ENDOGENOUS GROWTH FACTORS IN FOUR CATEGORIES OF COUNTRIES BASED ON HDI

by Wasiaturrahma Wasiaturrahma

ENDOGENOUS GROWTH FACTORS IN FOUR CATEGORIES OF COUNTRIES BASED ON HDI

FAKTOR PERTUMBUHAN ENDOGEN DI EMPAT KATEGORI NEGARA BERDASARKAN IPM

Wasiaturrahma[1], Nanda Chairunissa[2]
[1,2]Faculty of Economics and Business, Airlangga University, Surabaya
[1]wasiaturrahma@yahoo.com, [2]nanda@gmail.com

Abstract

The economic slowdown is an issue that the global economy still faces since the 2007-2009 Great Recession. The decline in physical and natural capital will further exacerbate this slowdown. This study analyzes the factors driving growth based on endogenous growth theory using a case study of four country categories based on the Human Development Index (HDI) level to solve the economic slowdown problem and realize sustained economic growth as Goal 8 of Sustainable Development Goals (SDGs). The variables used in this study are HDI, Global Innovation Index (GII), labor force, and Gross Fixed Capital Formation (GFCF). This study analyzed 98 countries in 2011-2018 using Fixed Effect and Random Effect Model. The estimation results show that HDI, labor force, GII, and GFCF significantly affect economic growth in the very high, high, and medium HDI country categories. This study found that GII did not affect economic growth in the low HDI countries category.

Keywords: Endogenous Growth; Country Category; Human Development Index

Abstrak

Perlambatan ekonomi merupakan isu yang masih dihadapi ekonomi global sejak Resesi Hebat 2007-2009. Penurunan modal fisik dan alam akan semakin memperparah perlambatan ini. Studi ini menganalisis faktor-faktor pendorong pertumbuhan berdasarkan teori endogenous growth menggunakan studi kasus empat kategori negara berdasarkan tingkat Human Development Index (HDI) untuk mengatasi masalah perlambatan ekonomi dan mewujudkan pertumbuhan ekonomi berkelanjutan sebagai Tujuan 8 Tujuan Pembangunan Berkelanjutan (SDGs). Variabel yang digunakan dalam penelitian ini adalah IPM, Global Innovation Index (GII), angkatan kerja, dan Gross Fixed Capital Formation (GFCF). Studi ini menganalisis 98 negara pada tahun 2011-2018 dengan menggunakan model Fixed Effect dan Random Effect. Hasil estimasi menunjukkan bahwa IPM, angkatan kerja, GII, dan PMTB berpengaruh signifikan terhadap pertumbuhan ekonomi pada kategori negara IPM sangat tinggi, tinggi, dan sedang. Studi ini menemukan bahwa GII tidak mempengaruhi pertumbuhan ekonomi pada kategori negara dengan IPM rendah.

Kata Kunci: Pertumbuhan Endogen; Kategori Negara; Indeks Pembangunan Manusia

INTRODUCTION

The slowdown in economic growth is a significant problem in the global economy since the Great Recession between 2007-2009. The world economy then began to recover from the global financial crisis at an uneven pace and tended to experience a slowdown in output growth (United Nations, 2011).

An economy experiences a slowdown if economic growth slows down from the previous period. Macroeconomic factors that could affect this slowdown include the financial crisis, inflation, increases in interest rates, and international trade conditions. The decline in

production factors such as physical capital and natural capital will further exacerbate this economic slowdown.

The limited exploration in physical capital and natural capital is why a decrease in these two types of capital can contribute to an economic slowdown. Hakkio and Petersen (1990) explain that a real reduction in capital stock will cause an economy to experience very uneven economic growth. Slow economic growth will also occur when a country only relies on exhaustible natural capital as a production factor (Rodríguez and Sachs, 1999).

Some underdeveloped countries in the world still rely on physical capital and natural capital to support economic growth. Still, unfortunately, there's an absence of proper management of both physical and human capital in these countries (Lange et al., 2018). The development of other sources of growth, especially in human capital, is needed to deal with conditions when physical and natural capital is scarce (Brandt et al., 2017).

