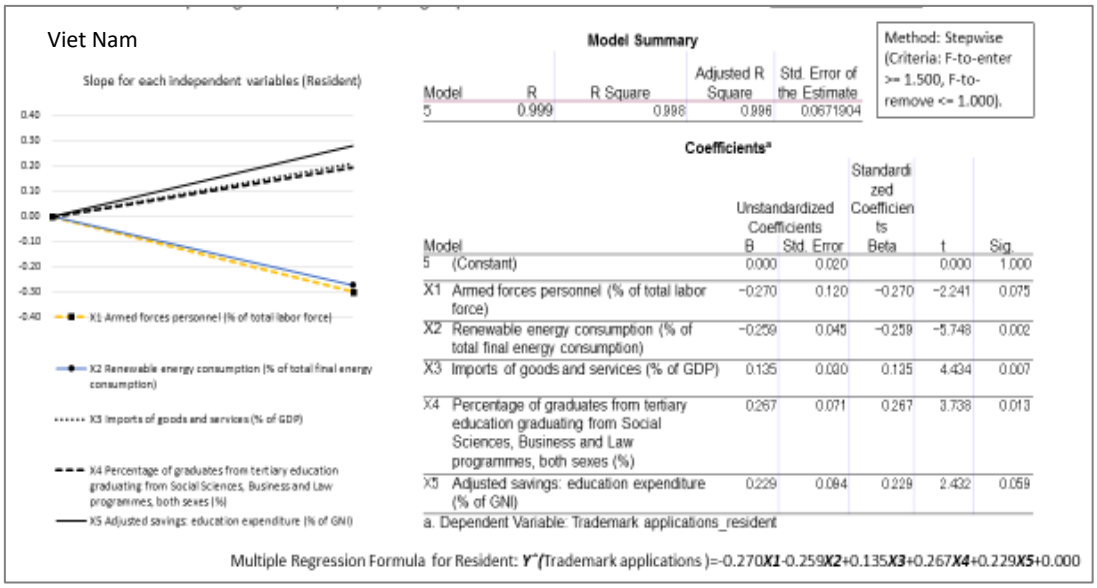
From Figure 33, in the area of education, X2 ‘percentage of graduates from tertiary education graduating from social sciences, business, and law programmes, both sexes (%)’ and X3 ‘primary completion rate, both sexes (%)’ should be increased to increase resident the design applications in Viet Nam.

Figure 34. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Design Applications



From Figure 34, X3 'manufactures exports (% of merchandise exports)' and X5 'scientific and technical journal articles' should be increased to decrease the non-resident design applications in Viet Nam.

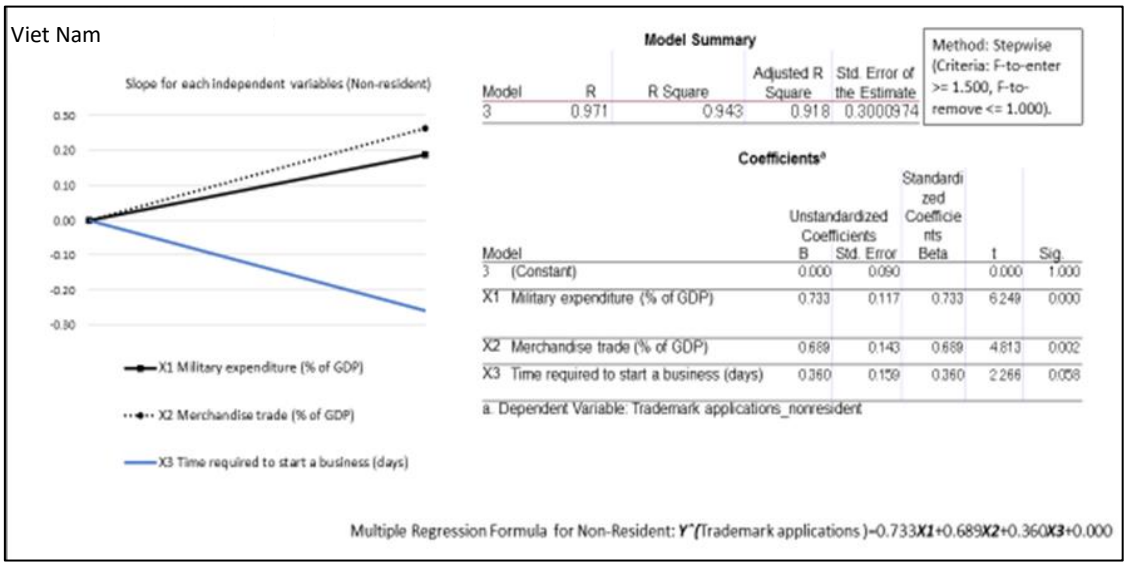
Figure 35. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Trademark Applications



Source: Authors' calculation.

From Figure 35, in the area of education, X4 ‘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 in Viet Nam.

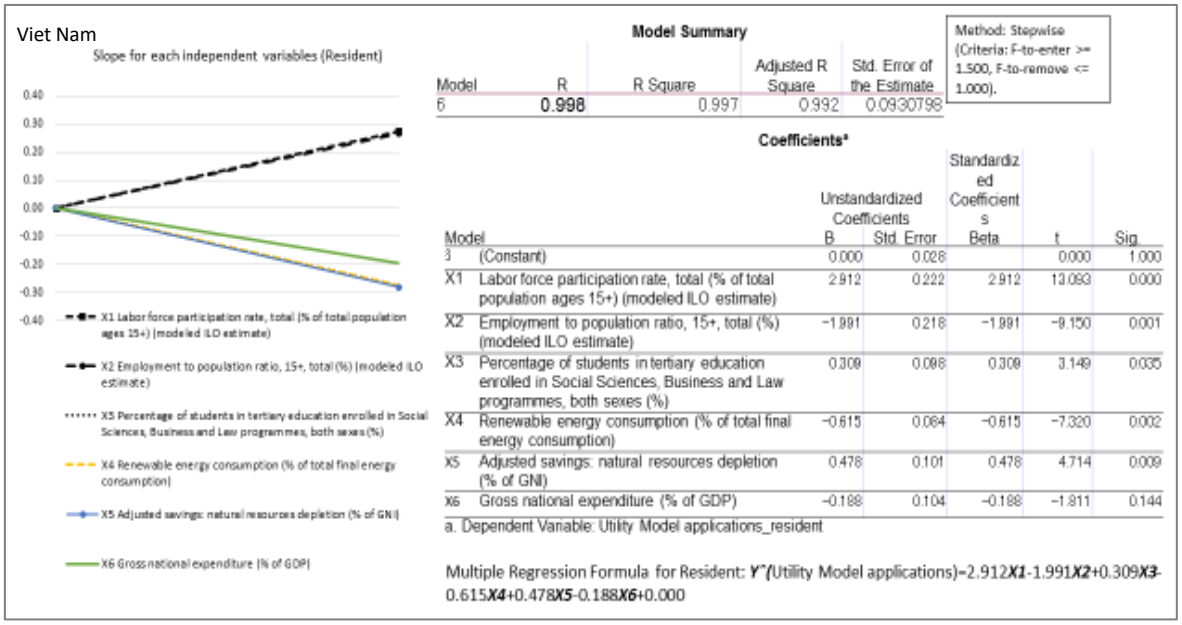
Figure 36. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Trademark



Source: Authors’ calculation.

From Figure 36, X1 ‘military expenditure (% of GDP)’ should be decreased to decrease the non-resident trademark applications in Viet Nam. The ratio of military-related costs to Viet Nam’s GDP has been increasing. Military-related business may be involved with non-resident companies in Viet Nam.

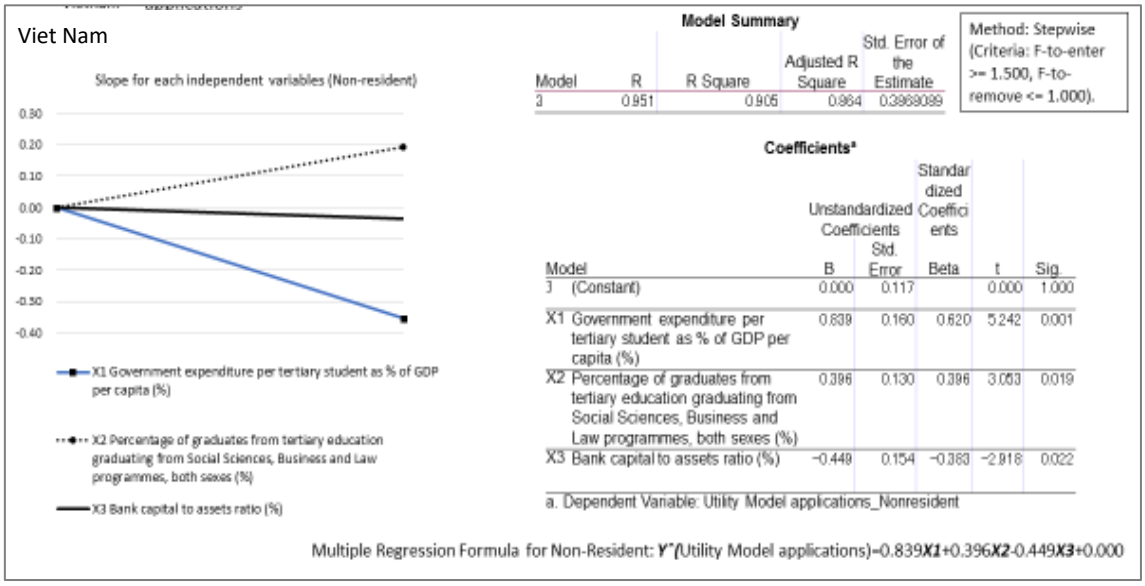
Figure 37. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Utility Model Applications



Source: Authors' calculation.

From Figure 37, X1 'labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate)' should be increased to increase the resident utility model applications in Viet Nam.

Figure 38. Multiple Regression Analysis by Using Stepwise Method on the relevant factors of Non-Resident Utility Model Applications

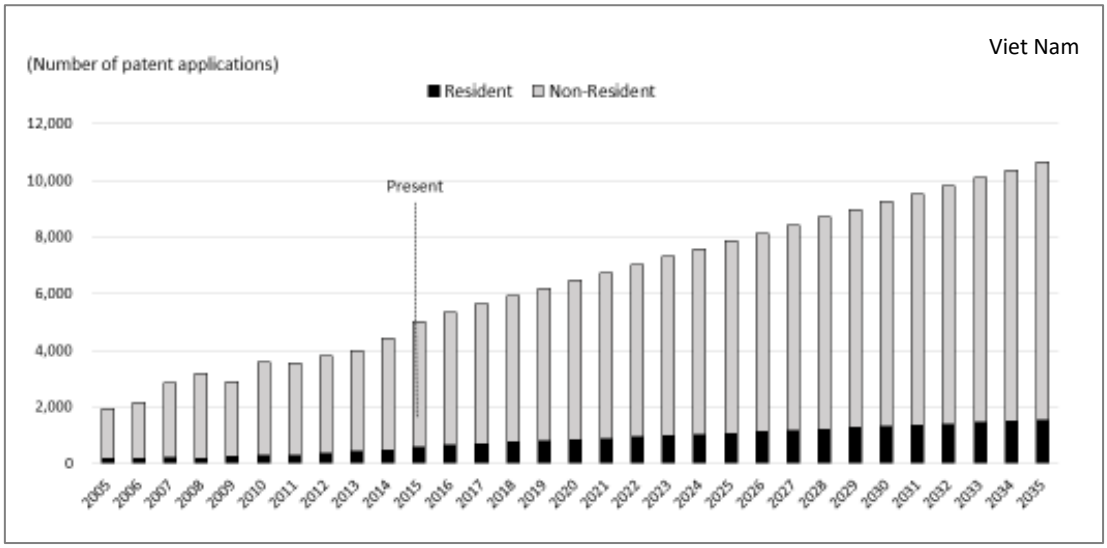


Source: Authors' calculation.

From Figure 38, X1 'government expenditure per tertiary student as % of GDP per capita (%)' should be decreased to decrease the non-resident utility model applications in Viet Nam. The actual government expenditure per tertiary student as a share of GDP per capita (%) has decreased in the past period.

c) Forecast

Figure 1. Forecast of Patent Applications by Using Multiple Regression Formula

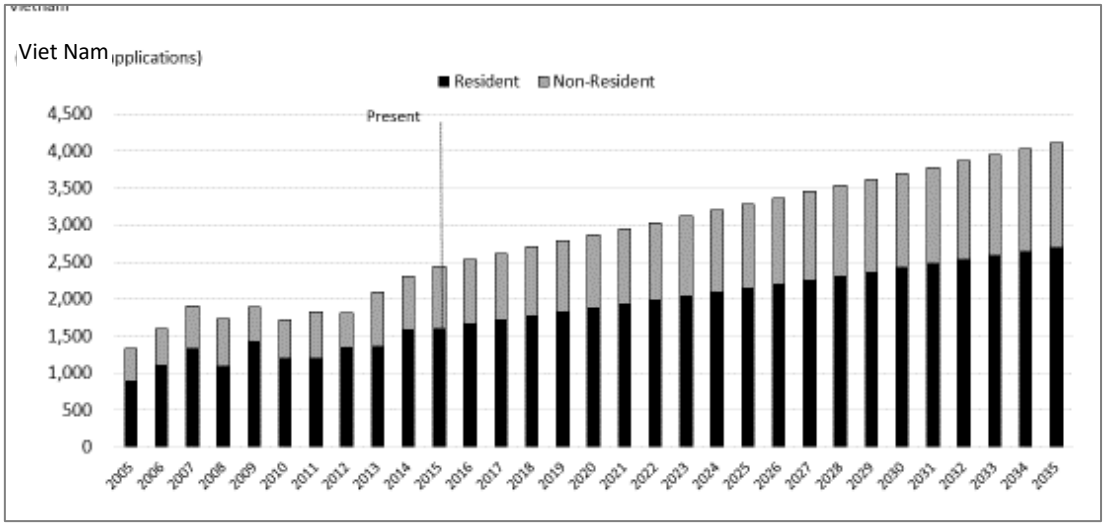


Source: Authors' calculation.

The increase in patent applications by residents is relatively low compared to those by non-residents.

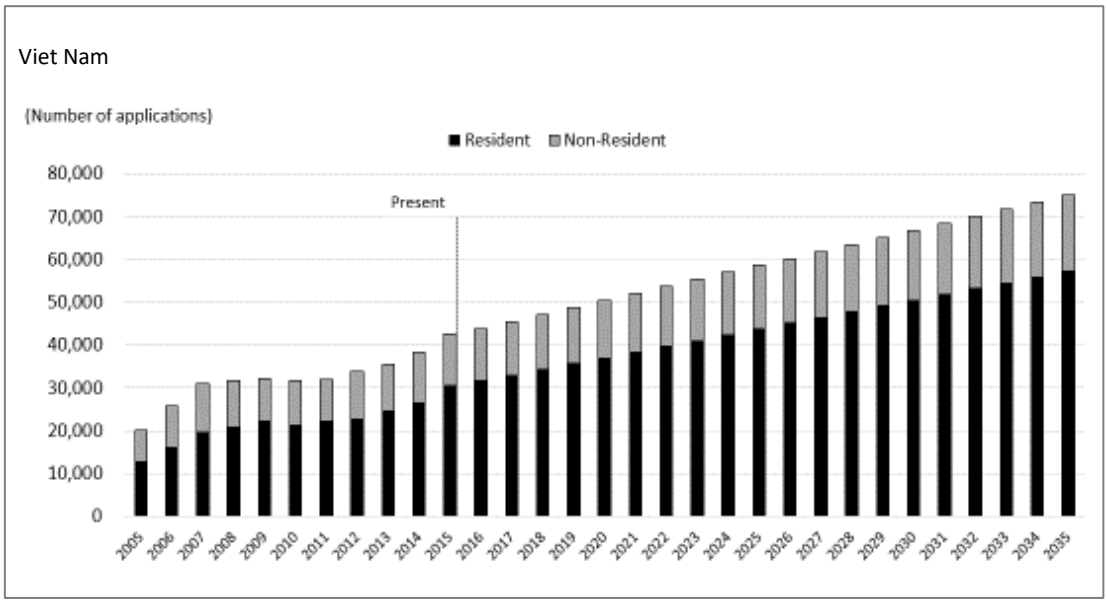
Drastic changes must be made as suggested above, e.g. increasing high-technology exports and decreasing agricultural methane emissions.

Figure 40. Forecast of Design Applications by Using Multiple Regression Formula (Stepwise Method)



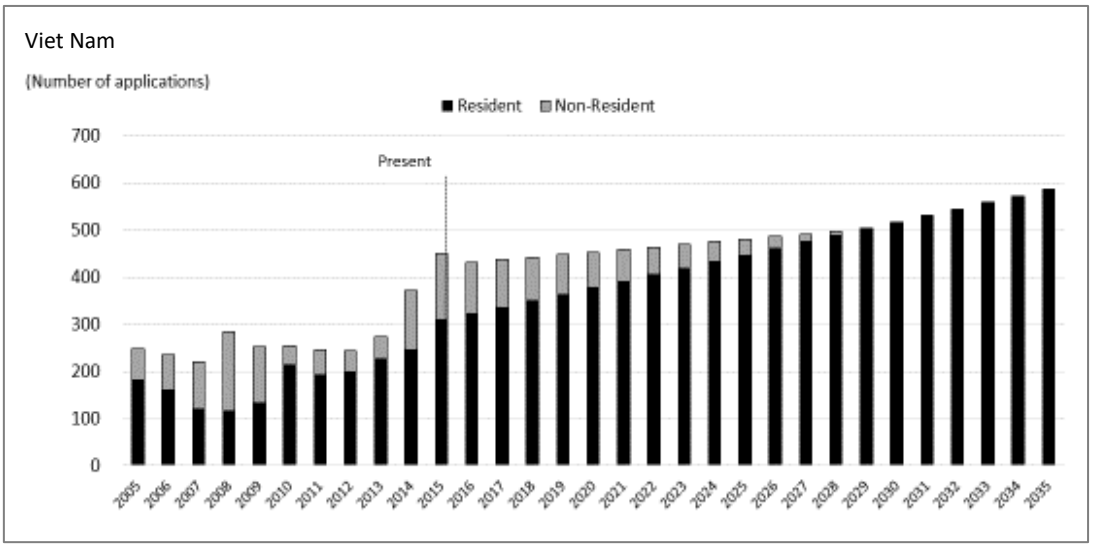
Source: Authors' calculation.

Figure 41. Forecast of Trademark Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

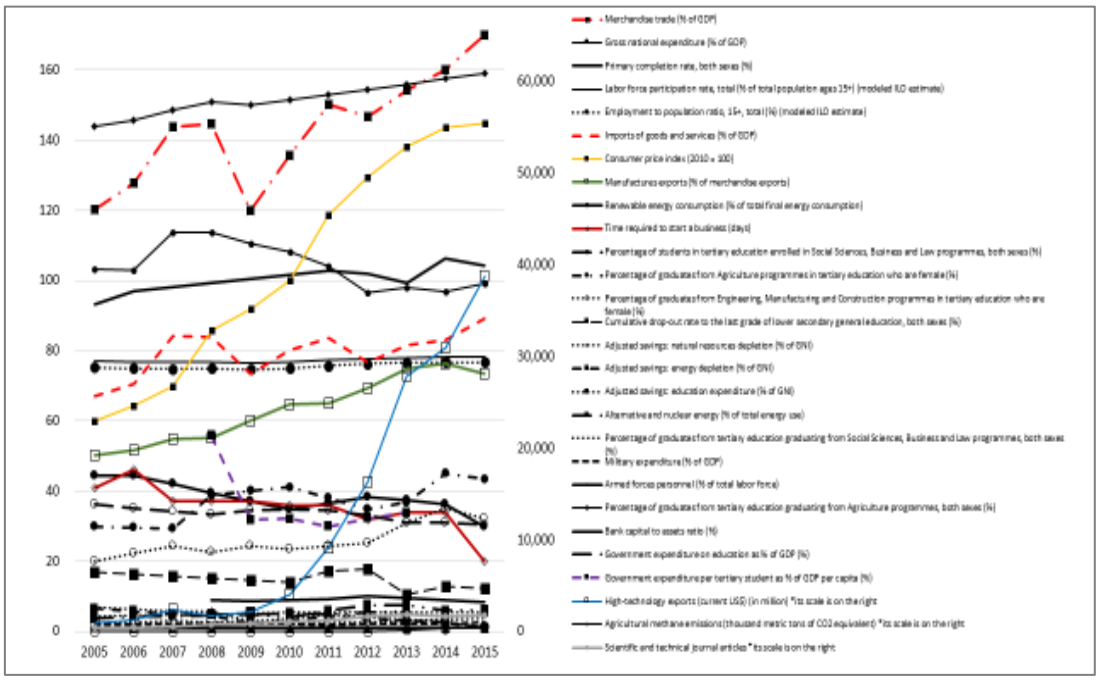
Figure 42. Forecast of Utility Model Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

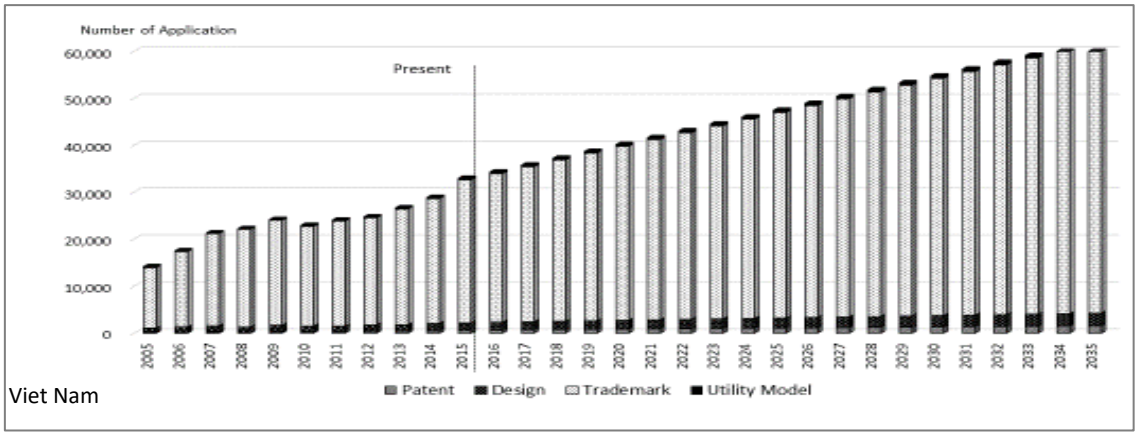
Applications from non-residents will decrease and will not exist after 2029 in the forecast.

Figure 43. The Actual WB Data Applicable to All IPs Regression Formulas (Viet Nam)



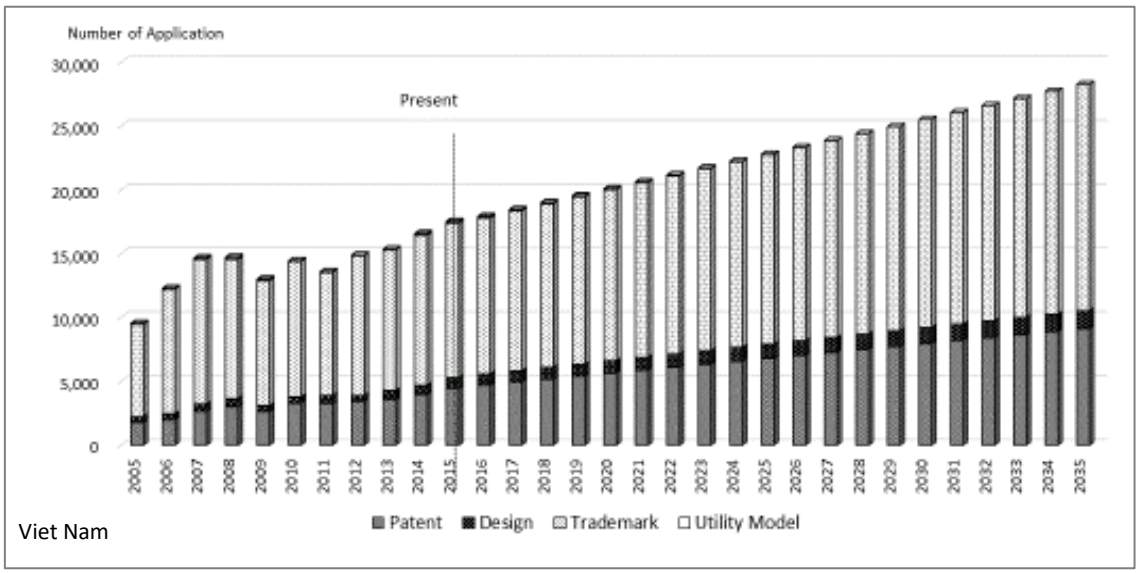
Source: Authors' calculation.

Figure 44. Forecast of Each Application by Residents



Source: Authors' calculation.

Figure 45. Forecast of Each Application by Non-Residents



Source: Authors' calculation.

10.3. Philippines

a) Correlation coefficients

Total of 111 factors of historical data during 2005–2015 extracted from World Bank database.

Note the definitions of the variables are in the Appendix. Numbers are the actual coefficients;

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

For patent resident applications, here is the list of significant variables.

1. Adjusted savings: energy depletion (% of GNI) -.702*
2. Armed forces personnel (% of total labour force) -.724*
3. Charges for the use of intellectual property, receipts (BoP, current US$) .758**
4. Chemicals (% of value added in manufacturing) -.615*
5. Compulsory education, duration (years) .786**
6. Computer, communications, and other services (% of commercial service imports) .776**
7. Cost of business start-up procedures (% of GNI per capita) -.615*
8. Cost to import (US$ per container) .770**
9. Duration of compulsory education (years) .786**
10. Employment in industry (% of total employment) .829**
11. Foreign direct investment, net inflows (% of GDP) .609*
12. GDP per capita (constant 2005 US$) .637*
13. GDP per person employed (constant 2011 PPP US$) .712*
14. Merchandise exports (current US$) .674*
15. Researchers in R&D (per million people) .677*
16. Technicians in R&D (per million people) .659*
17. Unemployment, total (% of total labour force) (modelled ILO estimate) -.660*

For patent non-resident applications, here is the list of significant variables.

1. Armed forces personnel (% of total labour force) -.612*
2. CO_2 emissions (kg per PPP US$ of GDP) -.615*
3. Current expenditure other than staff compensation as % of total expenditure in tertiary public institutions (%)-.759**
4. Expenditure on tertiary education as % of government expenditure on education (%) -.667*
5. Merchandise exports (current US$) .743**

For design resident applications, here is the list of significant variables.

1. Alternative and nuclear energy (% of total energy use) -.777**
2. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .655*
3. Enrolment in tertiary education per 100,000 inhabitants, both sexes .716*
4. Food exports (% of merchandise exports) .660*
5. Gross enrolment ratio, tertiary, both sexes (%) .703*
6. New businesses registered (number) .649*
7. Primary completion rate, both sexes (%) .719*
8. Researchers in R&D (per million people) .695*
9. Start-up procedures to register a business (number) -.624*
10. Technicians in R&D (per million people) .685*

For design non-resident applications, here is the list of significant variables.

1. Gross capital formation (% of GDP) .741**
2. Gross national expenditure (% of GDP) .706*

For trademark resident applications, here is the list of significant variables.

1. Adjusted net savings, excluding particulate emission damage (% of GNI) -.699*
2. Adjusted savings: consumption of fixed capital (% of GNI) -.805**
3. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) .953**
4. All staff compensation as % of total expenditure in lower-secondary public institutions (%) -.803**
5. Armed forces personnel (% of total labour force) -.873**

6. Birth rate, crude (per 1,000 people) -.900**
7. Charges for the use of intellectual property, payments (BoP, current US$) .945**
8. Charges for the use of intellectual property, receipts (BoP, current US$) .670*
9. Chemicals (% of value added in manufacturing) -.873**
10. CO_2 emissions (kg per PPP US$ of GDP) -.854**
11. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .921**
12. CO_2 emissions from manufacturing industries and construction (% of total fuel combustion) -.604*
13. Compulsory education, duration (years) .857**
14. Computer, communications, and other services (% of commercial service imports) .789**
15. Consumer price index (2010 = 100) .933**
16. Contributing family workers, total (% of total employment) -.890**
17. Cost of business start-up procedures (% of GNI per capita) -.962**
18. Duration of compulsory education (years) .857**
19. Electric power consumption (kWh per capita) .940**
20. Employers, total (% of total employment) -.960**
21. Employment in industry (% of total employment) .672*
22. Employment in services (% of total employment) .920**
23. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .646*
24. Enrolment in pre-primary education, both sexes (number) .838**
25. Enrolment in primary education, both sexes (number) .922**
26. Enrolment in secondary education, both sexes (number) .937**
27. Enrolment in tertiary education per 100,000 inhabitants, both sexes .913**
28. Enrolment in upper-secondary education, both sexes (number) .826**
29. Expenditure on education as % of total government expenditure (%) -.771**
30. Expenditure on tertiary education as % of government expenditure on education (%) -.893**
31. Exports of goods and services (% of GDP) -.810**
32. Food exports (% of merchandise exports) .685*
33. Food imports (% of merchandise imports) .663*

34. GDP per capita (constant 2005 US$) .978**
35. GDP per person employed (constant 2011 PPP US$) .981**
36. General government final consumption expenditure (% of GDP) .868**
37. Government expenditure on education as % of GDP (%) -.862**
38. Government expenditure per tertiary student as % of GDP per capita (%) -.956**
39. Graduates from tertiary education, both sexes (number) .932**
40. Gross enrolment ratio, tertiary, both sexes (%) .905**
41. High-technology exports (% of manufactured exports) -.772**
42. Household final consumption expenditure (annual % growth) .713*
43. Imports of goods and services (% of GDP) -.721*
44. Industry, value added (% of GDP) -.850**
45. Labour force, total .927**
46. Listed domestic companies, total .936**
47. Machinery and transport equipment (% of value added in manufacturing) .860**
48. Manufacturing, value added (% of GDP) -.842**
49. Merchandise exports (current US$) .847**
50. Merchandise trade (% of GDP) -.779**
51. Military expenditure (% of GDP) -.876**
52. Mobile cellular subscriptions .913**
53. Net foreign assets (current LCU) .908**
54. Net income from abroad (current US$) .655*
55. Percentage of enrolment in tertiary education in private institutions (%) -.888**
56. Personal computers (per 100 people) .869**
57. Price level ratio of PPP conversion factor (GDP) to market exchange rate .731*
58. Primary completion rate, both sexes (%) .706*
59. Renewable energy consumption (% of total final energy consumption) -.808**
60. Researchers in R&D (per million people) .927**
61. Scientific and technical journal articles .900**
62. Services, etc. value added (% of GDP) .950**

63. Start-up procedures to register a business (number) -.764**
64. Technicians in R&D (per million people) .938**
65. Time required to start a business (days) -.878**
66. Unemployment, total (% of total labour force) (modelled ILO estimate) -.929**

For trademark non-resident applications, here is the list of significant variables.

