Asian Economic and Financial Review
ISSN(e): 2222-6737
ISSN(p): 2305-2147
DOI: 10.18488/journal.aefr.2020.101.22.34
Vol. 10, No. 1, 22-34.

URL: www.aessweb.com

THE DIFFERENT STRUCTURE OF SOURCES OF GROWTH BETWEEN THE DEVELOPED AND THE DEVELOPING ASIA AND THE PACIFIC COUNTRIES

Paitoon Kraipornsak

Professor of Economics, Faculty of Economics, Chulalongkorn University, Wangmai, Pathumwan, Bangkok, Thailand.
Email: kpaitoon@chula.ac.th

Article History
Received: 24 September 2019
Revised: 5 November 2019
Accepted: 9 December 2019
Published: 20 January 2020

Keywords
Age dependency
Augmented Solow's growth Model
Competitiveness
Convergence of income per capital
Endogenous growth
Foreign direct investment
Governance
Heterogeneous bias
Human capital
Industrial employment
Labour augmented
Law of diminishing returns
Services employment
Technological progress
Urbanization.

JEL Classification:
D49, E02, F23, F43, H83, J00, N10, O00, O11.

ABSTRACT

This study analyzed the economic growth of Asia and the Pacific countries using the neoclassical augmented growth model. This study hypothesized that the structure of the growth model for the developed and the developing countries was different. A number of augmented input factors were incorporated into the standard growth model; the net inflow of foreign direct investment per capita, the competitiveness of the economy, age dependency ratio, governance index, industrial employment, employment in services, and the urban population ratio. All coefficients in the model were significant and the correct signs. The urbanization effect was found to be an inverted U-shaped curve, implying there is an optimum size of the urban population. Governance was insignificant for the developed countries but was significantly positive for the developing counties. The foreign direct investment and competitiveness were two factors that obeyed the principle of diminishing marginal returns to growth, with a larger effect on growth in the developing countries than in the developed countries. The other five factors contributed a larger effect in the developed countries than in developing countries and included physical capital, human capital, industrial employment, services employment, and the dependency ratio. This finding of the five factors implies that the markets of those factors in developing countries are inefficient under imperfect competition and several policy distortions. These two contradictory findings suggested that the income of some developing countries was not necessary for catching up with the income of the developed countries.

Contribution/ Originality: The study incorporated a full set of possible dimensions of growth factors. Additionally, it introduced a heterogeneous hypothesis of the structure of the growth model between two different income level countries. Lastly, governance played a significant role in the growth of developing countries but found insignificant for the developed countries.

1. INTRODUCTION

Many studies on sources of growth have been conducted since economic growth is one of the desired goals in the economic development of nations. From statistical evidence, growth rates of countries in the world have been accelerated significantly from the mid-nineteenth till twentieth centuries at more than one per cent for the first time in economic history from that very close to zero per cent in the earlier time periods (Maddison, 2006) Table 1, Table 2 and Table 3. The growth rate was, however, not always high and fluctuated over some periods and is often different across individual countries.

Studies on factors contributing to economic growth can be traced back to the past decades. In the late 1700s and 1800s, a number of the famous economists had asked questions on how an economy grew and how economic change improved the welfare of people (Berg, 2001). The issue of economic growth seemed irrelevant during the World Great Depression in 1930s, and thus the priorities of economists turned to find solutions to remedy unemployment and deflation. After the Second World War, many former colonies in Africa and Asia became independent and researchers increased their interest in raising standards of living and growth.

In the early nineteenth century, economic growth study mostly related to increased saving and investment, both of which were widely recognized to be growth by factor accumulation. Nevertheless, the simple growth model based on these factors' accumulation will tend to point out slowing down growth in the long run due to the law of diminishing returns of inputs used.

Later in 1956, the Solow's growth model determined that technological progress is essential for the economic growth as an exogenous factor. Nevertheless, the factors of production were still subject to diminishing returns so that the convergence in income per head could become evidence.

The conventional Solow's growth model treats the technological progress term (or the residual term) to be an exogenous variable in the model. The exogenous technological progress is, therefore, the critical determinant of the growths and productivity differences among countries.

The endogenous growth model postulates the other direction. The endogenous growth approach searches for additional factors being incorporated factors into the model. Those additional variables mostly refer to research and development activity, advanced knowledge, education, and human capital, international trade and investment, governance and corruption, geographic location, government policy, and political and social systems. These augmented factors of the growth model are essential to explain the technological progress such that they cause in productivity differences and efficiency of capital (Chirwa and Odhiambo, 2018).

It is interesting to examine details of all factors of growth empirically, particularly in a comparison between groups of countries by different levels of income. Are those factors affecting growth differences among the developed and the developing countries? As technology or advanced knowledge is non-rival, the income of the poor can catch up with the rich in the long run. Non-rivalry knowledge and technology cause a piece of the knowledge to be used in one place, not prevent it from being used elsewhere. Apart from the non-rival property of knowledge, law of diminishing marginal returns in Microeconomics theory also explains the smaller returns of factors of growth in developed countries than in developing countries. This hypothesis explains why the study expected to see the different structure of factors of growth between the two groups of countries.

