EDUCATION AND REGIONAL ECONOMIC GROWTH IN CENTRAL JAVA

Jamzani Sodik
UPN "Veteran" Yogyakarta
e-mail: jamzanis_edu@yahoo.com

Didi Nuryadin
UPN "Veteran" Yogyakarta

Abstract

There has been a long debate on the relationship betwen investment on human resources and economic growth. This paper examines the affect of investment and three level of education, namely elementary school, junior high school, and senior high school, on regional economic growth in Central Java. It estimates a General Least Square on a pool data of 35 districts from 2004 to 2008. The results suggest that regional economic growth is influenced by investments and the growth of junior high school attainment. However the growth of senior high school attainment and growth of elementary school attainment do not affect regional economic growth.

Keywords: Investment, education, regional economic growth, panel data
JEL classification numbers: O15, O43

Abstrak

Diskusi tentang hubungan antara investasi dalam sumber daya manusia dan pertumbuhan ekonomi telah lama berlangsung. Makalah ini membahas pengaruh investasi dan tiga tingkat pendidikan, yaitu Sekolah Dasar, Sekolah Menengah Pertama, dan Sekolah Menengah Atas, terhadap pertumbuhan ekonomi regional di Jawa Tengah. Penelitian ini menggunakan teknik *Ordinary Least Square* pada data panel atas 35 pemerintah daerah dari 2004 sampai 2008. Hasil penelitian menunjukkan bahwa pertumbuhan ekonomi regional dipengaruhi oleh investasi dan pertumbuhan lulusan Sekolah Menengah Pertama. Namun pertumbuhan lulusan Sekolah Menengah Atas dan pertumbuhan lulusan Sekolah Dasar tidak mempengaruhi pertumbuhan ekonomi regional.

Keywords: Investasi, pendidikan, pertumbuhan ekonomi regional, data panel
JEL classification numbers: O15, O43

INTRODUCTION

Human resources is one of the factors of production, along with natural resources, capital, and entrepreneur. The higher the quality of human resources, the higher the efficiency and productivity of the country will be. Countries paying more attention on human dimension on their economic development have been successful in their economic development despite the limited natural resources. The emphasis on investment in human resources is the basis for the increase in total productivity of factors of production. Land, labour, and physical capital are subject to diminishing returns, but science does not.

Solow (1956) emphasized on the role of science and human capital investment in spurring economic growth, which inspired the development of a new theory of economic growth known as the New Growth Theory (see also Tilaar, 2000).

Some arguments for the importance of education are as follows. First, education increases knowledge and rationality of society. Second, education allows people to learn technical knowledge to lead and run modern corporations. Third, knowledge stimulates reforms in the fields of engineering, economics and various other aspects of community life.

Thus, level of education can ensure the continuous improvement in technology used by the society. Based on the aforementioned issues, this paper analyzes investment in human resources through education. In this globalization era, human resource development is a decisive victory in international competition, because the mastery of science and technology must be supported by qualified human resources.

Education as an element of human capital formation has attracted the attention of many economists, which then led to various models of economic growth that introduces education as one of the sources of economic growth. Belong to the group are Barro (2001); Mankiw et al. (1992); Barro and Lee (2001); and De La Fuente (2003).

In addition to its technical economic function, investment in education has many other functions, namely socio-humanitarian, political, cultural and educational functions. In its technical economic function, education is associated with economic growth (human capital theory). People who have higher education levels, measured by the length of time for the school, will have better jobs and higher wages compared to those whose education is lower. If wages reflect productivity, the more people who have higher education, the higher the productivity and national economic output (Tobing, 2005).

Investment on education in the social-humanitarian functions is associated with the contribution of education to human development and social relations in a variety of different social levels.