This study focuses on endogenous growth theory, which explains the role of human capital in driving economic growth to solve an economic slowdown to produce sustained economic growth as Goal 8 of Sustainable Development Goals. The endogenous growth view that has begun to develop widely since Romer's (1986) research emphasizes that the determinant of economic growth is the system that regulates the production process from within, not forces from outside the system. It is essential to identify and analyze the determinants of growth originating from within (endogenous) the economic system itself.
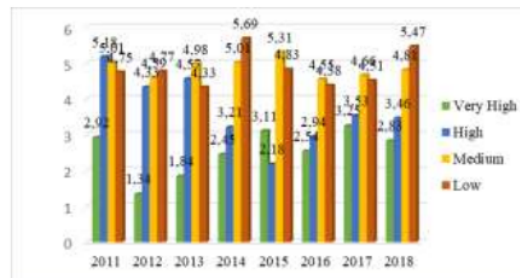
Figure 1. Economic Growth by Human Development Index (HDI) Category (in per cent)

Source: World Bank (2018), compiled

Four categories or levels of the Human Development Index (very high, high, medium, low) are used as case studies in this research to analyze and compare the drivers of economic growth in countries with different human capital levels. Figure 1 shows that countries in each

HDI category experienced economic slowdown and stagnation during the last eight years, namely, in the 2011-2018 period.

This study uses HDI as a case study to categorize countries globally; it measures the quality of human resources using indicators of life expectancy, education and income with an index of 0-1. Since United Nations Development Program (UNDP) introduced it in the 1990 Human Development Report, the HDI has been used globally as an indicator to evaluate a country's economic growth and development.

UNDP divides countries into four HDI categories, namely very high, high, medium, and low. The very high HDI category represents about 33 per cent of the countries in the world, the high category represents 28 per cent of the countries in the world, the medium represents 20 per cent of the countries in the world, and the low represents 19 per cent of the countries in the world. The Human Development Index is a strategic quantitative assessment tool in the concept of human capital (Yakunina and Bychkov, 2015). Therefore, human development is an essential non-physical resource for achieving economic growth (Costantini and Monni, 2008).

The factors analyzed in this study with human development are the labor force, innovation, and physical capital owned by a country. Human development, labor force, and physical capital are crucial inputs for a country's economic growth in line with the endogenous growth theory of Romer (1986) and Lucas (1988). Romer (1990) highlighted the importance of innovation has been since the second wave of endogenous growth theory.

Another factor that can affect economic growth and still related to the human is the labor force. A greater labor force is directly proportional to the production level (Todaro and Smith, 2011). The growth of the country's labor force is associated with rapid economic growth (Young, 1995; Appiah et al., 2019).

Romer (1990) then analyzed the importance of intellectual capital in addition to human and physical capital. Intellectual capital that grows through innovation will result in productivity growth, so we should consider innovation one of the main drivers of economic growth. This study uses the Global Innovation Index (GII) indicator to provide a detailed picture of countries' innovation performance through scores and rankings. Dutta et al. (2013) explain that the GII illustrates the critical role of innovation in economic growth and prosperity in high-income and developing countries.

The last factor in the form of physical capital analyzed in this study is the Gross Fixed Capital Formation (GFCF) or GFCF. GFCF is one crucial component that is useful for

facilitating economic growth. Research findings that use capital formation as a capital variable have proven its positive effect on a country's economic growth rate (Kormendi and Meguire, 1985; de Long and Summers, 1991; Levine and Renelt, 1992).

In contrast to previous research by Agénor and Neanidis (2015), which used case studies of developed and developing countries based on state income or used one country as a case study as in Fleisher et al. (2010), this study uses country categories based on HDI level as a case study. Previous research also mainly used innovation variable to analyze the effect of innovation on economic growth in the form of investment in R&D, as in research by Bilbao-Osorio and Rodríguez-Pose (2004) and Wang et al. (2013). This study uses the Global Innovation Index, which describes a country's innovation performance as a whole.

This study is unique because it analyzes the drivers of economic growth in different human development categories to produce policy suggestions and solutions to conditions of economic slowdown in countries in each category of HDI. The endogenous growth theory approach is relevant because this theory explains the role of internal factors in developing new forms of technology and efficient and effective means of production to increase economic output.

Literature Review

This research focuses on the theory of endogenous growth. The endogenous growth theories used as a reference in this study (models are simplified) is as follows:

Romer's (1986) Endogenous Growth Theory

Romer (1986) introduced a long-run growth model assuming that knowledge is a production input that has an increasing return to capital, in contrast to the neoclassical growth theory approach, which considers diminishing returns to capital. Previously, Solow's (1956) model had described technological change as the key to economic growth. However, the technological changes in Swan's (1956) neoclassical model are exogenous. The technological changes in the Romer model are endogenous.

Romer used the learning by doing Arrow (1962) model as a starting point for eliminating diminishing returns to capital by assuming that knowledge creation is a by-product of investment. Firms that increase their physical capital simultaneously learn how to produce more efficiently. This positive effect is called learning by doing or, in this case, learning by investing. Romer illustrated his model by considering the neoclassical production function with labor augmenting technology for i firm as follows:

$Y = F (K_i, A_i L_i)$ .... (1.1)

L_i (labor) and K_i (capital) are conventional inputs; A_i is the knowledge available to firms. Technology is labor augmenting, so a steady state can be achieved when A_i grows at a constant level. However, in contrast to the neoclassical theory, A_i in the endogenous model does not grow exogenously.

