

Does the government expenditure on education and family income boost educational expansion? Lesson from panel FMOLS

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Abstract: *One of the problems of education development in Indonesia is the slow distribution of education, especially in the regions. Understanding the relationship between government spending on education and family income helps improve education equity in the region and formulate appropriate education policies. The study examines the effects of government expenditure in education, family income, poverty, and control variables on the primary, junior, senior secondary of net enrollment ratio and means years of schooling. This study utilized secondary data from regencies/municipalities in Banten Province over the period from 2000 to 2019. The panel FMOLS model found that family income contributed significantly to increasing the education expansion as measured by net enrollment rate in primary, junior, senior high schools and mean years of schooling for all models. Poverty only affected the net enrollment rate for junior high school, senior high school, and mean years of schooling in the long term. However, the findings regarding the impact of education spending on educational expansion are ambiguous. Furthermore, it depended on the method utilized. This research contributes to providing local government policy input to improve education services through increasing family income, reducing poverty, and providing educational opportunities for the school-age population to obtain equal education services.*

Keywords: educational expansion, government spending, mean years of school, school participation

JEL Codes: H76; I22; I25

1. Introduction

Educational expansion is one of the crucial issues widely studied by researchers in economics, education, and policymakers. It has also become an essential agenda in achieving sustainable development goals, especially the achievement of the population at the primary and secondary education levels by 2030 (United Nations, 2016). Moreover, educational expansion impacted society (C. Li, 2019), increased income, economic growth, and income inequality (Sabur et al., 2021; Wolhuter, 2019).

Many previous studies have focused on educational expansion (Hardy & Marcotte, 2020; Kuno et al., 2021; Takahashi, 2011; Truong et al., 2021; Valente, 2019) in the contexts of non-formal education participation (Ansong et al., 2018; Asadullah & Maliki, 2018; Dubois et al., 2012; Heymann et al., 2014; Ho et al., 2019). Expanding education is generally considered a major investment in human resources. One way

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of determining human resources produced by schooling is by measuring students' attendance in school, the net enrollment ratio, and the mean years of schooling (UNESCO-UIS, 2014).

The determinants of educational expansion include the government expenditure in regional education characteristics (Heymann et al., 2014), cash transfer, and region (Dubois et al., 2012; Muralidharan & Prakash, 2017). Other factors were age, household characteristics, and region (Asadullah & Maliki, 2018), infrastructure, number of classes, teachers, and residence (Ansong et al., 2018), academic and ethnic performance (Ho et al., 2019), family resources (Iddrisu et al., 2017a), environment and school characteristics (Takahashi, 2011). Furthermore, the authors combine variables formed by individual data into aggregate data from previous studies. The authors will examine government expenditure in education, family income, and poverty on educational expansion.

Concerning government expenditure in education, the previous study found a positive correlation between the increased allocation of government expenditure in education and educational expansion (Baldacci et al., 2004; del Granado et al., 2007). Meanwhile, Doriza et al. (2013) found that a specific fiscal instrument called the education special allocation fund (Indonesia, DAK) had a more significant impact than a general instrument. It had a relatively more tangible effect on reducing disparity in access to secondary education. Another study concluded that fiscal decentralization in the education sector significantly affected student attainment as measured by consistently rising figures (Salinas & Solé Ollé, 2009) and educational participation (Heymann et al., 2014; Listianawati, 2012).

However, not all research results on the correlation between government spending and the distribution of education are statistically significant. For example, (Harbison & Hanushek, 1992) found no significant correlation between government expenditure in education and educational performance. In addition, Anand & Ravallion (1993) showed that per capita government expenditure on education had contributed to the literacy rate in the country. However, government expenditure in education was ineffective in increasing educational attainment and gross enrollment rate (Singh & Shastri, 2020) and school dropouts (Rajkumar & Swaroop, 2008).

Family income has an essential role in improving children's education because families must allocate a portion of their income to finance their education. A common problem in developed countries (for example, Indonesia) is the low income received by their parents. As a result, the family has economic instability, which prevents children from completing higher education (Hardy & Marcotte, 2020). Furthermore, family income correlates significantly to the distribution of education because it is directly related to the number of school fees (Hübner, 2012; Suwandana, 2018). Other studies also conclude that family welfare significantly affects education participation (Iddrisu et al., 2017b; Tharmmapornphilas, 2013).

Conventionally, poverty means a lack of income. The measurement of poverty in various ways reaches the minimum calorie level consumption (Tilak, 2018). Poverty will fail to meet such basic needs as education, an issue related to equality and accessibility. The state, in this case, must provide a universal school system and finance it (Siddiqui, 2017). A previous study by Duarte et al. (2018) also concluded that reducing poverty between generations can be done through education. Also, previous studies showed that poverty significantly affected education participation rates (Khairunnisa et al., 2015; Rahmatin & Soejoto, 2017). However, other studies found that poverty did not correlate with school participation rates (Listianawati, 2012). Also, del Granado et al. (2007) demonstrated that poverty and working school-age children were obstacles to school participation.