The government budget for education in Indonesia is relatively small compared with those of Southeast Asian countries. According to the World Bank (2004), the average percentage of government expenditure for education sector in Indonesia is 1.66% of GNP in the period 1970-1990, and 1.36% of GNP in 1991-2000. If the data is associated with quality of human resources as measured by the Human Development Index (HDI), then based on the HDR-UNDP in 2002, Indonesia was ranked 110 out of 177 countries. This indicates that the level of human development in Indonesia was at medium and low categories. The data in some other countries is available from the UNESCO Human Development Programme 2002, as shown in Table 1.

With this small budget on education, the chance is rather small for Indonesia to execute Resolution Millennium Development Goals (MDGs), as the agreement of 189 UN member states. One of the objectives to be achieved is the establishment of equitable distribution of basic education for allby 2015.

Table 1: Percentage of Government Spending on Education of the GNP

No	Countries	Year	
		1985-1987	1995-1997
1.	Hong Kong	2.5	2.9
2.	Singapore	3.9	3.0
3.	Korea	3.8	3.7
4.	Malaysia	6.9	4.9
5.	Thailand	3.4	4.8
6.	Philippines	2.1	3.4
7.	Indonesia	0.9	1.4

Source: HDR-UNESCO 2002.

Another important issue is the necessity of national consensus about education policy development. To achieve this, the government should be more transparent and efficient in spending the available budget, and avoid the education gap between regions. These issues occur at both the national and local

Based on Indonesia Central Bureau of Statistics data until 2004, the population of Indonesia categorized as illiterate aged 15 and over is 15.4 million people, in which 81.26 percent are spread across nine provinces, namely East Java (29.32 percent), Central Java (21.39 percent), West Java (10.66 percent), South Sulawesi (6.07 percent), West Nusa Tenggara (4.29 percent), East Nusa Tenggara (2.51 percent), Papua (2.49 percent), Banten (2.41 percent), and West Kalimantan (2.13 percent).

In Central Java Province, a major human resource issue is the low quality of labour, measured from the low percentage of workers who have completed formal education. Data in 2009 showed that residents who complete primary, junior high, and senior high schools are 64.37%, 16.58%, and 19.05%, respectively (*Jawa Tengah dalam Angka*). As a result, the workers are incapable of understanding the rules, rights and obligations as workers. Associated with finding jobs in overseas, these will lead some of them to work as illegal workers. Furthermore, as they do not have complete information, they can't find jobs they want. At the end, this will of cause the weak competitiveness of Indonesian Workers as compared with labour from other countries.

This study analyzed the influence of the quality of workers' education to economic growth in the regional city of Magelang. This study also conducted a comparative study with districts in Central Java Province.

Solow neoclassical growth model is a pillar of the neoclassical growth theories. This model is the development of Harrod-Domar formulation by adding manpower and technological factors. This theory states that output growth is always sourced from the increase in the quantity and quality of labour through population growth and education, additional capital through savings and investment, and technological improvements (further review of Solo growth model can be find in Hansen and Prescott, 2002)

Based on the aforementioned New Growth Theory, the growth of junior and senior high school graduates is expected to improve the quality of human capital stock which would then be corre lated positively to economic growth. But the growth of secondary education graduates is volatile and has a negative trend.

This is an important issue since the junior and senior high schools are critical to (1) develop human capital and boost the opportunity to enter job markets, and (2) supply of higher education that became a symbol of quality in the formation of human resources. Failure in providing qualified junior high school graduates will be a failure the formation of human capital and the provision of qualified workers in the future (Fatah, 2005).

Several researchers have investigated the relationship between economic growth with human capital. Birdsal and Sabot (1992) showed a significant relationship between the growth in human capital that includes investments in education, with economic growth and equity.

Azariadis and Drazen (1990) found that the quality of human resources is a necessary but not sufficient condition to guarantee the creation of high and sustainable economic growth. To create a positive externality from the quality human resources, the education must reach the threshold (critical mass). He also found that the growth response to the quality of human resources often requires a fairly long grace period.

Barro (2001) found the following results. First, economic growth has a significant and positive correlation to the initial human capital. Second, the ratio of government consumption (excluding expenditures for education) is negatively correlated to *GDP*. Third, the ratio of investment to *GDP* is positively correlated to GDP Fourth, political instability and mar-

ket distortions are negatively correlated to economic growth.