There are two assumptions in Romer's endogenous growth model. The first assumption is learning by doing (the acquisition of knowledge and productivity comes from investment and production). The second assumption is that the knowledge of each firm is a public good, which means that the knowledge of a firm has a spill over effect throughout the economy. A_i corresponds to the economy as a whole and is proportional to changes in aggregate capital stock, namely, K.

These two assumptions (learning by doing and spill over) are combined into the Romer model. A_i can be replaced by K in equation (1.2), and the production function for firm i will be:

$Y = F (K_i, K L_i)$ .... (1.2)

K and L_i in equation (1.2) are constant so that each firm will face a diminishing return to capital (K_i) as in the neoclassical approach. Still, if the producer develops K_i, then K will also increase and provide spill over benefits, increasing the productivity of the entire economy.

Lucas's (1988) Endogenous Growth Theory

Lucas (1988) proposed an endogenous growth model that centres on two types of capital: physical capital used in the production process and human capital, which also affects labor productivity and physical capital growth. Lucas also uses the assumption of increasing returns which refers to Arrow's (1962) concept of learning by doing as used in Romer's (1986) endogenous model. The production function in the Lucas model using human capital is:

$Y = K^\alpha (hL)^{1-\alpha}$ .... (1.3)

h is human capital per individual, which develops based on:

$\dot{h} = (1 - u)h$ .... (1.4)

Time spent on learning is indicated by *(1-u)*, and *u* is the time spent working. The equation below shows that an increase in time spent on learning will increase human capital growth:

$\dot{h}/h = (1 - u)h$ .... (1.5)

571

Romer's (1990) Innovation-Based Endogenous Growth Theory

The second wave of endogenous growth theory is marked by the emergence of literature that adds the vital role of innovation into growth models. Romer (1990) emphasized that intellectual capital or the source of technological progress is different from physical capital and human capital. Physical and human capital is accumulated through saving and schooling, but intellectual capital grows through innovation.

Romer (1990) describes the technology in the form of knowledge stocks as A and K as physical capital. The production function is:

$$Y = K^\alpha (AL_Y)^{1-\alpha} \dots\dots\dots\dots\dots (1.6)$$

L is labor used to produce output (L_Y) or technology (L_A). This model assumes that companies that invest in research and development or R&D have positive externalities on the R&D productivity of other firms in an economy.

Previous Studies

Previous research using endogenous variables also proved a significant positive relationship between the variables used in this study and economic growth. Agénor and Neanidis (2015) conducted a study that analyzed the effects of human capital, public capital, and innovation on the economic growth of 38 countries from the 1981-2008 period. The method used was panel data regression. The results of this study indicate that a higher level of innovation will promote growth, public capital influences through increased productivity, and the ability of the economy to generate human capital will boost economic growth in a country. Fleisher et al. (2010) analyzed the effects of human capital, physical capital, infrastructure capital and labor on 28 provinces of China. The method used in this study was a two-way fixed effect (2FE). The results showed that investment in human capital, physical capital, and infrastructure capital had a significant positive impact on economic growth. In contrast, workers with low education had a significant negative effect.

Ridha and Budi (2020), with the study case of Indonesia, used HDI as a variable that represents human development and the GFCF variable to represent macroeconomic conditions together with the variables of FDI and NX. This study used time-series data from 1985-2015 and the Error Correction Model (ECM) method. This study indicates that HDI and GFCF have a significant positive effect on economic growth in Indonesia, both in the short and long term. Appiah et al. (2019) analyzed the impact of HDI, capital, consumer prices, FDI, and the labor force. This study used data from the 1990-2015 period using panel data regression methods; it

572

concluded that the HDI, investment, and labor force variables significantly positively affect economic growth in these countries.

Only a few studies have used the Global Innovation Index. One of them was the study by Al-Zaroog and Bakir (2020), which used a case study of 32 developing countries. The method used in this research is Fully Modified OLS (FMOLS) with the analysis period of 2011-2018. This research found a significant positive relationship in the variables of GII, GFCF, and the labor force on economic growth in 32 developing countries globally.

RESEARCH METHODS

The research data is divided into four country categories based on the Human Development Index (HDI) level: the very high, high, medium, and low categories with a research period of 8 years, 2011-2018. The countries analyzed in this study were 98 countries. This sample of countries aims to analyze economic growth in four different HDI categories to produce policy suggestions appropriate for each category.

