The Effect of Human Capital and Human Capital Spillover on Economic Growth

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Abstract. The economic growth of DKI Jakarta Province is the highest among provinces on Java. Economic growth is among others, determined by the quality of human resources and supply of labor. Workers include those originate in the region itself or migrate from other regions. This study aims to analyze the effect of average years of schooling, life expectancy, number of workforce, and number of in-migrants on the economic growth of DKI Jakarta Province. Time series data during 2000-2018 were analyzed using multiple linear regression with Ordinary Least Squares (OLS) model. The results showed that the independent variables have positive significant effect on the economic growth. This finding implies the importance of improving the quality of human resources including education and health, and the need for policy improvement regarding in-migration, in term that not all people from various educational backgrounds move to the DKI Jakarta Province, so as to promote economic growth.

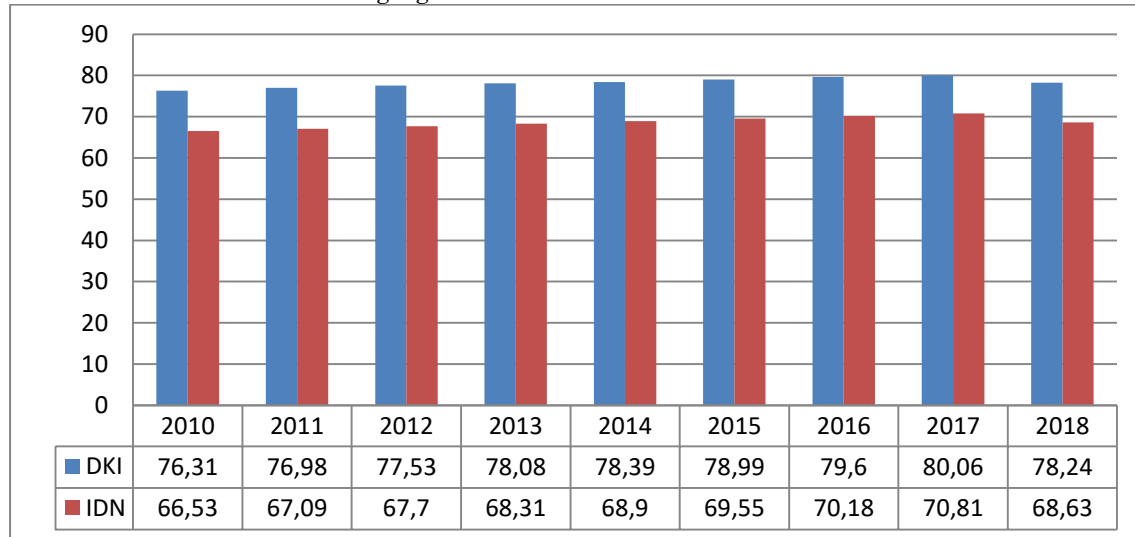Keywords: 1 Economic Growth · 2 Human Capital · 3 Human Capital Spillovers

1. INTRODUCTION

Human capital has an important role in economic development.Unlike physical capital, human capital tends to have accumulative and long-term effects. The accumulation of human capital is expected to become an initial source of sustainable development. According to Solow (1956) the reciprocal relationship between economic growth and the growth of human capital may be an important key to sustainable economic growth, in the sense that development does not only contribute to one aspect, namely economic growth but is able to improve people's welfare and to reduce unemployment and poverty.

Acemoglu & Autor (2011) define human capital as individual's knowledge, information, ideas, expertise, and health that will influence productivity. The development of ideas about the contribution of human capital is explained by Romer (1990), Lucas (1988), and Cohen & Soto (2007) who explain that the better human capital will have an impact on sustainable economic growth. The contribution of human capital can be analyzed from two micro as well as macro perspectives. Micro perspective views that human capital is part of individuals' production function which is then related to the quality of human resources. On the one hand, knowledge can have an impact on the mastery of technology and the innovations carried out in terms of the production process which leads to higher efficiency. On the other hand the expertise will make individuals become more competent in the production process, thus encouraging productivity (Xiao and Song, 2013).