This study re-examines previous research findings and incorporates the variable of poverty in the analysis model. It also contributes to the literature on the impact of poverty on educational expansion. In addition, to avoid potential bias in estimating the correlation between government expenditure on education, family income, and poverty it maintains cross-sectional interdependence and panel heterogeneity as essential issues.

Furthermore, the variables' stationarity is very important when dealing with long-term panels. This study examines the long-term relationship between government expenditure on education, family income, and poverty with the educational expansion at the regional macro level in Banten from 2000 – 2019 from 6 districts/cities. Then it tackles the problems of heterogeneity and serial correlation. It also assesses the differences in education expansion by area and gender. Previous research has not utilized the panel Fully Modified Least Square (FMOLS) model for this topic. It is crucial to do so as an effort to reduce the inconsistency of research results. The research findings accelerate the increase of education level and equitable access to educational institutions. The community has the same right to education provided by the government and the private.

2. Literature Review

The authors' idea of equity in education is that everyone is born equal and has the right to quality education, enabling them to develop and master the knowledge and essential skills to lead a fulfilling life. As long as one works hard, one has equal chances to succeed (Guo et al., 2019). Meanwhile, equity in education makes primary and higher education more accessible to all residents. The role of government through its regulations and budgeting is one of the factors in improving education because the government should provide educational services for the community through the allocation of the budget for the education sector. Government expenditure on education is a form of long-term investment. It is part of improving people's welfare and ultimately affects economic growth. In other words, the government creates demand for education through the availability of schools and additional educational assistance (Khairunnisa et al., 2015). Therefore, the proper allocation and distribution of the budget will impact social and economic development, especially the future development of the education sector (Yun & Yusoff, 2019).

Baldacci et al. (2004) found a positive correlation between increased allocation budget in health and education in 86 developing countries with increased education and health outcomes. Del Granado et al. (2007) notably revealed that government expenditure played a role in determining the educational expansion in Indonesia. A similar study in 38 countries by Maozhong & Hua (2011) showed that 11.46% of government investment/budget in the education sector significantly affected educational inequality. However, it had a relatively more tangible effect on reducing disparity in access to secondary education. Another study concluded that fiscal decentralization in the education sector significantly impacted educational participation (Megawati, 2020; Zhou et al., 2020) and student attainment (Salinas & Solé Ollé, 2009). In contrast, the study of Rajkumar & Swaroop (2008) found that the correlation between government expenditure in education and school dropouts was not significant. Finally, a recent study found that public spending on education did not influence educational attainment (Singh & Shastri, 2020).

Badan Pusat Statistik (2018) stated that family income is income received by the family measured by expenditure per month per capita. The total household expenditure per capita is the measurement of household income variable (Iddrisu et al., 2017b). Improved income received by a population reflects increased welfare. Therefore, the income received plays an essential role in encouraging people to improve their education. The study by Maurin (2002) showed that income had three times a stronger effect than gender on the probability of grade repetition in primary school. These results indeed confirm the previous basic statistical data.

A study in Indonesia conducted by Megawati (2020) found that the level of household welfare significantly affected student enrollment. Other research by Iddrisu et al. (2017a) strengthened previous research which supported that parental income played an important role in increasing educational expansion. The same result was reported by Linan & Chen (2009) on the importance of family income in influencing access to further education. The high income of parents meant greater parental participation in education to reduce dependence on a limited government budget. Parents have a responsibility for education in the

community. The involvement of parents is not only in the form of funding but also in collaborating with the government to improve education services for the community, especially those who cannot afford it.

The poverty experienced by students who are currently studying may lead to incomplete education, due to limited funds (Hardy & Marcotte, 2020). Meanwhile, Takahashi (2011) stated that certain geographical conditions might benefit poor households with more affordable education. His research shows that affluent homes could increase secondary school enrollment, especially with children from poor households. Other researchers conclude that the low welfare of the home economy influences the education level of women and men, and this situation certainly contributes to intergenerational poverty transfer (Duarte et al., 2018). An increase in poverty in one region will be followed by a decrease in school enrollment rates (Khairunnisa et al., 2015; Rahmatin & Soejoto, 2017). Suwandana (2018) also found that the percentage of poor people was correlated with equal distribution of education, although not very strongly. Not all studies confirmed that poverty reduction contributed to increased educational expansion. Some research reported contrary findings, in which an increase in poverty correlated to the rise in education participation rates (del Granado et al., 2007; Listianawati, 2012) and increase inequality in education (Khusaini et al., 2021).

3. Research Methodology

3.1 Data

The data in this study consist of various documents describing the senior high school net enrollment rate in Banten. We got the documents from governments' institutions in Banten Province, such as the Central Bureau of Statistics (Indonesian, BPS), Regional Development Planning Agency (Indonesian, Bappeda), Education and Culture Office, Central Bureau of Statistics of regencies and cities, Regional Working Unit (Indonesian, SKPD) of regencies and cities, and related agencies. The secondary data used in the study covered data from six regions: Lebak Regency, Pandeglang Regency, Serang Regency, Tangerang Regency, Tangerang Municipality, and Cilegin Municipality. As the Southern Tangerang Municipality and Serang Municipality were new autonomous regions, the authors combined the two with Tangerang and Serang Regencies. Meanwhile, the time-series data covered the period 2000 -2019.