The data consisted of a cross-section and a time series so that the test was carried out using the panel data regression method (FEM and REM) using the STATA 14.2 analysis tool. The random-effect model was selected for countries with a very high, high, and medium HDI, while the fixed effect model was selected for the category of countries with a low HDI.

Model

This study uses one model for four categories of the Human Development Index. The variables used in this model were adopted from previous studies that used the endogenous growth theory approach in analyzing the factors driving economic growth.

$$LnGDP_{it} = \alpha + \beta_1 HDI_{it} + \beta_2 GII_{it} + B_3 LnLF_{it} + B_4 LnGFCF_{it} + U_{it} \ (2.1)$$

To model the effect of endogenous variables on economic growth in the four-country categories, GDP in constant 2010 US$ (LnGDP) describes economic growth. HDI (HDI) is Human Development Index in each category. Global Innovation Index (GII) is innovation rates across four HDI categories, Labour Force (LnLF) is the total workforce in each category, Gross Fixed Capital Formation (LnGFCF) represents capital. β_1, β_2, β_3, β_4 represent coefficient for each independent variables, α is the intercept, U is the error term, i is countries in four HDI categories, stands as a cross-section, and t stands as a time series with a research period of 2011-2018.

Variables and Data

Table 1. Data, Descriptions, and Data Sources

Data	Descriptions	Data Sources
Economic Growth (Real GDP)	Real GDP is the result of dividing nominal GDP by the GDP deflator, expressed in the formula as: $$Real\ GDP: \frac{Nominal\ GDP}{GDP\ Deflator}$$ The GDP data in this study is calculated based on the amount of value-added in an economy.	World Bank
Human Development Index (HDI)	The HDI has an index range of 0-1, which is divided into four categories, namely the very high HDI category (0.800–1.000), the high HDI category (0.700–0.799), the medium HDI category (0.550–0.699), and the low HDI category (0.350–0.549). The formula for calculating HDI is as follows: $$\sqrt[3]{I_{Health} \times I_{Education} \times I_{Standart\ of\ Living}}$$	United Nations Development Programme
Global Innovation Index (GII)	The Global Innovation Index (GII) provides a detailed picture of countries' innovation performance globally in a score range of 0-100. GII is a calculation of the average of the innovation input sub-index and the innovation output sub-index. The final GII calculation formula is as follows: $$\frac{Innovation\ Input\ Sub-Index + Innovation\ Output\ Sub-Index}{2}$$	World Intellectual Property Organization
Labour Force (LF)	During a certain period, the total labor force, namely the working-age population 15-64 years, including people who are working and people looking for work and first-time job-seekers.	World Bank
Gross Fixed Capital Formation (GFCF)	GFCF, or net investment, consists of land improvement, purchase of plant, machinery and equipment, construction of roads, railroads and the like, including schools, offices, hospitals, private residences, and commercial and industrial buildings.	World Bank

Table 1 describes the operational description of the variables and data sources used in this study. Real GDP, labor force, and GFCF data are processed into natural logarithms. Natural logarithm transformation is carried out to reduce the scale of the data, reduce data fluctuations, and make the data normally distributed.

Analysis Method

This study uses a static panel data regression analysis. There are three types of panel data models (estimators), namely Pooled Least Square (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM). Here are the differences between each estimator:

Pooled Least Square (PLS)

The PLS model treats data sets like normal cross-sectional data and ignores the fact that they have individual dimensions and time. The analysis in the PLS model has similarities with the Ordinary Least Square (OLS) linear regression model.

Fixed Effect Model (FEM)

The Fixed Effect Model has constant variables between individuals or time-invariant values (the values of these variables do not change over time). The variables in question can be in the form of age, gender, ethnicity and others. There is a correlation between the error term and the independent variables in this model.

Random Effect Model (REM)

The Random Effect Model can estimate the effect or influence of time-invariant variables. REM has parameters in the form of random variables or random. This model assumes that the intercept of a unit is taken at random from a much larger population. The error term is a combination of error from time-series and cross-section.

There is no correlation between the error term and the independent variable in REM. If N (population size) is large and T is small with the assumptions underlying the model valid, then REM is a more efficient estimator than FEM. According to Gujarati and Porter (2009), REM uses the Generalized Least Square (GLS) method to meet classical assumptions. A classical assumption test is not necessary if the selected model is REM.