From macro perspective, the contribution of human capital can be analyzed from a micro contribution that is aggregated into national economic development. The development has resulted from an increase in welfare which is indicated by an increase in the level of per capita Gross Regional Domestic Product (GRDP). The higher economic growth achieved by a region indicates the better economic activity is obtained from the growth rate of Gross Domestic Product (GDP) on the basis of constant prices (Todaro and Smith, 2011). According to Lucas (1988) human capital has internal as well as external productivity effects. The increase in individual

human capital does not only come from their own productivity but is part of the productivity of other workers at a certain level of expertise.

This study purposively selected DKI Jakarta Province because it has the highest HDI in Indonesia.In 2018 DKI Jakarta province has the highest HDI in Indonesia and is above the Indonesian HDI. The following figure that shows HDI in DKI Province and Indonesia.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
DKI	76,31	76,98	77,53	78,08	78,39	78,99	79,6	80,06	78,24
IDN	66,53	67,09	67,7	68,31	68,9	69,55	70,18	70,81	68,63

DKI : DKI Jakarta Province
IDN : Indonesia

Figure 2. Human Development Index of DKI Jakarta Province and Indonesia
Source: Central Agency of Statistics,2018

Empirical studies regarding the effect of human capital on economic growth were carried out by Lucas (1988), Romer (1990), Rauch (1993), Mathur (1999), Moretti (2004), and Acemoglu & Autor (2005) which showed that there was a correlation between human capital and economic growth. This study provides empirical evidence about the contribution of human capital to economic growth in DKI Jakarta Province. Logically, if the quality of human capital increases, economic growth will also increase.

In addition, this study also analyzes the effect of the supply of labor,measured by the migration of people entering the DKI Jakarta Province on economic growth. The findings of Hugo (1993), Mathur (1999), and Moretti (2004) show that supply of labor influences production capacity and economic growth. DKI Jakarta Province is the second largest province as a migrant recipient after West Java, which is around 0.6 million migrants from Central Java (37.87%) and West Java (29.53%). This shows that DKI Jakarta has high attractiveness as a province to improve living standards for people from outside Jakarta (National Population Family Planning Board, 2010). Although the number of migrants coming in DKI Jakarta Province is lower as compared to West Java Province, inward migration is concentrated in a fairly narrow area, so the supply of labor is very abundant. This is different from the migration in West Java Province which is spread in a fairly large area, so that the availability of labor is much less concentrated.

According to Todaro and Smith (2011) rapid population growth may lead to backwardness. In addition, population problems in urban areas arise not only because of the large household size, but because of the large number of migrants. However, a sufficient number of people with high levels of education and skills will be able to drive the pace of economic growth. Large population of productive age will be able to increase the number of labor forces and will ultimately increase output.

2. RESEARCH METHOD

This study uses a quantitative approach using time series data from 2000 to 2018. The dependent variable in this study is economic growth measured in percentage, whereas the independent variables consist of average years of schooling, life expectancy (measured in units of years), the number of workforce, and inward migration. Adata were then analyzed using multiple linear regression with Ordinary least Square (OLS). The research model is written as follows:

$$EG = B_0 + B_1 AYS_1 + B_2 LE_2 + B_3 NL_3 + B_4 IM_4 + e$$

where :
EG	= economic growth (percent)
AYS	= average years of schooling (years)
LE	= life expectancy (years)
NL	= number of labor (persons)
IM	= in-migration (personsJiwa)
e	= Residual (error term)

The next stage is the classical assumption test to produce the Best Linear Unbiased Estimator (BLUE) from the regression model obtained from the Ordinary Least Square (OLS) model. The estimation results were tested for normality, multicollinearity, heteroscedasticity, and autocorrelation test (Gujarati, 2012).

3. RESULTS AND DISCUSSION

The result of the multiple regression estimation using the Ordinary Least Square (OLS) model with the dependent variable of economic growth, and the independent variables of average years of schooling, life expectancy, number of labor and in-migration is presented as follows:

Table 1. Estimation result of multiple linear regression

Variables	Coefficient	t-statistic	Prob.
Constant	11.90432	13.91256	0.0000
AYS	2.847256	7.962486	0.0089
LE	0.097624	3.849685	0.0489
NL	3.364928	4.144718	0.0001
IM	0.927401	2.495853	0.0173
t-table			1.992
i F-statistic			345.9383
F-table			2.78
R^2			0.85934

Source: data processed with *Eviews 9*

The classic assumption test is carried out before statistical test of the regression results is performed. Using histogram to test for normality, the probability is 0.765> 0.05, meaning that the data were normally distributed.