Rappaport (1999) examines inter-regional economic growth in the United States using panel data, employing a variety of local attributes of the United States from 1970-1990, and suggesting four facts. First, in the year 1970-1990, local economic growth is negatively correlated with government finances. Second, local economic growth is positively correlated with local government spending for primary and secondary education. Third, economic growth in 1970-1990 is negatively correlated with local personal income tax. Four, regional economic growth is negatively correlated with certain sales taxes are taken by local governments.

Several studies with similar results are as follows. Mankiw et al. (1992) analyze cross section data from various countries are obtained from the UNESCO Yearbook. Ranis et al. (2000) investigated the relationship between economic growth and human development in the form of the relationship of two chains. Bayhaqi (2000) used three model formulations that show total factor production (TFP) growth in Indonesia during the years 1969-1998.

Studies conducted in other developing countries such as China (see Lin, 2003) and Brazil (see Lau et al., 1993) also showed a positive and significant relationship between the level of public education and economic growth (World Development Report, 1996).

Gupta (1999) investigated the relationship between spending on education and literacy rate in a simultaneous model. The higher the spending on education, the more demand for services related to education. Thus, there is a reciprocal relationship between literacy and education expenditure as a percentage of *GNP*. Other variables that affect the level of literacy is the *GNP* per capita and the enrolment ratio. The same is true for education spending that is affected by health expenditures, because the variable is a component of health education and social security that cannot be separated. The use of OLS in the study provides bias and inconsistent results, so he uses two-stage OLS (TSLS). He uses data from the WDR 1980 and 1975 in 151 countries that have low income, medium and high.

Meier and Rauch (2000) found that education, or human capital in a broader term, can contribute to development, because education is essentially a form of savings. These savings could increase human capital accumulation and growth in aggregate output, if human capital is considered as one of the inputs in aggregate production function.

Sylwester (2002), using a cross section data from several countries, investigating the influence of human resource education on income distribution, as measured by the Gini index, in a given country. He found that countries that give more attention to education as a share of *GDP* have lower levels of inequality.

Wang and Yao (2003) examine China's economic growth by dividing the study period into two periods, namely before the reform (before 1978) and after the reform (from 1978 to 2000). They found that the accumulation of human capital has been growing very rapidly and that it has significantly contributed to economic growth and welfare. They also found that by incorporating human capital into the model, the growth of total factor production (*TFP*) is still positively contributing to *GDP* growth in the reform period, and negatively contribute before the reform. This indicates a tremendous change in the variable labour as part of *GDP*.

Lin (2003) estimates the impact of education and the role of technical progress to economic growth in Taiwan from 1965 to 2000. She found that education has a positive and significant effect on growth, but not the technical progress. She sug-

gested that the addition of 1% on education increases real output by 0.15%.

Andrianus (2003) estimates a regression model using TSLS technique and found that levels of literacy, which indicates the quality of human resources, providing a positive influence on economic growth. He also found that labour also influences economic growth. Using the ECM analysis, he found that the quality of human resources provide a positive influence on economic growth.

Hari (2004) examined the effect of government spending on public goods in the form of health facilities and education to economic growth in 14 states in India during 1970 to 2000. He found that the bigger the government spending, the higher the economic growth. Health facilities and education are important factors to improve the quality of human resources, while the quality of resources is an important factor in increasing economic growth.

Facts about Indonesia have been investigated by Garcia and Soelistianingsih (1988). They estimate the effect of human capital variables, measured by share of population aged 10 years and over who completed basic and medium level of education, to economic growth and income distribution. They found that investment in education and health are important factors for increasing economic growth and reduce regional income inequality.

Wibisono (2001) uses attainment education, life expectancy, fertility rates, infant mortality, the rate of inflation and also regional as dummy variable, to explain the behaviour of regional economic growth. He found that education, life expectancy, and infant mortality rate has a positive effect on growth.