This paper estimated and analyzed the augmented neoclassical growth model for the countries in Asia and the Pacific region in the sample. Since the economic growth structure of each country in the growth model can be heterogeneous, the study separated the sample into two groups based on levels of development, i.e., developed countries and developing countries. The estimated augmented growth models of the two groups of countries were estimated and compared. The study examined any different structure of growth determinants between the two heterogeneous groups of countries.

2. REVIEW OF LITERATURE

A famous model in economics history can be traced back to the long-term Harrod and Domar growth model (Harrod, 1939; Domar, 1946). Domar placed a significant role of capital input to be an essential factor for growth. Harrod explained the process of growth based on a dynamic approach or acceleration principle, with investment being equal to saving in the long run.

The Solow model relaxed an implicit assumption of the linear relationship between saving and output of the Harrod-Domar model. A consequence was that investment could not cause a sustainable growth in the long run. The Solow growth (Solow, 1956) defined an aggregate production function that permits factor inputs to substitute

for each other, and each of them was subject to diminishing marginal returns. A standard four variables of output (Y), capital (K), labour (L), and knowledge, or the effectiveness of labour (A) are focused and expressed as the production function. The model of production function incorporated A and L multiplicatively and referred to as effective labour, and technological progress incorporated in the form of labour augmenting or Harrod Neutral (Romer, 1996). Harrod-neutral technological progress can be named if, with given labour force and the same distribution of income, capital increases by the same proportion as output. Under constant returns to scale assumption, the aggregate production function is expressed in terms of per capita output being a function of capital per head, if no other augmented factor. Explanation of changes in population growth, savings accumulation, and technical change can be widely shown to affect growth in this model.

Sometimes, the Solow growth model is called the Solow-Swan model. The Neoclassical Swan's Growth model was developed independently in the same year, but the model included more analysis of technological progress which Solow treated separately (Dimand and Spencer, 2008). However, Swan expressed the growth model in verbal terms rather than mathematical.

The new growth theory is consistent with the augmented growth approach that incorporates some other vital factors of growth into the model. That is to relax the assumption of exogenous residual growth.

New endogenous growth theory considers augmenting factors that contribute to growth, such as the roles of knowledge accumulation, research and development, learning by doing, and human capital. Therefore, advanced knowledge or technological progress can represent the effectiveness of labour. The role of research and development is seen to be a significant factor of the endogenous growth model developed by Romer (1990); Grossman and Helpman (1991). The model including human capital was introduced in Mankiw *et al.* (1992); Lucas (1988); Rebelo (1991); Becker *et al.* (1990).

Foreign direct investment (FDI) contributes to the recipient economy at least two-folds: through capital accumulation and knowledge transfer, augmenting the existing stock of knowledge (Mello, 1999). Therefore, FDI can increase productivity and stimulate domestic investment and technological progress. The study used a bivariate vector autoregressive method to analyze the long-term contribution of FDI to economic growth. The study found a positive impact of FDI on output growth in all panels (OECD and non-OECD).

Urbanization and growth have been discussed widely in their linkages. By experience, Lewis (1977) found that very few countries have reached income levels of $10,000 per head before having 60 per cent of urbanization. Spence *et al.* (2009) examined the role of urbanization on Gross Domestic Product (GDP) per head in the United States between 1880 and 2006. They concluded that both the urban population rate and the GDP per head increased continually until 1940 when the urban rate moved up close to 60 per cent. GDP per head has grown much faster since then.

Romer (1988) found that the urban population rate could increase the income of countries at roughly the same rate in the initial stage of development due to the improvement of labour productivity. Productivity gains rapidly in the later phases reflecting improvements within industries and services.

Nevertheless, there are arguments about urbanization and growth, as to whether rapid urban growth helps raise living standards. Turok and McGranahan (2013) found that urbanization and growth or city size and productivity relationship is not linear. The benefit of the contribution of urbanization on growth depends on how favourable infrastructure and institutional settings are in the country.

Non-economic factors have also played an essential role in economic growth. Among those non-economic factors, quality of governance (good governance) and political stability are two crucial factors playing a role in growth in Singapore (Abeysinghe, 2015). An excellent economic institution is an essential factor relevant to policymaking. The economic institution can cause different prosperity of countries and help solve the problem of growth and poverty. Policymakers can create appropriate incentives for investment and adoption of technology (Acemoglu and Robinson, 2008).

Kraipornsak (2018) estimated production function for sixteen Asian countries from 1996 to 2016 using the fixed effect model. In the study, good governance was found to be a significant factor that contributes to the growth of income per head of countries in the study. Quibria (2014) analyzed the relationship between income per head and governance indicator using a simple regression equation of a composite index of governance on the logarithm of real GDP per head. The slope of the regression line was found to be 0.471, with the goodness of fit of 0.6320.

3. METHODOLOGY AND THE MODEL

Several studies have adopted the Solow's augmented growth model by incorporating relevant explanatory variables that considerably contribute to technological progress or the increased residual growth. Possible barriers to the free flow of technology in different countries can occasionally exist. Those components of technological progress do not necessarily have the same effect on growth among different countries, especially between countries with varying levels of income. The impacts of those endogenous growth factors are therefore different, and it is useful to make a comparison empirically of structures of the model between the developed countries and the developing countries.