1. Adjusted net savings, excluding particulate emission damage (% of GNI) -.632*
2. Adjusted savings: consumption of fixed capital (% of GNI) -.799**
3. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) .951**
4. All staff compensation as % of total expenditure in lower-secondary public institutions (%) -.771**
5. Alternative and nuclear energy (% of total energy use) -.685*
6. Armed forces personnel (% of total labour force) -.875**
7. Birth rate, crude (per 1,000 people) -.904**
8. Charges for the use of intellectual property, payments (BoP, current US$) .938**
9. Chemicals (% of value added in manufacturing) -.781**
10. CO_2 emissions (kg per PPP US$ of GDP) -.790**
11. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .955**
12. CO_2 emissions from manufacturing industries and construction (% of total fuel combustion) -.617*
13. Compulsory education, duration (years) .887**
14. Computer, communications and other services (% of commercial service imports) .732*
15. Consumer price index (2010 = 100) .936**
16. Contributing family workers, total (% of total employment) -.943**
17. Cost of business start-up procedures (% of GNI per capita) -.925**
18. Duration of compulsory education (years) .887**
19. Electric power consumption (kWh per capita) .974**
20. Employers, total (% of total employment) -.960**
21. Employment in industry (% of total employment) .691*
22. Employment in services (% of total employment) .928**

23. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .680*
24. Enrolment in pre-primary education, both sexes (number) .785**
25. Enrolment in primary education, both sexes (number) .934**
26. Enrolment in secondary education, both sexes (number) .934**
27. Enrolment in tertiary education per 100,000 inhabitants, both sexes .944**
28. Enrolment in upper-secondary education, both sexes (number) .822**
29. Expenditure on education as % of total government expenditure (%) -.807**
30. Expenditure on tertiary education as % of government expenditure on education (%) -.901**
31. Exports of goods and services (% of GDP) -.813**
32. Food exports (% of merchandise exports) .717*
33. Food imports (% of merchandise imports) .652*
34. GDP per capita (constant 2005 US$) .982**
35. GDP per person employed (constant 2011 PPP US$) .978**
36. General government final consumption expenditure (% of GDP) .872**
37. Government expenditure on education as % of GDP (%) -.902**
38. Government expenditure per tertiary student as % of GDP per capita (%) -.975**
39. Graduates from tertiary education, both sexes (number) .950**
40. Gross enrolment ratio, tertiary, both sexes (%) .936**
41. High-technology exports (% of manufactured exports) -.815**
42. Household final consumption expenditure (annual % growth) .703*
43. Imports of goods and services (% of GDP) -.713*
44. Industry, value added (% of GDP) -.809**
45. Labour force, total .937**
46. Listed domestic companies, total .935**
47. Machinery and transport equipment (% of value added in manufacturing) .810**
48. Manufacturing, value added (% of GDP) -.834**
49. Merchandise exports (current US$) .900**
50. Merchandise trade (% of GDP) -.769**
51. Military expenditure (% of GDP) -.850**
52. Mobile cellular subscriptions .909**

53. Net foreign assets (current LCU) .919**
54. Net income from abroad (current US$) .714*
55. Percentage of enrolment in tertiary education in private institutions (%) -.914**
56. Personal computers (per 100 people) .856**
57. Price level ratio of PPP conversion factor (GDP) to market exchange rate .764**
58. Primary completion rate, both sexes (%) .825**
59. Renewable energy consumption (% of total final energy consumption) -.845**
60. Researchers in R&D (per million people) .950**
61. Scientific and technical journal articles .917**
62. Services, etc. value added (% of GDP) .937**
63. Start-up procedures to register a business (number) -.804**
64. Technicians in R&D (per million people) .961**
65. Time required to start a business (days) -.894**
66. Unemployment, total (% of total labour force) (modelled ILO estimate) -.889**

For utility model resident applications, here is the list of significant variables.

1. Adjusted savings: consumption of fixed capital (% of GNI) -.732*
2. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) .870**
3. All staff compensation as % of total expenditure in lower-secondary public institutions (%) -.654*
4. Alternative and nuclear energy (% of total energy use) -.725*
5. Armed forces personnel (% of total labour force) -.769**
6. Birth rate, crude (per 1,000 people) -.829**
7. Charges for the use of intellectual property, payments (BoP, current US$) .822**
8. Charges for the use of intellectual property, receipts (BoP, current US$) .619*
9. Chemicals (% of value added in manufacturing) -.683*
10. CO_2 emissions (kg per PPP US$ of GDP) -.635*
11. CO_2 emissions from electricity and heat production, total (% of total fuel combustion) .918**

12. CO_2 emissions from manufacturing industries and construction (% of total fuel combustion) -.762**
13. Compulsory education, duration (years) .829**
14. Consumer price index (2010 = 100) .886**
15. Contributing family workers, total (% of total employment) -.855**
16. Cost of business start-up procedures (% of GNI per capita) -.937**
17. Duration of compulsory education (years) .829**
18. Electric power consumption (kWh per capita) .928**
19. Employers, total (% of total employment) -.897**
20. Employment in industry (% of total employment) .670*
21. Employment in services (% of total employment) .856**
22. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) .760**
23. Enrolment in pre-primary education, both sexes (number) .705*
24. Enrolment in primary education, both sexes (number) .904**
25. Enrolment in secondary education, both sexes (number) .912**
26. Enrolment in tertiary education per 100,000 inhabitants, both sexes .932**
27. Enrolment in upper-secondary education, both sexes (number) .848**
28. Expenditure on education as % of total government expenditure (%) -.862**
29. Expenditure on tertiary education as % of government expenditure on education (%) -.750**
30. Exports of goods and services (% of GDP) -.762**
31. Food exports (% of merchandise exports) .747**
32. Food imports (% of merchandise imports) .637*
33. GDP per capita (constant 2005 US$) .905**
34. GDP per person employed (constant 2011 PPP US$) .880**
35. General government final consumption expenditure (% of GDP) .818**
36. Government expenditure on education as % of GDP (%) -.915**
37. Government expenditure per tertiary student as % of GDP per capita (%) -.889**
38. Graduates from tertiary education, both sexes (number) .899**
39. Gross enrolment ratio, tertiary, both sexes (%) .923**
40. Gross national expenditure (% of GDP) .627*

41. High-technology exports (% of manufactured exports) -.818**
42. Household final consumption expenditure (annual % growth) .665*
43. Imports of goods and services (% of GDP) -.631*
44. Industry, value added (% of GDP) -.752**
45. Labour force, total .891**
46. Listed domestic companies, total .863**
47. Machinery and transport equipment (% of value added in manufacturing) .801**
48. Manufacturing, value added (% of GDP) -.752**
49. Merchandise exports (current US$) .792**
50. Merchandise trade (% of GDP) -.695*
51. Military expenditure (% of GDP) -.904**
52. Mobile cellular subscriptions .837**
53. Net foreign assets (current LCU) .863**
54. Net income from abroad (current US$) .621*
55. Percentage of enrolment in tertiary education in private institutions (%) -.901**
56. Personal computers (per 100 people) .868**
57. Price level ratio of PPP conversion factor (GDP) to market exchange rate .672*
58. Primary completion rate, both sexes (%) .786**
59. Renewable energy consumption (% of total final energy consumption) -.767**
60. Researchers in R&D (per million people) .902**
61. Scientific and technical journal articles .882**
62. Services, etc. value added (% of GDP) .860**
63. Start-up procedures to register a business (number) -.784**
64. Technicians in R&D (per million people) .909**
65. Time required to start a business (days) -.851**
66. Unemployment, total (% of total labour force) (modelled ILO estimate) -.803**

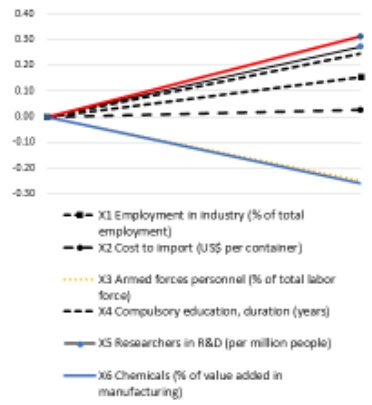
For utility model non-resident applications, there were no significant variables for which correlation is significant at the 0.05 level (2-tailed). Therefore, the following variables were selected for correlation significant at the 0.10 level (2-tailed).

1. Adjusted savings: consumption of fixed capital (% of GNI)
2. Agriculture, value added (annual % growth)
3. All education staff compensation, tertiary (% of total expenditure in tertiary public institutions)
4. Capital expenditure as % of total expenditure in tertiary public institutions (%)
5. Current education expenditure, tertiary (% of total expenditure in tertiary public institutions)
6. Population growth (annual %)
7. Technical cooperation grants (BoP, current US$)

b) Multi-regression analysis

Figure 46. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Patent Applications

Philippines



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	0.999	0.999	0.996	0.0695211

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	-0.056	0.022		-2.547	0.084
X1	Employment in industry (% of total employment)	0.598	0.068	0.598	9.862	0.003
X2	Cost to import (US$ per container)	0.324	0.037	0.356	8.728	0.003
X3	Armed forces personnel (% of total labor force)	-0.191	0.046	-0.191	-4.112	0.026
X4	Compulsory education, duration (years)	0.490	0.081	0.490	6.019	0.009
X5	Researchers in R&D (per million people)	-0.867	0.162	-0.867	-5.367	0.013
X6	Chemicals (% of value added in manufacturing)	-0.254	0.064	-0.254	-3.955	0.029
X7	GDP per capita (constant 2005 US$)	0.214	0.072	0.214	2.969	0.059

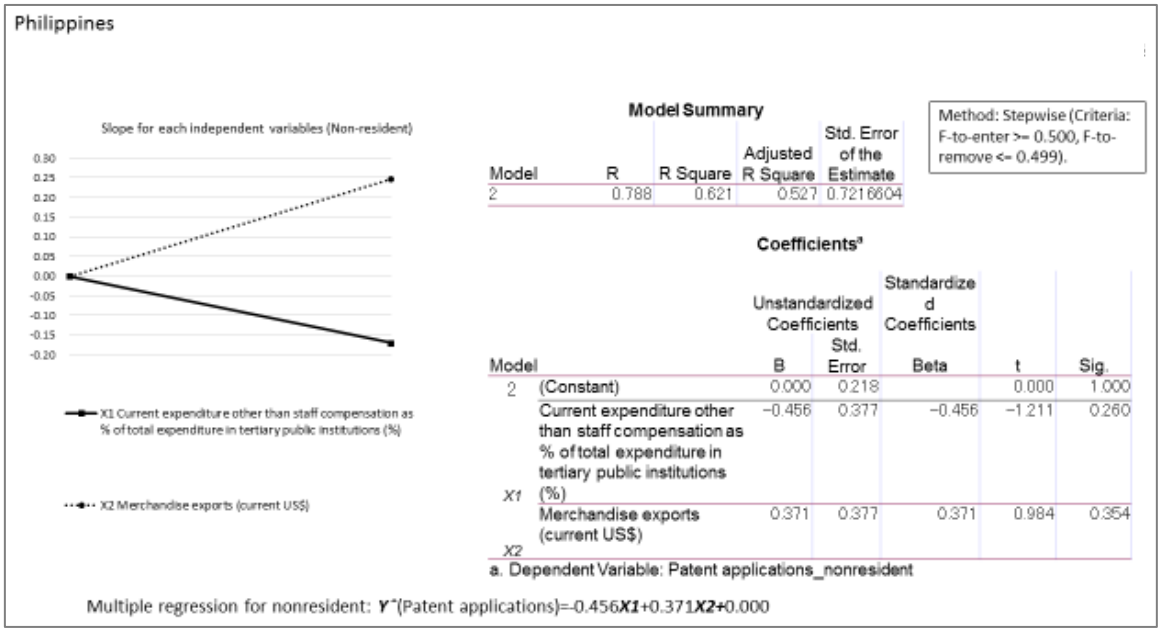
a. Dependent Variable: Patent applications_resident

Multiple regression for resident: *Y*'(Patent applications)=0.598*X1*+0.324*X2*-0.191*X3*+0.490*X4*-0.867*X5*-0.254*X6*+0.214*X7*-0.056

Source: Authors' calculation.

From Figure 46, X1 'employment in industry (% of total employment)' and X7 'GDP per capita (constant 2005 US$)' should be increased to increase the resident patent applications in the Philippines.

Figure 47. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Patent Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	0.788	0.621	0.527	0.7216604

Method: Stepwise (Criteria: F-to-enter >= 0.500, F-to-remove <= 0.499).

Coefficients[a]

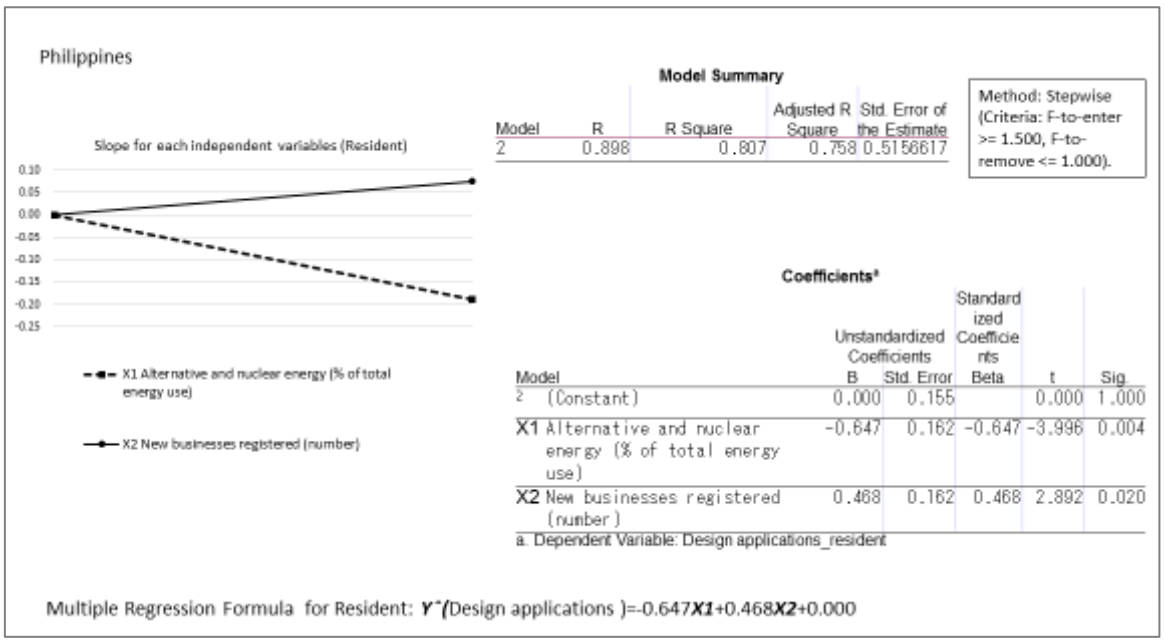
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
2	(Constant)	0.000	0.218		0.000	1.000
X1	Current expenditure other than staff compensation as % of total expenditure in tertiary public institutions (%)	-0.456	0.377	-0.456	-1.211	0.260
X2	Merchandise exports (current US$)	0.371	0.377	0.371	0.984	0.354

a. Dependent Variable: Patent applications_nonresident

Multiple regression for nonresident: Y'(Patent applications)=-0.456***X1***+0.371***X2***+0.000

Source: Authors' calculation.

Figure 48. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Design Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	0.898	0.807	0.758	0.5156617

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
2	(Constant)	0.000	0.155		0.000	1.000
X1	Alternative and nuclear energy (% of total energy use)	-0.647	0.162	-0.647	-3.996	0.004
X2	New businesses registered (number)	0.468	0.162	0.468	2.892	0.020

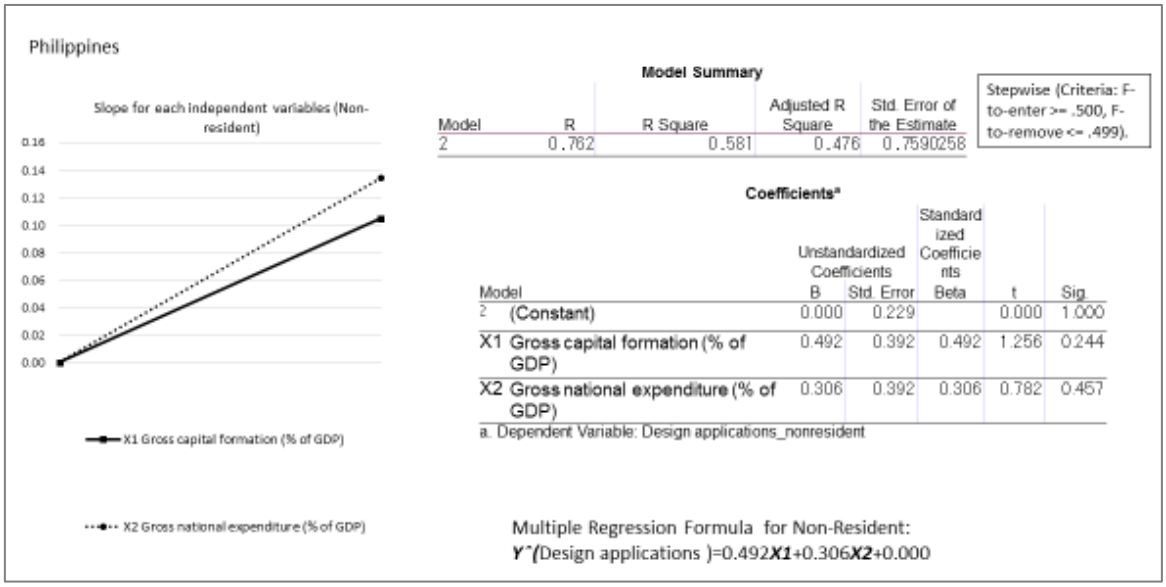
a. Dependent Variable: Design applications_resident

Multiple Regression Formula for Resident: Y'(Design applications)=-0.647***X1***+0.468***X2***+0.000

Source: Authors' calculation.

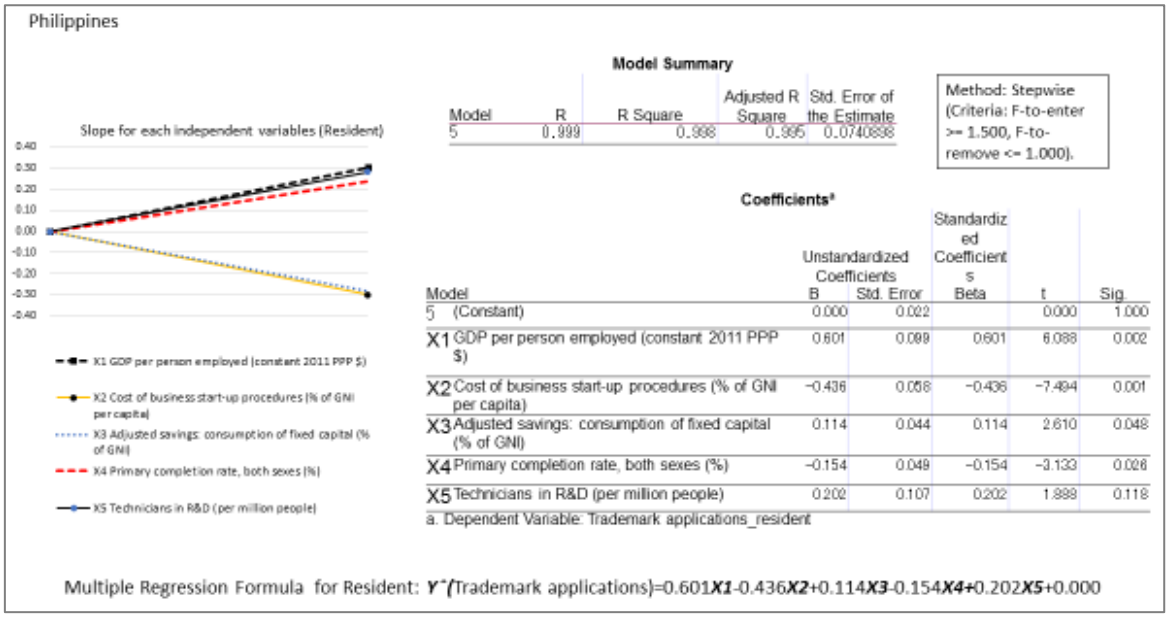
In order to increase resident design applications in the Philippines, newly registered business entities are encouraged.

Figure 49. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Design Applications



Source: Authors' calculation.

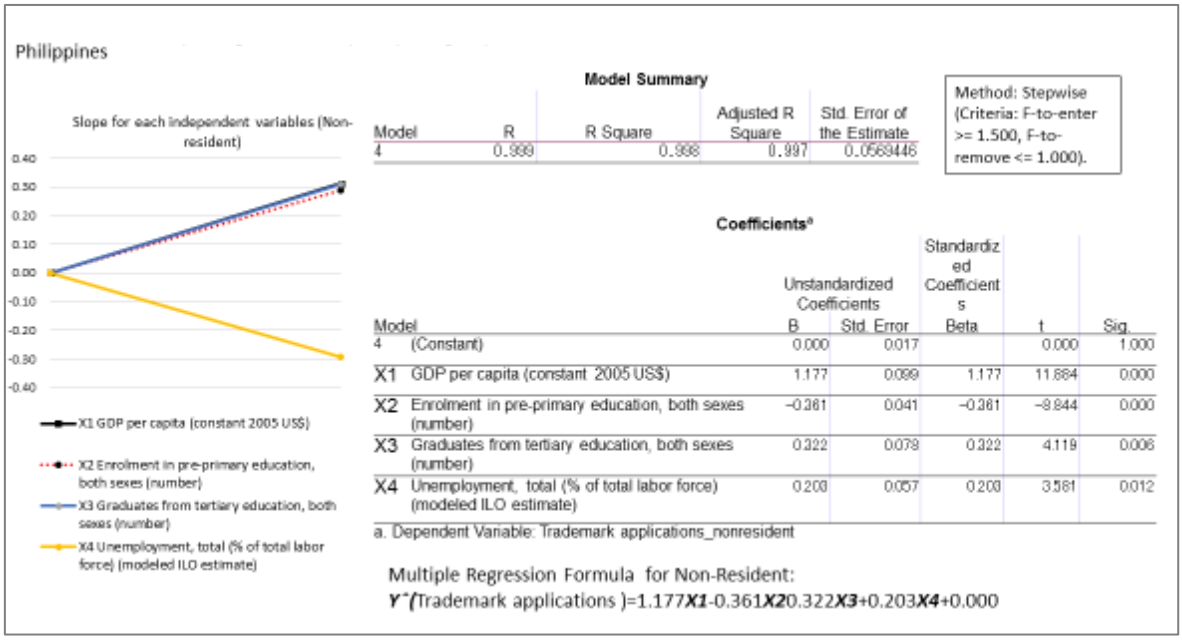
Figure 50. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Trademark Applications



Source: Authors' calculation.

From Figure 50, X1 'GDP per person employed (constant 2011 PPP US$)' should be increased and X2 'cost of business start-up procedures (% of GNI per capita)' should be lowered to increase resident trademark applications in the Philippines.

Figure 51. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Trademark Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
4	0.999	0.998	0.997	0.0569446

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

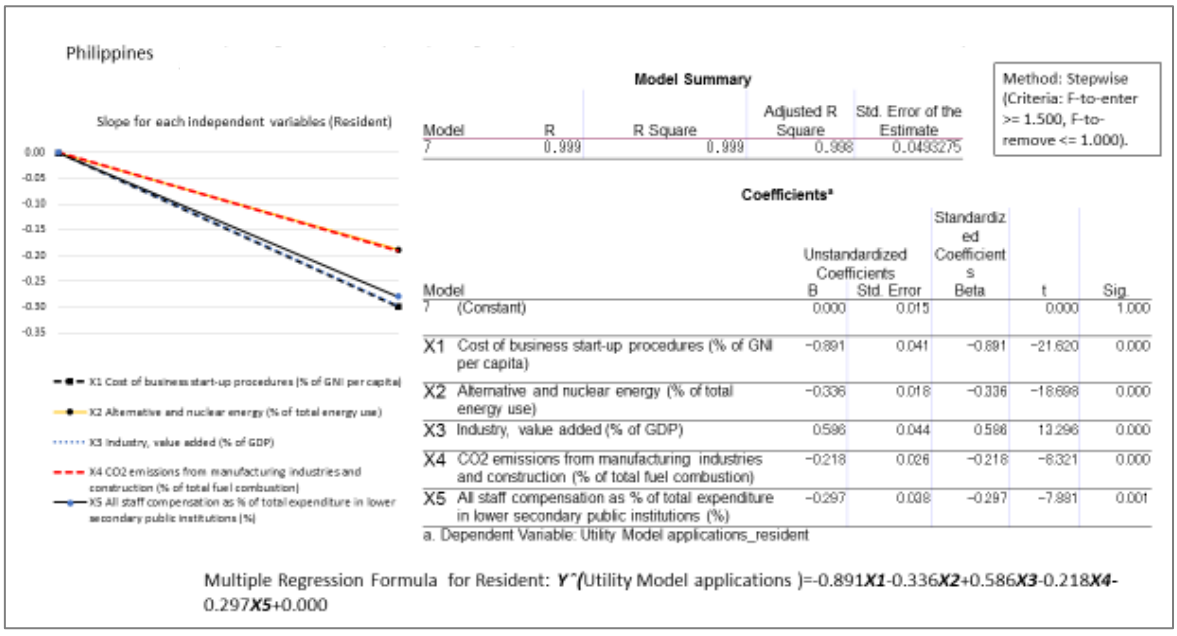
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
4	(Constant)	0.000	0.017		0.000	1.000
X1	GDP per capita (constant 2005 US$)	1.177	0.099	1.177	11.884	0.000
X2	Enrolment in pre-primary education, both sexes (number)	-0.361	0.041	-0.361	-8.844	0.000
X3	Graduates from tertiary education, both sexes (number)	0.322	0.078	0.322	4.119	0.006
X4	Unemployment, total (% of total labor force) (modeled ILO estimate)	0.203	0.057	0.203	3.561	0.012

a. Dependent Variable: Trademark applications_nonresident

Multiple Regression Formula for Non-Resident:
$Y\hat{}$(Trademark applications)=1.177***X1***-0.361***X2***0.322***X3***+0.203***X4***+0.000

Source: Authors' calculation.

Figure 52. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Utility Model Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	0.999	0.999	0.998	0.0493275

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	0.000	0.015		0.000	1.000
X1	Cost of business start-up procedures (% of GNI per capita)	-0.891	0.041	-0.891	-21.620	0.000
X2	Alternative and nuclear energy (% of total energy use)	-0.336	0.018	-0.336	-18.698	0.000
X3	Industry, value added (% of GDP)	0.586	0.044	0.586	13.296	0.000
X4	CO2 emissions from manufacturing industries and construction (% of total fuel combustion)	-0.218	0.026	-0.218	-8.321	0.000
X5	All staff compensation as % of total expenditure in lower secondary public institutions (%)	-0.297	0.038	-0.297	-7.891	0.001

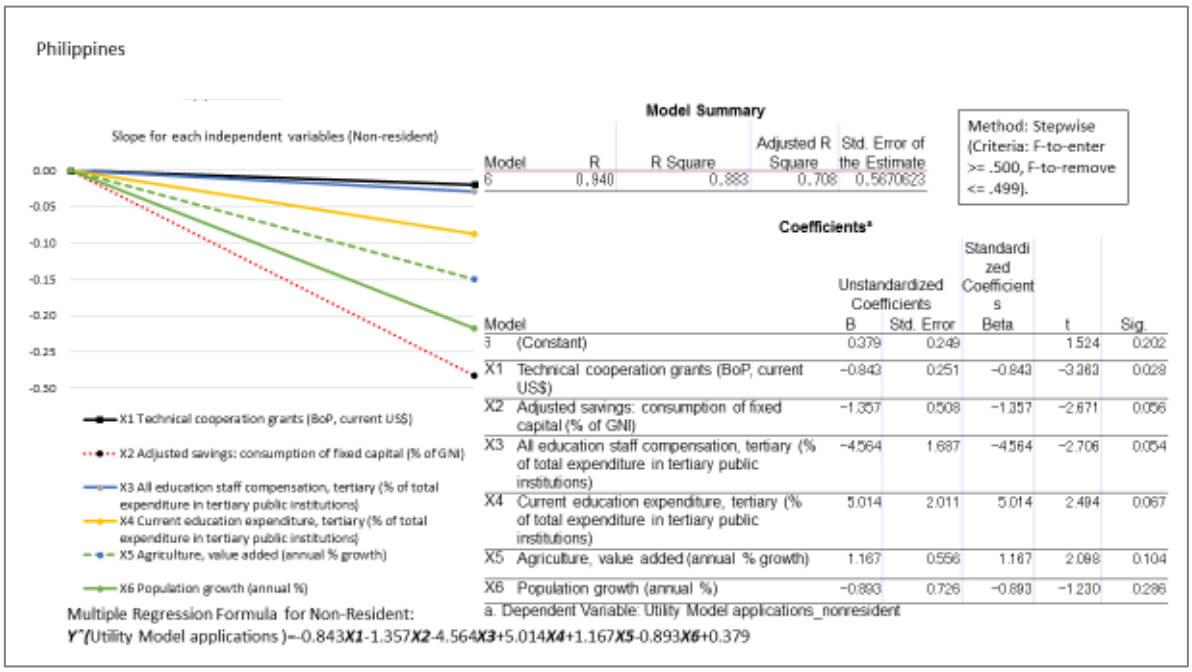
a. Dependent Variable: Utility Model applications_resident

Multiple Regression Formula for Resident: $Y\hat{}$(Utility Model applications)=-0.891***X1***-0.336***X2***+0.586***X3***-0.218***X4***-0.297***X5***+0.000

Source: Authors' calculation.

From Figure 52, X3 ‘industry, value added (% of GDP)’ should be increased to increase resident utility model applications in the Philippines.

