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Abstract

The achievement of an education program can be measured from the results of national examination that is the average of national exam score. In Indonesia, it is measured through the average *nilai evaluasi belajar tahap akhir* (EBTANAS) *nasional* (national exam score)/NEM. The results of national examination are expected to be the portrait of the success of government program in education. This study aims to investigate the economic and development determinants of NEM in Indonesia. The data used came from the INDODAPOER of the World Bank that covered 440 districts with complete data in 2009. The dependent variables are the average of NEM at primary, junior secondary, and senior secondary level. The independent variables are the economic and development variables: education function expenditure and household access to electricity. The data was analyzed using the multivariate multiple regression. The results of the study show that education function expenditure and household access to electricity statistically have significant effect on education achievement. Better achievement in education is associated with higher education function expenditure and household access to electricity.

Keywords: education, average national exam score, economic determinant, multivariate multiple regression, Indonesia.

JEL Code: A13, A21, dan C15

1. Introduction

During the 1965–1990 period, the world was stunned by the growth of eight Asian economies: Japan, Hong Kong, Korea, Taiwan, Singapore, Indonesia, Thailand, and Malaysia (Ray, 1998, pp. 119), which then called as the East Asian Miracle. The economy of these eight countries grew faster than the economy of other regions in the world (Young, 1995; World Bank, 1993). Significant achievement in education program has been attributed to this achievement.

The importance of education in development has been addressed (Nafziger, 2006; Rothstein, 2000; Krueger and Lindahl, 2001). Education helps an individual to meet his/her needs and to apply his/her capability and talents. Education also enhances productivity, improves health and nutrition, and limits family sizes. On the other hand, education facilities, including school, provides specific knowledge, develop skills, in particular general cognitive skills, that cause changes in values and increase in acceptance toward new ideas, and transforms attitude about work world and society. In addition, education has been found to be related to poverty alleviation and improvement in income.

Education is a basic human right (UNICEF, 2007). The Law of the Republic of Indonesia No. 20 in 2003, Chapter IV, Article 5, stipulates that each Indonesia's citizen has the same right to obtain quality education. In addition, Article 6(1) instructs that every Indonesia's citizen age 7–12 is obliged to participate in primary education.

Education has been a main focus of governments for centuries. It was started from the empire period and feudal era where education emerged to build the European Renaissance to human rights revival during industrial era. Education has been proven to be an approach to enhance the overall quality of a society.

In the third world context, the governments work hard to develop education centers from the lowest to the highest level to ensure the availability of a mechanism that makes their people capable intellectually, so that they can contribute to the national economy (Hardcastel, 2010). A number of countries, such as Mexico, India, Brazil, Egypt, South Africa, Malaysia, and Thailand, has had a good education system that contributes significantly in the improvement of their people's welfare (Hardcastle, 2010; Anastacia, 2011).

There is a strong relationship between education and poverty alleviation. An educated person has a potency to earn higher income and is more likely to have better life quality. Someone with at least basic education is more likely to receive social services and participates in local and national government through election and involvement in community (Asian Development Bank, 2010). Education helps people to be more proactive, empowered to control their lives and to obtain broader choosing rights in life. Education is enabling and developing students into learning process.

A study by Börkan and Bakış (2016) in Turkey found that socio deand mographic characteristics of students and parents' mean years of schooling and income had significant effects on exam score. Full day education and living in urban areas were also found to be associated with higher student's exam score. The same results were also found by Coleman et al. (1996).

Other determinants of school achievement were also found. A study in Bangladesh found that socioeconomic characteristics and school-related factors influenced primary school achievement. These include the age, sex, and place of residence of students, parents' education, and household economy. Meanwhile, school-related factors include teacher's education, training, and experience, and class size (Ranjan, 2012; Afifi et al., 2004).

How is education achievement measured? Indonesia measures education achievement at primary level (*Sekolah Dasar*/SD), junior secondary level (*Sekolah Menengah Pertama*/SMP), and senior secondary level (*Sekolah Menengah Atas*/SMA) (Government Regulation No. 19 in 2005, Article 68). The result of measurement is called *Nilai Ujian Nasional* (national exam score/NUN). Before 2003 it was called *Nilai* EBTANAS *Murni*/NEM. NUN is the score achieved in national exam conducted by the Government nationally at SD, SMP, and SMA level. This system was first introduced by the Minister of Education and Culture at that time, Prof. Dr. Nugroho Notosusanto. The objective of the national examination is to assess the competency of graduates at each level nationally. The national exam is implemented for certain subjects of Sciences and Technology.

The World Bank and International Energy Agency (2013) reported that more than half of primary schools in Africa were lack of electricity. 90 million of primary school students in Sub-Saharan Africa, 94 million primary school students in South Asia, and four million primary school students in Latin America went to school without electricity. In addition, 90% of students in Sub-Saharan Africa went to schools that lack of electricity. Lack of electricity might have been a factor of lower education achievement in these regions compared to in other regions.

Kagawa and Nakata (2008) found that lighting enables learning activity conducted early in the morning or late at night. Access to electricity facilitates information and communication technologies (ICTs) introduction in class, such as computer and television. Schools with electricity enable the principals to recruit and retain quality teachers and have been proven positively correlated with the improvement in exam score and graduation levels. Electricity makes education and communication access and opportunities to those with low income. A major impact of electrification is illiteracy rate reduction and education quality improvement (Kagawa, 2009). The provision of electricity has a positive impact on education achievement improvement of young generation.

Lee and Barro (2001) using data from the International Association for the Evaluation of Educational Achievement (IEA) and International Assessment of Educational Progress (IAEP) found that school resources were related to student's score. Among school resources was student-teacher ratio that was negatively related with student's score, and teacher's income, expenditure per pupil, and length of years of schooling that were positively related with student's score (Gaudet, 1994).