Both studies proved that human capital in the form of education and health has an important contribution to economic growth and has a role in accelerating the process of equitable distribution of income between provinces.

Fatah (2005) investigated the effect of growth on education towards economic growth rates across regions in Indonesia. He found that the TS and elementary school did not affect significantly. He also found that the junior high school, senior high school, and universities PT have a significant influence.

Atmanti (2005) suggests that the goal of education is more than simply preparing productive workers. She stated the importance of using the approach of humanism, which requires the educational process as a total process to develop the whole person. Dual role of education should be emphasized and applied. First, it serves to foster humanity education (human being). This means that education is ultimately intended to develop the whole person, including the preparation of human beings as members of the community, good citizenship and a sense of unity (cohesiveness). Second, education should increase human resources functions, namely to develop the ability to enter such a competitive era of new life and employability (Tilaar, 2000).

Given the central role of education, investment in human capital through education in developing countries is indispensable. However, it should be remembered that these are long-term investment, so that new benefits can be felt after a long period. Another issue is that the government only have limited budget, so it must choose the right investments, namely investments which in the long run could push the pace of economic growth, namely investment in human capital to enhance creativity, productivity and competitive spirit in the community.

METHODS

The research was conducted in the districts in Central Java Province in the period of 2004-2008, using secondary data in the form of time series data for seven years (2004-2008) and a cross section covering

35 districts. Such data include local GDP growth, investment growth, and growth of primary, junior high, and senior high school graduates. The sources of data in this study are the official government institutions, namely the Department of Education, Central Java in the figure (2004-2008) and Indonesia Central Bureau of Statistics-Central Java.

To determine the effect of education on economic growth in Magelang and other districts in Central Java Province, the paper uses Human Capital Model which can be formulated as follows: (Fatah, 2005)

$$Y(t) = K(t)^{\alpha} E(t)^{\beta} \left[A(t)L(t)\right]^{1-\alpha-\beta} \quad (1)$$

Dividing (1) with AL, we get the equation in the form of average per effective labour as follows

$$y(t) = k(t)^{\alpha} e(t)^{\beta} \quad (2)$$

where

$y(t) = \frac{Y}{AL}$;

$k(t) = \frac{K}{AL}$; and

$e(t) = \frac{E}{AL}$.

Following the Sources of Growth Model, Equation (2) can be represented as a production function as follows:

$$y = f(k, e, t) \quad (3)$$

where *y* is regional *GDP*, *k* is capital, *e* is education, and *t* is time which shows technological change in its relationship with production function which changes through time.

Differentiation of (3) with respect to *t* resulted in the following equation.

$$\frac{dy}{dt} = \left(\frac{\partial f}{\partial k}.\frac{dk}{dt}\right) + \left(\frac{\partial f}{\partial e}.\frac{de}{dt}\right) + \left(\frac{\partial f}{\partial t}.\frac{dt}{dt}\right) \quad (4)$$

Dividing equation (4) with *y* and inserting *k* and *e*, we get:

$$\frac{1}{y}.\frac{dy}{dt} = \frac{1}{y}.\left(\frac{\partial f}{\partial k}.\frac{dk}{dt}.k.\frac{1}{k} + \frac{\partial f}{\partial e}.\frac{de}{dt}.e.\frac{1}{l} + \frac{df}{\partial t}\right) \quad (5)$$

Equation (5) can be reformualted as follows:

$$\frac{dy/dt}{y} = \frac{(\partial f/\partial k)k}{y}.\frac{(dk/dt)}{k} + \frac{(\partial f/\partial e)e}{y}.\frac{de/dt}{e} + \frac{\partial f/dt}{y} \quad (6)$$

where:

$\frac{dy/dt}{y}$ is growth in regional *GDP*

$\frac{dk/dt}{k}$ is capital growth

$\frac{de/dt}{e}$ is growth in education

$\frac{(\partial f/\partial k)k}{y}$ is elasticity of regional *GDP* t capital

$\frac{(\partial f/\partial e)e}{y}$ is elasticity of regional *GDP* to education

$\frac{(\partial f/\partial t)}{y}$ is the change in output not caused by changes in capital and education.