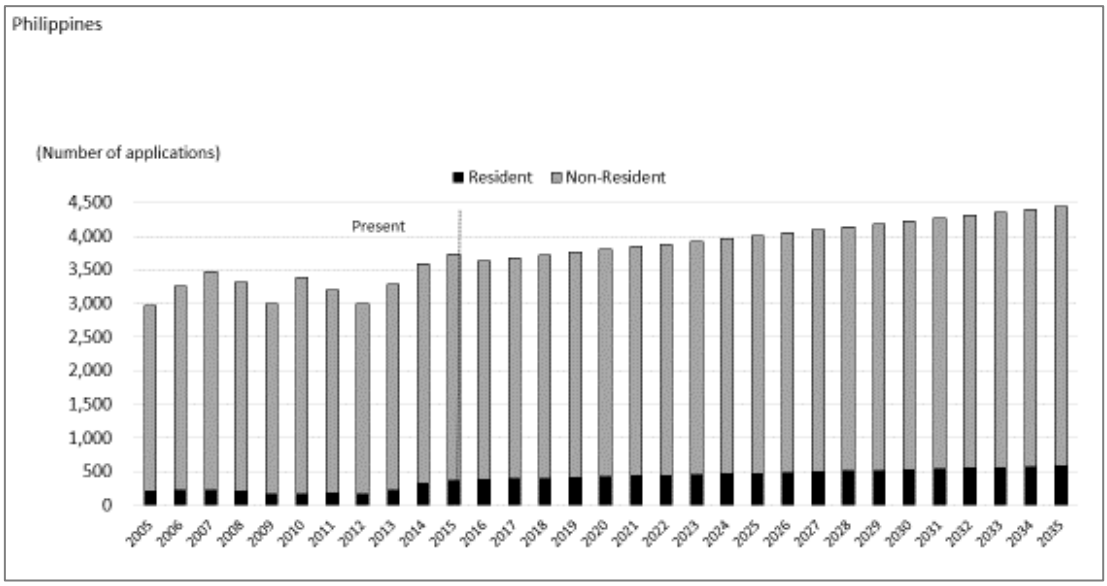
Figure 53. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Utility Model Applications



Source: Authors’ calculation.

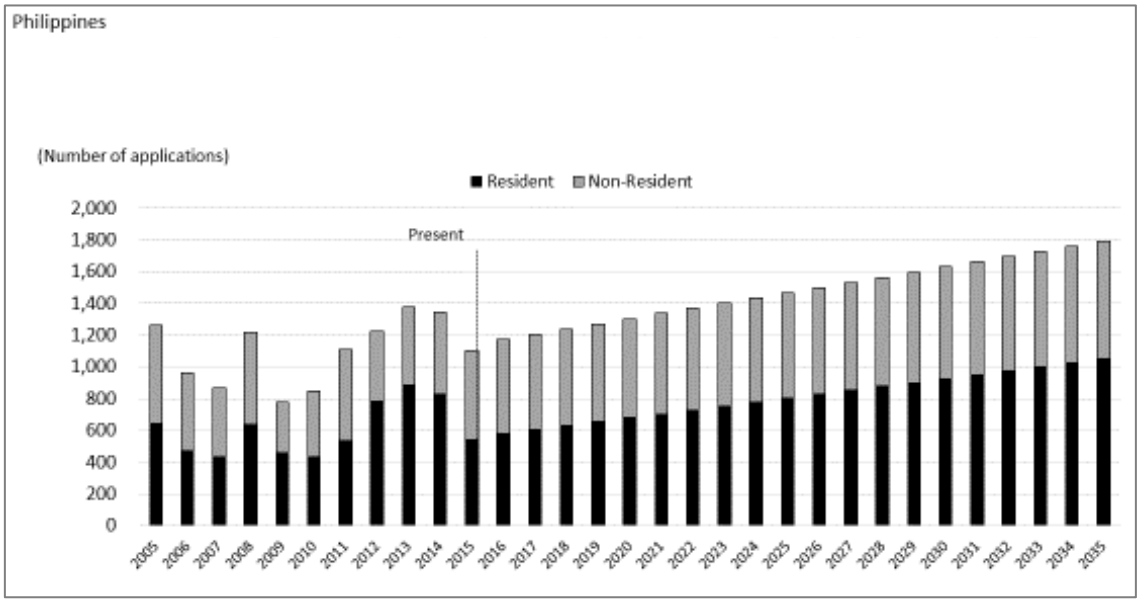
c) Forecast

Figure 54. Forecast of Patent Applications by Using Multiple Regression Formula (Stepwise Method)



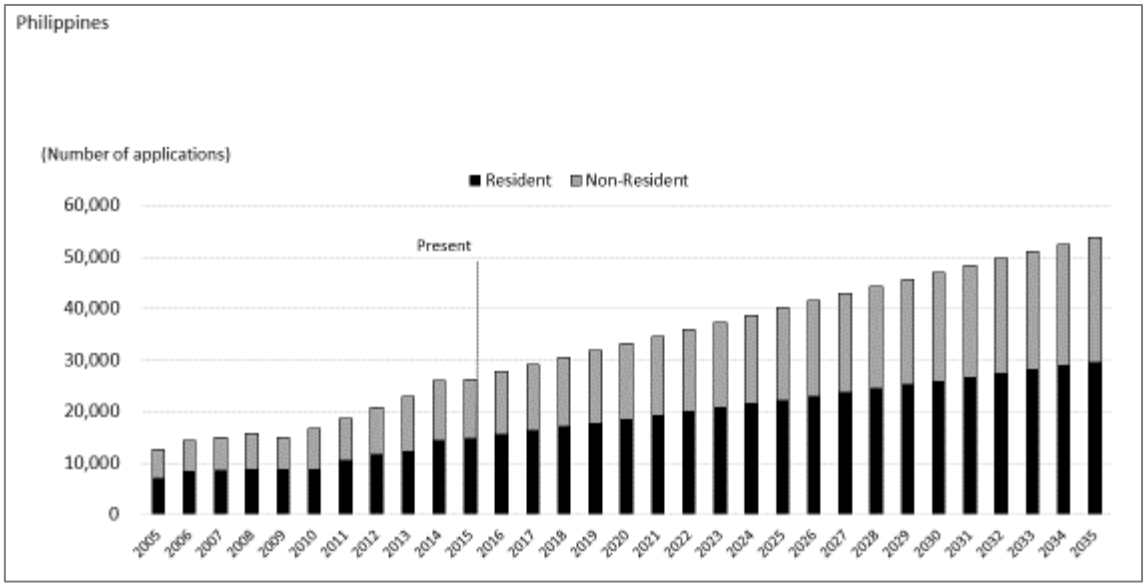
Source: Authors' calculation.

Figure 55. Forecast of Design Applications by Using Multiple Regression Formula (Stepwise Method)



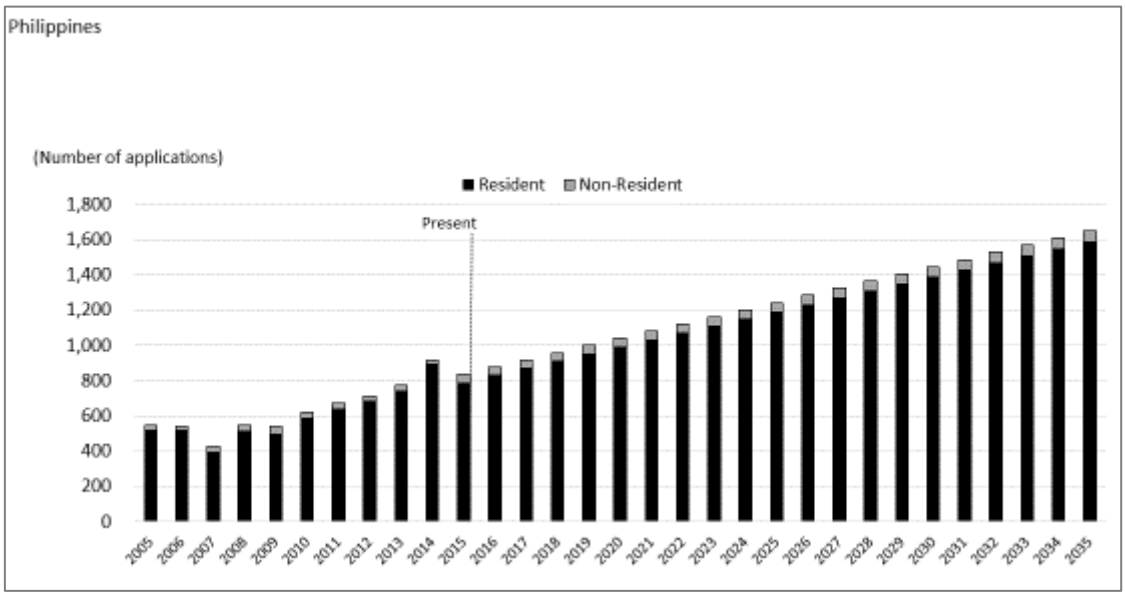
Source: Authors' calculation.

Figure 56. Forecast of Trademark Applications by Using Multiple Regression Formula (Stepwise Method)



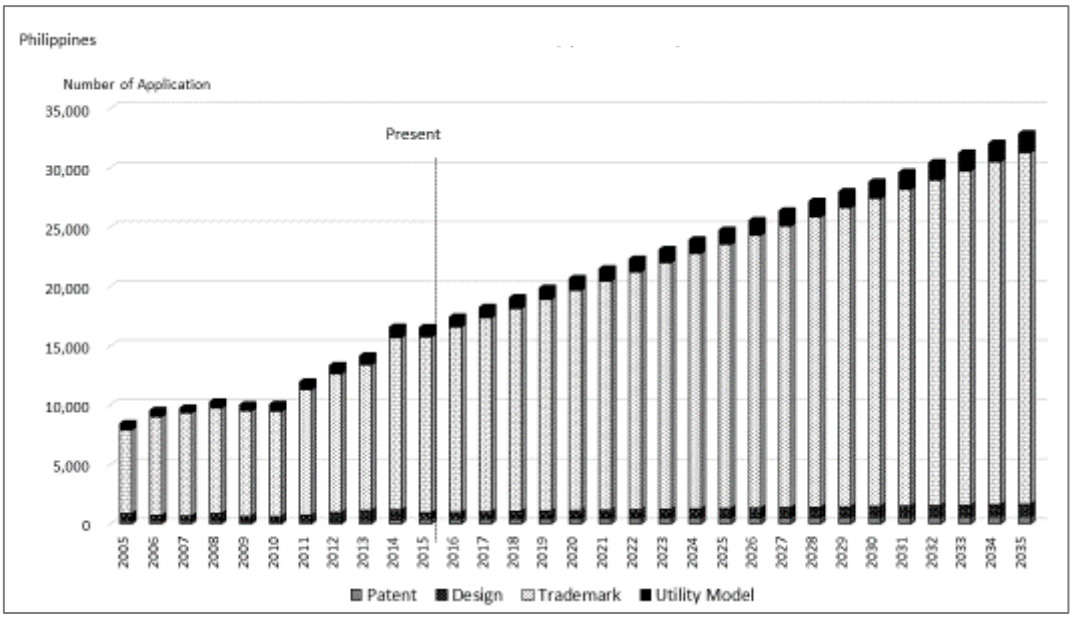
Source: Authors' calculation.

Figure 57. Forecast of Utility Model Applications by Using Multiple Regression Formula (Stepwise Method)



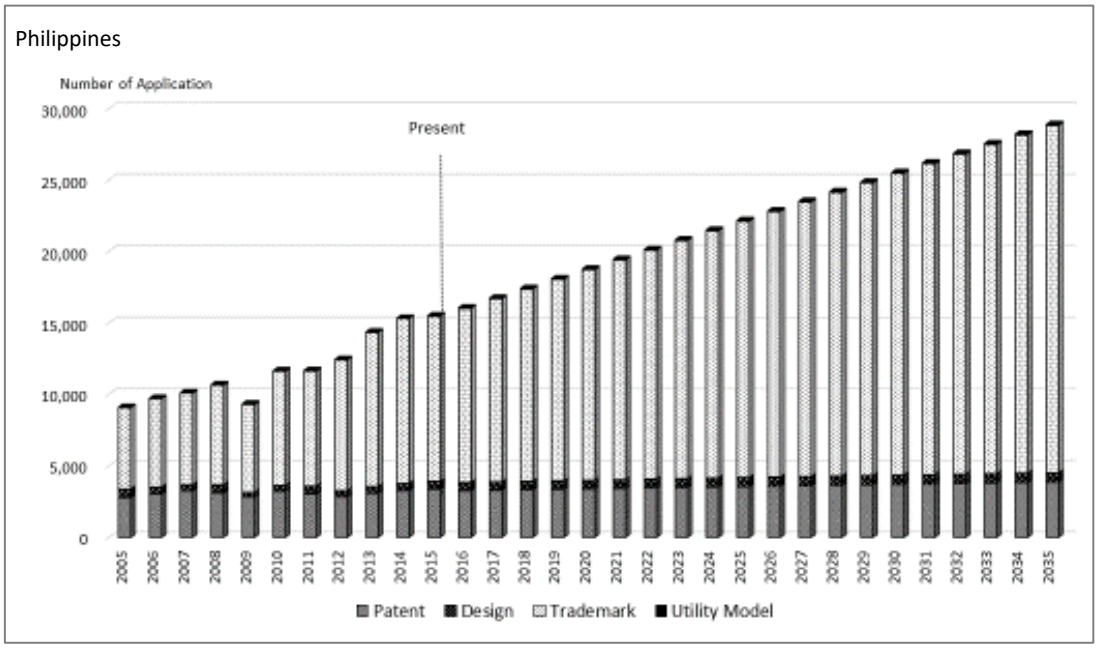
Source: Authors' calculation.

Figure 58. Forecast of Each Application by Residents



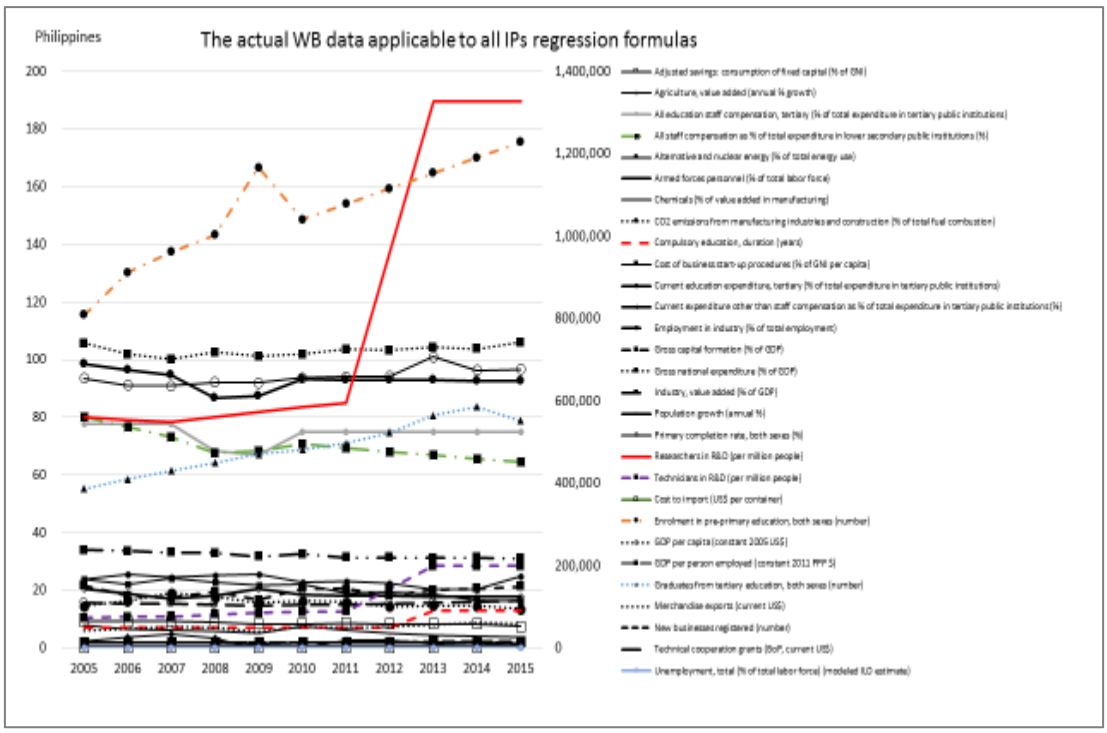
Source: Authors' calculation.

Figure 59. Forecast of Each Application by Non-Residents



Source: Authors' calculation.

Figure 60. The Actual WB Data Applicable to All IPs Regression Formulas



Source: Authors' calculation.

10.4. Brunei Darussalam

a) Correlation coefficients

Total of 107 factors of historical data during 2005–2015 extracted from World Bank database.

Note the definitions of the variables are in the Appendix. Numbers are the actual coefficients;

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

For patent resident applications, here is the list of significant variables.

1. Industry, value added (% of GDP) -.682*
2. Services, etc. value added (% of GDP) .678*
3. Adjusted savings: energy depletion (% of GNI) -.739**
4. Adjusted savings: natural resources depletion (% of GNI) -.739**
5. Aquaculture production (metric tons) .859**
6. Charges for the use of intellectual property, payments (BoP, current US$) .651*

7. Communications, computer, etc. (% of service exports, BoP) -.801**
8. Computer, communications, and other services (% of commercial service exports) -.801**
9. Computer, communications, and other services (% of commercial service imports) .778**
10. Electric power consumption (kWh per capita) .799**
11. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) -.826**
12. Exports of goods and services (% of GDP) -.657*
13. Food exports (% of merchandise exports) .709*
14. GDP per person employed (constant 2011 PPP US$) -.689*
15. Government expenditure on education, total (% of GDP) .694*
16. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) -.786**
17. Labour force, total .653*
18. Manufactures exports (% of merchandise exports).855**
19. Military expenditure (% of GDP) .628*
20. Start-up procedures to register a business (number) -.713*
21. Time required to start a business (days) -.718*
22. Government expenditure on education as % of GDP (%) .694*
23. Primary completion rate, both sexes (%) -.684*
24. Enrolment in early childhood education, both sexes (number) .715*
25. Enrolment in primary education, both sexes (number) -.760**
26. Enrolment in tertiary education per 100,000 inhabitants, both sexes .762**
27. GDP per capita (constant 2005 US$) -.765**
28. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .794**
29. Graduates from tertiary education, both sexes (number) .964**
30. Gross enrolment ratio, tertiary, both sexes (%) .872**
31. Percentage of enrolment in tertiary education in private institutions (%) .670*
32. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) .839**

33. Percentage of graduates from tertiary education graduating from science programmes, both sexes (%) .850**
34. Percentage of male graduates from tertiary education graduating from science programmes, male (%) .783**
35. Percentage of male graduates from tertiary education graduating from social sciences, business, and law programmes, male (%) .752**
36. Personal computers (per 100 people) .658*
37. Pupil-teacher ratio in secondary education (headcount basis) -.842**
38. Pupil-teacher ratio in tertiary education (headcount basis) .675*
39. Pupil-teacher ratio in upper-secondary education (headcount basis) -.723*
40. Teachers in tertiary education programmes, both sexes (number) .796**

For patent non-resident applications, here is the list of significant variables.

1. Household final consumption expenditure (annual % growth) -.727*
2. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .710*

For design resident applications, here is the list of significant variables.

1. Industry, value added (% of GDP) -.662*
2. Services, etc. value added (% of GDP) .671*
3. Adjusted savings: education expenditure (% of GNI) -.659*
4. Adjusted savings: energy depletion (% of GNI) -.699*
5. Adjusted savings: natural resources depletion (% of GNI) -.699*
6. Agricultural methane emissions (thousand metric tons of CO2 equivalent) .680*
7. Birth rate, crude (per 1,000 people) -.603*
8. GDP per person employed (constant 2011 PPP US$) -.722*
9. General government final consumption expenditure (% of GDP) .634*
10. Unemployment, total (% of total labour force) (modelled ILO estimate) -.608*
11. Cumulative drop-out rate to the last grade of lower-secondary general education, both sexes (%) -.708*
12. Enrolment in pre-primary education, both sexes (number) .768**
13. GDP per capita (constant 2005 US$) -.689*

14. Percentage of male graduates from tertiary education graduating from science programmes, male (%) .604*
15. Percentage of students in tertiary education enrolled in engineering, manufacturing, and construction programmes, both sexes (%) .808**
16. Percentage of teachers in secondary education who are female (%) .604*

For design non-resident applications, here is the list of significant variables.

1. Industry, value added (% of GDP) -.763**
2. Services, etc. value added (% of GDP) .767**
3. Adjusted net national income per capita (annual % growth) -.688*
4. Adjusted savings: energy depletion (% of GNI) -.790**
5. Adjusted savings: natural resources depletion (% of GNI) -.790**
6. Agricultural methane emissions (thousand metric tons of CO_2 equivalent) .631*
7. Agriculture, value added (annual % growth) .614*
8. Aquaculture production (metric tons) .715*
9. Birth rate, crude (per 1,000 people) -.759**
10. Charges for the use of intellectual property, payments (BoP, current US$) .691*
11. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) -.684*
12. Exports of goods and services (% of GDP) -.605*
13. GDP per person employed (constant 2011 PPP US$) -.749**
14. General government final consumption expenditure (% of GDP) .613*
15. High-technology exports (% of manufactured exports) .639*
16. High-technology exports (current US$) .705*
17. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) -.682*
18. Labour force, total .686*
19. Military expenditure (% of GDP) .607*
20. Start-up procedures to register a business (number) -.802**
21. Time required to start a business (days) -.802**
22. Primary completion rate, both sexes (%) -.617*
23. Cumulative drop-out rate to the last grade of lower-secondary general education, both sexes (%) -.676*

24. Effective transition rate from primary to lower-secondary general education, both sexes (%) .768**
25. Enrolment in primary education, both sexes (number) -.692*
26. GDP per capita (constant 2005 US$) -.762**
27. Graduates from tertiary education, both sexes (number) .640*
28. Gross enrolment ratio, tertiary, both sexes (%) .662*
29. Percentage of enrolment in tertiary education in private institutions (%) .649*
30. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) .682*
31. Percentage of graduates from tertiary education graduating from science programmes, both sexes (%) .651*
32. Percentage of students in tertiary education enrolled in engineering, manufacturing, and construction programmes, both sexes (%) .686*
33. Percentage of teachers in secondary education who are female (%) .660*
34. Personal computers (per 100 people) .693*
35. Pupil-teacher ratio in secondary education (headcount basis) -.616*
36. Pupil-teacher ratio in upper-secondary education (headcount basis) -.759**
37. Teachers in tertiary education programmes, both sexes (number) .851**

For trademark resident applications, here is the list of significant variables.

1. Electric power consumption (kWh per capita) .659*
2. Food exports (% of merchandise exports) .793**
3. GDP per capita growth (annual %) -.619*
4. Manufactures exports (% of merchandise exports) .774**
5. Primary completion rate, both sexes (%) -.647*
6. Enrolment in early childhood education, both sexes (number) .705*
7. Enrolment in tertiary education per 100,000 inhabitants, both sexes .726*
8. Graduates from ISCED 5 programmes in tertiary education, both sexes (number) .801**
9. Graduates from tertiary education, both sexes (number) .760**
10. Gross enrolment ratio, tertiary, both sexes (%) .707*
11. Percentage of graduates from tertiary education graduating from agriculture programmes, both sexes (%) .619*

12. Percentage of graduates from tertiary education graduating from science programmes, both sexes (%) .610*
13. Percentage of male graduates from tertiary education graduating from science programmes, male (%) .714*
14. Percentage of male graduates from tertiary education graduating from social sciences, business, and law programmes, male (%) .803**
15. Pupil-teacher ratio in tertiary education (headcount basis) .675*

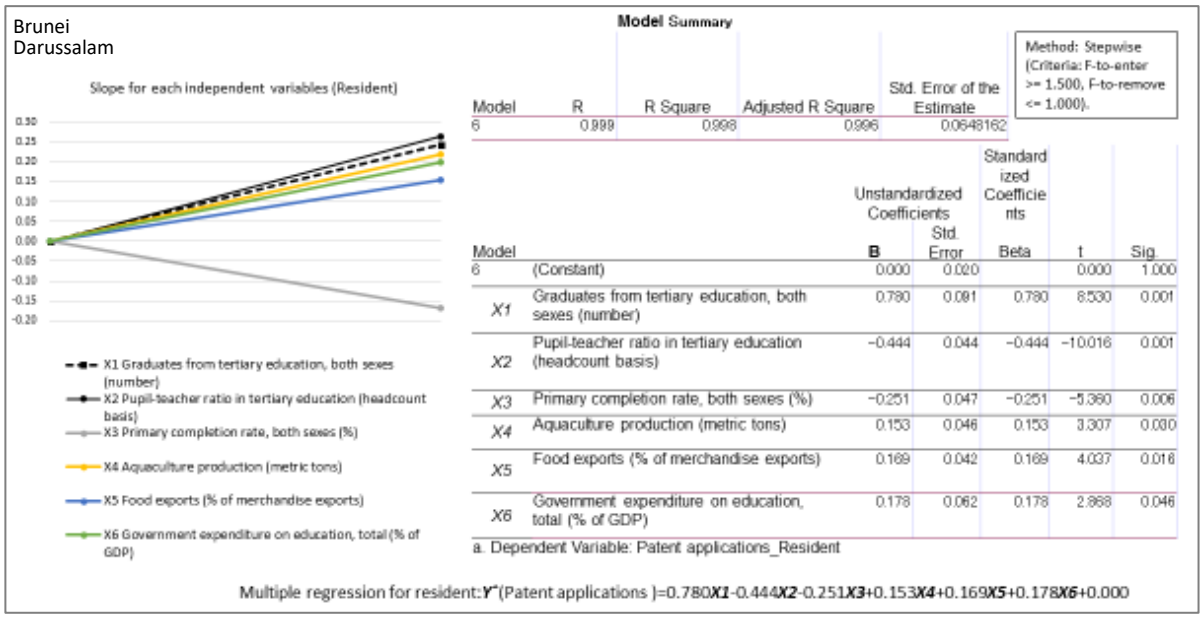
For trademark non-resident applications, here is the list of significant variables.

1. Manufacturing, value added (% of GDP) .621*
2. Adjusted net savings, excluding particulate emission damage (% of GNI) .664*
3. Alternative and nuclear energy (% of total energy use) .823**
4. Charges for the use of intellectual property, payments (BoP, current US$) .650*
5. Communications, computer, etc. (% of service exports, BoP) -.679*
6. Computer, communications, and other services (% of commercial service exports) -.679*
7. Computer, communications, and other services (% of commercial service imports) .759**
8. Consumer price index (2010 = 100) .664*
9. Electric power consumption (kWh per capita) .711*
10. Employment-to-population ratio, 15+, total (%) (modelled ILO estimate) -.709*
11. Final consumption expenditure, etc. (% of GDP) -.613*
12. Foreign direct investment, net outflows (% of GDP) .655*
13. Gross capital formation (% of GDP) .699*
14. Gross domestic savings (% of GDP) .613*
15. Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate) -.712*
16. Labour force, total .652*
17. Merchandise exports (current US$) .625*
18. Net foreign assets (current LCU) .720*
19. Physicians (per 1,000 people) .643*
20. Price level ratio of PPP conversion factor (GDP) to market exchange rate .712*
21. Renewable energy consumption (% of total final energy consumption) .773**

22. Scientific and technical journal articles .831**
23. Tertiary education, academic staff (% female) .677*
24. Enrolment in primary education, both sexes (number) -.689*
25. Enrolment in tertiary education per 100,000 inhabitants, both sexes .783**
26. Enrolment in upper-secondary education, both sexes (number) .610*
27. Gross enrolment ratio, tertiary, both sexes (%) .710*
28. Percentage of enrolment in tertiary education in private institutions (%) .723*
29. Percentage of graduates from tertiary education graduating from science programmes, both sexes (%) .701*
30. Percentage of male graduates from tertiary education graduating from social sciences, business, and law programmes, male (%) .645*
31. Percentage of students in tertiary education enrolled in health and welfare programmes, both sexes (%) -.683*
32. Percentage of students in tertiary education enrolled in science programmes, both sexes (%) .730*
33. Percentage of students in tertiary education enrolled in social sciences, business, and law programmes, both sexes (%) .822**
34. Percentage of students in upper-secondary education enrolled in vocational programmes, both sexes (%) .630*
35. Percentage of teachers in tertiary education who are female (%) .677*
36. Personal computers (per 100 people) .646*
37. Pupil-teacher ratio in tertiary education (headcount basis) .776**
38. Pupil-teacher ratio in upper-secondary education (headcount basis) -.612*

b) Multi-regression analysis

Figure 61. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Patent Applications



Model Summary

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	0.999	0.998	0.996	0.0648162

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
6	(Constant)	0.000	0.020		0.000	1.000
X1	Graduates from tertiary education, both sexes (number)	0.780	0.091	0.780	8.530	0.001
X2	Pupil-teacher ratio in tertiary education (headcount basis)	−0.444	0.044	−0.444	−10.016	0.001
X3	Primary completion rate, both sexes (%)	−0.251	0.047	−0.251	−5.360	0.006
X4	Aquaculture production (metric tons)	0.153	0.046	0.153	3.307	0.030
X5	Food exports (% of merchandise exports)	0.169	0.042	0.169	4.037	0.016
X6	Government expenditure on education, total (% of GDP)	0.178	0.062	0.178	2.868	0.046

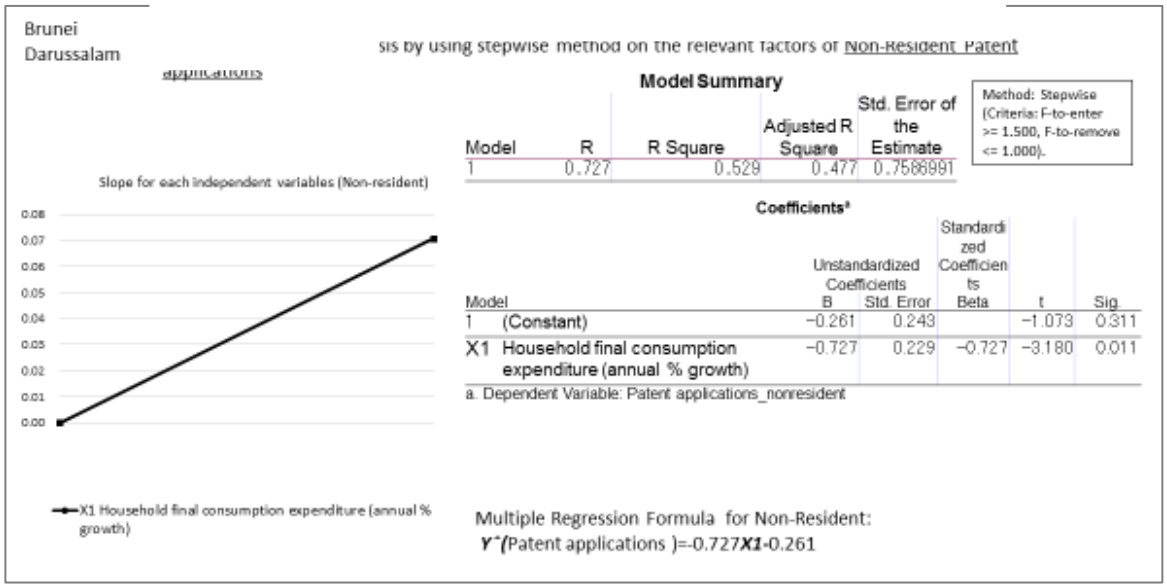
a. Dependent Variable: Patent applications_Resident

Multiple regression for resident: Y'(Patent applications)=0.780***X1***-0.444***X2***-0.251***X3***+0.153***X4***+0.169***X5***+0.178***X6***+0.000

Source: Authors' calculation.