Multicollinearity test was performed with client detection. Client detection is done by regressing an independent variable with another independent variable. The rule of thumb is by comparing the R^2 of the model value with R^2 of auxiliary regressions. If the auxiliary R^2 is greater than the R^2 model, then the model contains the symptoms of multicollinearity, and otherwise.

Table 2. Results of Multicollinearity Using Client Test

Independent variables	R^2 of auxiliary regression	R^2 of regression model
Average years of schooling	0.575	0.859
Life expectancy	0.643	0.859
Number of labor	0.526	0.859
In-migration	0.625	0.859

Source: data processed with *Eviews 9*

Because the R^2 of auxiliary regressions are lower that R^2 of the regression model, the model does not contain multicollinearity symptom.

Heteroscedasticity was tested using Breusch-Pagan-Godfrey test. The Breusch-Pagan-Godfrey test shows that the value of the chi-square probability is 0.073. Based on the criteria that the value of the chi-square probability is greater than the level of significance ($\alpha = 0.05$) then there is no heteroscedasticity. The Breusch-Godfrey Serial Correlation LM test is 0.2815 > 0.05 meaning that there is no problem of autocorrelation.

The results of the regression analysis show that the regression coefficient value of average years of schooling is 2.847256 and the probability value is 0.0089. This shows that the average years of schooling has a positive and significant effect on economic growth. This finding supports Rauch (1991), Mathur (1999), and Acemoglu & Autor (2005) which shows that there is an association between human capital and economic growth. Moretti's findings (2004) show that companies located in urban areas with college graduates will increase productivity faster. This is because the higher the level of education, the knowledge and expertise will also increase, so that it will encourage an increase in one's productivity. Companies will get more output by hiring workers with higher productivity, so companies will be willing to provide higher wages or salaries.

According to Romer (1986) in the theory of endogenous economic growth, knowledge is one form of capital that will encourage innovation in the production process. Romer (1994) also states that capital accumulation has an important role in economic growth. In this sense, the main determinant of economic growth is talent, ability, capacity quality and skills, attitudes, customs, values, goals and motivations and political structures in the institution. Robert Sollow also mentioned that output growth always comes from three factors, namely the increase in the quality and quantity of labor through population and education, the addition of capital through savings and investment and technological improvements (Todaro and Smith, 2011).

According to Reza & Widodo (2013) and Xiao & Song (2013) average years of schooling affects economic growth. Higher level of education will have an externality towards policies in the education sector. The better education in the country will have an impact on increasing foreign investment from developed countries and can help in technology transfer. This is in accordance with Schumpeter's hypothesis, which shows that in technologically developed countries there is a population with a higher education level. The greater the investment value from abroad (developed countries) will encourage the absorption of local workers and will increase national output, so that it will have an impact on economic growth in Indonesia.

Regression coefficient of life expectancy is 0.097624 and the probability value is 0.0489. This shows that life expectancy has a positive and significant effect on economic growth. This is in line with the findings of Fu (2007) that human capital can increase economic growth. Communities that have a long life and have a high concentration of skilled workers can promote innovation, diffusion, and accumulation of knowledge, leading to economic growth. The findings of Brunow and Hirte (2009) show that the age structure of workers affect output. In addition, Ranis (2000) explains that reinforcing factors between human development and economic growth include economic structure, asset distribution, policy, social capital, high investment, equitable income

distribution, and appropriate economic policies. Improving the quality of human capital can be achieved if we pay attention to the determinants of the quality of human capital namely education and health. Fleisher et al. (2010) argued that age of workers supported by the expansion of scientific and technical knowledge can increase labor productivity and other inputs in production activities. Therefore, improved education and job training will generate superior human capital such as scientists, technicians, managers and so on.

The regression coefficient of number of labor is 3.364928 and the probability value is 0.0001. This shows that labor has a positive and significant effect on economic growth. This is mainly due to the fact that workers who are classified into the workforce working in the economic sector are the production factors that drive the economy of the region. In addition, the large number of workers with high productivity is one of the positive drivers in accelerating economic growth (Xiao and Song, 2013). In line with the theory of Solow-Swan, economic growth depends on the availability of production factors such as population, labor, and capital accumulation and technological progress. In this theory Solow-Swan mentioned that labor factors can increase economic growth. The workforce here is not merely the quantity of labor, but also the quality of the workforce is taken into account. Human capital is one of the important capital in increasing productivity. The higher the level of education of a person, the higher the productivity produced, so that it can spur economic growth (Ramos, Suriñach, and Artís, 2010).