Assuming the labour-augmenting technology of the Cobb Douglas production function (Mankiw *et al.*, 1992; Hall and Jones, 1999) the augmented Solow growth model can be defined as follows in Equation 1:

$$Y_t = K_t^{\alpha} H_t^{\beta} (A(t)L_t)^{1-\alpha-\beta} e^{\varepsilon_t} \quad (1)$$

Where,

Y = Gross Domestic Product (in PPP, constant 2011 prices).

K = physical capital input (gross fixed capital formation, mil. $, prices in constant 2010 $).

H = human capital index.

L = labour input or supply of work (persons).

ε = disturbance term.

t = subscription for time period.

$0 < \alpha < 1, 0 < \beta < 1$

A is technological progress and

$$A(t) = A_0 e^{\gamma . Z_t} \quad (2)$$

In Equation 2, Z refers to those augmented exogenous factors of technological progress.

Under constant returns to scale of the Cobb Douglas production function and the same distribution of income, Equation 1 with natural logarithmic form can be re-written in per capita terms, including the augmented factors as in Equation 3.

$$\ln(y_t) = \gamma_0 + \alpha \ln(k_t) + \beta \ln(h_t) + \gamma_1 NFDIPC_t + \gamma_2 COMP_t + \gamma_3 DPND_t + \gamma_4 GOVN_t + \gamma_5 INDEMP_t + \gamma_6 SEREMP_t + \gamma_7 URBPRC_t + \gamma_8 URBPRC_t^2 + \varepsilon_t \quad (3)$$

Here, y, k, and h are GDP per capita, physical capital per capita, and human capital per capita, respectively.

The augmented exogenous factors are defined as follows. These factors are considered alternatively as a component of shifting factors of the conventional production function in general terms.

NFDIPC = net inflow of foreign direct investment per capita, (mil $).

COMP = competitiveness of an economy (Economic Fitness Metric).

DPND = age dependency ratio (% of working-age population).

GOVN = good governance index (Percentile, 0 to 100).

INDEMP = employment in industry (% of total employment).

SEREMP = employment in services (% of total employment).

URBPRC = urban population (% of total population).

The discussion of the rationale for those augmented exogenous factors is as follows.

Net Foreign Direct Investment (NFDI) can be a component of the inflow of foreign investment in complementing local investment. FDI can contribute to technology transfer to local firms.

Competitiveness (COMP) is one of the crucial factors of growth. It can be an outcome of advanced knowledge and research and development. If a country is more competitive than the others, that country has a high capability to produce more output. The study adopted the Economic Fitness Metric (EF) of the World Bank as the proxy of the competitiveness in this study. The EF is both a measure of a country's diversification and the ability to produce sophisticated goods on a globally competitive basis. A higher level of the EF means the capability to create a diverse portfolio of products, the ability to upgrade into ever-increasing sophisticated goods, to have more predictable long-term growth, and to attain an excellent competitive position relative to other countries.

The dependency ratio (DPND) reflects the burden of the workforce in a country. If a country has many more children and non-active workers, or a high dependency ratio, the income per capita of the country tends to be smaller.

Good governance (GOVN) is vital for enhancing a country's competitiveness and help to keep the economy operating most efficiently. The governance index can also imply an excellent institutional arrangement such that the government of a nation can govern the economy effectively. The governance index of the World Bank consists of six components, i.e., control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, the rule of law, and voice and accountability. The governance index in this study is constructed by averaging the percentile ranks of those six components.

Industrialization has been playing an essential role in economic growth and employment. A higher proportion of people engaging in the industrial sector (INDEMP) or a lower percentage of employed workers in the agricultural sector alongside the industrialization process can be crucial for growth in economic development and growth.

Service is widely accepted to be high value-added intangible assets. Many more people engaged in services (SEREMP) implying that countries are involved in high value-added activities.

The urban population ratio (URBPRC) is one of those factors that can contribute to growth. The urban sector can increase the utilization of public infrastructure and facilities and bring down user cost per head. At the same time, urbanization attracts too many people to the city where after a certain point the infrastructure and utilities are not adequately provided by the government. In this model, the functional form of URBPRC is in terms of polynomial degree two under the hypothesis that there is an optimal size of urbanization. The study expects to see an inverted U-shaped curve of the relationship between the output and the urban population ratio.

Most data series in this study were obtained from The World Bank open data of the selected eighteen Asia and the Pacific countries from 2000 to 2017. The human capital index is available from Penn World Table 9.1 (Feenstra *et al.*, 2015). Several studies used the proportion of workers with secondary school attainment in the total labour force to be the proxy of human capital in their studies. Nevertheless, by using the human capital index based on educated workers, the study occasionally finds statistical insignificance in the estimation of the growth model. Human capital is not merely the number of educated workers in the labour market alone. Some other quality of humans must also count in the measurement of the human capital input. The Penn World index of human capital per person is calculated based both on years of schooling (Barro and Lee, 2013) and returns to education (Psacharopoulos, 1994). The later human capital index was therefore adopted and used in the study.