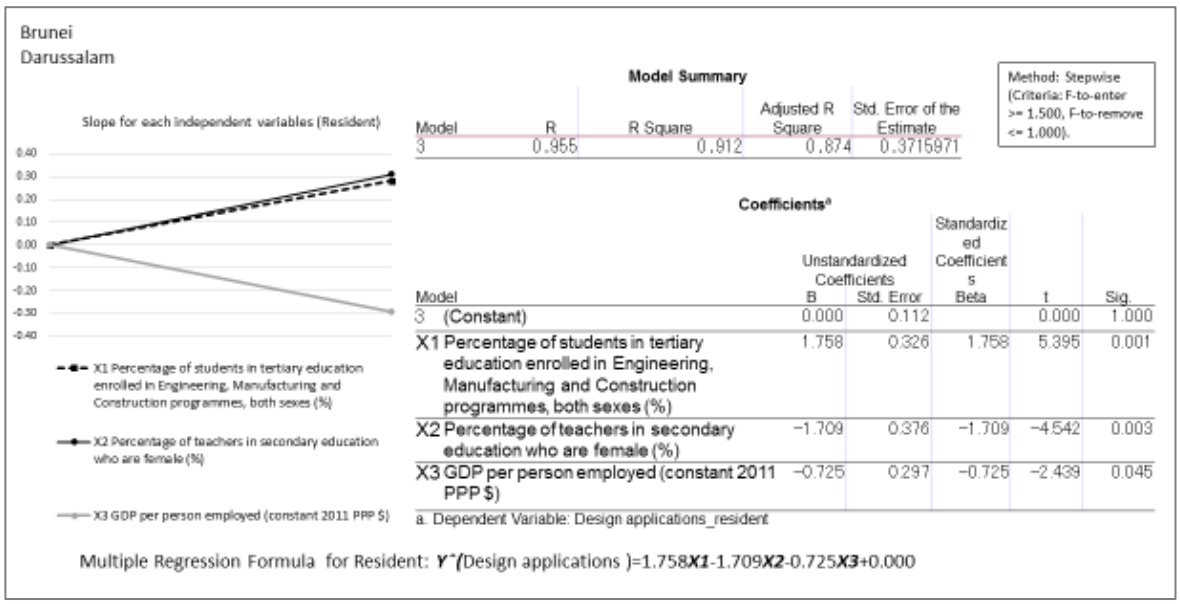
From Figure 61, X1 'graduates from tertiary education, both sexes (number)' should be increased to increase the resident patent applications in Brunei. On the other hand, X2 'pupil-teacher ratio in tertiary education (headcount basis)' should be decreased, which means more teachers are needed in tertiary education.

Figure 62. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Patent Applications



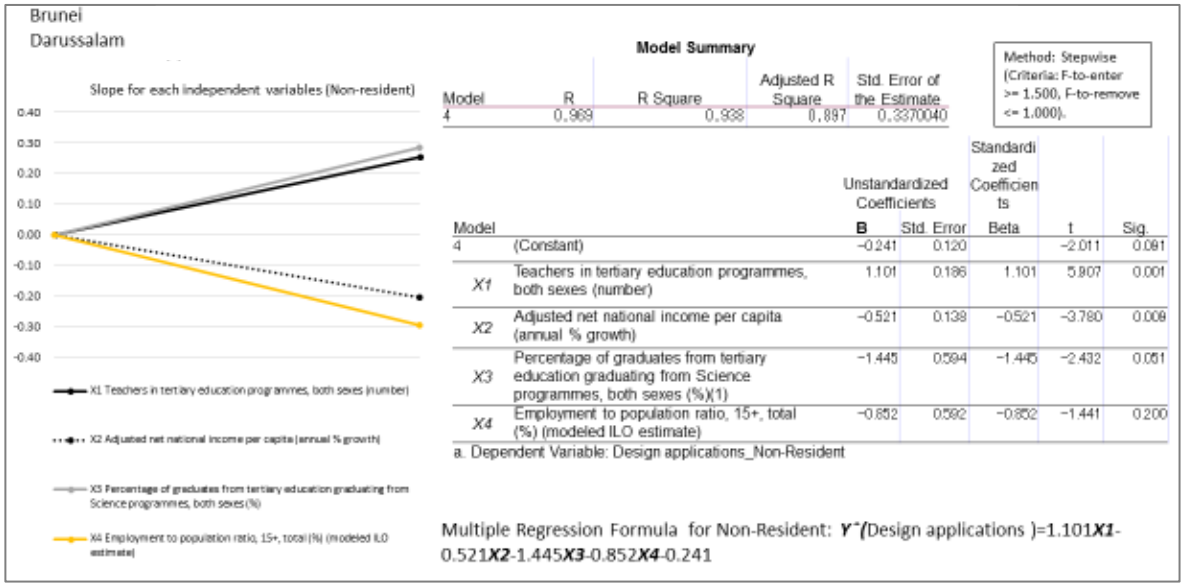
Source: Authors' calculation.

Figure 63. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Design Applications



Source: Authors' calculation.

Figure 64. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Design Applications



Model Summary

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
4	0.969	0.938	0.897	0.3370040

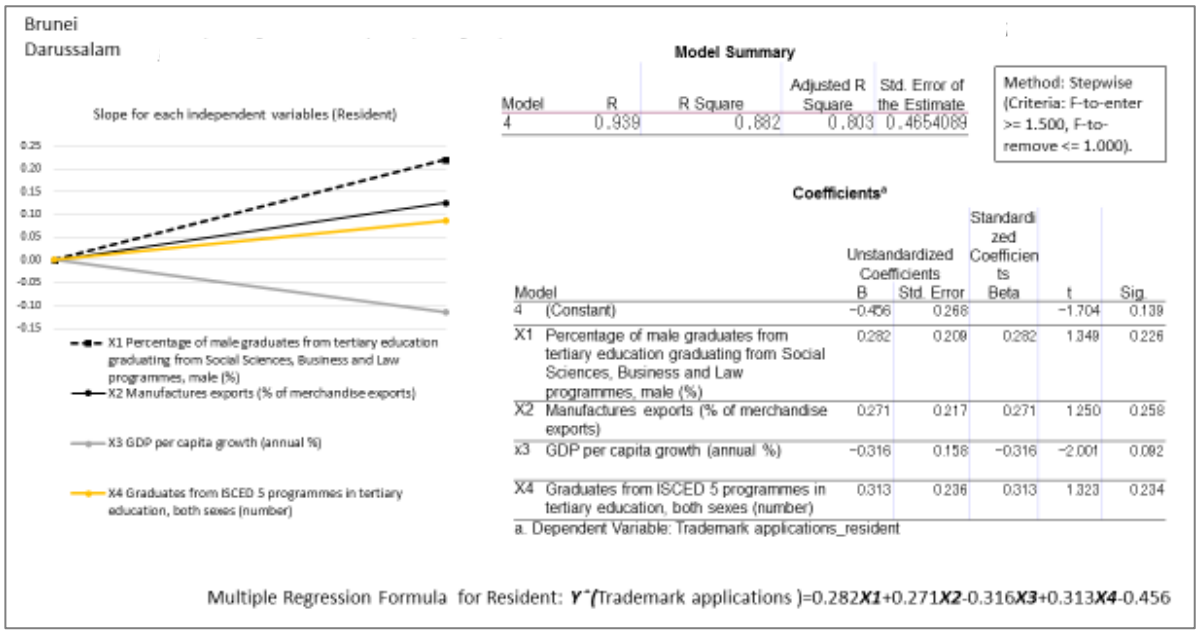
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
4	(Constant)	-0.241	0.120		-2.011	0.091
X1	Teachers in tertiary education programmes, both sexes (number)	1.101	0.186	1.101	5.907	0.001
X2	Adjusted net national income per capita (annual % growth)	-0.521	0.139	-0.521	-3.760	0.009
X3	Percentage of graduates from tertiary education graduating from Science programmes, both sexes (%)(1)	-1.445	0.594	-1.445	-2.432	0.051
X4	Employment to population ratio, 15+, total (%) (modeled ILO estimate)	-0.852	0.592	-0.852	-1.441	0.200

a. Dependent Variable: Design applications_Non-Resident

Multiple Regression Formula for Non-Resident: Y^{*}(Design applications)=1.101***X1***-0.521***X2***-1.445***X3***-0.852***X4***-0.241

Source: Authors' calculation.

Figure 65. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Trademark Applications



Model Summary

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
4	0.939	0.882	0.803	0.4654089

Coefficients[a]

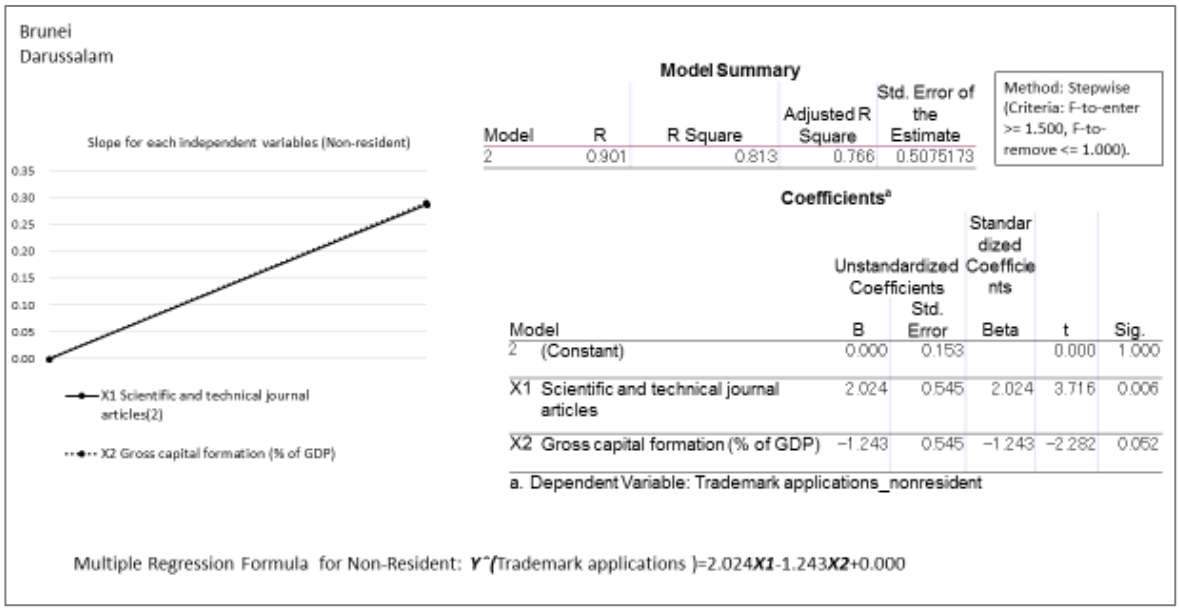
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
4	(Constant)	-0.456	0.268		-1.704	0.139
X1	Percentage of male graduates from tertiary education graduating from Social Sciences, Business and Law programmes, male (%)	0.282	0.209	0.282	1.349	0.226
X2	Manufactures exports (% of merchandise exports)	0.271	0.217	0.271	1.250	0.258
x3	GDP per capita growth (annual %)	-0.316	0.158	-0.316	-2.001	0.092
X4	Graduates from ISCED 5 programmes in tertiary education, both sexes (number)	0.313	0.236	0.313	1.323	0.234

a. Dependent Variable: Trademark applications_resident

Multiple Regression Formula for Resident: Y^{*}(Trademark applications)=0.282***X1***+0.271***X2***-0.316***X3***+0.313***X4***-0.456

Source: Authors' calculation.

Figure 66. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Trademark Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	0.901	0.813	0.766	0.5075173

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
2	(Constant)	0.000	0.153		0.000	1.000
X1	Scientific and technical journal articles	2.024	0.545	2.024	3.716	0.006
X2	Gross capital formation (% of GDP)	−1.243	0.545	−1.243	−2.282	0.052

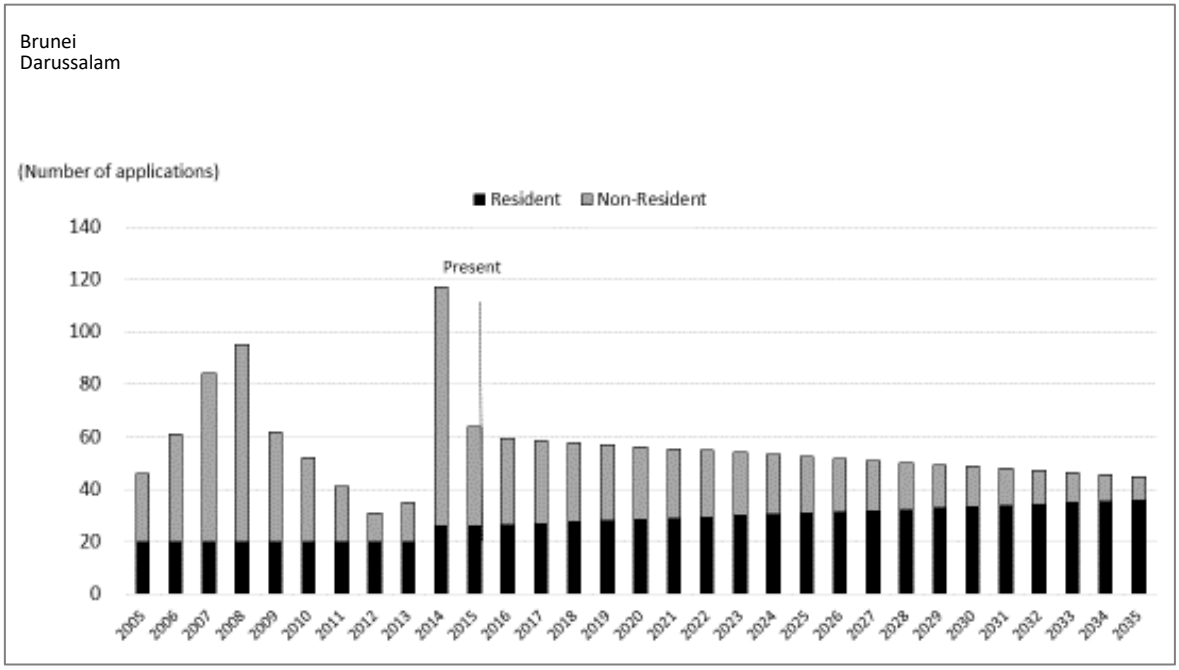
a. Dependent Variable: Trademark applications_nonresident

Multiple Regression Formula for Non-Resident: $\hat{Y}$(Trademark applications)=2.024***X1***-1.243***X2***+0.000

Source: Authors' calculation.

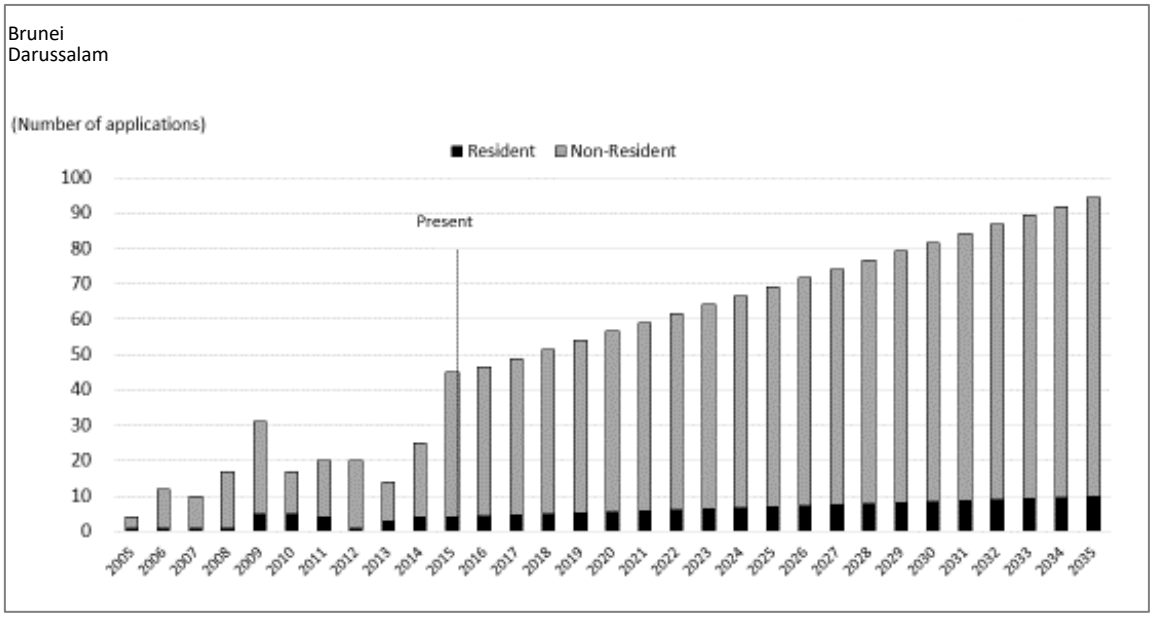
c) Forecast

Figure 67. Forecast of Patent Applications by Using Multiple Regression Formula (Stepwise Method)



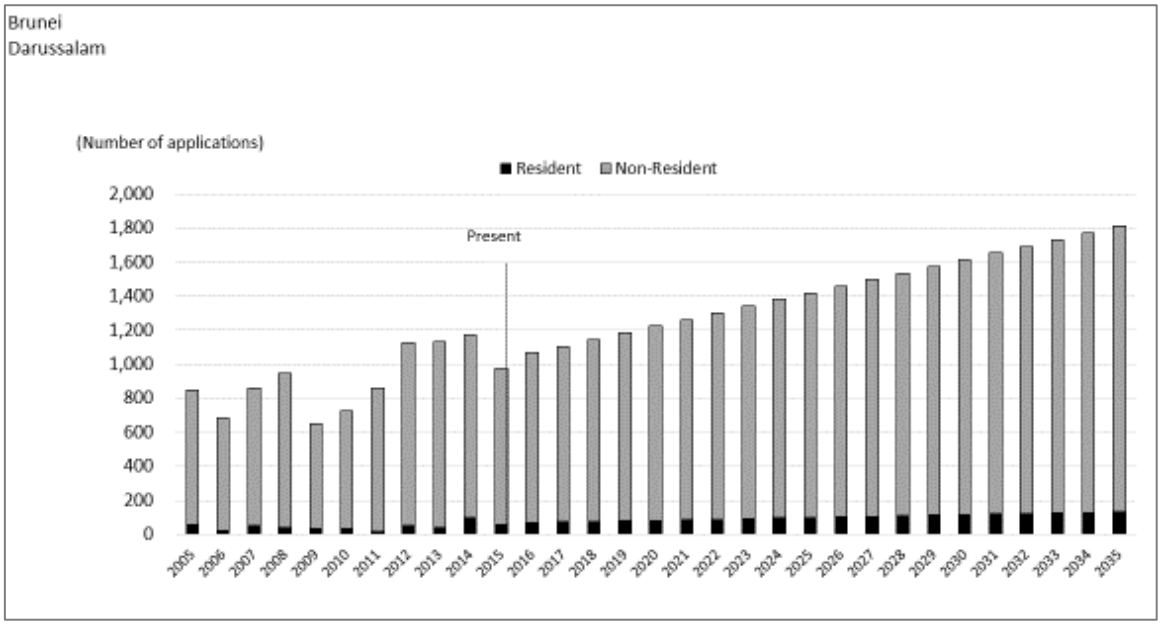
Source: Authors' calculation.

Figure 68. Forecast of Design Application by Using Multiple Regression formula (Stepwise Method)



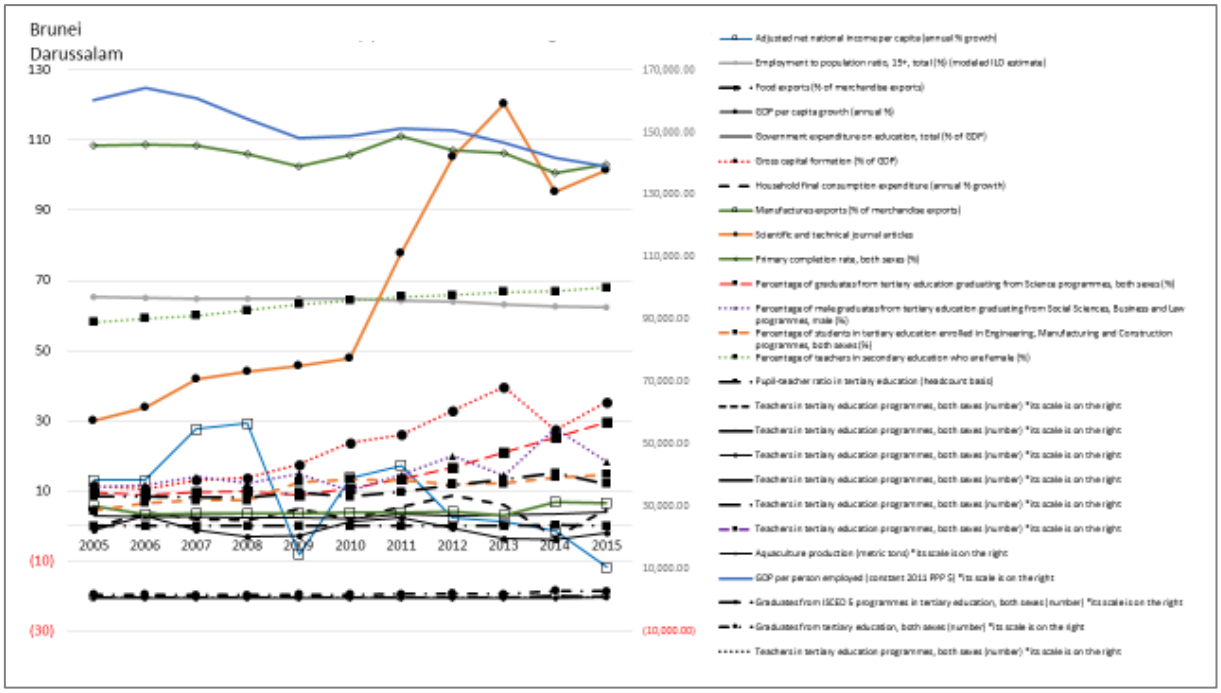
Source: Authors' calculation.

Figure 69. Forecast of Trademark Applications by Using Multiple Regression Formula (Stepwise Method)



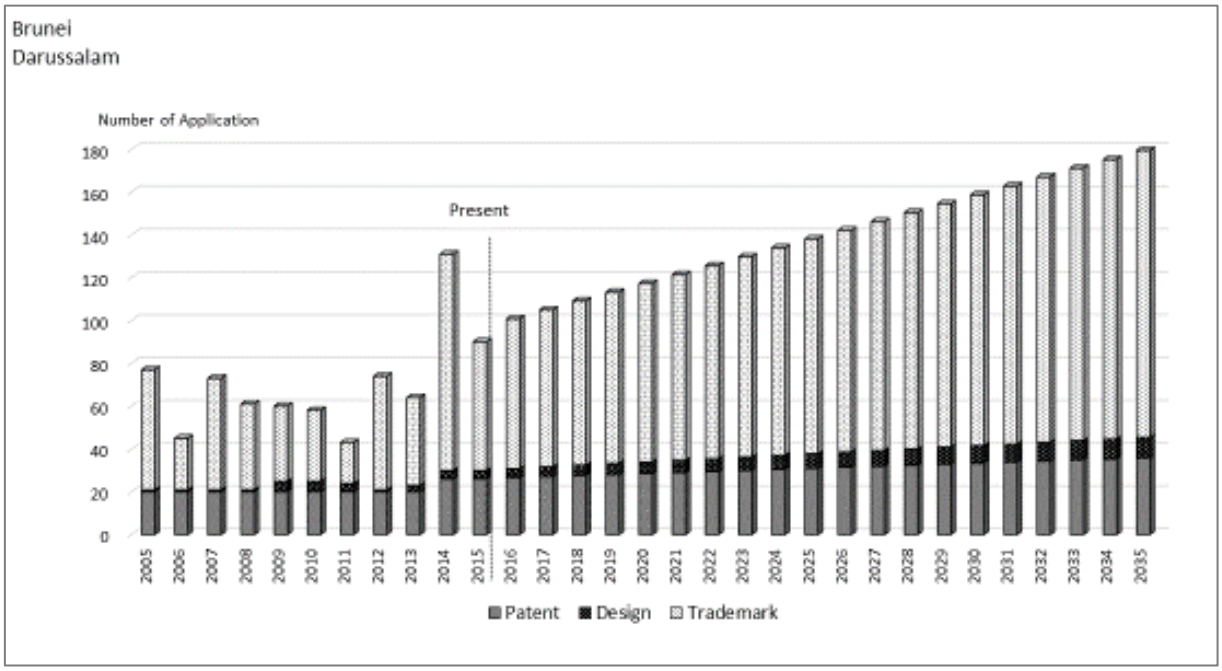
Source: Authors' calculation.

Figure 70. The Actual WB Data Applicable to all IPs Regression Formula



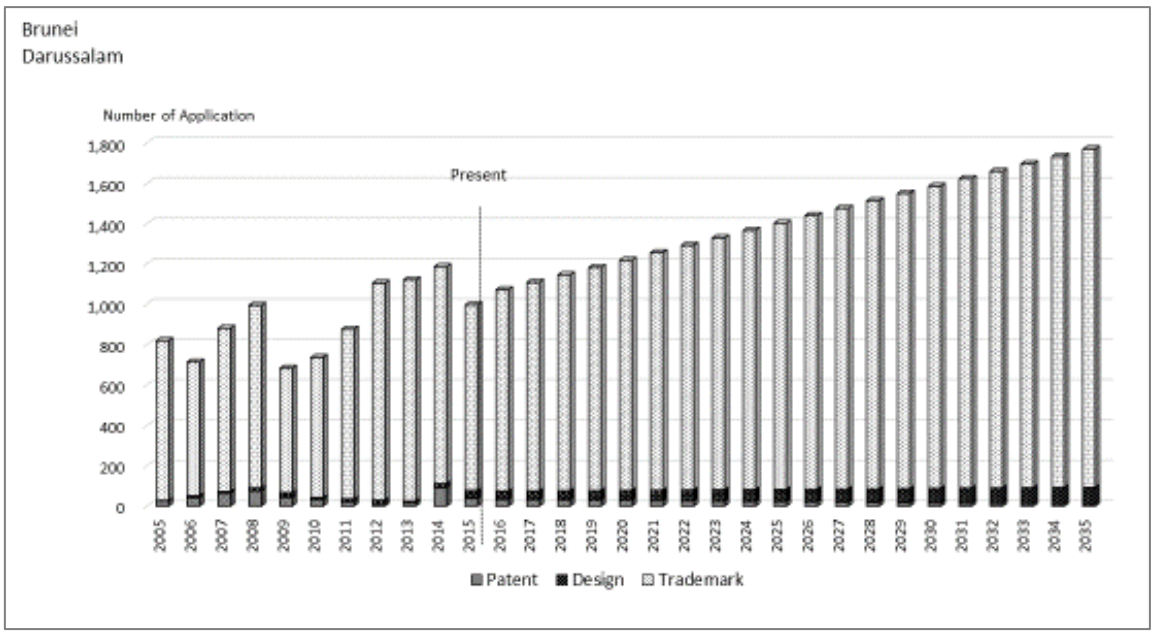
Source: Authors' calculation.

Figure 71. Forecast of Each Application by Resident



Source: Authors' calculation.

Figure 72. Forecast of Each Application by Non-Residents



Source: Authors' calculation.

10.5. Indonesia

a) The relevant factors for the regression analysis of IP applications were selected as follows during 2005–2017:

1. GDP (current US$)
2. Armed forces personnel, total
3. Birth rate, crude (per 1,000 people)
4. Employment in industry (% of total employment) (modelled ILO estimate)
5. Gross national expenditure (current US$)
6. ICT goods exports (% of total goods exports)
7. ICT goods imports (% total goods imports)
8. ICT service exports (% of service exports, BoP)
9. ICT service exports (BoP, current US$)
10. Labour force, total
11. Listed domestic companies, total
12. Manufacturing, value added (current US$)
13. Market capitalisation of listed domestic companies (current US$)

14. Merchandise trade (% of GDP)
15. Military expenditure (% of GDP)
16. Mineral rents (% of GDP)
17. Mobile cellular subscriptions
18. Natural gas rents (% of GDP)
19. Net foreign assets (current LCU)
20. Net ODA received (current US$)
21. New businesses registered (number)
22. Oil rents (% of GDP)
23. Ores and metals exports (% of merchandise exports)
24. Ores and metals imports (% of merchandise imports)
25. Population, total
26. School enrolment, tertiary (% gross)
27. Scientific and technical journal articles
28. Secondary education, pupils
29. Self-employed, total (% of total employment) (modelled ILO estimate)
30. Services, value added per worker (constant 2010 US$)
31. Total fisheries production (metric tons)
32. Total natural resources rents (% of GDP)
33. Trade (% of GDP)
34. Unemployment with advanced education (% of total labour force with advanced education)
35. Unemployment, total (% of total labour force) (modelled ILO estimate)
36. Urban population

b) Multi-regression analysis

Figure 73. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Patent Applications

Indonesia

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
9	.999[i]	0.999	0.997	0.0594701

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
9	(Constant)	0.920	0.082		11.223	0.000
X1	Net foreign assets (current LCU)	4.559	0.131	4.559	34.883	0.000
X2	Labor force, total	-3.176	0.277	-3.637	-11.458	0.000
x3	School enrollment, tertiary (% gross)	0.633	0.096	0.633	6.577	0.001
X4	Oil rents (% of GDP)	-0.665	0.135	-0.665	-4.929	0.004
X5	Market capitalization of listed domestic companies (current US$)	-0.494	0.053	-0.494	-9.250	0.000
X6	Services, value added per worker (constant 2010 US$)	-0.639	0.193	-0.639	-3.316	0.021
X7	Trade (% of GDP)	0.216	0.144	0.216	1.494	0.195

a. Dependent Variable: Patent applications_resident

Multiple Regression Formula for Resident: $\hat{Y}$(Patent applications)=4.559***X1***-3.176***X2***+0.633***X3***-0.665***X4***-0.494***X5***-0.639***X6***+0.216***X7+0.920***

Source: Authors' calculation.