What are other factors of education achievement in Indonesia, besides socioeconomic and demographic factors? Do education expenditure and access to electricity influence education achievement in Indonesia? This study aims to analyze the association between education expenditure and access to electricity on education achievement in Indonesia.

2. Research methods

The data in this study came from the Indonesia Database for Policy and Economic Research (INDODAPOER) of the World Bank. The data was accessed on June 14, 2019. The unit of analysis is 440 districts in Indonesia with complete data in 2009.

Three dependent variables were used in this study: the average NEM at SD, SMP, and SMA level. The independent variables are education function expenditure (million rupiah) and household access to electricity (percentage of total households). STATA 15.0 was employed in data processing.

The data was analyzed using the multivariate multiple regression (MMR). MMR was used to model linear relationship between a set of dependent variables and a set of independent variables (Dattalo, 2013). The multivariate multiple linear data is presented in Table 1.

The regression for the i-th observation from a data set can be modeled. The response for the i-th trial, y_i, can be written as a linear combination of predictor variables z_{i1}, z_{i2}, ..., z_{ir} with a constant β_0, and a random error term ε_i. The model is as follows.

$$y_i = [\beta_0 + \beta_1 z_{i1} + \beta_2 z_{i2} + \ldots + z_{ir}] + \varepsilon_i$$

or

$$y_i = \beta_0 + \sum_{j=1}^{r} \beta_j z_{ij} + \varepsilon_i$$

Table 1 Multivariate Multiple Linear Data

Observation, i	Response, y	Predictor, z_1	Predictor, z_2	···	Predictor, z_r
1	y_1	z_{11}	z_{12}	⋮	z_{1r}
2	y_2	z_{21}	z_{22}	⋮	z_{2r}
⋮	⋮	⋮	⋮	⋮	⋮
n	y_n	z_{n1}	z_{n2}	⋮	z_{nr}

3. Results

The summary statistics (number of observation, mean, standard deviation, minimum value, and maximum value) of variables in the study are presented in Table 2. It can be seen that the minimum average NEM for SD among districts in Indonesia was low. Meanwhile, the minimum average NEM for SMP and SMA was also not high, indicating low education achievement in some districts in Indonesia.

Table 2 Summary statistics of Variables

Variables	Obs.	Mean	Std. Dev	Min.	Max.
Average NEM: SD	440	64.25	7.39	39.50	83.37
Average NEM: SMP	440	71.59	4.58	60.01	83.84
Average NEM: SMA	440	70.99	4.59	59.54	81.79
Education function expenditure (million rupiah)	440	211,000.00	150,000.00	0.00	1,020,000.00
Household access to electricity: total (in % of total households)	440	84.71	19.57	0.42	100.00

Sources: World Bank 2019 (Author's calculation).

The results of MMR are presented in Table 3. It can be seen that both education function expenditure and access to electricity statistically have significant effects on education achievement at SD, SMP, and SMA level in Indonesia. On average, an increase in one million rupiah in education function expenditure will increase the average NEM at SD, SMP, and SMA level, respectively, 0.0000067, 0.00000246, and 0.00000442 points. Meanwhile, an increase in one percent of households with electricity, on average, will increase the average NEM at SD, SMP, and SMA level, respectively, 0.2119071, 0.09157390, and 0.11629000 points.

Table 3 Coefficient, standard error, and confidence interval of multivariate multiple regression of the determinants of the average NEM: Indonesia 2009

Covariates	Coefficient	Std. Err.	*t*	P>*t*	[95% Conf. Interval)	
Average NEM: SD						
Education function expenditure (million rupiah)	0.0000067	0.00000000	3.34	0.001	2.8E-12	1.1E-11
Household access to electricity: total (in % of total households)	0.2119071	0.01540560	13.76	0.000	1.8E-01	2.4E-01
Constant	44.8875700	1.22442400	36.66	0.000	4.2E+01	4.7E+01
Average NEM: SMP						
Education function expenditure (million rupiah)	0.00000246	0.00000000	1.7	0.090	-3.8E-13	5.3E-12

Household access to electricity: total (in % of total households)	0.09157390	0.01110630	8.25	0.000	7.0E-02	1.1E-01
Constant	63.31625000	0.88272160	71.73	0.000	6.2E+01	6.5E+01
Average NEM: SMA						
Education function expenditure (million rupiah)	0.00000442	0.00000000	3.36	0.001	1.8E-12	7.0E-12
Household access to electricity: total (in % of total households)	0.11629000	0.01012310	11.49	0.000	9.6E-02	1.4E-01
Constant	60.20369000	0.80457420	74.83	0.000	5.9E+01	6.2E+01

Source: World Bank 2019 (Author's calculation).

4. Discussion and Conclusions

The results of this study support findings from previous studies on the importance of economic and development factors on education achievement (e.g. Gaudet, 1994; Lee and Barro, 2001; Kagawa and Nakata 2008; Kagawa, 2009). Higher education function expenditure will enable district's governments to provide better education services, such as (i) quality teachers with better income and (ii) quality education facilities, such as quality school buildings and equipment including those that respond to Industrial Revolution 4.0, as well as art, culture, and sport facilities that are needed by the young generation to exert their wills to the full highest. These all will improve education achievement in a district. Meanwhile, household access to electricity will allow students to study at home optimally and to access additional education materials from other sources, such as from the Internet. This access will, in turn, certainly, improve education achievement.

Based on the findings from this study, in order to improve education achievement, it is therefore recommended that the district governments should increase the education function expenditure allocation and household access to electricity in their districts.

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