Regression Model Selection Test

The Chow test was conducted to determine the use of the PLS or FEM model with the criteria that if the probability value (P-value) is less than α (significance level), then the selected model is FEM. The LM test was conducted to determine the use of the PLS or REM model with the criteria that if P-value is less than α, then the selected model is REM. Hausman test is conducted to determine the use of the FEM or REM model with the criteria that if the P-value is less than α (significance level), then the selected model is FEM. The value is 0.05.

Classical Assumption Test

Gujarati (2004) explains that the best estimator is the one that fulfils the assumption of the Best Linear Unbiased Estimator. Therefore, the panel data regression model that meets BLUE is free from problems in the classical assumption test. There are three types of classical assumption tests, namely:

Multicollinearity Test

A multicollinearity test was conducted to determine whether there is a linear relationship on each independent variable in the model. The model is free from multicollinearity if the value of Variance Inflation Factor on the independent variable (VIF) < 10.

575

Heteroscedasticity Test

A heteroscedasticity test was conducted to determine whether the variance of the error was inconsistent using the White test. If prob>chi2 in the White test the value is> 0.05, then the model is homoscedastic.

Autocorrelation Test

The autocorrelation test in panel data regression was performed using the Wooldridge test. If prob > F > 0.05, then the model is free from autocorrelation problems.

Statistical Analysis

A partial test (t-test) was conducted to analyze the effect of the variable partially (individually) on the dependent variable, assuming that the other independent variables were constant. A partial test is done by looking at the probability value at a significance level of 1%, 5% or 10%. Statistical analysis was also carried out through a simultaneous test (f-test) to determine how the independent variables in the model simultaneously or as a whole affect the dependent variable. A simultaneous test, the same as a partial test, is done by looking at the probability value.

Robustness Test

The robustness test aims to analyze the uncertainty in the model by comparing the initial method with alternative methods to obtain valid research results. Violation of classical assumptions in the model can cause the estimation results to be biased. The Feasible Generalized Least Square (FGLS) method is used to overcome the problem of violating classical assumptions in models such as heteroscedasticity, autocorrelation, and multicollinearity (Greene, 2002).

RESULTS AND DISCUSSION

Estimation Results of Panel Data Regression in Four Country Categories

Table 2 shows the regression results for the categories of countries with very high, high, and moderate HDI with the REM model selected. The model chosen for the low country category is FEM. The estimation results in Table 2 show that the HDI, GII, labor force and GFCF variables have a significant positive effect on economic growth in countries with very high, high, and medium HDI. Table 2 also shows that the variables HDI, labor force, and GFCF have a significant positive effect. In contrast, the GII variable has no effect on economic growth in countries with low HDI.

Table 2. Estimation Results of Panel Data Regression in Four Country Categories

Independent Variable	Dependent Variable: lngdp (Economic Growth)			
	1 Very High HDI Category (REM)	2 High HDI Category (REM)	3 Medium HDI Category (REM)	4 Low HDI Category (FEM)
hdi	2.824454*** (.2310056)	3.449138*** (.3496185)	4.547305*** (.3437238)	4.070933*** (.6226967)
gii	.3085095*** (.1069244)	-.4444774** (.2036936)	-.4424705* (.2670782)	.1384489 (.1659281)
lnlf	.5789885*** (.0266827)	.7295734*** (.0455151)	.6118747*** (.0526214)	.6854733*** (.1053873)
lngfcf	.3666578*** (.0207639)	.2540359*** (.0245958)	.177421*** (.0329712)	.1260031*** (.0341615)
_cons	.9450965 (.2179616)	-.3818194 (.4090004)	.6356998 (.4278117)	.6322276 (.746738)
Obs.	400	216	96	72
Prob.	0.0000	0.0000	0.0000	0.0000

Source: Regression Results, STATA 14.2

Columns 1-4 are country categories based on HDI level; the number in brackets ( ) is the standard error; ***, **, and * indicate the significance level at 1%, 5%, and 10%, respectively.

Estimation Results of Feasible Generalized Least Square (FGLS) in Low HDI Country Category

The classical assumption test is performed for the FEM model selected in the low HDI category. The other three categories with REM as the chosen model have met the classical assumptions because they use the GLS method (Gujarati and Porter, 2009). A robustness test is carried out to eliminate classical assumptions problem in the FEM model in the low HDI category. The robustness test in this study was conducted using the Feasible Generalized Least Square (FGLS) method. The results of the robustness test in Table 3 show that the variables HDI, labor force, and GFCF have a significant positive effect on economic growth in the category of countries with low HDI.