From Figure 73, X1 'net foreign assets (current LCU)' and X3 'school enrolment, tertiary (% gross)' should be increased to increase the resident patent applications in Indonesia.

Figure 74. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Patent Applications

Indonesia

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	.999[i]	0.998	0.995	0.0702309

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	-0.323	0.073		-4.448	0.007
X1	Self-employed, total (% of total employment) (modeled ILO estimate)	-1.221	0.166	-1.221	-7.358	0.001
X2	Armed forces personnel, total	-0.660	0.094	-0.698	-7.003	0.001
x3	Total natural resources rents (% of GDP)	0.728	0.069	0.728	10.617	0.000
X4	Birth rate, crude (per 1,000 people)	-1.305	0.164	-1.622	-7.970	0.001
X5	Ores and metals imports (% of merchandise imports)	-0.128	0.025	-0.128	-5.143	0.004
X6	Mobile cellular subscriptions	-0.697	0.165	-0.697	-4.228	0.008
X7	Market capitalization of listed domestic companies (current US$)	0.139	0.058	0.139	2.424	0.060

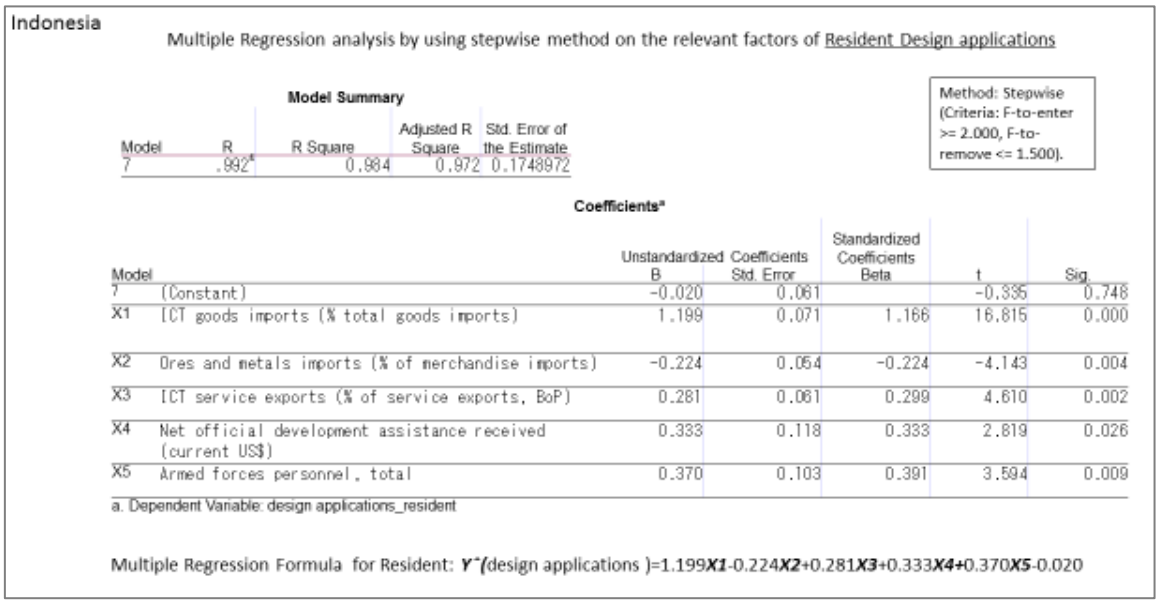
a. Dependent Variable: Patent applications_nonresident

Multiple Regression Formula for Non-Resident: $\hat{Y}$(Patent applications)=-1.221**X1**-0.660**X2**+0.728**X3**-1.305**X4**-0.128**X5**-0.697**X6**+0.139**X7-0.323**

Source: Authors' calculation.

From Figure 74, X1 'self-employed, total (% of total employment) (modelled ILO estimate)' and X4 'birth rate, crude (per 1,000 people)' should be increased to decrease the non-resident patent applications in Indonesia.

Figure 75. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Design Applications



Indonesia

Multiple Regression analysis by using stepwise method on the relevant factors of Resident Design applications

Method: Stepwise (Criteria: F-to-enter >= 2.000, F-to-remove <= 1.500).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	.992[a]	0.984	0.972	0.1748972

Coefficients[a]

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	-0.020	0.061		-0.335	0.748
X1	ICT goods imports (% total goods imports)	1.199	0.071	1.166	16.815	0.000
X2	Ores and metals imports (% of merchandise imports)	-0.224	0.054	-0.224	-4.143	0.004
X3	ICT service exports (% of service exports, BoP)	0.281	0.061	0.299	4.610	0.002
X4	Net official development assistance received (current US$)	0.333	0.118	0.333	2.819	0.026
X5	Armed forces personnel, total	0.370	0.103	0.391	3.594	0.009

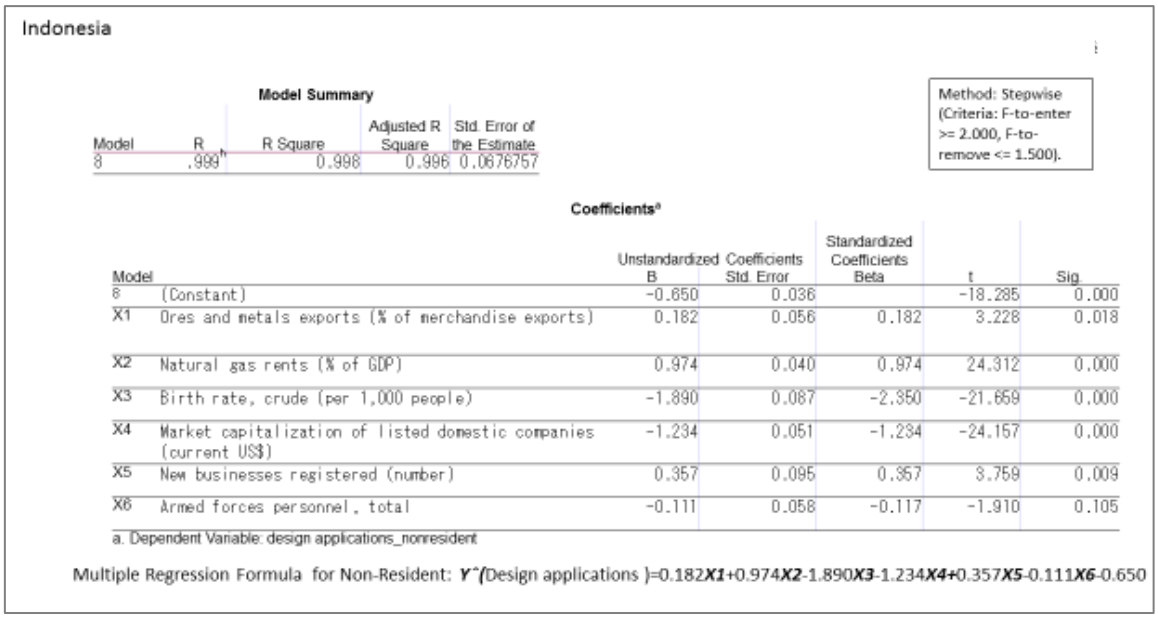
a. Dependent Variable: design applications_resident

Multiple Regression Formula for Resident: Y^*(design applications)=1.199***X1***-0.224***X2***+0.281***X3***+0.333***X4***+0.370***X5***-0.020

Source: Authors' calculation.

From Figure 75, X1 'ICT goods imports (% total goods imports)' should be increased to increase the resident design applications in Indonesia.

Figure 76. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Design Applications



Indonesia

Method: Stepwise (Criteria: F-to-enter >= 2.000, F-to-remove <= 1.500).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
8	.999[h]	0.998	0.996	0.0676757

Coefficients[a]

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
8	(Constant)	-0.650	0.036		-18.285	0.000
X1	Ores and metals exports (% of merchandise exports)	0.182	0.056	0.182	3.228	0.018
X2	Natural gas rents (% of GDP)	0.974	0.040	0.974	24.312	0.000
X3	Birth rate, crude (per 1,000 people)	-1.890	0.087	-2.350	-21.659	0.000
X4	Market capitalization of listed domestic companies (current US$)	-1.234	0.051	-1.234	-24.157	0.000
X5	New businesses registered (number)	0.357	0.095	0.357	3.759	0.009
X6	Armed forces personnel, total	-0.111	0.058	-0.117	-1.910	0.105

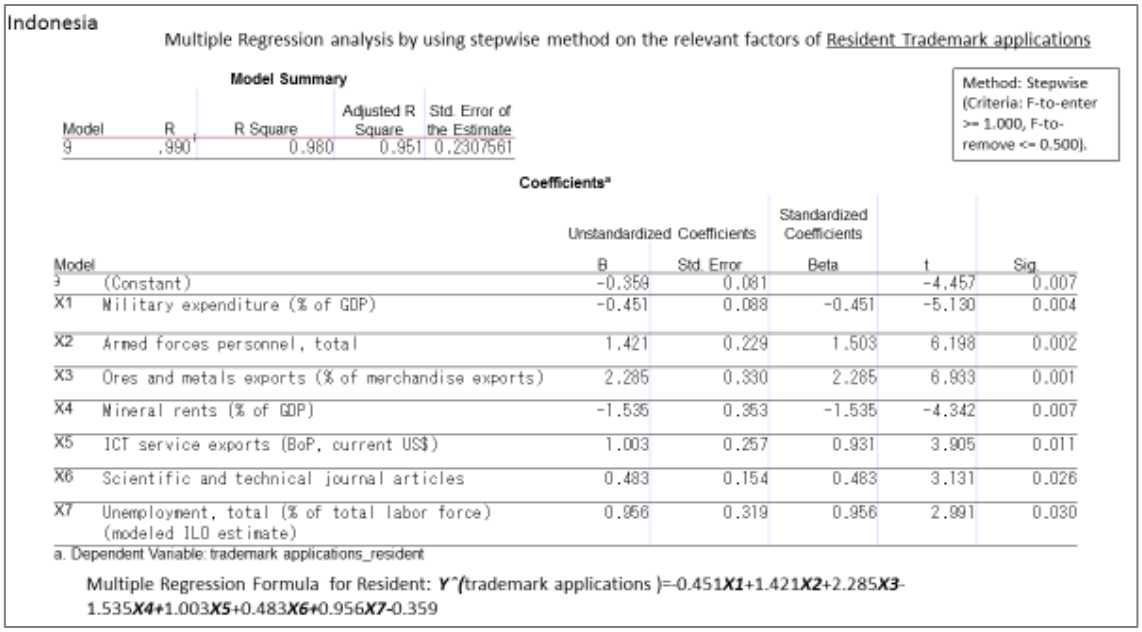
a. Dependent Variable: design applications_nonresident

Multiple Regression Formula for Non-Resident: Y^*(Design applications)=0.182***X1***+0.974***X2***-1.890***X3***-1.234***X4***+0.357***X5***-0.111***X6***-0.650

Source: Authors' calculation.

From Figure 76, X3 'birth rate, crude (per 1,000 people)' and X4 'market capitalisation of listed domestic companies (current US$)' should be increased to decrease non-resident applications in Indonesia.

Figure 77. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Trademark Applications



Indonesia

Multiple Regression analysis by using stepwise method on the relevant factors of Resident Trademark applications

Method: Stepwise (Criteria: F-to-enter >= 1.000, F-to-remove <= 0.500).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
9	.990[i]	0.980	0.951	0.2307561

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
9	(Constant)	-0.359	0.081		-4.457	0.007
X1	Military expenditure (% of GDP)	-0.451	0.088	-0.451	-5.130	0.004
X2	Armed forces personnel, total	1.421	0.229	1.503	6.198	0.002
X3	Ores and metals exports (% of merchandise exports)	2.285	0.330	2.285	6.933	0.001
X4	Mineral rents (% of GDP)	-1.535	0.353	-1.535	-4.342	0.007
X5	ICT service exports (BoP, current US$)	1.003	0.257	0.931	3.905	0.011
X6	Scientific and technical journal articles	0.483	0.154	0.483	3.131	0.026
X7	Unemployment, total (% of total labor force) (modeled ILO estimate)	0.956	0.319	0.956	2.991	0.030

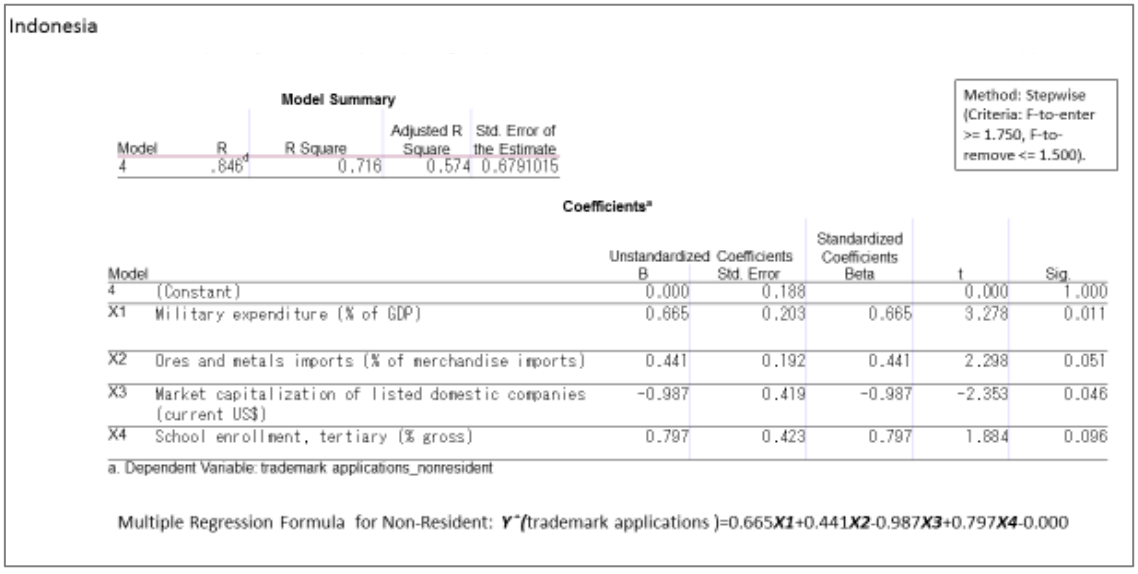
a. Dependent Variable: trademark applications_resident

Multiple Regression Formula for Resident: $Y^{\wedge}$(trademark applications)=-0.451***X1***+1.421***X2***+2.285***X3***-1.535***X4***+1.003***X5***+0.483***X6***+0.956***X7***-0.359

Source: Authors' calculation.

From Figure 77, X5 'ICT service exports (BoP, current US$)' should be increased to increase resident trademark applications in Indonesia.

Figure 78. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Trademark Applications



Indonesia

Method: Stepwise (Criteria: F-to-enter >= 1.750, F-to-remove <= 1.500).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
4	.846[d]	0.716	0.574	0.6791015

Coefficients[a]

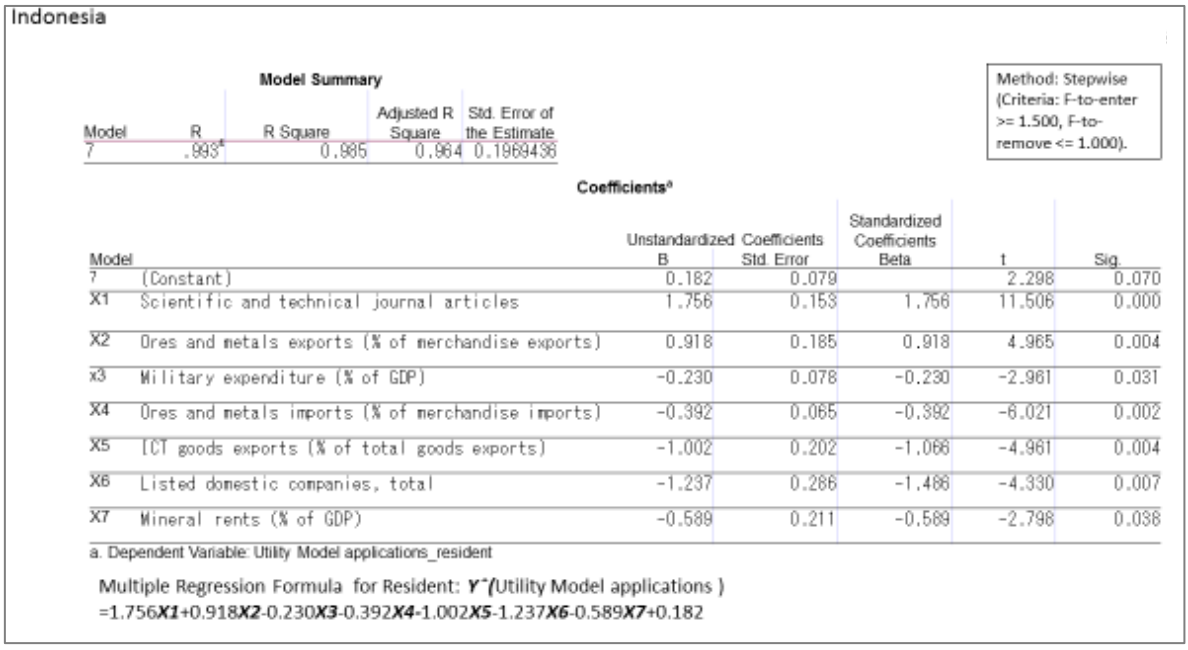
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
4	(Constant)	0.000	0.188		0.000	1.000
X1	Military expenditure (% of GDP)	0.665	0.203	0.665	3.278	0.011
X2	Ores and metals imports (% of merchandise imports)	0.441	0.192	0.441	2.298	0.051
X3	Market capitalization of listed domestic companies (current US$)	-0.987	0.419	-0.987	-2.353	0.046
X4	School enrollment, tertiary (% gross)	0.797	0.423	0.797	1.884	0.096

a. Dependent Variable: trademark applications_nonresident

Multiple Regression Formula for Non-Resident: $Y^{\wedge}$(trademark applications)=0.665***X1***+0.441***X2***-0.987***X3***+0.797***X4***-0.000

Source: Authors' calculation.

Figure 79. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Utility Model Applications



Indonesia

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	.993[a]	0.985	0.964	0.1969436

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	0.182	0.079		2.298	0.070
X1	Scientific and technical journal articles	1.756	0.153	1.756	11.506	0.000
X2	Ores and metals exports (% of merchandise exports)	0.918	0.185	0.918	4.965	0.004
x3	Military expenditure (% of GDP)	-0.230	0.078	-0.230	-2.961	0.031
X4	Ores and metals imports (% of merchandise imports)	-0.392	0.065	-0.392	-6.021	0.002
X5	ICT goods exports (% of total goods exports)	-1.002	0.202	-1.066	-4.961	0.004
X6	Listed domestic companies, total	-1.237	0.286	-1.486	-4.330	0.007
X7	Mineral rents (% of GDP)	-0.589	0.211	-0.589	-2.798	0.038

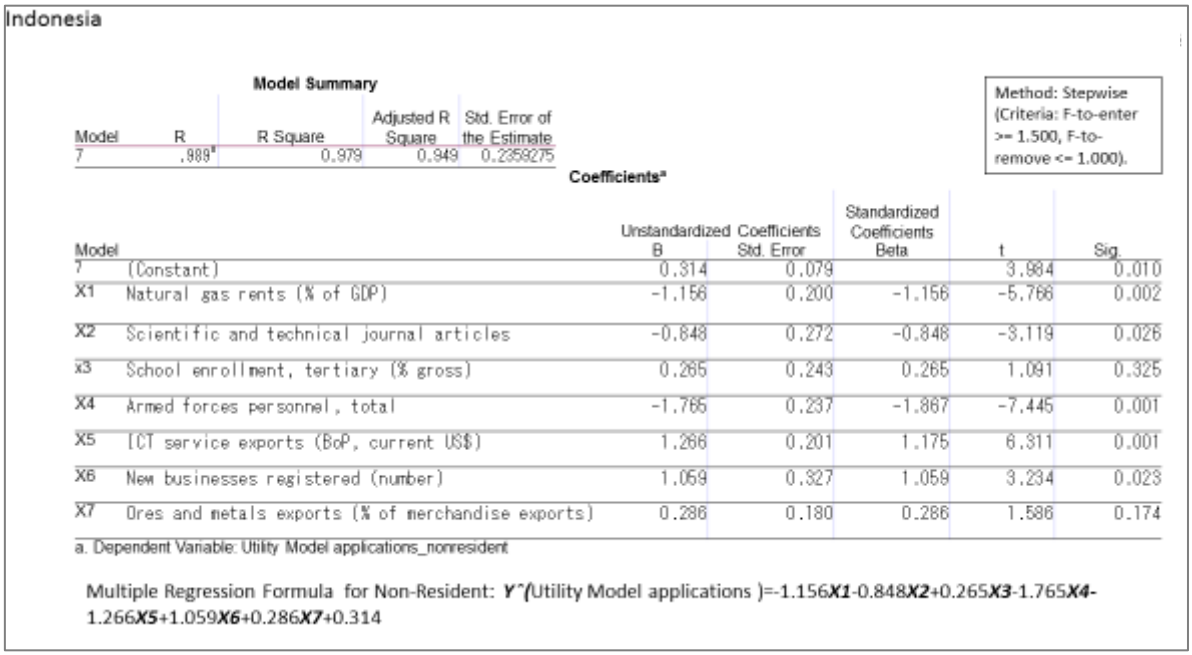
a. Dependent Variable: Utility Model applications_resident

Multiple Regression Formula for Resident: $Y^{\wedge}$(Utility Model applications) =1.756***X1***+0.918***X2***-0.230***X3***-0.392***X4***-1.002***X5***-1.237***X6***-0.589***X7***+0.182

Source: Authors' calculation.

From Figure 79, X1 'Scientific and technical journal articles' should be increased to increase resident utility model resident applications in Indonesia.

Figure 80. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Utility Model Applications



Indonesia

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	.989[a]	0.979	0.949	0.2359275

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	0.314	0.079		3.984	0.010
X1	Natural gas rents (% of GDP)	-1.156	0.200	-1.156	-5.766	0.002
X2	Scientific and technical journal articles	-0.848	0.272	-0.848	-3.119	0.026
x3	School enrollment, tertiary (% gross)	0.265	0.243	0.265	1.091	0.325
X4	Armed forces personnel, total	-1.765	0.237	-1.867	-7.445	0.001
X5	ICT service exports (BoP, current US$)	1.266	0.201	1.175	6.311	0.001
X6	New businesses registered (number)	1.059	0.327	1.059	3.234	0.023
X7	Ores and metals exports (% of merchandise exports)	0.286	0.180	0.286	1.586	0.174

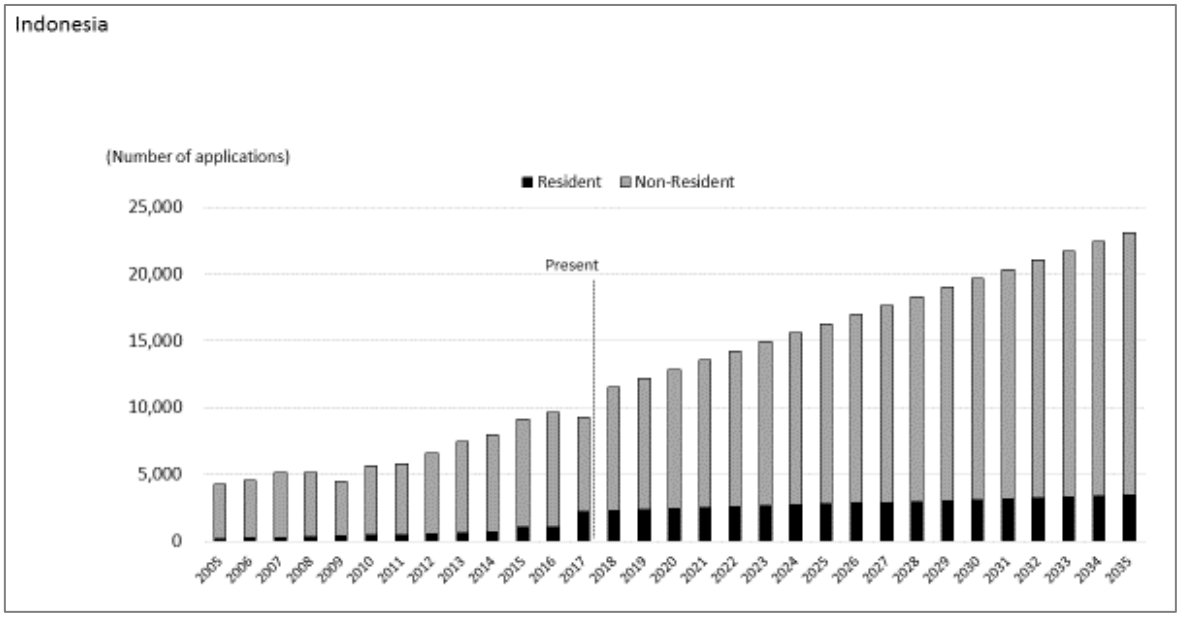
a. Dependent Variable: Utility Model applications_nonresident

Multiple Regression Formula for Non-Resident: $Y^{\wedge}$(Utility Model applications)=-1.156***X1***-0.848***X2***+0.265***X3***-1.765***X4***-1.266***X5***+1.059***X6***+0.286***X7***+0.314

Source: Authors' calculation.

c) Forecast

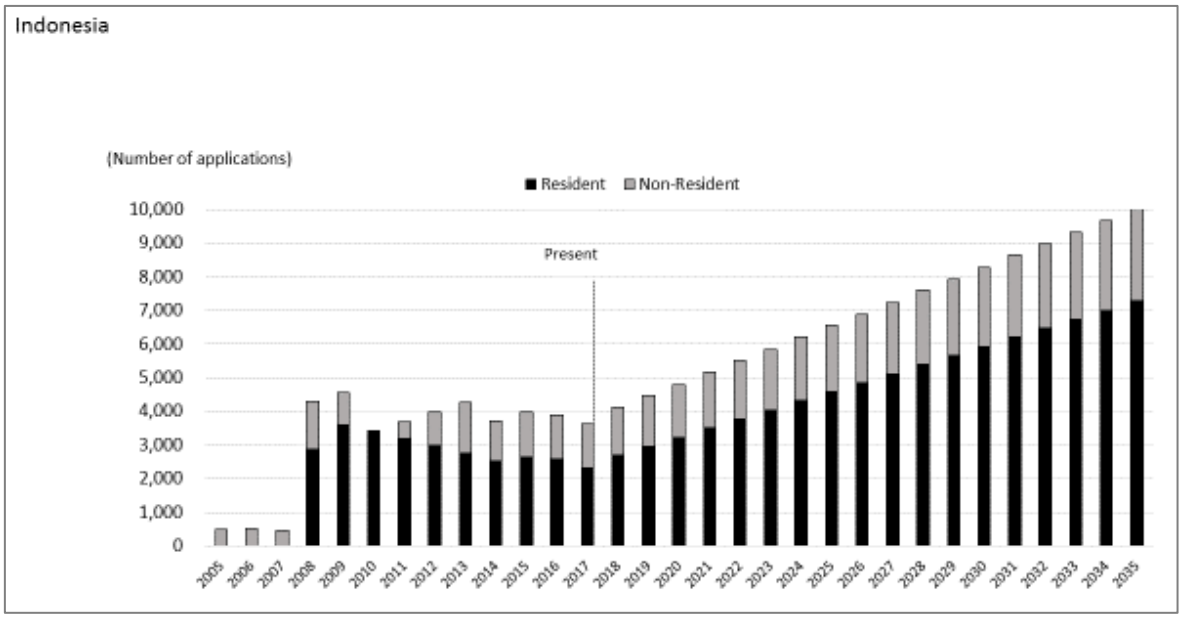
Figure 81. Forecast of Patent Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Total patent applications are expected to increase to nearly 24,000 in 2035 as a result of an increase in application by non-residents, while applications by residents are expected to increase gradually.

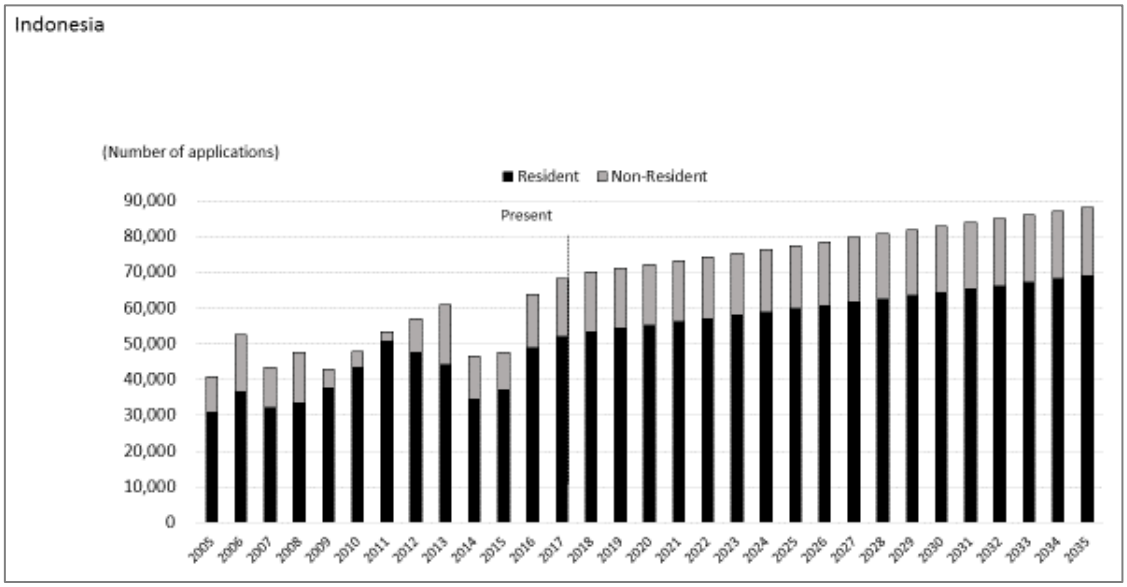
Figure 82. Forecast of Design Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Total design applications are expected to increase to nearly 10,000 in 2035 as a result of a constant increase in applications both by residents and non-residents.