3.1 Variables

The dependent variable in this study is educational expansion. The net enrollment rate in primary, junior, and senior high school and the mean years of schooling were used to calculate it. We selected the net enrollment rate (NER) over the gross enrollment rate (GER) because the NER can evaluate the population's timeliness in connection to prescribed age standards. Another advantage of using the high net enrollment rate variable was finding out the number of populations of standard age who utilized educational facilities provided by the government or the community. It could also measure the success of education development and measure equal access to education (UNESCO-UIS, 2014).

The *NER* has a weakness in its lack of estimation. Because students may enter school above the standard age group for various reasons such as starting school at an older age, repeating a grade, dropping out of school temporarily, and graduating early; hence the number is smaller than *GER* (UNESCO-UIS, 2014). Higher the educational expansion shows upper primary, junior, senior high school, and mean years of schooling. The dependent variables in this study are the primary, junior, senior high school, and mean years of schooling, while independent variables include government expenditure in education, family income, and poverty. The control variables include gender, number of schools, teacher-student ratio, and road infrastructure.

3.2 Econometric model

Panel data regression analysis was a regression model that models the influence of predictor variables on response variables in several sectors observed from a research object over a certain period. Compared to other models, the advantages of the panel data model were heterogeneity in each unit, more information, and reduced multicollinearity. It also increases the degree of freedom, more efficiency, capturing the dynamics of change, measuring and detecting impacts, more complete, and biases produced more minimum (Baltagi, 2005). The basic model is:

$$y = \alpha_o + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon \quad (1)$$

This model assumed that behavior between individuals was the same over some time so that α and slope β are the same for each individual, i.e., $\alpha_1 = \alpha_2 = \dots = \alpha_n$ and $\beta_1 = \beta_2 = \dots = \beta_n$.

While models with individual effects could be written, namely parameter estimation (α and β), taking into account the nature of individual effects α , regardless of the structure of covariant error term. The model is:

$$y_{it} = \alpha_{it} + \beta_{it} + \varepsilon_{it} \quad (2)$$

where i is the number of units cross-section and t is the number of series time.

Based on the equation of (2), the author specified a panel data analysis of the educational expansion modified from a model built of a probability model with macro data (Arshed et al., 2018; Chakrabarti & Joglekar, 2006; Singh & Shastri, 2020) to find out the long-term correlation. Therefore, we can write the equation as follows:

$$Y_{it} = \varphi_0 + \varphi_1 LOG_INCOME_{it} + \varphi_2 LOG_EB_{it} + \varphi_3 POV_{it} + \varphi_4 G_{it} + \varphi_5 LOG_TS_{it} + \varphi_6 ROAD_{it} + \varphi_7 LOG_TSR_{it} + v_{it} \quad (3)$$

The Y_{it} is the *NER* of primary school, junior high school, or senior high school net enrollment ratio. The Y_{it} is also the mean years of schooling in area I in period t . The LOG_GEE_{it} is the government expenditure in education in region i period t . The LOG_INCOME_{it} is a parents' income in region i in period t . The POV_{it} is the poverty in region i in period t . The G_{it} is the proportion of the female population in region i in period t . The TS_{it} is the number of primary schools, junior high schools, or senior high schools in region i in period t . The $ROAD_{it}$ is the road infrastructure in region i in period t . The TSR_{it} is the teacher-student ratio of primary school, junior high, or senior high school in region i in period t . The v_{it} is the error term in the panel model, φ_0 is the constant, φ_i is the coefficient, t is period 2000 -2019, and $i = 1, 2, \dots, 7$.

3.3 Unit Root Test

The unit root tested the stationarity of the data because there was an element of time in the panel data. If a time series data was not stationary, the data faced a unit root problem. It would violate the *OLS* assumption by variables with a constant mean and variance in time. It causes autocorrelation problems in the data (Wooldridge, 2018). The presence of this property in the panel data can be confirmed by using the panel unit root test. Determining whether the data is stationary or non-stationary, this study will utilize *LLC* (Levin et al., 2002), *IPS* (Im et al., 2003), *ADF* Fisher, and *PP* Fisher (Fisher, 1934; Maddala & Wu, 1999). Because the data was not stationary (unit root), it rejected the null hypothesis, while the alternative hypothesis was that the variable was stationary.

3.4 Panel Cointegration Test

After testing the unit root with *I*(1), as a result, we obtained a cointegration relationship and produced a valid and efficient estimate. The type of test used is the panel cointegration test (Kao, 1999). The residual must be *I*(0) if the variable was cointegrated. If the variable was not cointegrated, on the other hand, the residual is *I*(1). Kao (1999) and Pedroni (1999) utilized panel data to extend the (Engle & Granger, 1987) approach for

testing cointegration. The Kao test followed the same basic approach as the Pedroni test but determined a specific cross-section using the intercept and homogeneous coefficients of the first-stage regressor.