The selection of countries was mainly dependent on the availability of all related variables over the period. The data series of three variables in the model needed to be estimated to fix the gaps for some missing data for a few years and few countries and the details of these estimations are discussed in Appendix A1.

4. RESULTS AND DISCUSSION

The study used panel data method in the estimation. The econometric model is shown in Equation 4. This study assumed that the structures of the model for countries in the sample were different. The study arranged countries in the sample into two groups based on income levels. The developed countries consisted of Australia, Japan, Korea, New Zealand, Singapore, and the USA. The developing countries included Bangladesh, Cambodia, China, Indonesia, India, Lao PDR., Malaysia, Nepal, Pakistan, Philippines, Thailand, and Viet Nam. The abbreviation of each country is listed in Appendix A2.

$$\ln(y_{it}) = \gamma_{0i} + \alpha \ln(k_{it}) + \beta \ln(h_{it}) + \gamma_1 NFDIPC_{it} + \gamma_2 COMP_{it} + \gamma_3 DPND_{it} + \gamma_4 GOVN_{it}$$

$$+\gamma_5 INDEMP_{it} + \gamma_6 SEREMP_{it} + \gamma_7 URBPRC_{it} + \gamma_8 URBPRC_{it}^2 + \varepsilon_{it} \quad (4)$$

4.1. The Estimated Model for All Countries in the Sample

The method of panel data is applied in the estimation of Equation 4 using a total of eighteen countries from 2000 to 2017. The F- test for common intercept was found to be statistically significant. Thus, the test confirmed the validity of the country-specific effect model. The Hausman test for random effect indicated that it was preferential to use the random effect model. The panel random effect method was used to estimate for all Asian and Pacific countries. The result of the estimated model is as follows in Equation 5.

$$\widehat{\ln(y_{it})} = 7.2034 + 0.0637 \ln(k_{it}) + 0.5650 \ln(h_{it}) + 0.0000056 NFDIPC_{it}$$

(SE) (0.1803) (0.0123) (0.1014) (0.0000024)

$$0.0422 COMP_{it} - 0.0120 DPND_{it} + 0.0042 GOVN_{it} - 0.0003_5 INDEMP_{it}$$

(SE) (0.0080) (0.0011) (0.0010) (0.0017)

$$+0.0105\ SEREMP_{it} + 0.0280\ URBPRC_{it} - 0.000096 (URBPRC_{it})^2$$

(SE) (0.0013) (0.0049) (0.000041) (5)

F test for common intercept F (17, 291) = 166.3016 [P = 0.0000]

Hausman test $\chi^2(10)$ = 12.5398 [P = 0.2506]

Table-1. Country specific effect.

γ_{AUS}	γ_{BGD}	γ_{KHM}	γ_{CHN}	γ_{IDN}	γ_{IND}	γ_{JPN}	γ_{KOR}	γ_{LAO}
0.0510	-0.3452	0.0311	-0.3648	-0.0107	-0.1182	-0.1208	-0.2549	0.4654
γ_{MYS}	γ_{NPL}	γ_{PAK}	γ_{NZL}	γ_{PHL}	γ_{SGP}	γ_{THA}	γ_{USA}	γ_{VNM}
0.1248	0.1550	0.2616	-0.0700	-0.3233	0.2212	0.3408	0.1024	-0.1454

The result of the model estimation using the total sample was consistent with the hypothesis of the growth model. All coefficients of variables were statistically significant with the correct sign by at less than 5 per cent. There was only the industrial employment variable (INDEMP) that was statistically insignificant. However, employment in the service sector was found to be positive and significant to growth.

Physical capital (k), human capital (h), net foreign direct investment (NFDIPC), competitiveness (COMP) as an outcome of advanced knowledge and technological improvement, good governance (GOVN), and services employment (SEREMP) were all found to have a positive impact on output per capita. Urbanization or urban population ratio (URBPRC) was found to contribute to economic growth positively, but its contribution was in the form of an inverted U-curve. This finding indicated that the urbanization policy is beneficial to the growth of an

economy. There is, however, an optimum size of the urban population that can stimulate growth. On the contrary, the dependency ratio (DPND) was found to be an obstacle to growth. The high dependency ratio impedes growth.

γ_{0i} in Equation 4 represented both the mean of specific effects and each country-specific effects as shown in Table 1. The coefficient of country effects expresses in terms of deviation from the means. The country-specific effect was found to be higher than average for Australia, Cambodia, Lao, Malaysia, Nepal, Pakistan, Singapore, Thailand, and the USA. It was lower than the average for Bangladesh, China, Indonesia, India, Japan, Korea, New Zealand, Philippines, and Viet Nam.

For further investigation, the study experimentally estimated the conventional growth model (with only physical capital input (k), human capital input (h)), as shown in Equation 6.