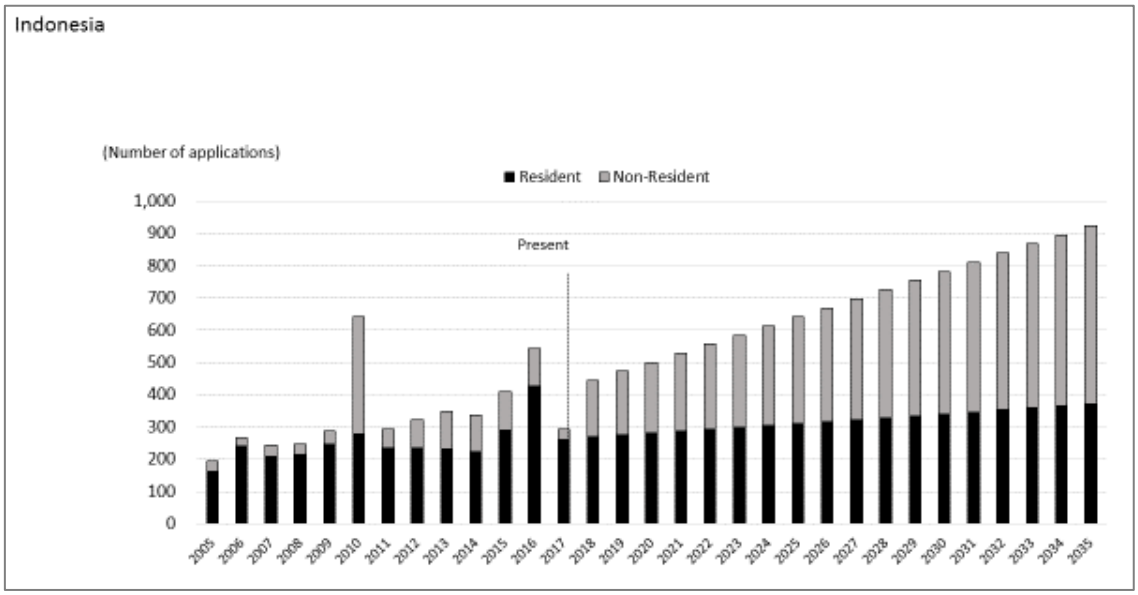
Figure 83. Forecast of Trademark Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Total trademark applications are expected to increase to nearly 90,000 in 2035 as a result of a constant increase in applications both by residents and non-residents.

Figure 84. Forecast of Utility Model Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Total utility model applications are expected to increase to nearly over 900 in 2035 as a result of an increase in applications by non-residents, while applications by residents are expected to increase gradually.

10.6. Cambodia

a) The relevant factors for the regression analysis of IP applications were selected as follows during 2005–2018:

1) GDP (current US$)
2) Armed forces personnel, total
3) Birth rate, crude (per 1,000 people)
4) CO_2 emissions from manufacturing industries and construction (% of total fuel combustion)
5) Compensation of employees (% of expense)
6) Current health expenditure (% of GDP)
7) Employment in industry (% of total employment) (modelled ILO estimate)
8) Government expenditure on education, total (% of GDP)
9) Gross national expenditure (current US$)
10) ICT goods exports (% of total goods exports)
11) ICT goods imports (% total goods imports)
12) ICT service exports (% of service exports, BoP)
13) ICT service exports (BoP, current US$)
14) Labour force, total
15) Manufacturing, value added (current US$)
16) Merchandise trade (% of GDP)
17) Military expenditure (% of GDP)
18) Mobile cellular subscriptions
19) Net foreign assets (current LCU)
20) Net ODA received (current US$)
21) Ores and metals exports (% of merchandise exports)
22) Ores and metals imports (% of merchandise imports)
23) Population, total
24) Scientific and technical journal articles

25) Self-employed, total (% of total employment) (modelled ILO estimate)

26) Services, value added per worker (constant 2010 US$)

27) Total fisheries production (metric tons)

28) Total natural resources rents (% of GDP)

29) Trade (% of GDP)

30) Unemployment, total (% of total labour force) (modelled ILO estimate)

31) Urban population

32) Primary completion rate, both sexes (%)

33) Internet users (per 100 people)

34) Pupil-teacher ratio in lower-secondary education (headcount basis)

35) Pupil-teacher ratio in pre-primary education (headcount basis)

36) Pupil-teacher ratio in primary education (headcount basis)

b) Multi-regression analysis

No analysis was performed due to insufficient data for resident patent applications in Cambodia.

Figure 85. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Patent Applications

Cambodia

Model Summary

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
4	.983[d]	0.967	0.952	0.2275853

Coefficients[a]

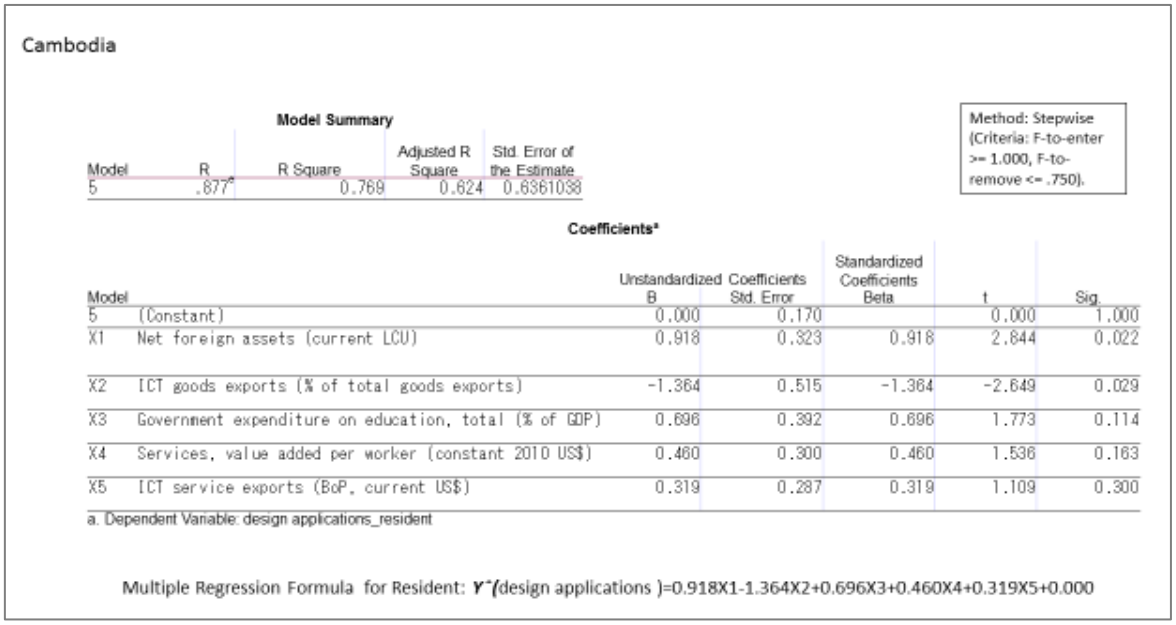
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
4	(Constant)	0.000	0.061		0.000	1.000
X1	Mobile cellular subscriptions	1.109	0.107	1.109	10.354	0.000
X2	Ores and metals exports (% of merchandise exports)	0.252	0.064	0.252	3.936	0.003
X3	Net foreign assets (current LCU)	-0.277	0.104	-0.277	-2.665	0.026
X4	Government expenditure on education, total (% of GDP)	0.172	0.087	0.172	1.968	0.081

a. Dependent Variable: Patent applications_nonresident

Multiple Regression Formula for Non-Resident: Y'(Patent applications)=1.109X1+0.252X2-0.277X3+0.172X4+0.000

Source: Authors' calculation.

Figure 86. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Design Applications



Cambodia

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
5	.877[e]	0.769	0.624	0.6361038

Method: Stepwise (Criteria: F-to-enter >= 1.000, F-to-remove <= .750).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
5	(Constant)	0.000	0.170		0.000	1.000
X1	Net foreign assets (current LCU)	0.918	0.323	0.918	2.844	0.022
X2	ICT goods exports (% of total goods exports)	-1.364	0.515	-1.364	-2.649	0.029
X3	Government expenditure on education, total (% of GDP)	0.696	0.392	0.696	1.773	0.114
X4	Services, value added per worker (constant 2010 US$)	0.460	0.300	0.460	1.536	0.163
X5	ICT service exports (BoP, current US$)	0.319	0.287	0.319	1.109	0.300

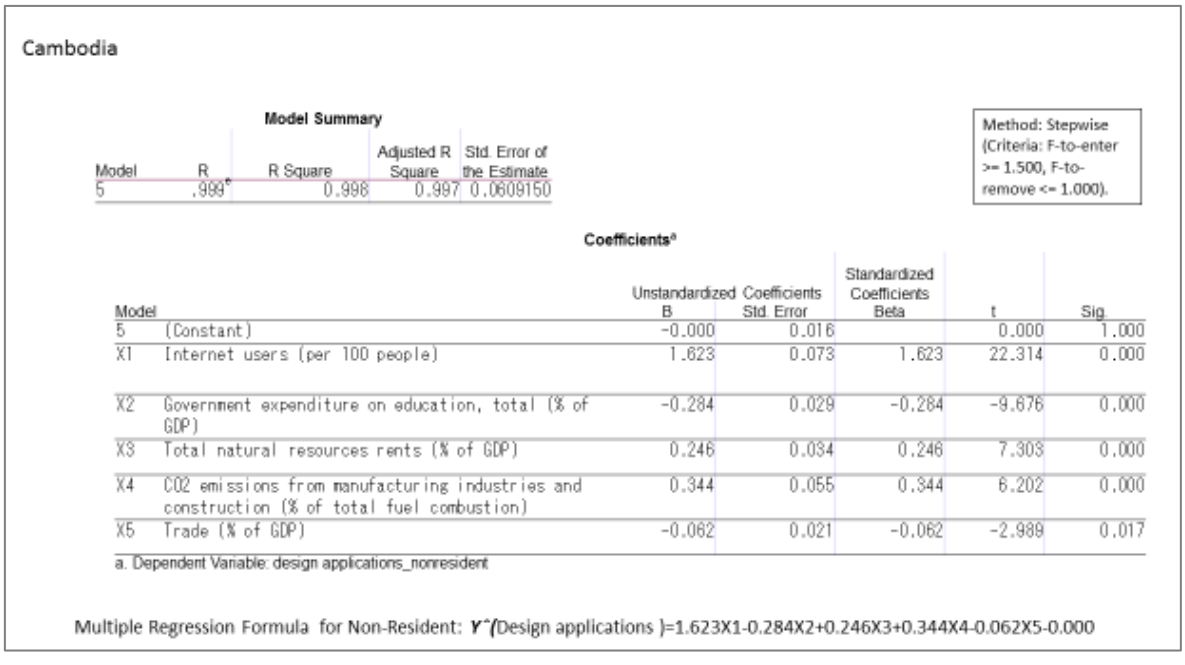
a. Dependent Variable: design applications_resident

Multiple Regression Formula for Resident: $Y^{\wedge}$(design applications)=0.918X1-1.364X2+0.696X3+0.460X4+0.319X5+0.000

Source: Authors' calculation.

From Figure 86, X1 'net foreign assets (current LCU)' and X3 'government expenditure on education, total (% of GDP)' should be increased to increase resident design applications in Cambodia.

Figure 87. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Design Applications



Cambodia

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
5	.999[e]	0.998	0.997	0.0609150

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
5	(Constant)	-0.000	0.016		0.000	1.000
X1	Internet users (per 100 people)	1.623	0.073	1.623	22.314	0.000
X2	Government expenditure on education, total (% of GDP)	-0.284	0.029	-0.284	-9.676	0.000
X3	Total natural resources rents (% of GDP)	0.246	0.034	0.246	7.303	0.000
X4	CO2 emissions from manufacturing industries and construction (% of total fuel combustion)	0.344	0.055	0.344	6.202	0.000
X5	Trade (% of GDP)	-0.062	0.021	-0.062	-2.989	0.017

a. Dependent Variable: design applications_nonresident

Multiple Regression Formula for Non-Resident: $Y^{\wedge}$(Design applications)=1.623X1-0.284X2+0.246X3+0.344X4-0.062X5-0.000

Source: Authors' calculation.

Figure 88. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Trademark Applications

Cambodia

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
5	.999[e]	0.999	0.998	0.0497029

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
5	(Constant)	0.000	0.013		0.000	1.000
X1	Net foreign assets (current LCU)	0.493	0.054	0.493	9.129	0.000
X2	Internet users (per 100 people)	0.190	0.089	0.190	2.127	0.066
X3	Trade (% of GDP)	-0.081	0.018	-0.081	-4.410	0.002
X4	Employment in industry (% of total employment) (modeled ILO estimate)	-0.479	0.130	-0.479	-3.687	0.006
X5	Population, total	0.742	0.222	0.742	3.342	0.010

a. Dependent Variable: trademark applications_resident

Multiple Regression Formula for Resident: Y'(trademark applications)=0.493X1+0.190X2-0.081X3-0.479X4+0.742X5+0.000

Source: Authors' calculation.

From Figure 88, X1 'net foreign assets (current LCU)' and X5 'population, total' should be increased to increase resident trademark applications in Cambodia.

Figure 89. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Trademark Applications

Cambodia

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
5	.993[e]	0.986	0.978	0.1542049

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
5	(Constant)	0.000	0.041		0.000	1.000
X1	Mobile cellular subscriptions	1.168	0.083	1.168	14.113	0.000
X2	Internet users (per 100 people)	-0.896	0.127	-0.896	-7.077	0.000
X3	Trade (% of GDP)	0.293	0.057	0.293	5.118	0.001
X4	Pupil-teacher ratio in pre-primary education (headcount basis)	0.575	0.161	0.575	3.563	0.007
X5	Total natural resources rents (% of GDP)	0.154	0.061	0.154	2.501	0.037

a. Dependent Variable: trademark applications_nonresident

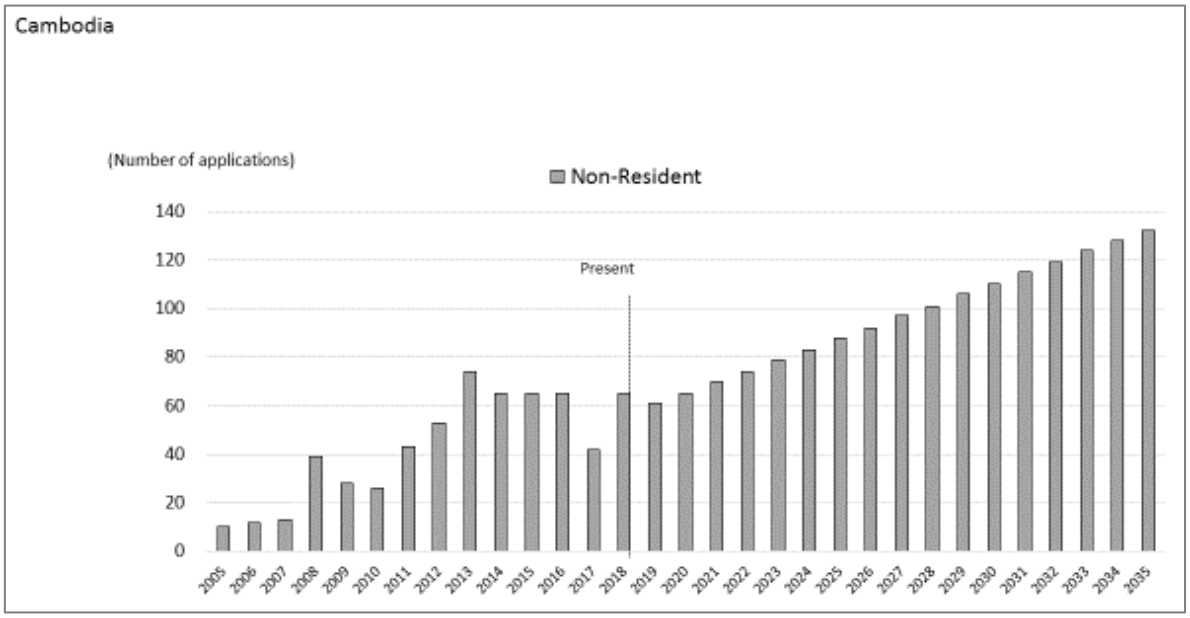
Multiple Regression Formula for Non-Resident: Y'(trademark applications)=1.168X1-0.896X2+0.293X3+0.575X4+0.154X5+0.000

Source: Authors' calculation.

No analysis was performed due to insufficient data for utility model applications in Cambodia.

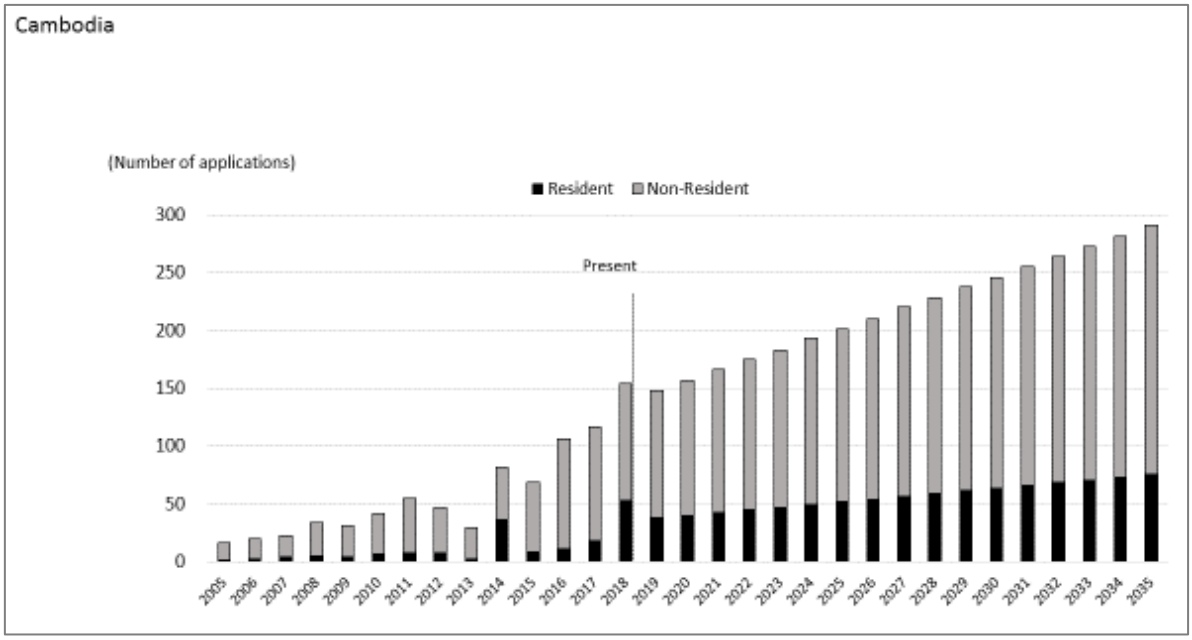
c) Forecast

Figure 90. Forecast of Patent Applications by Using Multiple Regression Formula (Stepwise Method)



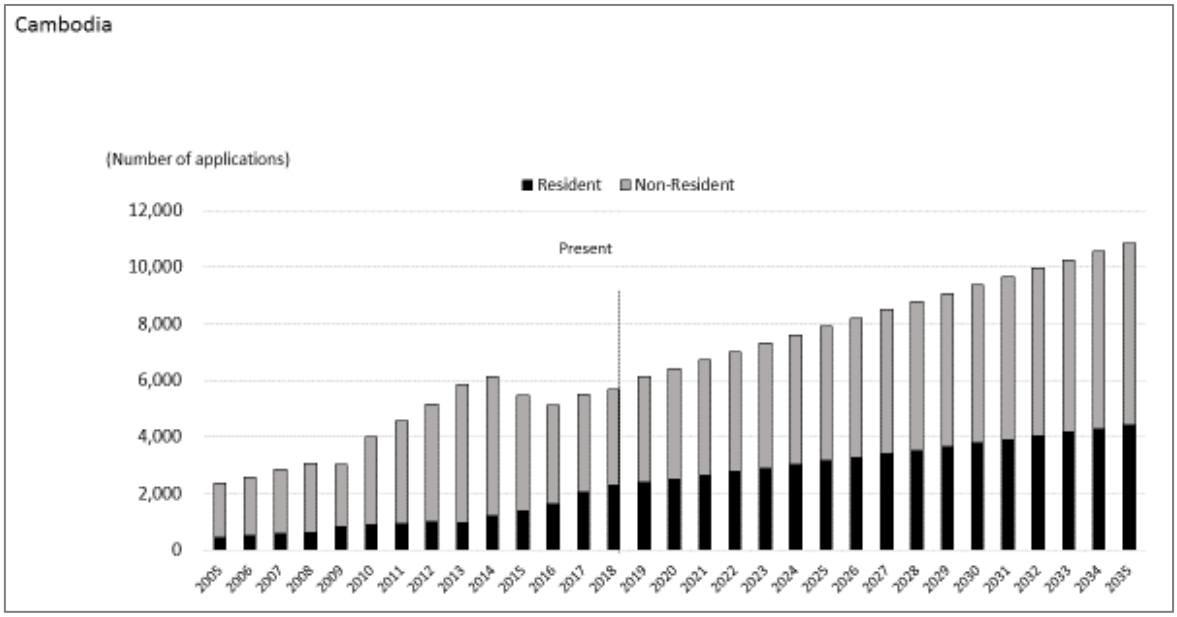
Source: Authors' calculation.

Figure 91. Forecast of Design Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Figure 92. Forecast of Trademark Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

10.7. Thailand

a) The relevant factors for the regression analysis of IP applications were selected as follows during 2005–2017:

1. GDP (current US$)
2. Armed forces personnel, total
3. Birth rate, crude (per 1,000 people)
4. Compensation of employees (% of expense)
5. Employment in industry (% of total employment) (modelled ILO estimate)
6. Gross national expenditure (current US$)
7. ICT goods exports (% of total goods exports)
8. ICT goods imports (% total goods imports)
9. ICT service exports (% of service exports, BoP)
10. ICT service exports (BoP, current US$)
11. Labour force, total
12. Listed domestic companies, total
13. Manufacturing, value added (current US$)
14. Market capitalisation of listed domestic companies (current US$)

15. Merchandise trade (% of GDP)
16. Military expenditure (% of GDP)
17. Mineral rents (% of GDP)
18. Mobile cellular subscriptions
19. Natural gas rents (% of GDP)
20. Net foreign assets (current LCU)
21. Net ODA received (current US$)
22. New businesses registered (number)
23. Oil rents (% of GDP)
24. Ores and metals exports (% of merchandise exports)
25. Ores and metals imports (% of merchandise imports)
26. Population, total
27. School enrolment, tertiary (% gross)
28. Scientific and technical journal articles
29. Secondary education, pupils
30. Self-employed, total (% of total employment) (modelled ILO estimate)
31. Services, value added per worker (constant 2010 US$)
32. Total fisheries production (metric tons)
33. Total natural resources rents (% of GDP)
34. Trade (% of GDP)
35. Unemployment, total (% of total labour force) (modelled ILO estimate)
36. Urban population
37. Internet users (per 100 people)

b) Multi-regression analysis

Figure 93. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Patent Applications

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	.991[a]	0.982	0.966	0.2192641

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	0.209	0.126		1.663	0.157
X1	Unemployment, total (% of total labor force) (modeled [LO estimate]	-1.178	0.122	-1.178	-9.662	0.000
X2	Self-employed, total (% of total employment) (modeled [LO estimate]	1.119	0.094	1.119	11.917	0.000
x3	Merchandise trade (% of GDP)	-1.485	0.161	-1.485	-9.209	0.000
X4	Labor force, total	-1.040	0.132	-1.040	-7.908	0.001
X5	Ores and metals exports (% of merchandise exports)	-0.349	0.076	-0.349	-4.580	0.006
X6	Total natural resources rents (% of GDP)	0.873	0.190	0.873	4.596	0.006
X7	Net official development assistance received (current US$)	0.214	0.113	0.214	1.900	0.116

a. Dependent Variable: Patent applications_resident

Multiple Regression Formula for Resident: $Y^{\wedge}$(Patent applications)=-1.178***X1***+1.119***X2***-1.485***X3***-1.040***X4***-0.349***X5***+0.873***X6***+0.214***X7+0.209***

Source: Authors' calculation.

Figure 93 shows that X2 'self-employed, total (% of total employment) (modelled ILO estimate)' should be increased and X1 'unemployment, total (% of total labour force) (modelled ILO estimate)' should be decreased to increase the resident patent applications in Thailand.

Figure 94. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Patent Applications

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	.999[a]	0.997	0.993	0.0878816

Coefficients[a]

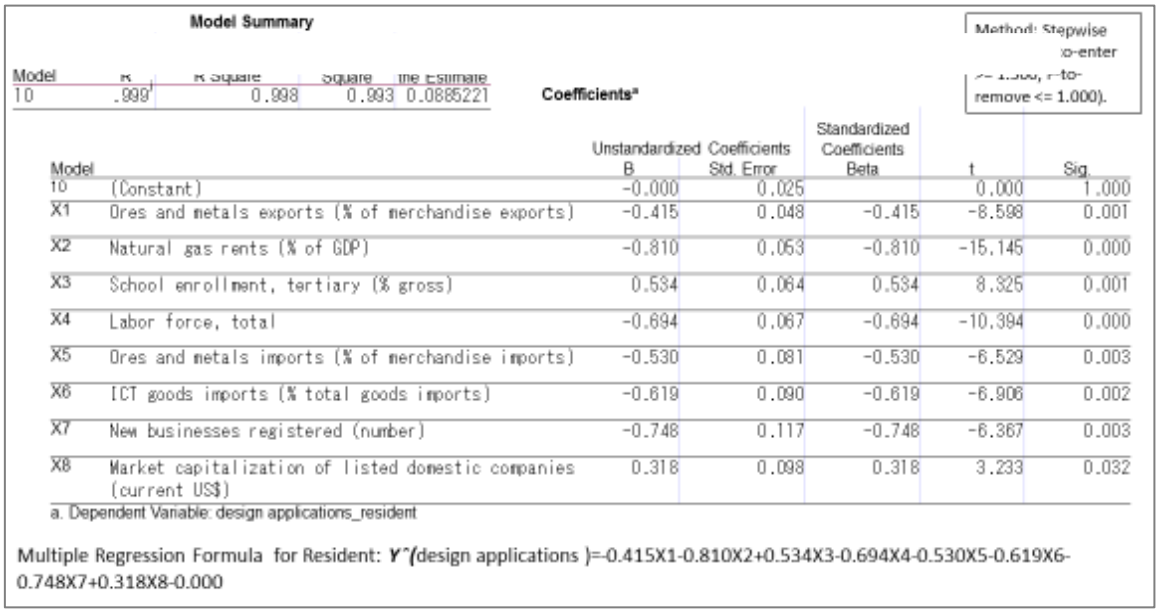
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7						0.006
X1						0.000
X2	Gross national expenditure (current US$)	-1.832	0.268	-1.832	-6.847	0.001
x3	ICT service exports (% of service exports, BoP)	-1.369	0.092	-1.369	-14.848	0.000
X4	Military expenditure (% of GDP)	0.374	0.037	0.374	10.175	0.000
X5	Net official development assistance received (current US$)	0.362	0.076	0.362	4.751	0.005
X6	Total natural resources rents (% of GDP)	0.430	0.068	0.430	6.288	0.001
X7	ICT goods imports (% total goods imports)	0.599	0.198	0.599	3.021	0.029

a. Dependent Variable: Patent applications_nonresident

Multiple Regression Formula for Non-Resident: $Y^{\wedge}$(Patent applications)
=-1.571**X1**-1.832**X2**-1.369**X3**+0.374**X4**+0.362**X5+0.430X6**+0.599**X7+0.354**

Source: Authors' calculation.

Figure 95. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Design Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
10	.999[j]	0.998	0.993	0.0885221

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
10	(Constant)	-0.000	0.025		0.000	1.000
X1	Ores and metals exports (% of merchandise exports)	-0.415	0.048	-0.415	-8.598	0.001
X2	Natural gas rents (% of GDP)	-0.810	0.053	-0.810	-15.145	0.000
X3	School enrollment, tertiary (% gross)	0.534	0.064	0.534	8.325	0.001
X4	Labor force, total	-0.694	0.067	-0.694	-10.394	0.000
X5	Ores and metals imports (% of merchandise imports)	-0.530	0.081	-0.530	-6.529	0.003
X6	ICT goods imports (% total goods imports)	-0.619	0.090	-0.619	-6.906	0.002
X7	New businesses registered (number)	-0.748	0.117	-0.748	-6.367	0.003
X8	Market capitalization of listed domestic companies (current US$)	0.318	0.098	0.318	3.233	0.032

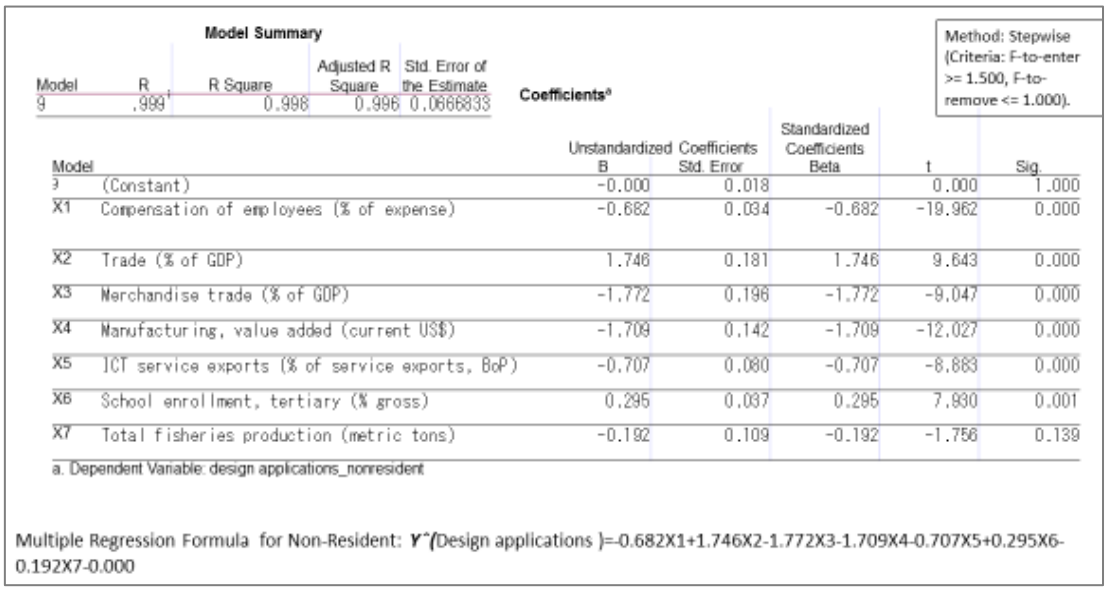
a. Dependent Variable: design applications_resident

Multiple Regression Formula for Resident: Y'(design applications)=-0.415X1-0.810X2+0.534X3-0.694X4-0.530X5-0.619X6-0.748X7+0.318X8-0.000

Source: Authors' calculation.