The cointegration testing used the Dickey-Fuller and Augmented Dickey-Fuller tests (Kao & Chiang, 2001). The expected result is a probability p-value <0.05, so it stated that the variables used are cointegrated with each other or have a long-term correlation. This situation involves panel data analysis using the Fully Modified Ordinary Least Square (*FMOLS*) model.

3.5 Panel Fully Modified Ordinary Least Square (*FMOLS*) Model

The *FMOLS* panel is a model that may predict the long-term equilibrium correlation between independent variables. This model was initially conceived by (Phillips & Hansen, 1990) to assist in the optimal analysis for the cointegrated regression. The *FMOLS* model considered the impact of autocorrelation and endogeneity in cointegration correlation. The panel *FMOLS* model uses semi-parametric correction for the variance-covariance matrix to eliminate problems caused by endogeneity, serial correlation, cross-sectional random differences, and produce consistent analyzes (Pedroni, 2000, 2004; Phillips & Hansen, 1990). This study uses a grouped approach within the *FMOLS* panel, as stated by (Pedroni, 2000, 2004), who proposes a grouped mean *FMOLS* estimator that is averaged over individual cross-sectional *FMOLS* estimates:

$$\hat{\beta}_{FG} = N^{-1} \sum_{i=1}^N [(\sum_{t=1}^T X_{it} X_{it}')^{-1} \sum_{t=1}^T (X_{it} y_{it} - \lambda_{12i}')] \quad (4)$$

Pedroni (2000) stated that the grouped mean estimator offers the desired property to provide a consistent estimate of the cointegration vector sample. It meant given the heterogeneity in cointegration relationships. (Pedroni, 2004) estimated the asymptotic covariance matrix for this estimator by calculating the variance of the mean of the individual estimates:

$$V_{FG} = N \sum_{i=1}^N \left(\hat{\omega}_{1,2i} \frac{1}{T^2} \sum_{t=1}^T X_{it} X_{it}' \right)^{-1} \quad (5)$$

Keep in mind that the baseline t-statistic obtained using this covariance estimator differs from the t-statistic proposed by (Pedroni, 2000), which incorporates individual statistics across the cross-sectional dimensions. The advantage of using the *FMOLS* panel model is the ability to control the presence of endogeneity, serial correlation, and heterogeneity between individuals and produce consistent analysis results (Pedroni, 2000).

4. Results and Discussion

Table 1 reported summary statistics to describe the aggregate data observed between 2000 - 2019, covering the mean and standard deviation of the variables. The mean value of students enrolled in primary, junior, and senior secondary schools were 94.51, 68.47, and 45.92, respectively. It meant that the primary, junior, and senior secondary enrollments rates were 94.51%, 68.47%, and 45.92%. The mean years of schooling were 8.01 years, which meant that the population aged 15 years and over had an average length of schooling of 8.01 years.

Table 1: Summary of Statistic

Variables	Obs	Mean	Std. Dev	Max	Min
<i>NER_PS</i>	120	94.51	2.92	100.00	83.18
<i>NER_JS</i>	120	68.47	13.29	85.92	29.17
<i>NER_SS</i>	120	45.92	14.57	77.20	14.37
<i>MYS</i>	120	8.01	1.72	10.88	5.30
<i>LOG_INCOME</i>	120	5.68	0.33	6.30	4.99
<i>LOG_GEE</i>	120	5.48	0.62	6.32	3.30

POV	120	8.43	5.05	32.46	3.03
G	120	49.28	2.27	58.99	41.43
LOG_TSPS	120	2.87	0.29	3.15	2.19
LOG_TSJS	120	2.29	0.29	2.79	1.69
LOG_TSSS	120	2.11	0.33	2.79	1.38
ROAD	120	1.36	2.03	8.81	0.06
STR_PS	120	25.77	8.96	54.45	12.89
STR_JS	120	19.78	6.52	36.70	8.59
STR_SS	120	15.67	3.95	29.28	9.05
STR	120	20.04	5.41	34.72	10.62

Note: *NER_PS* = net enrollment rate in primary school, *NER_JS* = net enrollment rate in junior high school, *NER_SS* = net enrollment rate in senior high school, *mys* = mean years of schooling, *LOG_INCOME* = logarithmic transformation of family income, *LOG_GEE* = transformation of the logarithm of government spending on education, *POV* = poverty, *AFM* = average of family member, *LOG_TSPS* = logarithmic transformation in number of primary school, *LOG_TSJS* = logarithmic transformation in number of primary school, *LOG_TSJS* = logarithmic transformation in number of primary school, *LOG_TSSS* = logarithmic transformation in number of primary school, *STR_PS* = total primary school student-teacher ratio, *STR_JS* = total junior high school student-teacher ratio, *STR_SS* = total senior high school student-teacher ratio, *STR* = total student-teacher ratio.