Based on equation (6), we can infer the relationship between capital, education, and regional *GDP*. The model can also be expressed in the formulation as follows:

$$g_Y = \alpha_0 + \alpha_1 g_K + \alpha_2 g_e \quad (7)$$

where

$g_y = \frac{dy/dt}{y}$ is growth in regional *GDP*

$g_k = \frac{dk/dt}{k}$ is capital growth

$g_e = \frac{de/dt}{e}$ is growth in education

$\alpha_2 = \frac{(\partial f/\partial t)}{y}$ is change in output not caused by changes in capital and education.

$\alpha_1 = \frac{(\partial f/\partial k)k}{y}$ is elasticity of *PDRB* to capital

$\alpha_2 = \frac{(\partial f/\partial e)e}{y}$ is elasticity of *PDRB* to education.

Similar to Barro and Lee (2001), we also investigate three level of education, namely elementary, junior high, and senior high schools. Equation (7) can be rearranged as:

$$gy = \alpha_0 + \alpha_1 gk + \sum_{e=2}^{3} \alpha_e g_e \quad (8)$$

The final model is formulated as:

$$gy_{it} = \alpha_0 + \alpha_1 ginvest_{it} + \sum_{e=2}^{3} \alpha_e geduc_{it} + \varepsilon_{it} \quad (9)$$
$$\alpha_1 = 0; \alpha_2 = 0; \alpha_3 = 0; \alpha_4 = 0$$

where: *gy* is regional GDP growth, *ginvest* is investment growth, *geduc* is growth in education where 1, 2, and 3 represent growth of elementary, junior high, and senior high school, respectively, α_j is parameter (j = 1...5), i is region (i = 1...35), t is year (t = 2002-2008), and ε is error term.

This paper analyzes the data pool of 35 districts in Central Java Province, from 2004 to 2008. Pool data allows having grater degree of freedom and less probability of collinearity between independent variables. In addition, it is also possible to estimate of each individual characteristic according to time separately. Thus, analysis of the estimation results will be more comprehensive and include things that are closer to reality (see, Hsio, 1995).

In the classical linear regression model, error terms are always assumed to be homoscedastic and serially uncorrelated to get ordinary least squares estimates that are best linear unbiased (BLUE). However, these assumptions cannot be applied to panel data, since panel data are composed of several individuals for some period, brought new problems in the nature of the disorder. These problems arise because of the disturbances are now of three kinds, namely the disturbance across time, across individuals, and the combination of both.

If all individual disturbances (μ_i), time disturbance (λ_t) and random noise are combined and follow the assumption of random noise, which is normally identically and independently distributed (normally *iid*), then the use of generalized least squares (GLS) method will yield BLUE estimators that satisfy the properties. This method, in other words, states that the disturbance follows the normal distribution, with a mean (expected value) of zero, as the assumption held in the classical linear regression model equation. This method is known as the Random Effect Model, or also called the Error Components Model.

However, if the disturbance does not follow the assumption of random noise as in the classical linear regression model equation, then the use of OLS and GLS will not give BLUE. In this way, the disturbance component of disturbance over time and disturbance across individual components will be incorporated in the intercept of the model. This method is known as the Fixed Effect Model or Dummy Variable Model. This estimation method provides efficient estimator by applying the estimation process to the data of deviation from the time-series mean, the across individual mean, and mean from both. To choose be-

tween both models, we can use the Hausmann test (Sitanggang and Nachrowi, 2004).