Figure 95 shows that X3 'school enrolment, tertiary (% gross)' and X8 'market capitalisation of listed domestic companies (current US$)' should be increased to increase the resident design applications in Thailand.

Figure 96. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Design Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
9	.999[i]	0.998	0.996	0.0666833

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

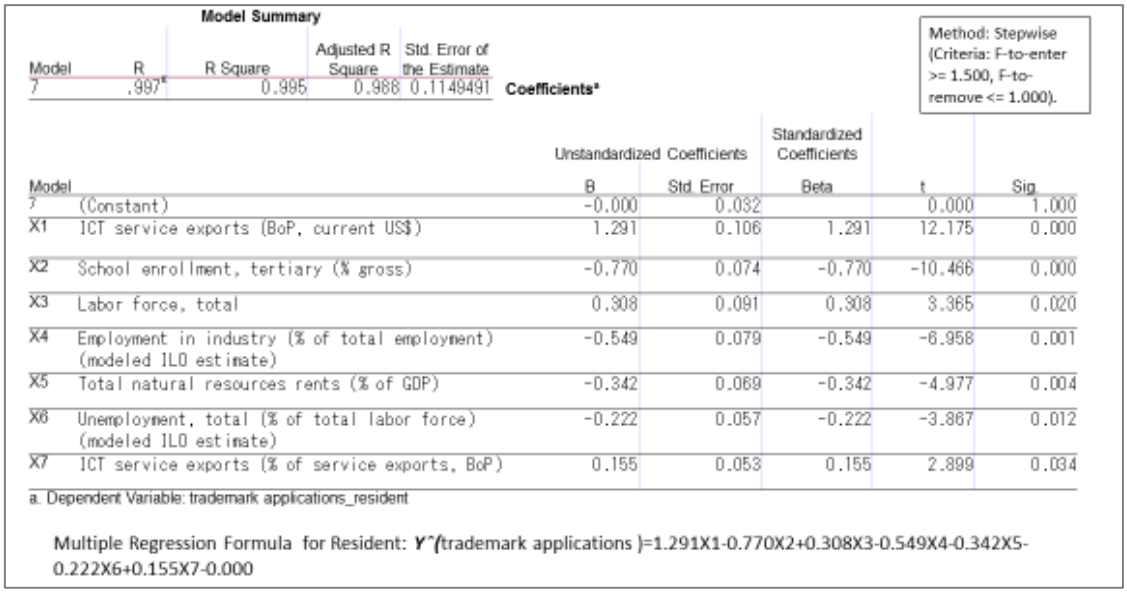
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
9	(Constant)	-0.000	0.018		0.000	1.000
X1	Compensation of employees (% of expense)	-0.682	0.034	-0.682	-19.962	0.000
X2	Trade (% of GDP)	1.746	0.181	1.746	9.643	0.000
X3	Merchandise trade (% of GDP)	-1.772	0.196	-1.772	-9.047	0.000
X4	Manufacturing, value added (current US$)	-1.709	0.142	-1.709	-12.027	0.000
X5	ICT service exports (% of service exports, BoP)	-0.707	0.080	-0.707	-8.883	0.000
X6	School enrollment, tertiary (% gross)	0.295	0.037	0.295	7.930	0.001
X7	Total fisheries production (metric tons)	-0.192	0.109	-0.192	-1.756	0.139

a. Dependent Variable: design applications_nonresident

Multiple Regression Formula for Non-Resident: Y'(Design applications)=-0.682X1+1.746X2-1.772X3-1.709X4-0.707X5+0.295X6-0.192X7-0.000

Source: Authors' calculation.

Figure 97. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Trademark Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	.997[g]	0.995	0.988	0.1149491

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

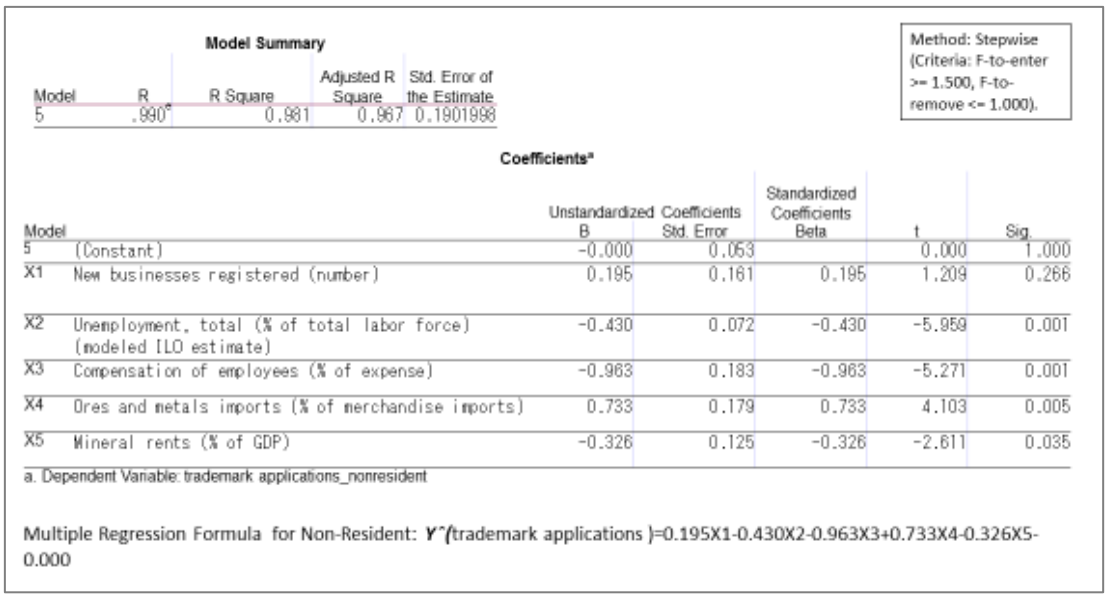
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	-0.000	0.032		0.000	1.000
X1	ICT service exports (BoP, current US$)	1.291	0.106	1.291	12.175	0.000
X2	School enrollment, tertiary (% gross)	-0.770	0.074	-0.770	-10.466	0.000
X3	Labor force, total	0.308	0.091	0.308	3.365	0.020
X4	Employment in industry (% of total employment) (modeled ILO estimate)	-0.549	0.079	-0.549	-6.958	0.001
X5	Total natural resources rents (% of GDP)	-0.342	0.069	-0.342	-4.977	0.004
X6	Unemployment, total (% of total labor force) (modeled ILO estimate)	-0.222	0.057	-0.222	-3.867	0.012
X7	ICT service exports (% of service exports, BoP)	0.155	0.053	0.155	2.899	0.034

a. Dependent Variable: trademark applications_resident

Multiple Regression Formula for Resident: Y'(trademark applications)=1.291X1-0.770X2+0.308X3-0.549X4-0.342X5-0.222X6+0.155X7-0.000

Figure 97 shows that X1 'ICT service exports (BoP, current US$)' and X3 'labour force, total' should be increased to increase the resident trademark applications in Thailand.

Figure 98. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Trademark Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
5	.990[e]	0.981	0.967	0.1901998

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

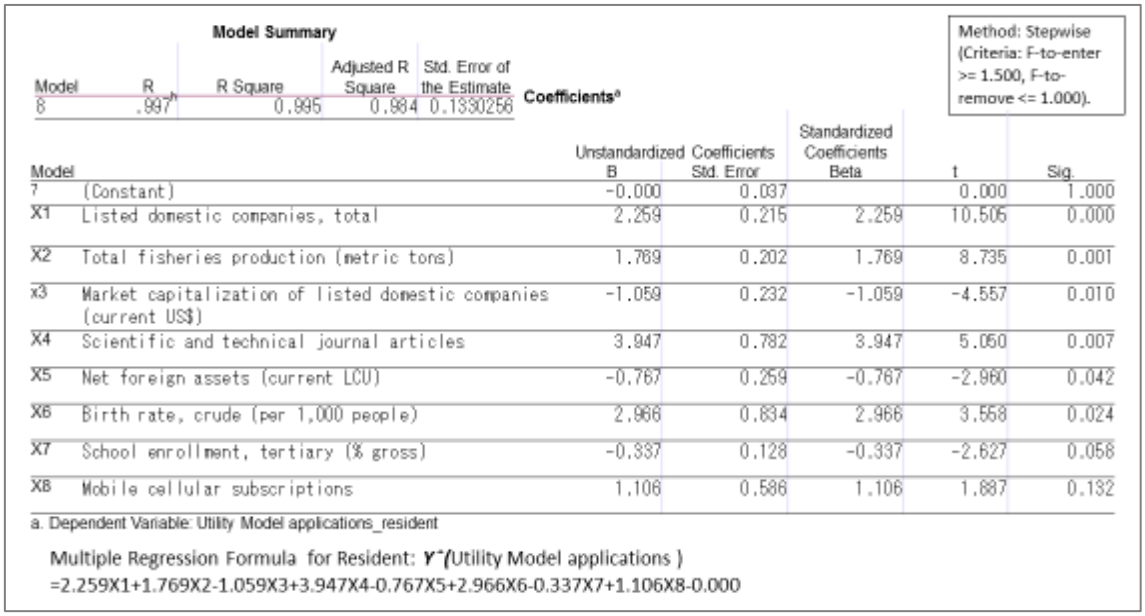
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
5	(Constant)	-0.000	0.063		0.000	1.000
X1	New businesses registered (number)	0.195	0.161	0.195	1.209	0.266
X2	Unemployment, total (% of total labor force) (modeled ILO estimate)	-0.430	0.072	-0.430	-5.959	0.001
X3	Compensation of employees (% of expense)	-0.963	0.183	-0.963	-5.271	0.001
X4	Ores and metals imports (% of merchandise imports)	0.733	0.179	0.733	4.103	0.005
X5	Mineral rents (% of GDP)	-0.326	0.125	-0.326	-2.611	0.035

a. Dependent Variable: trademark applications_nonresident

Multiple Regression Formula for Non-Resident: Y'(trademark applications)=0.195X1-0.430X2-0.963X3+0.733X4-0.326X5-0.000

Source: Authors' calculation.

Figure 99. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Utility Model Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
8	.997[h]	0.995	0.994	0.1330256

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	-0.000	0.037		0.000	1.000
X1	Listed domestic companies, total	2.259	0.215	2.259	10.505	0.000
X2	Total fisheries production (metric tons)	1.769	0.202	1.769	8.735	0.001
x3	Market capitalization of listed domestic companies (current US$)	-1.059	0.232	-1.059	-4.557	0.010
X4	Scientific and technical journal articles	3.947	0.782	3.947	5.050	0.007
X5	Net foreign assets (current LCU)	-0.767	0.259	-0.767	-2.960	0.042
X6	Birth rate, crude (per 1,000 people)	2.966	0.834	2.966	3.558	0.024
X7	School enrollment, tertiary (% gross)	-0.337	0.128	-0.337	-2.627	0.058
X8	Mobile cellular subscriptions	1.106	0.586	1.106	1.887	0.132

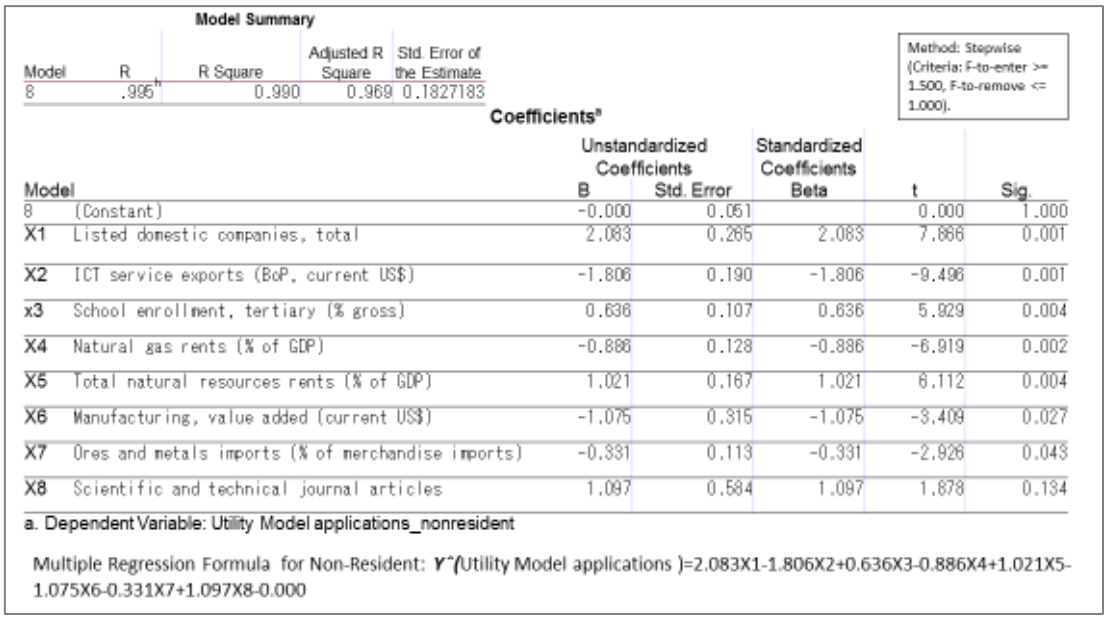
a. Dependent Variable: Utility Model applications_resident

Multiple Regression Formula for Resident: Y^{*}(Utility Model applications)
=2.259X1+1.769X2-1.059X3+3.947X4-0.767X5+2.966X6-0.337X7+1.106X8-0.000

Source: Authors' calculation.

Figure 99 shows that X1 'listed domestic companies, total', X2 'total fisheries production (metric tons)', X4 'scientific and technical journal articles', X6 'birth rate, crude (per 1,000 people)', and X8 'mobile cellular subscriptions' should be increased to increase the resident utility model applications in Thailand.

Figure 100. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Utility Model Applications



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
8	.995[h]	0.990	0.969	0.1827183

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
8	(Constant)	-0.000	0.051		0.000	1.000
X1	Listed domestic companies, total	2.083	0.265	2.083	7.866	0.001
X2	ICT service exports (BoP, current US$)	-1.806	0.190	-1.806	-9.496	0.001
x3	School enrollment, tertiary (% gross)	0.636	0.107	0.636	5.929	0.004
X4	Natural gas rents (% of GDP)	-0.886	0.128	-0.886	-6.919	0.002
X5	Total natural resources rents (% of GDP)	1.021	0.167	1.021	6.112	0.004
X6	Manufacturing, value added (current US$)	-1.075	0.315	-1.075	-3.409	0.027
X7	Ores and metals imports (% of merchandise imports)	-0.331	0.113	-0.331	-2.926	0.043
X8	Scientific and technical journal articles	1.097	0.584	1.097	1.878	0.134

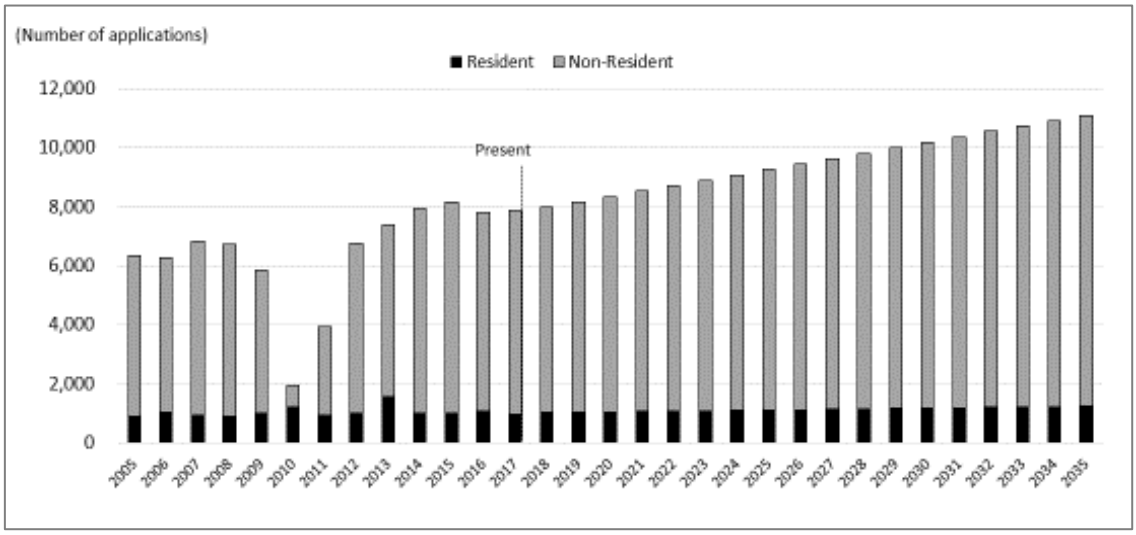
a. Dependent Variable: Utility Model applications_nonresident

Multiple Regression Formula for Non-Resident: Y^{*}(Utility Model applications)=2.083X1-1.806X2+0.636X3-0.886X4+1.021X5-1.075X6-0.331X7+1.097X8-0.000

Source: Authors' calculation.

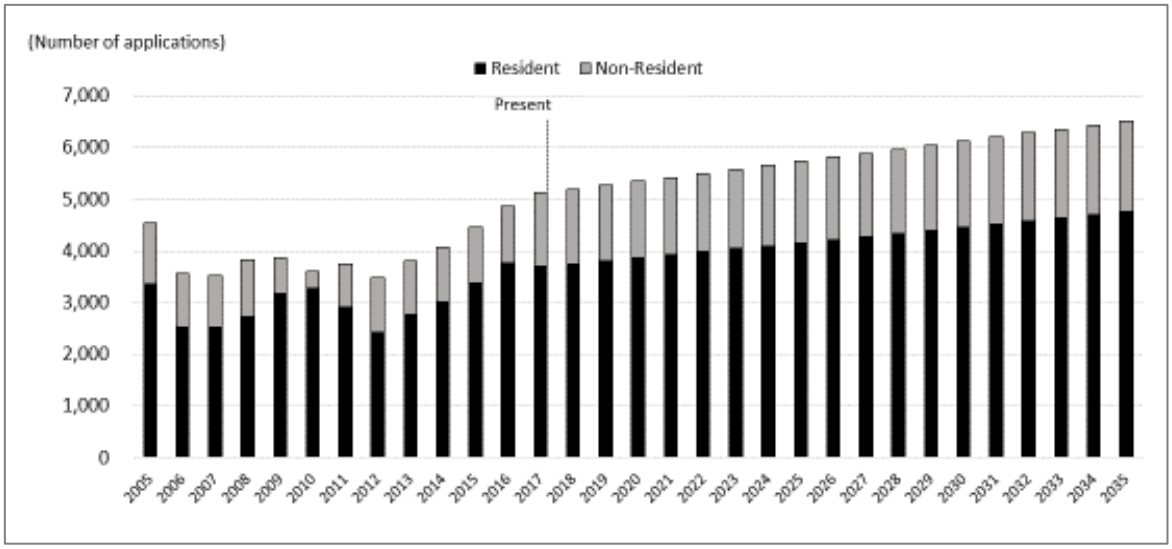
c) Forecast

Figure 101. Forecast of Patent Applications by Using Multiple Regression Formula (Stepwise Method)



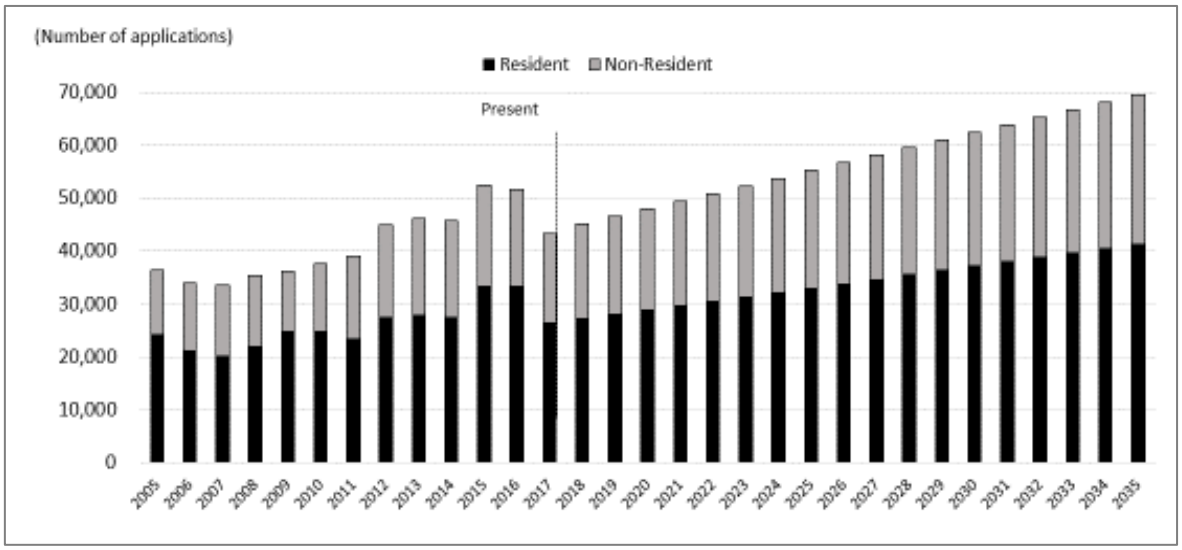
Source: Authors' calculation.

Figure 102. Forecast of Design Applications by Using Multiple Regression Formula (Stepwise Method)



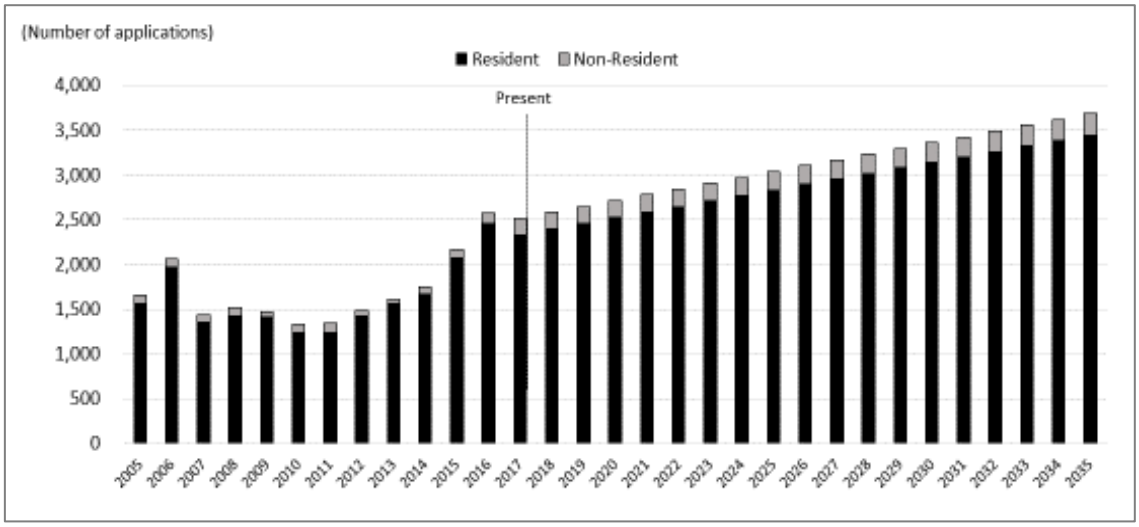
Source: Authors' calculation.

Figure 103. Forecast of Design Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Figure 104. Forecast of Utility Model Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Except for patents, all IPs applications by residents exceed those by non-residents over the forecasting period.

10.8. Lao PDR

a) Correlation coefficients

The relevant factors for the regression analysis on IP applications during 2005–2018 are as follows:

1. GDP (current US$)
2. Armed forces personnel, total
3. Birth rate, crude (per 1,000 people)
4. Current health expenditure (% of GDP)
5. Employment in industry (% of total employment) (modelled ILO estimate)
6. Government expenditure on education, total (% of GDP)
7. Gross national expenditure (current US$)
8. ICT service exports (% of service exports, BoP)
9. ICT service exports (BoP, current US$)
10. Labour force, total
11. Manufacturing, value added (current US$)
12. Merchandise trade (% of GDP)
13. Mineral rents (% of GDP)
14. Mobile cellular subscriptions
15. Net ODA received (current US$)
16. Population, total
17. School enrolment, tertiary (% gross)
18. Scientific and technical journal articles
19. Secondary education, pupils
20. Self-employed, total (% of total employment) (modelled ILO estimate)
21. Total fisheries production (metric tons)
22. Total natural resources rents (% of GDP)
23. Trade (% of GDP)
24. Unemployment, total (% of total labour force) (modelled ILO estimate)
25. Urban population
26. Internet users (per 100 people)
27. Primary completion rate, both sexes (%)

28. Pupil-teacher ratio in lower-secondary education (headcount basis)
29. Pupil-teacher ratio in pre-primary education (headcount basis)
30. Pupil-teacher ratio in primary education (headcount basis)
31. Pupil-teacher ratio in secondary education (headcount basis)
32. Pupil-teacher ratio in tertiary education (headcount basis)
33. Pupil-teacher ratio in upper-secondary education (headcount basis)

b) Multi-regression analysis

Figure 105. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Patent Applications by Resident

Lao PDR

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
5	.964[a]	0.929	0.884	0.3528433

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
5	(Constant)	-0.000	0.094		0.000	1.000
X1	ICT service exports (BoP, current US$)	-1.243	0.194	-1.243	-6.416	0.000
X2	Government expenditure on education, total (% of GDP)	0.522	0.119	0.522	4.387	0.002
X3	Trade (% of GDP)	0.857	0.169	0.857	5.072	0.001
X4	Net official development assistance received (current US$)	0.356	0.145	0.356	2.450	0.040
X5	Current health expenditure (% of GDP)	0.385	0.199	0.385	1.932	0.089

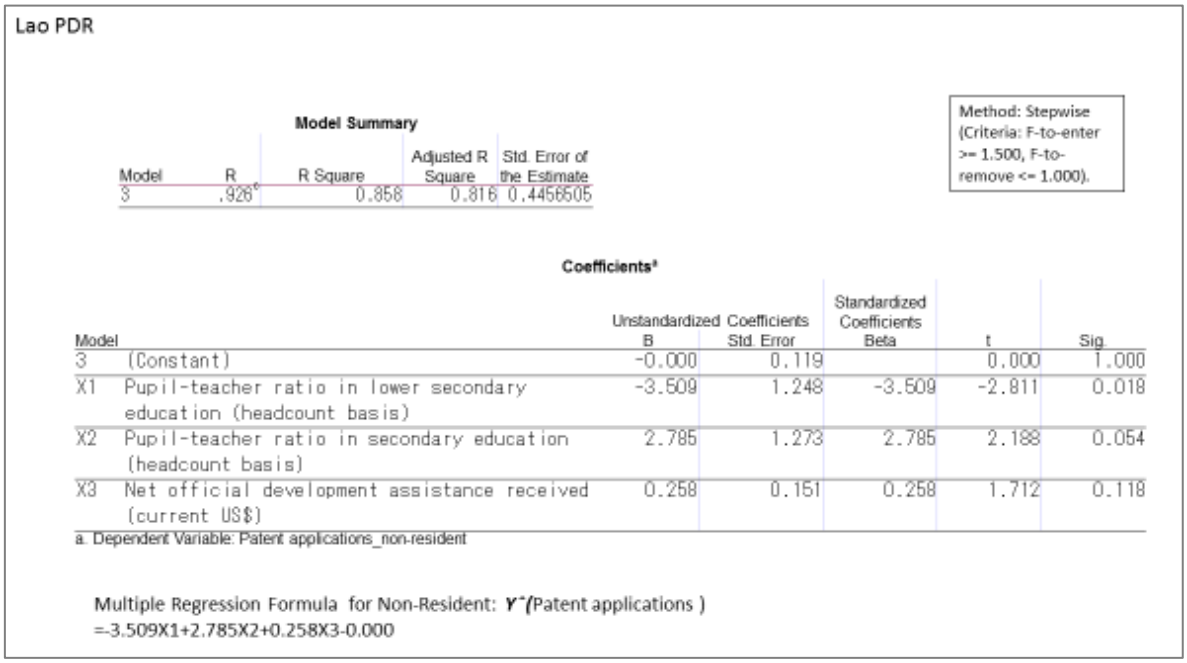
a. Dependent Variable: Patent applications_resident

Multiple Regression Formula for Resident: Y'(Patent applications)=-1.243X1+0.522X2+0.857X3+0.356X4+0.385X5-0.000

Source: Authors' calculation.

Figure 105 shows that X2 'government expenditure on education, total (% of GDP)' and X3 'trade (% of GDP)' should be increased most to increase resident patent applications in the Lao PDR.

Figure 106. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Patent Applications



Lao PDR

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
3	.926[c]	0.858	0.816	0.4456605

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

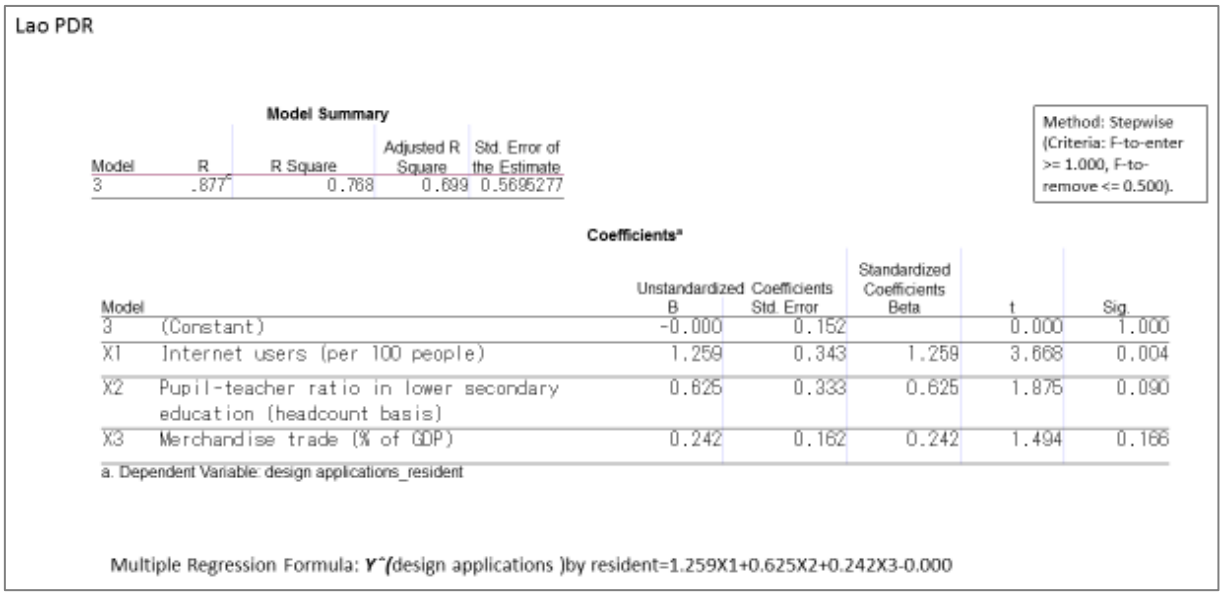
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
3	(Constant)	-0.000	0.119		0.000	1.000
X1	Pupil-teacher ratio in lower secondary education (headcount basis)	-3.509	1.248	-3.509	-2.811	0.018
X2	Pupil-teacher ratio in secondary education (headcount basis)	2.785	1.273	2.785	2.188	0.054
X3	Net official development assistance received (current US$)	0.258	0.151	0.258	1.712	0.118

a. Dependent Variable: Patent applications_non-resident

Multiple Regression Formula for Non-Resident: $Y^{\wedge}$(Patent applications)
=-3.509X1+2.785X2+0.258X3-0.000

Source: Authors' calculation.