Table 1 also showed that the average government expenditure in education (*LOG_EB*) was only 5.48% or IDR 30,2 billion, less than 20% of the total regional expenditure as stipulated in the Regional Government Revenue and Expenditure (Indonesia, APBD) of the regencies/municipalities in Banten. The average family income (*LOG_INCOME*) was IDR 478 thousand during 2000 – 2019. The poverty (*POV*) was the poor people in the regencies/municipalities 8.43%, while the variation in the number of poor people was still relatively high. The female population aged over ten years is 49.28% on average, meaning that the female population is smaller than the male population. Meanwhile, the average number of primary schools and equivalent are 741 units, junior high schools and equivalent are 195 units, and high school and equivalent are 129 units. The average length of roads in the good category is 230 kilometers. The teacher-student ratio of primary, junior, and senior high school and equivalent means that each teacher guides 26, 20, and 16 students, respectively.

This study investigates the dynamic relationship between government expenditure in education, family income, and poverty with the educational expansion (measured by net enrollment and mean years of schooling). In this context, the method used is panel cointegration estimation. To overcome the homogeneity problem, the researchers used the unit root test as suggested by (Im et al., 2003). After confirming that there was no homogeneity problem and the variables were in the order of interest. We conducted a cointegration test. It determined whether the variables were cointegrated or not.

The null hypothesis in the IPS, ADF-Fisher, and PP-Fisher test statistics is that the variable includes a unit root at a level *I*(1). Table 2 below shows the results of the unit root test:

Table 2: The Results of Panel Unit Root

Variables	IPS		PP		ADF	
	Level	First Difference	Level	First Difference	Level	First Difference
<i>NER_PS</i>	-1.962**	-15.916***	28.981***	484.634***	24.600**	169.439***
<i>NER_JS</i>	-0.240	-9.579***	13.229	134.894***	13.363	88.769***
<i>NER_SS</i>	2.585	-8.346***	4.146	128.147***	3.875	80.814***
<i>MYS</i>	-3.333***	-7.811***	27.539***	292.311***	31.205***	71.510***

<i>LOG_GEE</i>	-4.343***	-12.143***	62.734***	116.544***	45.046***	122.594***
<i>LOG_INCOME</i>	1.660	-11.036***	12.445	206.917***	3.327	103.312***
<i>POV</i>	-2.802***	-11.231***	36.095***	126.545***	25.899**	107.079***
<i>G</i>	-19.009***	-7.220***	357.098***	323.324***	71.641***	62.555***
<i>AFM</i>	-6.995***	-10.127***	141.786***	370.413***	65.919***	96.865***
<i>LOG_TSPS</i>	-1.452	-6.897***	21.166**	76.472***	18.681	63.922***
<i>LOG_TSJS</i>	1.135	-9.546***	14.751	103.410***	5.636	87.083***
<i>LOG_TSSS</i>	-1.295	-8.293***	5.264**	91.362***	21.041**	77.701***
<i>ROAD</i>	-0.556	-7.989***	15.351	113.908***	17.807	73.447***
<i>STR_PS</i>	-1.933	-9.667***	22.336**	131.046***	20.329*	92.813***
<i>STR_JS</i>	-3.392***	-5.431***	22.800***	154.918***	32.314**	55.354***
<i>STR_SS</i>	-2.126**	-6.649***	25.895**	96.819***	23.369**	65.908***
<i>STR</i>	-2.524***	-8.987***	17.802	97.464***	24.872**	83.613***

Note: *** denotes the significance level at 1%. ** denotes the significance level at 5%. IPS = Im, Pesaran, & Shin, PP = Phillips-Perron, ADF = Augmented Dickey-Fuller.

Based on these results, the unit root variables at a level $I(1)$ were junior high school and secondary school net enrollment rate, family income, number of schools, road infrastructure, and the teacher-student ratio at the primary school level (see Table 3). As a result, the variables were not stationary, and spurious regression problems could occur if a static regression model like OLS were applied. However, the test results of all variables are confirmed to be stationary in the first difference $I(0)$.

Furthermore, we would evaluate the cointegration relationship between the dependent and independent variables. The residual cointegration test (Kao, 1999) was utilized to test the cointegration relationship. The test results are in the following Table 4:

Table 4: Kao's Panel Cointegration Test Results

Model	Statistic	t-statistic	p-value
Mean Years of Schooling	ADF	-4.249	0.000
	Residual Variance	0.092	
	HAC variance	0.063	
NER Primary School	ADF	-5.291	0.000
	Residual Variance	8.574	
	HAC variance	2.184	
NER Junior High School	ADF	-4.504	0.000
	Residual Variance	36.261	
	HAC variance	17.381	
NER Senior High School	ADF	-5.316	0.000
	Residual Variance	20.402	
	HAC variance	14.253	

Table 4 illustrated that the test results based on Kao's panel cointegration test model of the four models showed a probability value of less than 0.05. As a result of the findings, all models rejected the null hypothesis of no cointegration. Thus, there was a long-term equilibrium correlation between the independent and dependent variables, and the regression estimation would produce a stationary residual. The long-term coefficients of the independent variables were calculated using the FMOLS group mean, pooled, and pooled weighted estimators after we found the cointegration correlation.