Hausmann Test Specification

The main assumption in a regression model is $E(u_{it}/X_{it})=0$. This is important because the disturbance contains invariant individual effects (μ_i) that are unob-served basis and may be correlated with X_{it}. For example, in an equation, μ_i ma be notated unobservable on an individual basis and may be correlated with a number of variables on the right side of the equation. In this case, $E(u_{it}/X_{it})\neq 0$ and the GLS estimator $(\hat{\beta}_{GLS})$ will be biased and inconsistent β. However, by transforming μ_i and then ignore it, the within estimator $(\hat{\beta}_{Within})$ will be unbiased and consistent with β. Hausmann (1978) suggests to compare $\hat{\beta}_{GLS}$ with $\hat{\beta}_{Within}$, where both are consistent with the null hypothesis of $H_0: E(u_{it}/X_{it})=0$, but certainly with a different probability limit. In reality, $\hat{\beta}_{Within}$ will be consistent regardless of H_0 to be correct or incorrect, whereas $\hat{\beta}_{GLS}$ will be BLUE, consistent and asymptotic on H_0, but it would not be consistent when H_0 it is not true. The statistical test will be based on $\tilde{q}_1=\hat{\beta}_{GLS}-\tilde{\beta}_{Within}$, with H_0, $p\lim \tilde{q}_1=0$, and $\text{cov}(\hat{q}_1,\hat{\beta}_{GLS})=0$.

Considering the fact that $\hat{\beta}_{GLS}-\beta=(X'\Omega^{-1}X)^{-1}X'\Omega^{-1}u$ and also the fact that $\tilde{\beta}_{Within}-\beta=(X'QX)^{-1}X'Qu$ will get $E(\hat{q}_1)=0$, therefore:

$$\begin{aligned}\text{cov}(\hat{\beta}_{GLS},\hat{q}_1)&=\text{var}(\hat{\beta}_{GLS})-\text{cov}(\hat{\beta}_{GLS},\tilde{\beta}_{Within})\\&=(X'\Omega^{-1}X)^{-1}-(X'\Omega^{-1}X)^{-1}X\Omega^{-1}E(uu')QX(X'QX)^{-1}\\&=(X'\Omega^{-1}X)^{-1}-(X'\Omega^{-1}X)^{-1}=0\end{aligned}\quad(10)$$

Moreover, if $\tilde{\beta}_{Within}=\hat{\beta}_{GLS}-\hat{q}_1$, we will get $\text{var}(\tilde{\beta}_{Within})=\text{var}(\hat{\beta}_{GLS})+\text{var}(\hat{q}_1)$. Since $\text{cov}(\hat{\beta}_{GLS},\hat{q}_1)=0$, so;

$$\begin{aligned}\text{var}(\hat{q}1)&=\text{var}(\tilde{\beta}_{Within})-\text{var}(\hat{\beta}_{GLS})\\&=\sigma_v^2(X'QX)^{-1}-(X'\Omega^{-1}X)^{-1}\end{aligned}\quad(11)$$

Therefore, the Hausmann test statistic is:

$$m_1=\hat{q}_1'\left[\text{var}(\hat{q}_1\right]^{-1}\hat{q}_1 \quad(12)$$

Where H_0 is asymptotic and is distributed as χ_K^2 where K is the order of slope vector β. To fulfil the operational technique, Ω will be replaced by the consistent estimator $\hat{\Omega}$, so that GLS is possible to be conducted. The rejection to the Hausmann statistic means that rejection to the fixed effect model or the dummy variable model. Therefore, higher statistic value of Hausmann tends to the non-rejection of error components model.

RESULTS DISCUSSION

Based on the Hausmann test, we obtain the following results.

Table 1: Hausmann Test Results

Year	χ^2 statistic	χ^2 critical
2004-2008	0.141310*	9.48773

Notes: Entries in * is significant at 5%.
Sources: Data estimation.

Hausmann test result in Table 1 indicates that the chi square test statistic is smaller than its critical value, so that H_0 is not rejected. Thus, the random effects approach

is better than the fixed effect approach. In other words, the disruption occurred following the normal distribution, with a mean (expected value) of zero.

Table 2: Estimation Results on Random Effect Method

Variable	1993-2004
Investment (*ginvest*)	0.014090*
	(0.161356)
Elementary school (*gsd*)	-0.062924
	(-0.180748)
Junior high school (*gsmp*)	0.001337**
	(0.007593)
Senior high school (*gsma*)	-0.012021
	(-0.142297)
F-statistic	70.24564
R^2 statistic	0.877876

Notes: * and ** indicates significant at 10% and 5% level, respectively.
Source: Data estimation.