Table 3. FGLS Estimation Results in the Low HDI Category

| lngdp	Coef.	Std. Err.	Z	p>|z|
hdi	4.070933***	.5636848	7.22	0.000
gii	.1384489	.1502034	0.92	0.357
lnlf	.6854733***	.0953999	7.19	0.000
lngfcf	.1260031***	.0309241	4.07	0.000
_cons	.735422	.6661557	1.10	0.270

Source: Regression Results, STATA 14.2

(***) indicate the 1% significance level

Discussion

The Human Development Index has a significant positive effect on economic growth in the four categories of countries in the 2011-2018 period, this finding in line with the theory of endogenous growth, which emphasizes the role of humans as one of the main driving factors of economic growth (Lucas, 1988; Romer, 1990). Furthermore, Mankiw et al. (1992) stated that human capital as a factor of production is as significant as physical capital and the labor force.

These results are also in line with previous research, which showed a significant positive relationship between HDI and a country's economic growth and performance (Haller, 2014; Ulas and Keskin, 2017). In addition, the authors find that the countries with the highest HDI in the world are also the highest GDP producers in the world (Figure 2); this significant positive relationship is also explained by Ranis et al. (2000), who found that a higher HDI level will affect the economy through an increase in human capability, creativity, and productivity.
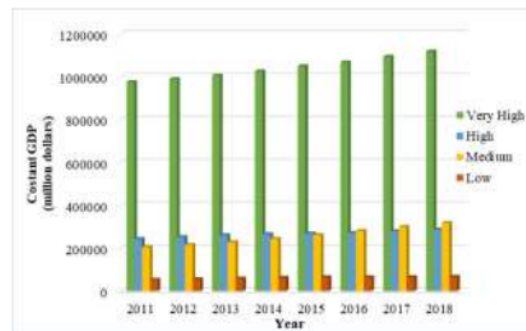
Figure 2. Economic Growth by HDI Category (in a million dollar)

An increase in HDI by one per cent will increase economic growth by 2.82 per cent in the very high HDI category, 3.45 per cent in the high HDI category, 4.55 per cent in the medium HDI category and lastly, 4.07 per cent in the low HDI category assuming ceteris paribus. The most significant impact of increasing HDI on economic growth is in the medium and low HDI categories. The category of countries with medium and low HDI must seek to increase the level of human development both in the education dimension in expected years of schooling and mean years of schooling, the health dimension in life expectancy at birth, as well as a decent standard of living, namely by increasing gross national income per capita as one of the main drivers of growth. The same is true for the very high and high HDI categories.

The second variable, Global Innovation Index, in countries with very high, high, and medium HDI has a significant positive effect on economic growth. These results are in line with

Romer's (1990) endogenous theory and the research of Pece et al. (2015) and Pradhan et al. (2020), who found that innovation is a driver of long-term economic growth. Innovation is a development process in ideas and technology that can increase efficiency and productivity in producing goods and services. Furthermore, an increase in productivity will encourage output growth in an economy.

An increase of one per cent in the GII will increase economic growth by 0.31 per cent in the category of countries with very high HDI, 0.44 per cent in the category of countries with high HDI, and 0.44 per cent in countries with medium HDI assuming ceteris paribus. The estimation results in the low HDI category are not in line with the theory. GII, which describes innovation in this category, does not affect economic growth.

The findings of innovation that do not affect economic growth in the low HDI category in this study may occur because the sample of countries included in this category has the lowest spending on R&D in the world. Previous research by Goñi and Maloney (2017) and Cirera and Maloney (2017) in the World Bank report found that low innovation in low-income countries can be an obstacle to growth because innovation is influenced by complementary factors such as physical capital and human capital.

Low-income countries do not invest maximally in innovation. The main focus is encouraging economic growth because the available physical capital and human capital have not supported the innovation process optimally. One example of physical capital is if a country does not have the machines or tools needed for the innovation process of goods and services, the return from the innovation process will be low. Like human capital, if a country experiences a shortage of both researchers and trained labor force, the return from the innovation process is also low.

The third variable, namely the labor force, has a positive influence on economic growth in the four categories of countries. Todaro and Smith (2011) explain that the labor force can stimulate a country's economic growth. The labor force is also an input in Romer's (1986) and Lucas's (1988) endogenous growth models.

The results obtained in this study are in line with previous research, which found a significant positive relationship between the labor force and economic growth (Appiah et al., 2019). This positive effect occurs because a high-productivity workforce can encourage economic growth (Korkmaz and Korkmaz, 2017).

The estimation results show that a one per cent increase in the workforce will increase economic growth by 0.58 per cent in the very high HDI category, 0.73 per cent in the high HDI category, 0.61 per cent in the medium HDI category, and 0.69 per cent in the middle HDI category. The category of low HDI with the assumption of ceteris paribus. The four categories of countries need to increase the labor force to encourage economic growth, especially in countries with low HDI with the lowest average labor force. Based on the estimation results, the effect of an increase in the labor force on economic growth in the high and low HDI categories is higher than in other categories.