The authors used *FMOLS* panel analyzed to examine the effect of the government expenditure in education, family income, gender, and control variables on the expansion of education in Banten. The effect resulting from this test was a long-term effect. The authors use the pooled, pooled weighted, and group means methods. In this analysis, the educational expansion variable is measured by the net enrollment ratio in primary school, junior high school, senior high school, and the mean years of schooling. The results of the model are in the following table 5:

Table 5: Long-run Elasticity Results with Panel FMOLS Analysis of the NER_PS Model

Independent Variable	Dependent variable: net enrollment rate in primary school		
	Pooled	Pooled weighted	Grouped
<i>LOG_GEE</i>	-1.452 (0.951)	-0.595*** (0.088)	2.506*** (0.906)
<i>LOG_INCOME</i>	11.226*** (1.444)	8.579*** (0.051)	3.047** (1.379)
<i>POV</i>	0.109 (0.087)	0.071 (0.099)	0.345*** (0.141)
<i>G</i>	0.449*** (0.138)	0.349*** (0.081)	0.249 (0.181)
<i>LOG_TSPS</i>	-19.108* (9.731)	-17.428*** (0.064)	3.742 (8.762)
<i>ROAD</i>	-0.109 (0.200)	0.023 (0.045)	-7.136 (17.641)
<i>STR_PS</i>	0.035 (0.033)	0.036 (0.051)	0.017 (0.024)
<i>R</i> ²	0.4552	0.4677	

Note: * sig. = 10%, ** sig = 5%, *** sig. = 1%.

Table 5 contained the results of the elasticity of the long-term correlation between government expenditure on education which was negative for the pooled method (not significant), pooled weighted (significant of 1%), and positive for the weighted model (significant of 1%). These results meant that government expenditure on education had an ambiguous effect on educational expansion in primary school. The coefficient of elasticity found was between -1.451 to 2.506. On the other hand, the elasticity coefficient of family income was positive between 3.047 to 11.226 and significant (1% and 5%) in all cases. Therefore, there was a unidirectional correlation between family income and educational expansion in primary school. Thus, the higher the family income, the higher the education expansion in primary school. Meanwhile, the long-term correlation between poverty and education expansion in primary school was positive and significant (1%) only in the pooled method.

Table 6: Long-run Elasticity Results with Panel FMOLS Analysis of the NER_JS Model

Independent variable	Dependent variable: net enrollment rate in junior high school		
	Pooled	Pooled weighted	Grouped
<i>LOG_GEE</i>	-11.662*** (3.373)	-7.431*** (0.099)	6.439*** (1.932)
<i>LOG_INCOME</i>	33.979*** (6.923)	23.254*** (0.054)	9.541** (4.275)
<i>POV</i>	-0.856*** (0.317)	-0.593*** (0.102)	-0.792*** (0.286)

<i>G</i>	2.452*** (0.538)	1.851*** (0.082)	0.017 (0.306)
<i>LOG_TSJS</i>	13.227 (9.604)	22.755*** (0.053)	30.327*** (11.040)
<i>ROAD</i>	0.265 (0.768)	0.318*** (0.042)	17.245 (22.337)
<i>STR_JS</i>	-0.156 (0.143)	-0.091 (0.068)	-0.097 (0.069)
<i>R</i> ²	0.7859	0.7842	

Note: * sig = 10%, ** sig. = 5%, *** sig. = 1%

Table 6 illustrated that in the long term, the government expenditure on education harmed the net enrollment rate in junior high school and has a significance of 1% with the pooled and weighted *FMOLS* panel model, while the grouped model was positive. It meant that government expenditure on education increased, so the enrollment rate in junior high school decreased. On the one hand, government expenditure on education increased the enrollment rate in junior high school. Meanwhile, the elasticity coefficient of family income was 9.541 to 33.979 and significant at 1% and 5%. This result meant that an increase in family income would increase the net enrollment rate in junior high school in the long term. The poverty elasticity coefficient also had a significant negative effect on the net enrollment rate in junior high school. The coefficient value obtained was -0.856 to -0.593 and is significant at 1%. This result found a decrease in poverty in the long term, increasing the enrollment rate in junior high schools in Banten.

Table 7: Long-run Elasticity Results with Panel *FMOLS* Analysis of the *NER_SS* Model

Independent variable	Dependent variable: net enrollment rate in senior high school		
	Pooled	Pooled weighted	Grouped
<i>LOG_GEE</i>	7.974*** (2.994)	-3.165*** (0.087)	1.066 (1.502)
<i>LOG_INCOME</i>	28.624*** (7.760)	22.369*** (0.059)	26.065*** (4.243)
<i>POV</i>	-0.283 (0.279)	-0.116 (0.093)	-0.572** (0.257)
<i>G</i>	1.675*** (0.433)	1.316*** (0.080)	0.135 (0.345)
<i>LOG_TSSS</i>	20.403** (8.788)	16.775*** (0.043)	-0.023 (5.949)
<i>ROAD</i>	0.489 (0.638)	-0.001 (0.043)	-13.914 (23.865)
<i>STR_SS</i>	0.867** (0.205)	0.500*** (0.065)	0.399*** (0.110)
<i>R</i> ²	0.8941	0.8959	

Note: * sig = 1%, ** sig. = 5%, ***sig = 1%.