The results o the growth model estimation with panel data regression showed that the growth of investment and the growth of education have positive and significant impacts on economic growth. This result tallied with the results of various previous studies.

Estimates also show that in the period 2004-2008, investment growth has a positive and significant impact on economic growth in various regions in Central Java, although with a small coefficient estimate (0.01) and the 10% significance level. Thus, for about 5 years of development, investment growth showed a positive influence on regional economic growth in the Regency / City in Central Java.

These results are in accordance study conducted by Sodik and Nuryadin (2005), in which investment affect economic growth. A small coefficient values indicate that the area has not provided a conducive climate for investors. The results are consistent with previous studies that the implementation of regional autonomy since 2001 has worsened the investment climate in Indonesia. The low public services, lack of legal certainty and various local regulations that are not "pro-business" is identified as evidence that is not conducive business climate. The main reason is the low investment in Indonesia macroeconomic instability, policy uncertainty, corruption (by governments and central government) licensing, and regulation of labour markets (World Bank, 2004).

This is in line with the Neoclassical economic growth theory, especially the economic growth model of Solow (1956) where growth in investment will increase the capital stock, increase the stock of capital equipment and technology, and eventually increase the ability to increase production and national income.

Kuncoro (2004) shows the existence of the bribery in the form of extortion, tributes and extra costs to be incurred by the company in various activities.

These results are also consistent with some empirical research on the relationship between investment and economic growth carried out by Borensztein, De Gregorio, and Lee (2000), Carkovic and Levine (2000), Kustituanto and Istikomah (1999), Suryati (2000), Almasaied et al. (2003), and Effendi and Soemantri (2003)

Estimation results also show that the growth of education attained by workers has a positive and significant impact on economic growth, except for the growth of elementary school and senior high school. This is in accordance with the New Growth Theory in which the growth of education level will increase the productivity of physical capital and labour which would then be correlated positively to economic growth. An increase in the growth of education level is closely related to the level of mastery of technology development, which ultimately improves the ability to produce and national income.

These results are also consistent with empirical studies on the relationship between educational level and economic growth made by Garcia and Soelistianing-

sih (1988), Meier and Rauch (2000), Wibisono (2001), Sylwester (2002), Andrianus (2003), Day (2003), and Atmanti (2005)

Estimation results also show that in the period 2004-2008, the growth of primary school graduates have did not significantly influence economic growth in Central Java. These results indicate that basic education has not been able to improve the quality of human resources. Primary education is essentially an implementation of the World Declaration on Education for All at the same time also the implementation of national development objectives. Nevertheless, basic education must still be improved since primary school education is a basic requirement necessary to be able to continue to junior high and high school, primary school graduates and demand for various occupations.

Estimates also show that in the period 2004-2008, the growth of junior high school graduates has a positive and significant impact on economic growth with an estimated coefficient of 0.001337 at a significance level of 5%. These results are consistent with research Situmorang (2007) who suggested that the number of educated middle-productive labour has a positive effect on the increase in GDP in Indonesia, although with a small coefficient value. Meanwhile, estimates show that in the period 2004-2008, the growth of high school graduates has no significant effect on economic growth in Central Java Province.

CONCLUSION

This paper examines the affect of investment and three level of education (elementary school, junior high school, and senior high school) on regional economic growth in Central Java. The estimated growth models with panel data regression methods showed that the growth of investment and growth in education has a positive and significant effect on economic growth. The estimation results indicate that the growth of education attained in a positive and significant impact on economic growth, except for variable growth SD, and graduated from high school graduates growth.

To further increase investment in these areas, there needs to be a coordination of legislation both at the vertical (between central and district governments) and at the horizontal level (between departments and other related bodies). Therefore, boosting investment in education, research and development was inevitable, both by governments and private citizens.

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