The fourth variable analyzed in this study is Gross Fixed Capital Formation (GFCF). The positive effect of Gross Fixed Capital Formation on economic growth in this study is in line with the research findings of Kormendi and Meguire (1985), Levine and Renelt (1992), and Adhikary (2011). The results of this study are also in line with Apergis and Payne (2010a). They used GFCF as one of the variables in their research to analyze economic growth in developed countries and obtained statistically significant positive results. The same result was found by Apergis and Payne (2010b) with a case study of emerging markets. This positive effect is explained by the role of capital formation, which helps increase the production capacity of goods and services to encourage economic growth.

GFCF as a physical capital variable in countries with very high, high, and low HDI has a significant positive effect on economic growth. An increase of one per cent in GFCF will increase economic growth by 0.37 per cent in the category of countries with very high HDI, 0.25 per cent in the high HDI category, 0.18 per cent in the medium HDI category and 0.13 per cent in the category of low HDI countries with ceteris paribus assumption.

Each category of countries must increase their GFCF, especially in the low HDI category, which has a much lower average GFCF than other categories. Countries in the low HDI category can take advantage of Official Development Assistance or official development assistance in increasing GFCF or other types of development assistance.

CONCLUSION

Variables in endogenous economic growth in the form of the Human Development Index, Global Innovation Index (GII), labor force, and Gross Fixed Capital Formation (GFCF) affect economic growth in the country category, which is divided based on the HDI level, namely the very high HDI category, high and moderate in the 2011-2018 research period partially and

simultaneously. On the other hand, the results of research estimates in countries with low HDI indicate that GII as a variable level of innovation does not affect economic growth.

The overall conclusion from the research results that have been carried out is that human development, innovation, labor force, and GFCF can encourage economic growth in each country category. Except for findings in the category of countries with low HDI, where innovation has no significant on economic growth. In addition, the results of the study also found that HDI is the most substantial driving factor for economic growth in all categories of countries, followed by the labor force, proving the critical role of humans in economic growth.

These findings are essential in realizing Goal 8 of Sustainable Development Goals about promoting economic growth, productivity, and technological innovation. This research contributes to planning and development economics using an endogenous growth theory approach with elements of novelty, both from case studies and research variables used. This study also provides suggestions that can be considered for science, namely contributing references and literature that can show the factors that influence the economic growth in each different category of human development.

This study provides suggestions in the form of policy implications for the government to support improvements in human development, such as facilitating access to education and health and policies to reduce income inequality. Second, increase in innovation, such as research and development (R&D) and information technology. Especially for countries with low HDI, an increase in physical capital and human capital is needed to support the innovation process to encourage economic growth. Improvement in the quality and productivity of the workforce through vocational training to build human resource skills and capabilities. An increase in GFCF by improving infrastructure, machinery and equipment, and other assets can increase an economy's production capacity.

This study has limitations and shortcomings, including the unavailability of data for each variable in certain countries in each category this study so that the study only uses case studies of 98 countries, in addition, the GII data per year began to be published in 2011 so that the research period be limited. This study also uses GFCF, which describes the overall net investment as a variable representing physical capital.

The following is the author's suggestion so that it can be considered for further research. The first suggestion is to add years and samples of observations, especially in countries with medium and low HDI. Second, using variables that describe each HDI dimension specifically

for the human capital variable. The third is to research specific innovation variables as a comparison of results for each category, such as R&D expenditure variables, infrastructure that supports innovation, or output in science and technology.

REFERENCES

[1]   Agénor, P. R., and Neanidis, K. C. (2015). Innovation, public capital, and growth. Journal of Macroeconomics, 44, 252-275.

[2]   Al-Zaroog, S. A. M., and Baqir, A. A. F. (2020). The Impact of Global Innovation on Economic Growth in Developing Countries. Journal of Social Sciences (COESandRJ-JSS), 9(2), 373-393.

[3]   Appiah, M., Amoasi, R., and Frowne, D. I. (2019). Human Development and its effects on Economic Growth and Development. International Research Journal Of Business Studies, 12(2), 101-109.

[4]   Brandt, N., Schreyer, P., and Zipperer, V. (2017). Productivity measurement with natural capital. Review of Income and Wealth, 63, S7-S21.

[5]   Cirera, X., and Maloney, W. F. (2017). The innovation paradox: Developing-country capabilities and the unrealized promise of technological catch-up. The World Bank.

[6]   Dutta, S., and Lanvin, B. (2012). The global innovation index 2012. Stronger innovation linkages for global. INSEAD, WIPO.