The conventional growth model was next estimated with the country-specific effect and time effect. The Hausman test for random effect indicated that a fixed effect method was preferable. The estimated conventional growth model is defined in Equation 5 as being different from the augmented growth model. The coefficients of capital investment and human capital in Equation 5 were noticeable omission biased estimates. Sizes of the estimated coefficients of physical capital and human capital were different noticeably from those in Equation 5. The size of the coefficient of human capital was unusually large, so that the effect of labour on output was slightly too small.

$$\widehat{\ln(y_{it})} = 8.0165 + 0.1772 \ln(k_{it}) + 0.7706 \ln(h_{it}) \quad (6)$$

(SE) (0.1211) (0.0136) (0.1340)

F Test for common intercept F(17,282) = 188.8185 [P value = 0.0000]

Hausman Test $\chi^2(2)$ = 17.0157 [p-value = 0.0002]

Table-2. Country specific effect.

γ_{AUS}	γ_{BGD}	γ_{KHMi}	γ_{CHN}	γ_{IDN}	γ_{IND}	γ_{JPN}	γ_{KOR}	γ_{LAO}
0.6994	-0.9236	-0.8002	-0.0590	-0.1414	-0.5578	0.6182	0.4881	-0.4904
γ_{MYS}	γ_{NPL}	γ_{PAK}	γ_{NZL}	γ_{PHL}	γ_{SGP}	γ_{THA}	γ_{USA}	γ_{VNM}
0.5026	-0.9420	-0.2761	0.6241	-0.4928	1.3428	0.2285	0.9245	-0.6526

Table-3. Time fixed effect.

2000	2001	2002	2003	2004	2005	2006	2007	2008
-0.1880	-0.1695	-0.1649	-0.1262	-0.0873	-0.0646	-0.0382	-0.0036	0.0074
2009	2010	2011	2012	2013	2014	2015	2016	2017
-0.0014	1.0476	0.0686	0.0741	0.0926	0.1034	01002	0.1439	0.2057

The sizes of the country-specific effects shown in Table 2 were mostly close to those of the estimated Equation 5 in Table 1. The time effect shows that it became positive after 2010.

As mentioned earlier, the model structure of Asia and the Pacific countries in the sample can be heterogeneous between the developed countries and the developing countries. Details of the estimation results of both groups of countries are as follows.

4.2. The Estimated Model of the Developing Countries

The growth model, as in Equation 4, was estimated for the twelve developing Asian countries in the sample. The F test for the common intercept indicated the existence of the country-specific effect. The Hausman test for random effect indicated the random effect method was preferable. Therefore, the study employed the random effect method in the estimation and the result of the estimation is as is shown in Equation 7.

$$\widehat{\ln(y_{it})} = 7.2846 + 0.0396\ln(k_{it}) + 0.2693\ln(h_{it}) + 0.000055NFDIPC_{it}$$

(SE) (0.2427) (0.0128) (0.1696) (0.000027)

$$0.0839COMP_{it} - 0.0130\,DPND_{it} + 0.0036\,GOVN_{it} + 0.0070\,INDEMP_{it}$$

(SE) (0.0109) (0.0014) (0.0011) (0.0029)

$$+0.0047SEREMP_{it} + 0.0380\,URBPRC_{it} - 0.0002(URBPRC_{it})^2 \quad (7)$$

(SE) (0.0019) (0.0062) (0.000064)

Cross section F test for common intercept F (11, 175) = 199.9573 [P = 0.0000].

Time period F test for common intercept F (17, 175) = 3.8439 [P = 0.0000].

Hausman test $\chi^2(10) = 5.5015$ [P = 0.8553].

Table-4. Country specific effect.

γ_{BGD}	γ_{KHM}	γ_{CHN}	γ_{IDN}	γ_{IND}	γ_{LAO}
-0.3066	0.0542	-0.6649	0.0198	-0.2722	0.5056
γ_{MYS}	γ_{NPL}	γ_{PAK}	γ_{PHL}	γ_{THA}	γ_{VNM}
0.2081	0.1996	0.2062	-0.1577	0.3458	-0.1380

From the result of the estimation, all coefficients were found statistically significant by at least 5 per cent. Interestingly, the only insignificant coefficient was the human capital (h) with a statistically significant level at 11 per cent. The signs of all the estimated coefficients were as expected. Most of them were a positive sign, and the coefficient of the dependency ratio (DPDN) was negative. The effect of urbanization (URBPRC) was positive, but with diminishing marginal rate.

Regarding the country-specific effect on growth in Table 4, five out of a total of twelve developing countries have the country effect smaller than their average effect, namely, Bangladesh, China, India, Philippines, and Viet Nam.

4.3. The Estimated Model of the Developed Countries

The study estimated the model in Equation 4 by using the data of the six developed countries in the sample. The F test for a common intercept indicated that the country-specific effect was the method of the estimation. Nevertheless, the Hausman test for a random effect, as well as random effect estimation could not be carried out since the number of countries was smaller than the number of parameters in the model. Therefore, the study estimated Equation 4 by using the fixed specific country effect and time effects in the estimation. The result of the estimation is seen in Equation 8.

$$\widehat{\ln(y_{it})} = 9.6370 + 0.0915\ln(k_{it}) + 0.3002\ln(h_{it}) + 0.000004\,NFDIPC_{it}$$

(SE) (4.7797) (0.0469) (0.1042) (0.0000014)

$$0.0450COMP_{it} - 0.0170DPND_{it} + 0.0043GOVN_{it} + 0.0201\,INDEMP_{it}$$

(SE) (0.0118) (0.0042) (0.0025) (0.0062)

$$+0.0239\,SEREMP_{it} - 0.0492\,URBPRC_{it} + 0.0003\,(URBPRC_{it}^2) \quad (8)$$

(SE) (0.0065) (0.1113) (0.0007)

F test for a common intercept, F(5, 89) = 14.3900 [P = 0.0000].