The three *FMOLS* panel models (see Table 7) showed that the long-term correlation between government expenditure and enrollment rate in senior high school was ambiguous. It got different results; the pooled model showed a positive long-term correlation (significant of 1%). The weighted model showed a negative correlation between two variables with a significance level of 1%, whereas the grouped method did not. The elasticity of family income coefficient was 22,369 to 28,624 and significant of 1%. It meant that an increase in family income would increase the net enrollment rate in senior high school in the long term. The poverty elasticity

coefficient also had a significant negative effect on the net enrollment rate in senior high school. The coefficient value was -0.572 (grouped model) and significant of 5%. This result found a decrease in poverty in the long term, increasing the enrollment rate in senior high schools in Banten.

Table 8: Long-run Elasticity Results with Panel FMOLS Analysis of the MYS Model

Independent variable	Dependent variable: mean years of schooling		
	Pooled	Pooled weighted	Grouped
<i>LOG_GEE</i>	-0.642*** (0.221)	-0.529*** (0.093)	-0.205* (0.116)
<i>LOG_INCOME</i>	2.449*** (0.513)	2.129*** (0.058)	1.822*** (0.380)
<i>POV</i>	-0.039** (0.019)	-0.033 (0.092)	-0.039* (0.021)
<i>G</i>	-0.055* (0.032)	-0.008 (0.081)	0.112*** (0.025)
<i>LOG_TSSS</i>	-1.252** (0.624)	-1.078*** (0.043)	-0.922* (0.508)
<i>ROAD</i>	0.019 (0.046)	0.062 (0.042)	2.306 (2.241)
<i>STR</i>	-0.044*** (0.013)	-0.045 (0.070)	-0.016** (0.007)
<i>R²</i>	0.9535	0.9540	

Note: * sig. = 10%, ** sig. = 5%, *** sig. = 1%.

Table 8 illustrates that in the long term, government expenditure on education is inversely correlated with educational expansion as measured by the mean years of schooling and is significant at 1% and 10%. It meant that a decrease in government spending on education could increase educational expansion. The elasticity coefficient of family income was 1.822 to 2.449 at 1% and 5% significance. These findings suggested that increasing family income would lead to increased educational expansion in the long term. Meanwhile, the poverty elasticity coefficient also negatively affected education expansion, except the pooled weighted model. The coefficient value obtained was -0.033 to -0.339, with a significance level of 5% and 10%. This result found that poverty reduction led to an increase in the educational expansion in Banten in the long term.

From the estimation results above, it could be seen that there was a negative and significant correlation between regencies/municipalities' government expenditure in education and the net enrollment rate of high schools in Banten. This negative correlation means that the higher the budget allocated by the regency/municipality government, the more likely it is for education to be more evenly distributed. This result was not in line with the previous research that the government budget in education contributed significantly to increased education participation rates (Ansong et al., 2018; Doriza et al., 2013; Dubois et al., 2012; Suryadarma, 2012). The present study results indicated that the higher the government expenditure in education, the lower the participation rate of high school/its equivalent school education. This result proved that the planning, management, and use of the budget in the regions under study were not accountable and on target.

As a result, children did not continue or dropped out of school, and the net enrollment rate of senior high school education decreased (Rajkumar & Swaroop, 2008). Another study also found that rapid enrollment increased in many developing countries since the government provided budgets for free education. However, the condition worsens the quality of education (Valente, 2019). The present study's findings also contributed

to the theory of return on benefits and social costs of schooling (Todaro & Smith, 2015); however (Singh & Shastri, 2020) found the opposite. Therefore, in managing the government expenditure in education, the regency/municipality government must pay attention to transparency, accountability, and high accuracy. It is so because the government expenditure in education should be used to fund one of the basic services for children aged 16-18 years to increase the knowledge, skills, and productivity of future human resources in Banten.

The average household expenditure per capita income, which was proxied by the average household expenditure per capita, significantly affects senior high schools' net enrollment rate for all regencies/municipalities in Banten. These results proved the research hypothesis that is the higher the household income, the higher the net enrollment rate of senior high schools for all regencies/municipalities. It implied that senior high school would be more evenly distributed. This research was consistent with (Iddrisu et al., 2017b) reporting that household income increases education participation. Studies in Indonesia also showed that household wealth positively affected secondary school participation (Hardy & Marcotte, 2020; Suwandana, 2018).

This study was consistent with Tharmmapornphilas (2013), proving that high parental income encouraged high school participation. However, the results of this study do not correspond to those of (Davis, 2018) which demonstrates that increased parental income did not significantly increase educational participation because parents were more likely to allocate their income for health or even buying alcoholic drinks. Families that are economically more prosperous (high incomes) should allocate their income for their children's education investment at a higher level. Thus, increased family income can encourage residents to study longer to boost the equitable distribution of education in one region. The higher the income of households, the more likely parents can meet the needs of schools, including tuition fees, skills development, uniforms, stationery, and so on.