[7]   Dutta, S., and Lanvin, B. (2013). The global innovation index 2013: The local dynamics of innovation. Johnson Cornell University, INSEAD, WIPO.

[8]   Dutta, S., Lanvin, B., and Wunsch-Vincent, S. (2014). The global innovation index 2014: The Human Factor in Innovation. Johnson Cornell University, INSEAD, WIPO.

[9]   Dutta, S., Lanvin, B., and Wunsch-Vincent, S. (2015). The global innovation index 2015: Effective Innovation Policies for Development. Johnson Cornell University, INSEAD, WIPO.

[10]   Dutta, S., Lanvin, B., and Wunsch-Vincent, S. (2016). The global innovation index 2016: Winning with global innovation. Johnson Cornell University, INSEAD, WIPO.

[11]   Dutta, S., Lanvin, B., and Wunsch-Vincent, S. (2017). The global innovation index 2017: Innovation feeding the world. Johnson Cornell University, INSEAD, WIPO.

[12]   Dutta, S., Lanvin, B., and Wunsch-Vincent, S. (2018). Global innovation index 2018: Energizing the world with innovation. Johnson Cornell University, INSEAD, WIPO.

[13]   Goñi, E., and Maloney, W. F. (2017). Why don't poor countries do R&D? Varying rates of factor returns across the development process. European Economic Review, 94, 126-147.

[14]   Gujarati, D.N. and Porter, D.C. (2019) Basic Econometrics. 5th Edition. New York: McGraw-Hill Companies.

[15]   Haller, A. P. (2014). Italy-Economic Growth and Human Development. Comparative Analysis. Procedia Economics and Finance, 15, 916-925.

[16]   Korkmaz, S., and Korkmaz, O. (2017). The relationship between labor productivity and economic growth in OECD Countries. International Journal of Economics and Finance, 9(5), 71.

[17]   Lange, G. M., Wodon, Q., and Carey, K. (Eds.). (2018). The changing wealth of nations 2018: Building a sustainable future. The World Bank.

[18]   Levine, R., and Renelt, D. (1992). A sensitivity analysis of cross-country growth regressions. The American economic review, 942-963.

[19]   Pece, A. M., Simona, O. E. O., and Salisteanu, F. (2015). Innovation and economic growth: An empirical analysis for CEE countries. Procedia Economics and Finance, 26, 461-467.

[20]   Pradhan, R. P., Arvin, M. B., Nair, M., and Bennett, S. E. (2020). The dynamics among entrepreneurship, innovation, and economic growth in the Eurozone countries. Journal of Policy Modeling.

[21]   Ridha, M. R., and Parwanto, N. B. (2020). The Effect of Foreign Direct Investment, Human Development and Macroeconomic Condition on Economic Growth: Evidence from Indonesia. Journal of Indonesian Applied Economics, 8(2), 46-54.

[22]   Ulas, E., and Keskin, B. (2017). Is There a Relation Between HDI and Economic Performances?. In New trends in finance and accounting (pp. 61-70). Springer, Cham.

[23]   United Nations. (2011). World economic situation and prospects 2011. New York: United Nations Publication.

[24]   Wang, D. H. M., Yu, T. H. K., and Liu, H. Q. (2013). Heterogeneous effect of high-tech industrial R&D spending on economic growth. Journal of Business Research, 66(10), 1990-1993.

[25]   Yakunina, R. P., and Bychkov, G. A. (2015). Correlation analysis of the components of the human development index across countries. Procedia Economics and Finance, 24, 766-771.

ENDOGENOUS GROWTH FACTORS IN FOUR CATEGORIES OF COUNTRIES BASED ON HDI

PRIMARY SOURCES

1	jurnal.radenfatah.ac.id Internet Source	2%
2	media.neliti.com Internet Source	1%
3	Christopher Kwesi O. Williams. "Cancer and AIDS", Springer Science and Business Media LLC, 2019 Publication	1%
4	www.researchgate.net Internet Source	1%
5	www.scribd.com Internet Source	1%
6	Soon-Ae Park, Hyunwoo Tak. "The environmental effects of the CNG bus program on metropolitan air quality in Korea", The Annals of Regional Science, 2011 Publication	1%
7	"Innovation, Governance and Entrepreneurship: How Do They Evolve in	1%

Middle Income Countries?", Springer Science and Business Media LLC, 2017
Publication

| 8 | journal.umpo.ac.id
Internet Source | 1 % |

ENDOGENOUS GROWTH FACTORS IN FOUR CATEGORIES OF COUNTRIES BASED ON HDI

FINAL GRADE

/0

GENERAL COMMENTS

Instructor