Table-5. Country specific effect.

γ_{AUS}	γ_{JPN}	γ_{KOR}	γ_{NZL}	γ_{SGP}	γ_{USA}
0.0933	-0.0950	-0.2715	0.0352	0.1271	0.1108

Table-6. Time fixed effect.

2000	2001	2002	2003	2004	2005	2006	2007	2008
-0.0936	-0.0930	-0.0678	-0.0569	-0.0493	-0.0214	-0.0133	0.0058	0.0094
2009	2010	2011	2012	2013	2014	2015	2016	2017
-0.0107	0.0133	0.0222	0.0372	0.0508	0.0668	0.0721	0.0802	0.1127

From the result of the estimation, all estimated coefficients had the correct signs as expected and were statistically significant at less than 5 per cent. The effect of governance (GOVN) was positive and significant at 9.5 per cent. The effect of the urban population ratio was also insignificant. Both the urban population ratio and the governance index of those developed countries were all excellent and about the same degree.

It was not surprising to find those two variables being statistical insignificant for developed countries. The study found that the urban population ratio (URBPRC) increases the output per capita significantly at a decreasing rate. Interestingly, the urban population ratio (URBPRC) was insignificant for both the linear term and the squared term. The urban population ratio in developed countries must achieve the optimal rate such that change of it cannot make a change or improvement significantly in growth.

Regarding the governance factor (GOVN), the estimated coefficient was statistically significant at 9 per cent. The governance index of those developed countries in the sample was around 85 to 95 which indicated a high level of governance over the study periods. A change of this factor does not firmly influence growth among those developed countries.

4.4. Comparison of the Estimated Models between the Developed and the Developing Countries

By comparison between the results of both the estimated models Table 7 it was noticeable that the coefficients of five factors of growth of the developed countries were stronger than those coefficients in the developing countries. These were physical capital (k), human capital (h), dependency rate (DPND), industrial employment (INDEMP), and services employment (SEREMP). The coefficient sizes of urbanization (URBPRC), competitiveness (COMP), and net foreign direct investment (NFDIPH) were more substantial in developing countries than in developed countries. The coefficient of the governance factor (GOVN) was stronger for the developed countries than for the developing countries; however, its estimated coefficient was statistically significant at 9 per cent.

Table-7. Comparison of the estimated coefficients.

Factors of growth	Developed countries	Developing countries
ln(k)	0.0915	0.0396
ln(h)	0.3002	0.2693
DPND	-0.0170	-0.0130
INDEMP	0.0201	0.0070
SEREMP	0.0239	0.0047
URBPRC	-0.4920	0.0380
$URBPRC^2$	0.0003	-0.00017
COMP	0.0450	0.0839
NFDIPC	0.000004	0.000055
GOVN	0.0043	0.0036

Source: Equation 7 and Equation 8.

Remarkably, the study found that the five-factor inputs of growth mentioned above had a more substantial impact in developed countries than in developing countries. The law of diminishing marginal returns on factor

inputs suggested seeing the effect of factor inputs to be a more significant effect on the less abundant countries, as in developing countries. Nevertheless, markets in developed countries are highly competitive and have less intervention. The impacts or returns of those five-factor inputs in the developing countries thus become smaller than they are in developed countries.

Distortion of the capital market in developing countries makes its return to be lower than the return in developed countries. The share of capital income must be about its average capital elasticity when the capital market is competitive or no market distortion (Brueckner, 2017). It is the usual situation in developed countries. On the contrary, there is more rent extraction in autocracies (most developing countries) than in democratic countries.

The more substantial coefficients of human capital (h) in developed countries can also be similar, as described in the case of physical capital. The human capital is less likely to work efficiently and productively in developing countries in comparison to those in developed countries.

Impacts on the output of industrial employment share (INDEMP) and service employment share (SEREMP) were smaller in developing countries than in developed countries. This finding indicated the fact and supported the issue that output per head (or productivity) in industry and services are higher in developed countries than in developing countries. In other words, their more significant coefficients indicated that the returns on labour who work in either industry or services usually are higher in developed countries than in developing countries.

An increase in the dependency rate (DPDN) can be costlier to people in developed countries than in developing countries. The estimated effect of dependency (DPDN) sharply worsened the growth of developed countries.

The current urban population in developed countries is already optimal. The effect of an increase in the urban population of the developed countries was therefore insignificant. Nevertheless, the study showed that the impact of increased urban population ratio in developing countries is significant and even more extensive than that of the model for entire countries in the sample. This observation can imply that developing countries can stimulate their growth successfully by encouraging the policy of urbanization.

The only two factors that followed the law of diminishing marginal returns were foreign direct investment (NFDIPC) and competitiveness (COMP). The inflow of foreign direct investment undoubtedly gives a higher return to growth in developing countries than in developed countries. Similarly, competitiveness (COMP) provides higher performance to output in developing countries than in developed countries.