According to Lewis's theory of employment, the excess of workers is an opportunity and not a problem. The labor surplus of one sector will contribute to the growth of output and supply of workers in other sectors. In addition, Lewis points out that there are two sectors in the economy of developing countries, namely the modern sector and the traditional sector. The traditional sector is not only in the agricultural sector in the countryside, but also includes the informal sector in urban areas (street vendors, retailers), which absorbs a lot of workers and can influence the economy and increase economic growth. The informal sector is able to absorb the excess labor during the industrialization process, so it is called the employment safety valve (Todaro and Smith, 2011). This is true in DKI Jakarta Province as the capital of the country as well as the center of government and industry, that the excess of labors in the urban center is absorbed by the industrial sector and the informal sector.

In addition, with the absorption of excess labor in the industrial sector (the modern sector) by the informal sector, the wage level in the countryside will increase. This increase in wages will reduce the difference in income levels between rural and urban areas, so that the excess supply of workers does not cause problems in economic growth. On the contrary, the excess of workers is actually capital to accumulate income, assuming that the movement of labor from the traditional sector to the modern sector runs smoothly and the movement has not become too much.

This finding is consistent with Kelley and Robert (1995) which shows that labor has a positive effect on economic growth. According to Swan (1956) and Kelley & Robert (1995) the effect of labor will have an impact on economic growth if the ratio of capital and labor is balanced. The ratio of capital and labor explains the amount of capital distributed by each workforce in a production process. Greater ratio of capital and labor shows that the distribution of capital in each workforce is getting bigger. This enlargement indicates that the production process goes towards capital-intensive production. This symptom also explains the greater investment for each worker. The investment in question can be in the form of increased expenditure to finance education and training for workers. With this understanding, a consistent increase in the ratio of capital and labor will increase labor productivity which is then seen in increasing GDP.

The incoming migration regression coefficient is 0.927401 and the probability value is 0.0173. This shows that incoming migration has a positive and significant effect on economic growth, meaning that the increase in the number of in-migrationto DKI Jakarta Province brought development to the economy, because the increase in incoming migration also increased the stock

of human resources involved in the production process. This is in line with the findings of Rauch (1993), Hugo (1993). Mathur (1999), Moretti (2004) which explain that migration has a positive and significant effect on economic growth.

However, it must be understood that to grow the economy is not only seen from the perspective of labor as part of the factor of production, but also other production factors such as investment, technology and the ability of the potential of natural resources within the region are needed. The results of this study corroborate the classical theory that labor is very useful for growing the economy.However according to the latest developments, the role of other resources is often far more influential on economic growth (Rosenthal & Strange, 2008). Theoretically according to Kelley and Robert (1995) to pursue a decent level of growth, in line with the speed of population growth, external sources of funding are needed. This review reaffirms that the role of capital is also dominant in growing the economy, which in this study has not been included as a determining variable.

The government firmness is needed to emphasize that the development of the quality of human resources is crucial, because increasing quality of the population will encourage an increase in productivity and produce high output as well. Economic growth will be followed by expansion of employment opportunities, expansion of employment can provide opportunities to earn income that can be used to meet certain standards of living (Rosenthal And Strange, 2008). High level of in-migration can be an opportunity and threat for the DKI Jakarta Province.When the high level of in-migration can be accompanied by many employment opportunities, in-migration will be absorbed and impact national output and trigger economic growth. However, when in-migration is not balanced with a high level of education and skill, it will create a burden on the government. Thus the government should make regulations that limit in-migration in cities in order to impose less educated and unskilled labor because it will have an impact on the urban economy.

4. CONCLUSION

The economic growth of the DKI Jakarta Province is the highest among other provinces on Java. This study aims to analyze the effect of human capital (average years of schooling and life expectancy), and supply of labor (number of labor and number of in-migrants) on the economic growth of DKI Jakarta Province. The results showed that all independent variables have positive significant effect on economic growth. This finding implies the importance of improving the quality of human resources and the need for policy regarding in-migration.Eventhough quantity as well as quality of human resources matter for economic growth, quantity and quality should be balanced. Therefore, policy to attract high quality human resources and to restrict unskilled in-migration could be taken into consideration. As for research limitation, this study covers only one province, so the finding may not be applicable to other regions. Therefore, it is recommended that further study include more regions.