The increase in household income reflects an increase in household welfare (Hübner, 2012). The development of the population welfare can be measured by developing the income level, which was reflected in the amount and pattern of consumption expenditure. The higher the income is, the higher the level of expenditure will be. Furthermore, according to Engel's law, if there was no change in taste, the proportion of spending on food consumption will tend to decrease, along with increased income. Therefore, parents who have higher incomes could allocate their income for their children's education. Besides that, parents also have a responsibility for education in the community. The involvement of parents is not only in the form of funding but also in collaborating with the government to improve education services for the community, especially those who cannot afford it. Thus, the family also becomes the prominent owner of including a child or family member to get a formal education (Rahmatin & Soejoto, 2017).

The poverty variable affects significant negatively the senior high school net enrollment rate. This finding was consistent with studies concluding that the poorer the population, the lower the rate of participation in education (Rahmatin & Soejoto, 2017), and even the higher the dropout rates. In addition, parents are likely more to encourage their children, especially those aged 16 years and over, to work compared to spending time at school (Badan Pusat Statistik, 2014). del Granado et al. (2007) proved that poor people who don't have sufficient economic capacity could not afford to pay for their children's schooling because higher education also requires higher costs. However, Duarte et al. (2018) found that reducing poverty could increase education.

Families still have to pay for school fees, even though there is a school operational assistance fund policy (Indonesian, BOS), especially for senior high school. Education costs consist of direct costs and opportunity costs. Direct education costs incurred by parents include tuition/student services fees, re-registration, parent-teacher association, practicum/skills development, evaluation fees, supporting materials for school subjects,

school and sports uniforms, textbooks, school equipment, transportation, and courses at school (Permana et al., 2010). Considering that the economic community is weak (it cannot afford school needs) who continue to study until entering high school level or will enter the level, it was very vulnerable to drop out of school. Therefore, the provincial government does not neglect poor high school students, but still schools. The local government can provide subsidy assistance, scholarships, and other school needs to keep schools safe.

This paper contributes to the literature on the correlation between public expenditure in education, family income, and poverty with the educational expansion. First, the increase in the education budget has not been directly proportional to the rise in the educational expansion covering districts/cities in Banten. Meanwhile, family income and poverty are the determinants of increasing educational expansion. A more rigorous analysis of the problem in addressing potential cross-correlation and heterogeneity issues in the panel is needed to bring the findings forward to realize how budget allocation and distribution, increasing family income and reducing poverty continue to be policy priorities by regency, municipality, or provincial governments. The findings are more reliable regarding using the *FMOLS* panel method in discussing cross-sectional correlation and panel heterogeneity. The current work has investigated a long-term relationship between the predictor variables with increased educational expansion compared to the traditional panel model. The *FMOLS* estimation technique has been used robustly to endogeneity and serial correlation.

5. Conclusions

We concluded that the educational expansion during the study period tends to increase with a higher average than national development. The educational expansion in north Banten is faster than in South Banten for all levels. We found that the government expenditure on education was ambiguous as a determinant of educational expansion. The resulting long-term correlation depends on the type of estimation method used. Family income significantly contributed to the educational expansion for all Banten indicators in the long term. In addition, poverty greatly affected secondary school and the mean years of schooling. It meant that poverty reduction must continue to be carried out in the long term to increase educational expansion.

The provincial government allocates the education budget for school operations, service improvement, education management, and campaigning the 12-year Compulsory Education Movement by involving education stakeholders and back-to-school programs. The problems or obstacles that increase the net enrollment rate in primary, junior, and senior high school include low family income, inadequate government expenditure in education, and less than optimal achievements of development goals. The reasons for children aged 7 - 24 years not to attend school include the inability to pay schooling fees, the requirement to earn a living and help parents, and getting married. The implication is that every family should allocate resources to benefit their children's education to go higher. In addition, families must also control their family demographics and be aware of the importance of education, especially for girls. The implication for local governments is to increase their role in managing the budget more efficiently, transparently, and accountably. Poverty is also an obstacle in raising the equal distribution of education in Banten. Therefore, the provincial government of Banten must make the poverty reduction agenda one of the priority development programs.

The research has limitations in variables, analytical models, and regional coverage. For example, the government expenditure in education variable is essential in increasing the educational expansion in Banten, but the research results are still inconsistent with the theory and previous studies. Therefore, we suggested that future research examine the impact of government expenditure on education on the senior high schools' net enrollment rate with more data series coverage. If necessary, it is recommended that future research test higher education participation rates. The researcher utilized panel DOLS (dynamic ordinary least square) models for the consistent study, which we strongly recommended. The extension of the research area is also important

because this research only involves regencies/municipalities in Banten. For this reason, future research can have more comprehensive coverage of regions in Indonesia and increase the amount of data used to yield better results.

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