The impact of good governance (GOVN) on growth was statistically significant at 9 per cent from the estimation of the developed countries. However, when the model was estimated either by using the sample of all countries or by using only the developing countries, the impact of excellent governance was strongly significant. In general, excellent governance (GOVN) was found to be positive and significant in supporting growth, especially for developing countries.

5. CONCLUSION

The study examined economic growth by incorporating some crucial augmented growth factors into the model. The objective was to investigate conventional growth factors and the augmented factors of sources of growth and make a comparison between two groups of countries: developing and developed countries. A question of interest was whether those factors affecting growth were different between both income groups.

This study hypothesized that the structure of the growth model for the two-income level countries was different. Panel data for the sample covered the study period from 2000 to 2017.

By using the sample of all countries, the result of estimation was consistent with the hypothesis of the growth model. All coefficients of variables were statistically significant with the correct sign by at less than 5 per cent. Only the industrial employment variable (INDEMP) was statistically insignificant.

The urban population ratio (URBPRC) was found to be favourable to income per capita. The effect of urbanization on growth appeared to be an inverted U-shaped curve and to imply the existence of the optimum size

of the urban sector. It was noticeable that the urbanization effect in the sample of the developed countries is insignificant on growth, but the effect was significant when using the sample of developing countries. These findings indicated that there is an optimal size of urban population ratio for the economies with adequate infrastructure and public utilities, like the developed countries.

The estimated coefficient of governance index (GOVN) was statistically significant (at 9 per cent) for developed countries. Once more, the percentile rank of the governance index (GOVN) of all developed countries was around 85 to 95 which was considered high over the period. The effect of governance (GOVN) on growth was positively significant in the estimated model for the developing countries as well as the entire countries of the sample.

The larger sizes of the contribution of five-factor inputs on growth in developed countries; i.e., physical domestic capital (k), human capital (h), dependency (DPND), industrial employment (INDEMP), and services employment (SEREMP) is due to less efficiency in the developing economies. Markets in developed countries are highly competitive and have less intervention. The inefficient markets in the developing countries make returns or changes on these inputs to be smaller than those in a competitive market, mostly in developed countries.

Similarly, but reversely, the dependency rate (DPDN) was a substantial negative impact on growth in developed countries since the cost of living and opportunity cost of time of people is higher than those in developing countries.

The only two factors that follow the law of diminishing marginal returns were the net foreign direct investment (NFDIPC) and competitiveness (COMP). The foreign direct investment in developing countries generates a higher return on investment than in developed countries. Likewise, competitiveness provides higher returns to output in developing countries than in developed countries.

The findings of factors contributing to growth in this study indicated that it is not always be the case that the poor countries can catch up the income of the rich countries in the long term following the catching up hypothesis. Some factors contribute to higher returns to growth, and some factor inputs give lower returns to growth in developed countries than in developing countries. Many input factors of growth were found not to follow the law of diminishing marginal returns.

Funding: This study received no specific financial support.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

REFERENCES

Abeysinghe, T., 2015. Lessons of Singapore's development for other developing economies. The Singapore Economic Review, 60(03): 1550029.

Acemoglu, D. and J. Robinson, 2008. The role of institutions in growth and development. Commission on growth and development. Working Paper No. 10. Washington, DC. The World Bank. pp: 1-30.

Barro, R.J. and J.W. Lee, 2013. A new data set of educational attainment in the world, 1950–2010. Journal of Development Economics, 104: 184-198.Available at: https://doi.org/10.1016/j.jdeveco.2012.10.001.

Becker, G.S., K.M. Murphy and R. Tamura, 1990. Human capital, fertility, and economic growth. Journal of Political Economy, 98(5, Part 2): S12-S37.

Berg, V.D.H., 2001. Economic growth and development. Singapore: McGraw-Hill International.

Brueckner, M., 2017. Rent extraction by capitalists. European Journal of Political Economy, 50: 157-170.Available at: https://doi.org/10.1016/j.ejpoleco.2017.03.001.

Chirwa, T.G. and N.M. Odhiambo, 2018. Exogenous and endogenous growth models: A critical review. Comparative Economic Research, 21(4): 63-84.Available at: https://doi.org/10.2478/cer-2018-0027.

Cristelli, M., A. Tacchella, M. Cader, K. Roster and L. Pietronero, 2017. On the predictability of growth. Policy Research Working Paper No. WPS 8117. Washington, D.C. The World Bank Group.

Dimand, R.W. and B.J. Spencer, 2008. Trevor Swan and the neoclassical growth model. NBER Working Paper No. 13950. Cambridge, National Bureau of Economic Research.

Domar, E.D., 1946. Capital expansion, rate of growth, and employment. Econometrica, 14(2): 137-147.

Feenstra, R.C., R. Inklaar and M.P. Timmer, 2015. The next generation of the penn world table. American Economic Review, 105(10): 3150-3182.

Grossman, G.M. and E. Helpman, 1991. Innovation and growth in the global economy. Cambridge: MIT Press.