Figure 107. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Design Applications by Resident



Lao PDR

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
3	.877[c]	0.768	0.699	0.5695277

Method: Stepwise (Criteria: F-to-enter >= 1.000, F-to-remove <= 0.500).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
3	(Constant)	-0.000	0.152		0.000	1.000
X1	Internet users (per 100 people)	1.259	0.343	1.259	3.668	0.004
X2	Pupil-teacher ratio in lower secondary education (headcount basis)	0.625	0.333	0.625	1.875	0.090
X3	Merchandise trade (% of GDP)	0.242	0.162	0.242	1.494	0.166

a. Dependent Variable: design applications_resident

Multiple Regression Formula: $Y^{\wedge}$(design applications)by resident=1.259X1+0.625X2+0.242X3-0.000

Source: Authors' calculation.

Figure 107 shows that X1 'Internet users (per 100 people)' should be increased most to increase the resident design applications in the Lao PDR.

Figure 108. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Design Applications by Non-Resident

Lao PDR

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	.954[f]	0.910	0.870	0.3740299

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
6	(Constant)	0.000	0.100		0.000	1.000
X1	Total fisheries production (metric tons)	4.382	0.732	4.382	5.984	0.000
X2	Pupil-teacher ratio in tertiary education (headcount basis)	0.971	0.245	0.971	3.956	0.003
X3	Manufacturing, value added (current US$)	-2.568	0.585	-2.568	-4.393	0.002
X4	Mineral rents (% of GDP)	0.422	0.171	0.422	2.473	0.035

a. Dependent Variable: design applications_non-resident

Multiple Regression Formula: $Y^{\wedge}$(design applications)by non-resident=4.382X1+0.971X2-2.568X3+0.422X4+0.000

Source: Authors' calculation.

Figure 109. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Trademark Applications by Resident

Lao PDR

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
3	.953[c]	0.909	0.881	0.3576263

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
3	(Constant)	0.000	0.096		0.000	1.000
X1	Internet users (per 100 people)	1.173	0.205	1.173	5.726	0.000
X2	Merchandise trade (% of GDP)	0.243	0.109	0.243	2.228	0.050
X3	Pupil-teacher ratio in tertiary education (headcount basis)	0.364	0.218	0.364	1.671	0.126

a. Dependent Variable: trademark applications_resident

Multiple Regression Formula : $Y^{\wedge}$(trademark applications) by resident =1.173X1+0.243X2+0.364X3+0.000

Source: Authors' calculation.

Figure 109 shows that X1 'Internet users (per 100 people)' should be increased most to increase the resident trademark applications in the Lao PDR.

Figure 110. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Trademark Applications by Non-Resident

Lao PDR

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	.990[f]	0.980	0.963	0.2001455

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.250).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
6	(Constant)	-0.000	0.053		0.000	1.000
X1	Pupil-teacher ratio in lower secondary education (headcount basis)	-1.408	0.361	-1.408	-3.899	0.006
X2	Pupil-teacher ratio in pre-primary education (headcount basis)	-0.012	0.108	-0.012	-0.106	0.918
X3	Net official development assistance received (current US$)	0.499	0.152	0.499	3.277	0.014
X4	Pupil-teacher ratio in primary education (headcount basis)	-2.436	0.786	-2.436	-3.098	0.017
X5	Urban population	-2.908	1.036	-2.908	-2.807	0.026
X6	ICT service exports (BoP, current US$)	-0.322	0.208	-0.322	-1.551	0.165

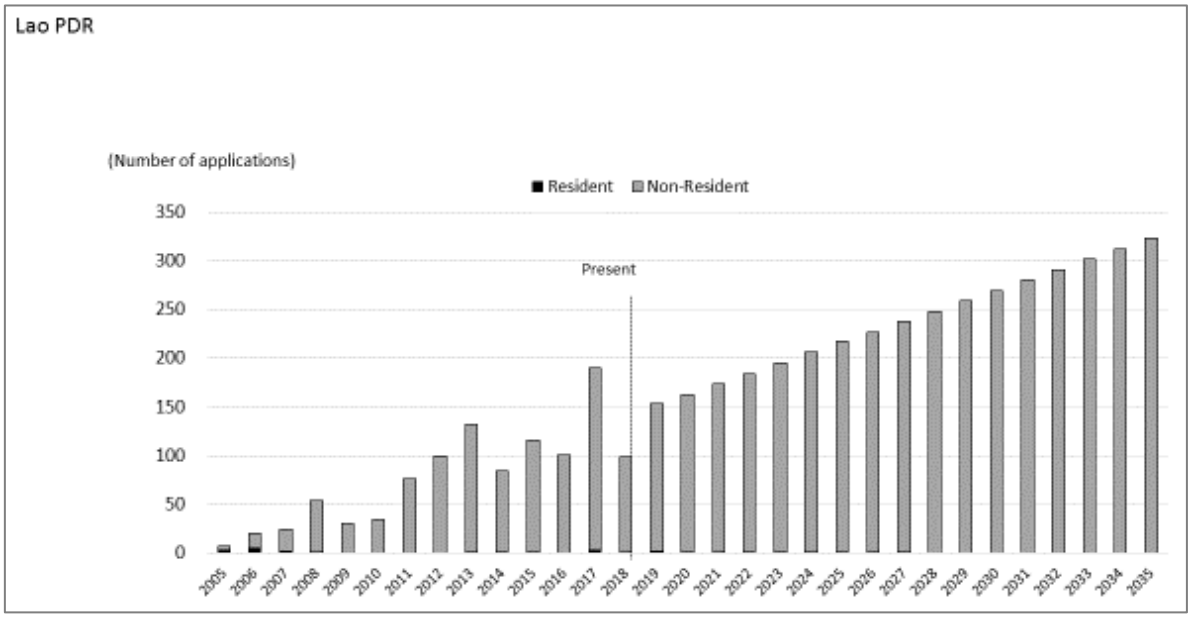
a. Dependent Variable: trademark applications_non-resident

Multiple Regression Formula : Y^(trademark applications) by non-resident =-1.408X1-0.012X2+0.499X3-2.436X4-2.908X5-0.322X6-0.000

Source: Authors' calculation.

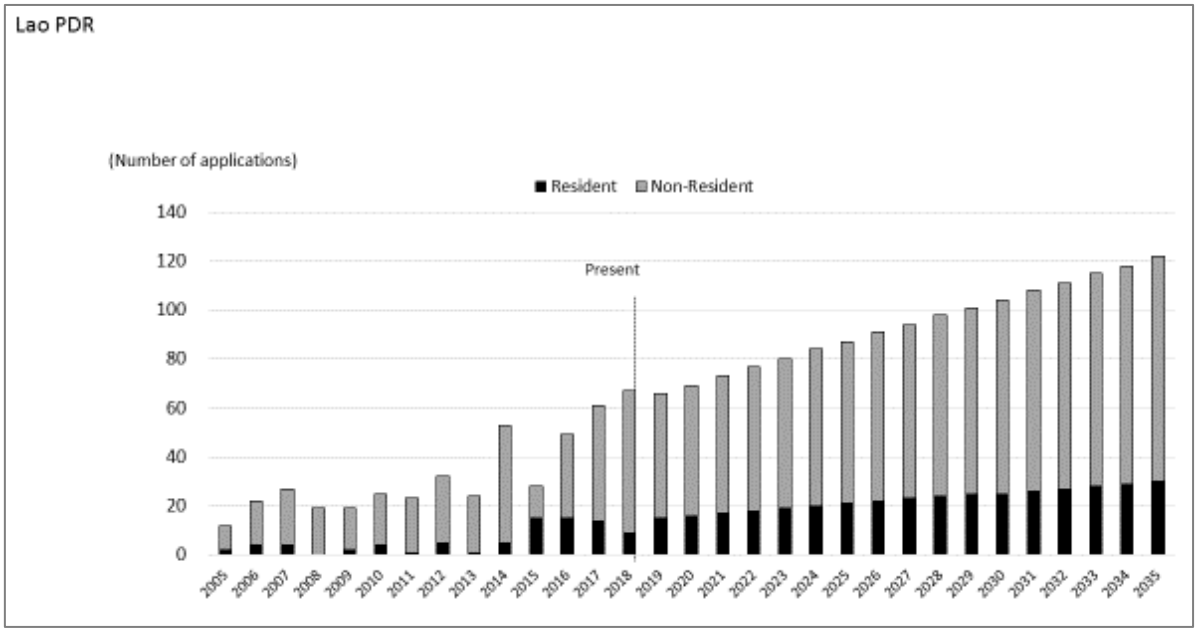
c) Forecast

Figure 111. Forecast of Patent Applications by Using Multiple Regression Formula (Stepwise Method)



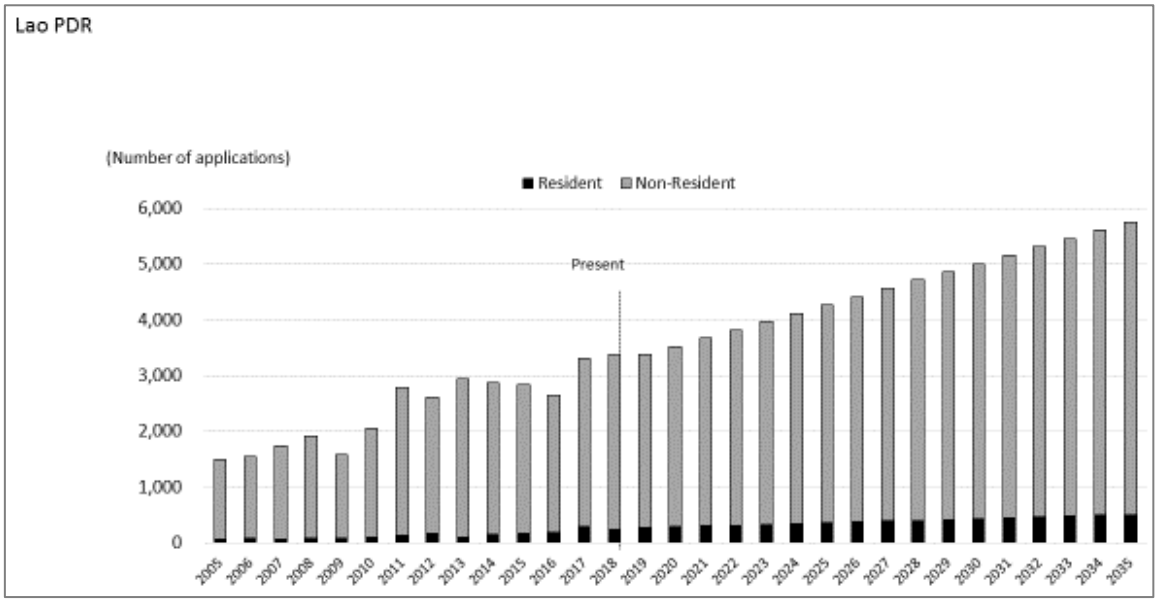
Source: Authors' calculation.

Figure 112. Forecast of Design Application by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Figure 113. Forecast of Trademark Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Figures 111–113 show that IP applications by non-residents in the Lao PDR continue to dominate, although total applications tend to increase over the forecasting period.

10.9. Singapore

a) The relevant factors for the regression analysis on IP applications include the following during 2005–2017:

1. GDP (current US$)
2. Merchandise trade (% of GDP)
3. Military expenditure (% of GDP)
4. Population, total
5. Armed forces personnel, total
6. Birth rate, crude (per 1,000 people)
7. Compensation of employees (% of expense)
8. Current health expenditure (% of GDP)
9. Employment in industry (% of total employment) (modelled ILO estimate)
10. Gross national expenditure (current US$)
11. ICT goods exports (% of total goods exports)
12. ICT goods imports (% total goods imports)
13. ICT service exports (% of service exports, BoP)
14. Labour force, total
15. Listed domestic companies, total
16. Manufacturing, value added (current US$)
17. Market capitalisation of listed domestic companies (current US$)
18. Mobile cellular subscriptions
19. Net foreign assets (current LCU)
20. New businesses registered (number)
21. Ores and metals exports (% of merchandise exports)
22. Ores and metals imports (% of merchandise imports)
23. Scientific and technical journal articles
24. Self-employed, total (% of total employment) (modelled ILO estimate)
25. Services, value added per worker (constant 2010 US$)
26. Textiles and clothing (% of value added in manufacturing)
27. Total fisheries production (metric tons)
28. Total natural resources rents (% of GDP)
29. Trade (% of GDP)

30. Unemployment, total (% of total labour force) (modelled ILO estimate)
31. Urban population
32. Internet users (per 100 people)

b) Multi-regression analysis

Figure 114. Multiple Regression Analysis by Using Stepwise Method on the Relevant Actors of Resident Patent Applications

Singapore

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	.999[f]	0.998	0.996	0.0631764

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
6	(Constant)	0.000	0.018		0.000	1.000
X1	ICT service exports (% of service exports, BoP)	0.427	0.057	0.427	7.465	0.000
X2	Employment in industry (% of total employment) (modeled ILO estimate)	-0.525	0.057	-0.525	-9.142	0.000
X3	ICT goods imports (% total goods imports)	0.142	0.023	0.142	6.241	0.001
X4	Market capitalization of listed domestic companies (current US$)	-0.204	0.033	-0.204	-6.218	0.001
X5	Armed forces personnel, total	-0.132	0.025	-0.132	-5.253	0.002
X6	Unemployment, total (% of total labor force) (modeled ILO estimate)	-0.110	0.023	-0.110	-4.695	0.003

a. Dependent Variable: Patent applications_resident

Multiple Regression Formula for Resident: Y'(Patent applications)=0.427X1-0.525X2+0.142X3-0.204X4-0.132X5-0.110X6+0.000

Figure 114 shows that X1 'ICT service exports (% of service exports, BoP)' should be increased most to increase the resident patent applications in Singapore.

Figure 115. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Pattern Applications

Singapore

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	.989[g]	0.978	0.962	0.2036839

Method: Stepwise (Criteria: F-to-enter >= 2.500, F-to-remove <= 2.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
7	(Constant)	-0.000	0.056		0.000	1.000
X1	Unemployment, total (% of total labor force) (modeled ILO estimate)	-1.359	0.126	-1.359	-10.795	0.000
X2	Self-employed, total (% of total employment) (modeled ILO estimate)	-0.143	0.090	-0.143	-1.593	0.155
X3	Military expenditure (% of GDP)	1.125	0.161	1.125	6.977	0.000
X4	Trade (% of GDP)	-0.893	0.133	-0.893	-6.712	0.000
X5	Ores and metals exports (% of merchandise exports)	0.218	0.068	0.218	3.223	0.015

a. Dependent Variable: Patent applications_nonresident

Multiple Regression Formula for Non-Resident: Y'(Patent applications)
=-1.359X1-0.143X2+1.125X3-0.893X4+0.218X5-0.000

Figure 116. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Design Applications

Singapore

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	.989[f]	0.978	0.966	0.2176159

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
6	(Constant)	0.000	0.060		0.000	1.000
X1	Employment in industry (% of total employment) (modeled ILO estimate)	-2.501	0.335	-2.501	-7.461	0.000
X2	Current health expenditure (% of GDP)	-1.843	0.250	-1.843	-7.387	0.000
X3	Unemployment, total (% of total labor force) (modeled ILO estimate)	0.619	0.093	0.619	6.659	0.001
X4	Armed forces personnel, total	0.461	0.093	0.461	4.979	0.003
X5	Internet users (per 100 people)	1.331	0.305	1.331	4.356	0.005
X6	New businesses registered (number)	-0.617	0.420	-0.617	-1.469	0.192

a. Dependent Variable: design applications_resident

Multiple Regression Formula for Resident: Y'(design applications)=-2.501X1-1.843X2+0.619X3+0.461X4+1.331X5-0.617X6+0.000

Source: Authors' calculation.

Figure 116 shows that X5 'Internet users (per 100 people)' should be increased most to increase the resident design applications in Singapore.

Figure 117. Multi Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Design Applications

Singapore

Multiple Regression analysis by using stepwise method on the relevant factors of Non-Resident Design applications

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	.995[f]	0.990	0.979	0.1501176

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
6	(Constant)	-0.000	0.042		0.000	1.000
X1	Ores and metals imports (% of merchandise imports)	-0.664	0.071	-0.664	-9.318	0.000
X2	Listed domestic companies, total	0.491	0.080	0.491	6.152	0.001
X3	Services, value added per worker (constant 2010 US$)	0.636	0.119	0.636	5.348	0.002
X4	Trade (% of GDP)	0.579	0.093	0.579	6.251	0.001
X5	Compensation of employees (% of expense)	-0.244	0.062	-0.244	-3.949	0.008
X6	Unemployment, total (% of total labor force) (modeled ILO estimate)	0.249	0.107	0.249	2.331	0.059

a. Dependent Variable: design applications_nonresident

Multiple Regression Formula for Non-Resident: Y'(Design applications)=-0.664X1+0.491X2+0.636X3+0.579X4-0.244X5+0.249X6-0.000

Source: Authors' calculation.

Figure 118. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Resident Trademark Applications

Singapore

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	.993[f]	0.986	0.972	0.1755594

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
6	(Constant)	0.000	0.049		0.000	1.000
X1	Services, value added per worker (constant 2010 US$)	0.792	0.143	0.792	5.521	0.001
X2	Military expenditure (% of GDP)	1.703	0.204	1.703	8.346	0.000
X3	Market capitalization of listed domestic companies (current US$)	1.102	0.156	1.102	7.073	0.000
X4	Employment in industry (% of total employment) (modeled ILO estimate)	-1.391	0.183	-1.391	-7.601	0.000
X5	Scientific and technical journal articles	-1.214	0.214	-1.214	-5.671	0.001
X6	Unemployment, total (% of total labor force) (modeled ILO estimate)	-0.434	0.125	-0.434	-3.470	0.013

a. Dependent Variable: trademark applications_resident

Multiple Regression Formula for Resident: Y^*(trademark applications)=0.792X1+1.703X2+1.102X3-1.391X4-1.214X5-0.434X6+0.000

Source: Authors' calculation.

Figure 118 shows that X1 'services, value added per worker (constant 2010 US$)', X2 'military expenditure (% of GDP)', and X3 'market capitalisation of listed domestic companies (current US$)' should be increased to increase the resident trademark applications in Singapore.

Figure 119. Multiple Regression Analysis by Using Stepwise Method on the Relevant Factors of Non-Resident Trademark Applications

Singapore

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	.994[f]	0.988	0.976	0.1617890

Method: Stepwise (Criteria: F-to-enter >= 1.500, F-to-remove <= 1.000).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
6	(Constant)	0.000	0.045		0.000	1.000
X1	Services, value added per worker (constant 2010 US$)	1.329	0.103	1.329	12.935	0.000
X2	Mobile cellular subscriptions	-0.170	0.265	-0.170	-0.642	0.545
X3	Manufacturing, value added (current US$)	0.940	0.172	0.940	5.477	0.002
X4	Gross national expenditure (current US$)	-1.399	0.308	-1.399	-4.540	0.004
X5	Birth rate, crude (per 1,000 people)	0.272	0.072	0.272	3.767	0.009
X6	Listed domestic companies, total	0.210	0.058	0.210	3.602	0.011

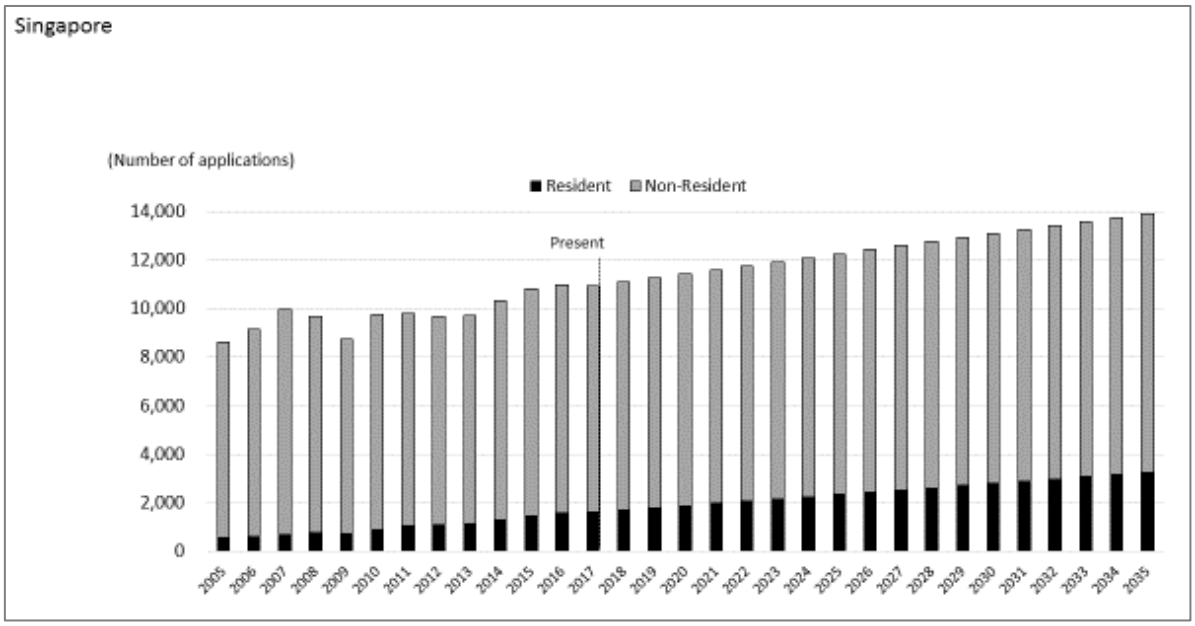
a. Dependent Variable: trademark applications_nonresident

Multiple Regression Formula for Non-Resident: Y^*(trademark applications)=1.329X1-0.170X2+0.940X3-1.399X4+0.272X5+0.210X6+0.000

Source: Authors' calculation.

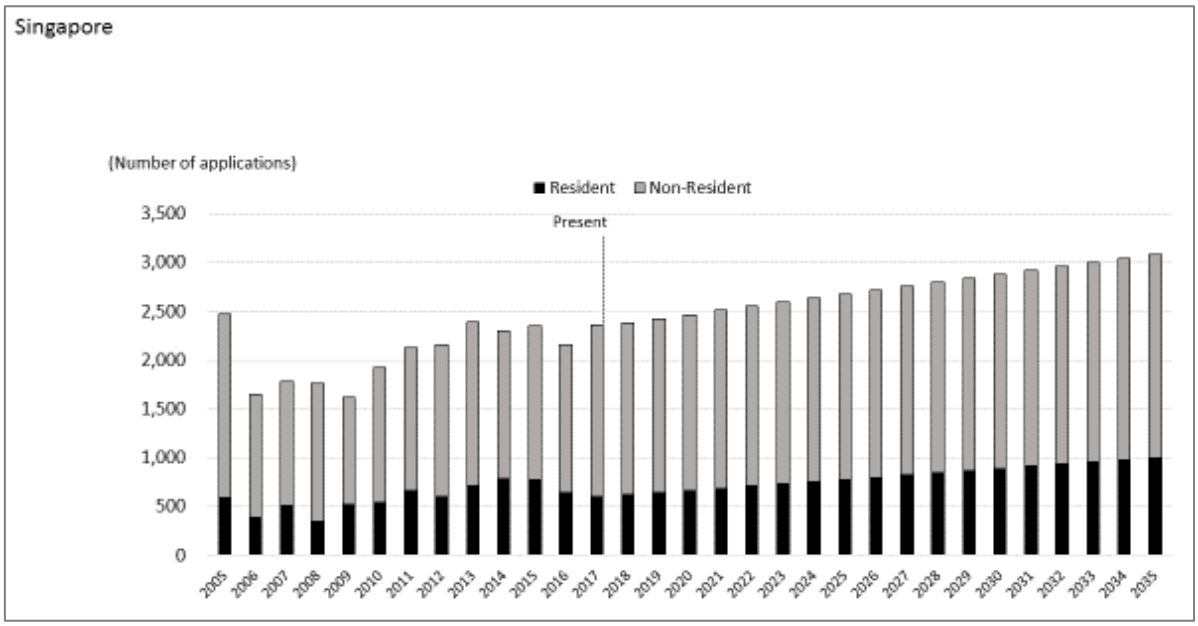
c) Forecast

Figure 120. Forecast of Patent Applications by Using Multiple Regression Formula (Stepwise Method)



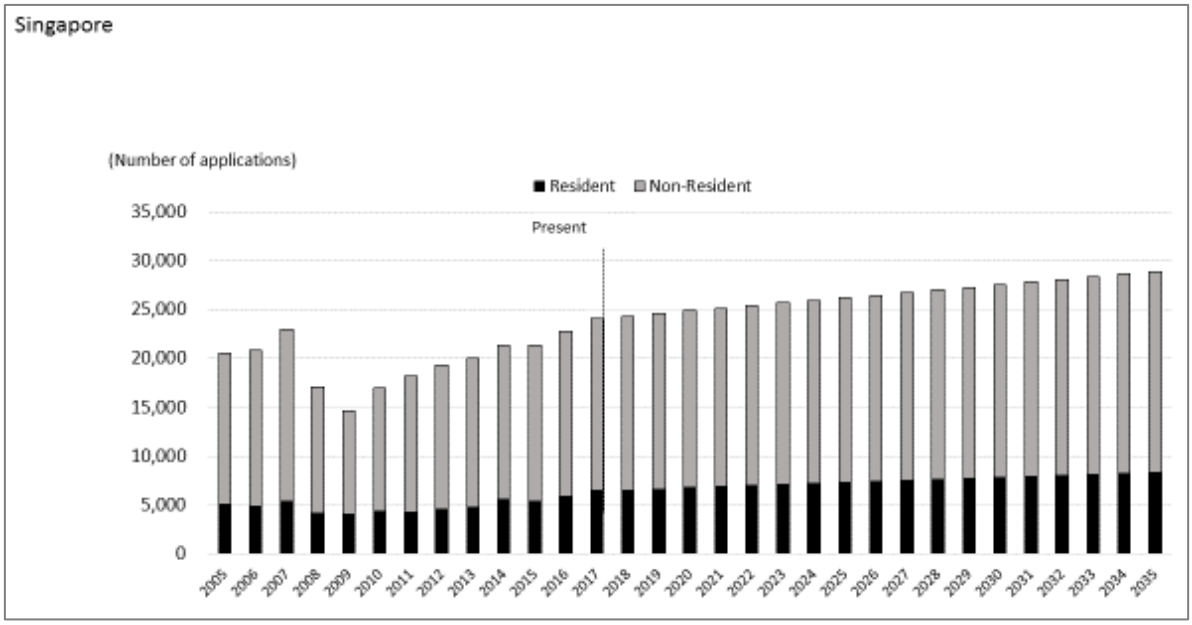
Source: Authors' calculation.

Figure 121. Forecast of Patent Applications by Using Multiple Regression Formula (Stepwise Method)



Source: Authors' calculation.

Figure 122. Forecast of Trademark Applications by Using Multiple Regression Formula (Stepwise Method)



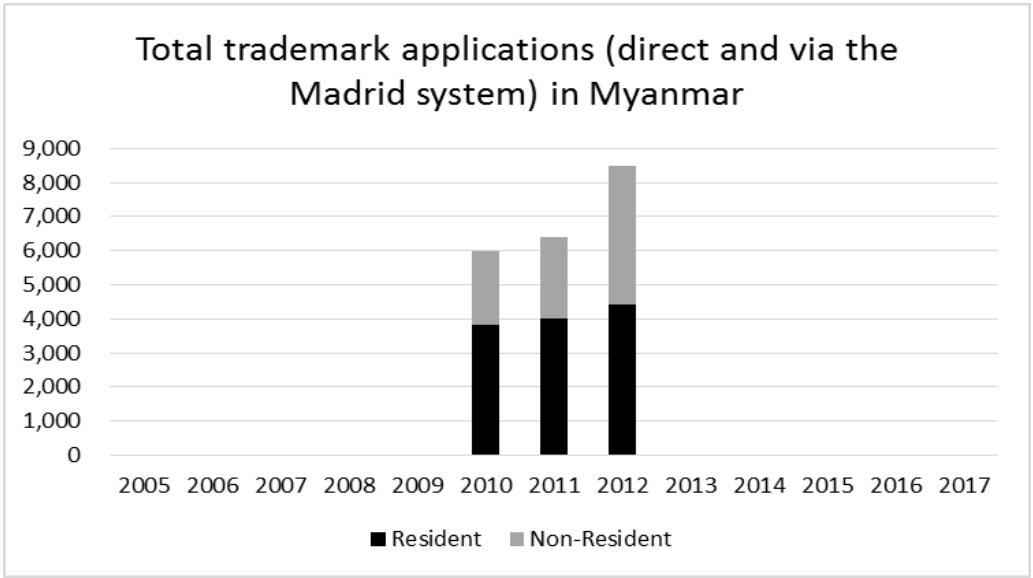
Source: Authors' calculation.

Figures 120–122 show that IP applications by non-residents in Singapore continue to dominate, although total applications tend to increase over the forecasting period.

10.10. Myanmar

The WIPO statistics database shows only trademark data as Myanmar's historical data for IP (as of December 2018). Since data are available for only three years, no analysis was performed.

Figure 123



Source: Authors' calculation.