REFERENCES

Acemoglu, D. & D. Autor. (2011). Skils, Tasks and Technologies: Implications for employment and aernings. *Handbook of Labor Economics*, 4, 1043-1171. DOI: 10.3386/w16082

Badan Pusat Statistik Provinsi DKI Jakarta. (2000-2018). Provinsi DKI Jakarta Dalam Angka. Jakarta. BPS.

Badan Kependudukan Keluarga Berencana Nasional (BKKBN). 2010. Ledakan Penduduk Mengancam Dunia. Jakarta: BKKBN.

Brunow, S., & Hirte, G. (2009). The age Pattern of Human Capital and Regional Productivity: A Spatial Econometric Study on German Regions. *Papers in Regional Science*, 88(4): 799–823

Cohen, D. & Soto, M. (2007). Growth and Human Capital: Good Data, Good Results. *Journal of Economic Growth*, 12, 51–76. DOI 10.1007/s10887-007-9011-5

Fleisher, Belton. Li, Haizheng, and Zhao, Min Qiang.(2010). Human Capital, Economic Growth, and Regional Inequality in China. *Journal of Development Economics*, 92(2): 215-231.

Fu, S. (2007). Smart Café Cities: Testing Human Capital Externalities in the Boston Metropolitan Area. *Journal of Urban Economics*, 61(1): 86–111. DOI: 10.1016/j.jue.2006.06.002

Hugo, G. (1993). Indonesian Labour Migration to Malaysia: Trends and Policy Implications. *Southeast Asian Journal of Social Science*, 21 (1): 36-70

Kelley, Allen and Robert M. Schmidt. 1995. Aggregate Population and Economic Growth: The Role of the Components of Demographic Change*, Journal of Demography*, 32(4): 543-551. DOI: 10.2307/2061674

Lucas, R.E. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics.* 22, 3-42. DOI: 10.1016/0304-3932(88)90168-7

Mathur , Vijay K. (1999). Human Capital-Based Strategy for Regional Economic Development. Economic Development Quarterly, 13(3): 203-216. DOI:10.1177/089124249901300301

Moretti, E. (2004). Workers' Education, Spillovers, and Productivity: Evidence from Plant-Level Production Functions. *American Economic Review*, 94(3): 656–690. DOI: 10.1257/0002828041464623

Ramos, Raul and Suriñach, Jordi and Artís, Manuel,. (2010). Human Capital Spillovers, Productivity and Regional Convergence in Spain, *Paper in Regional Scince,* 89(2): 435-447. DOI: 10.2139/ssrn.1825009

Ranis, Gustav. (2000). Economic Growth and Human Development. *Jurnal World Development*, 28 (2): 197-219.

Rauch, James E. (1993). Productivity Gains from Geographic Concentration of Human Capital: Evidence from the Cities. *Journal of Urban Economics*, 34(1): 380–400.

Reza, Faizal. And Widodo, T. (2013). The Impact Of Education On Economic Growth In Indonesia. *Journal of Indonesian Economy and Business*, 28(1): 23 – 44.

Romer, P.M., (1990). Human Capital And Growth: Theory and Evidence. *Carnegie-Rochester Conference Series on Public Policy*, 32, 251–286. DOI: 10.3386/w3905

Rosenthal, S, S., & Strange W, C., (2008).Attenuation of Human Capital Spillovers, *Journal of Urban Economics* 64, 373–389. DOI: 10.1016/j.jue.02.006

Solow, R.M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, 70 (1): 65-94.

Swan, T. W. (1956). Economic Growth and Capital Accumulation. *Ecinomic Record* 32(2): 334-361. DOI: 10.1111/j.1475-4932.1956.tb00434.x

Todaro, Michael P. and Smith, Stephen C. 2011. *Economic Development*. Eleventh Edition. United States: Addison Wesley.

Xiao, Zhen and Song, Fen, (2013). Impact of Human Capital on Economic Growth Based on Spatial Economic Perspective. *Information Technology Journal*, 12: 2002-2008. DOI: 10.3923/itj.2013.2002.2008