Hall, R.E. and C.I. Jones, 1999. Why do some countries produce so much more output per worker than others? The Quarterly Journal of Economics, 114(1): 83-116.Available at: https://doi.org/10.1162/003355399555954.

Harrod, R.F., 1939. An essay in dynamic theory. The Economic Journal, 49(193): 14-33.Available at: https://doi.org/10.2307/2225181.

Kraipornsak, P., 2018. Good governance and economic growth: An investigation of Thailand and selected Asian countries. Eurasian Journal of Economics and Finance, 6(1): 93-106.Available at: https://doi.org/10.15604/ejef.2018.06.01.009.

Lewis, A.W., 1977. The evolution of the international economic order. Discussion Paper No. 74, Research Program in Development Studies, Princeton, NJ. Princeton University, Woodrow Wilson School.

Lucas, J.R.E., 1988. On the mechanics of economic development. Journal of Monetary Economics, 22(1): 3-42.

Maddison, A., 2006. The world economy: Volume 1: A millennial perspective and volume 2: Historical statistics. Paris: OECD.

Mankiw, N.G., D. Romer and D.N. Weil, 1992. A contribution to the empirics of economic growth. The Quarterly Journal of Economics, 107(2): 407-437.

Mello, D.L.R., 1999. Foreign direct investment-led growth: Evidence from time series and panel data. Oxford Economic Papers, 51(1): 133-151.Available at: https://doi.org/10.1093/oep/51.1.133.

Psacharopoulos, G., 1994. Returns to investment in education: A global update. World Development, 22(9): 1325-1343.Available at: https://doi.org/10.1016/0305-750x(94)90007-8.

Quibria, M.G., 2014. Governance and developing Asia: Concepts, measurements, determinants, and paradoxes. ADB Economics Working Paper Series No. 388. Asian Development Bank.

Rebelo, S., 1991. Long-run policy analysis and long-run growth. Journal of Political Economy, 99(3): 500-521.Available at: https://doi.org/10.1086/261764.

Romer, D., 1996. Advanced macroeconomics. Singapore: McGraw-Hill International.

Romer, P.M., 1988. Capital accumulation in the theory of long run growth, RCER Working Papers No. 123, University of Rochester, Center for Economic Research.

Romer, P.M., 1990. Endogenous technological change. Journal of Political Economy, 98(5, Part 2): S71-S102.

Solow, R.M., 1956. A contribution to the theory of economic growth. The Quarterly Journal of Economics, 70(1): 65-94.

Spence, M., P.C. Annez and R.M. Buckley, 2009. Urbanization and growth: Commision on growth and development. Washingtom, DC. The World Bank. pp: 1-45. Available from https://openknowledge.worldbank.org/handle/10986/2582.

Turok, I. and G. McGranahan, 2013. Urbanization and economic growth: The arguments and evidence for Africa and Asia. Environment and Urbanization, 25(2): 465-482.Available at: https://doi.org/10.1177/0956247813490908.

Appendix

A1. Computation of some missing data

There are 3 series of variables employed in the study that the study needed to calculate for some missing values; those are capital input (GFCF), competitiveness (COMP), and governance (GOVN). Detailed computation of each series to fix missing data for a few years can discuss as follows.

1. Gross fixed capital formation (in constant 2011 prices) was the proxy of capital input. For China, the GFCF in constant prices is not available; the available GFCF in current prices was divided by its GDP deflator and used for GFCF at a constant price.

2. Competitiveness in this study refers to an outcome of advanced knowledge or technological progress. The study used the Economic Fitness Metric (EF) of the IFC Country Economics & Engagement of the World Bank as the proxy of competitiveness. The study under the EF project evaluated cross country differences of the productive capacities to define an aggregate measure of a country's competitiveness (Cristelli *et al*., 2017). The EF can be both a measure of a country's diversification and an ability to produce sophisticated goods based on a globally competitive basis. Countries with higher levels of EF are those having higher capabilities to produce a diverse portfolio of products, higher ability to upgrade into ever-increasing sophisticated goods, and tend to have more predictable long-term growth and to attain an excellent competitive position relative to other countries.

There are two different series of EF available: version 1 is for the period up to only 2015, and version 2 is from 2007 to 2017. Unfortunately, the statistics of those two series are not the same values. The study used the series in version 1 and learned the pattern of its growth rate of each country in version 2 to estimate the extended values for their next two years (in 2016 and 2017).

3. Governance Index of the World Bank comprises six components: control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, the rule of law, and voice and accountability. This study chose percentile rank (0 to 100) of each component to be the indicator of good governance by taking the average value of those 6 components.

For any reason, the governance statistic is not available for 2001, the study calculated statistic of each component in 2001 by averaged values of those data in 2000 and 2002 for all 6 components of good governance mentioned above.

A2. The developed countries and the developing countries in the study

The developed countries: Australia (AUS), Japan (JPN), Korea (KOR), New Zealand (NZL), Singapore (SGP) and the USA (USA).

The developing countries: Bangladesh (BGD), Cambodia (KHM), China (CHN), Indonesia (IDN), India (IND), Lao (LAO), Malaysia (MYS), Nepal (NPL), Pakistan (PAK), Philippines (PHL), Thailand (THA), and Viet Nam (VNM).