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Education Mediates the Nexus between Fiscal Decentralization and Economic Growth: Evidence from Indonesia

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Abstract
For a decade, global, national, and regional economic growth has shown a downward trend, resulting in low job creation, increasing income inequality, and decreasing social welfare. Studies related to the direct and indirect impact of fiscal decentralization on economic growth remain debatable. This study aims to assess the long-term effect of fiscal decentralization mediated by education on economic growth in Banten, Indonesia. We utilized data for the periods of 2010–2022 from eight regencies and municipalities in Banten Province. By using panel FMOLS, the current study showed that fiscal decentralization contributed to the long-term advancement of education and economic growth. This study also found that education mediated the impact of fiscal decentralization on boosting economic growth in Banten in the long term. These results suggest that local governments further improve budget management quality, both from transfer funds and regional revenue, to ensure that budget use is in line with its targets.

Keywords: Economic growth, Education, Fiscal decentralization, Investment

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1. Introduction

Economic growth is one of the important basic macroeconomic indicators that every country wants to achieve. The achievement of high-quality economic growth will have an impact on improving welfare, health, and reducing inequality and poverty (Mulok et al., 2012; Niu et al., 2021). It will also improve life quality (Jelušić & Mikulić, 2023). In addition, high-quality economic growth can also foster the improvement in people's quality of life (OECD, 2011). Economic growth reflects changes in the creation of added value of goods and services produced in the economy. The greater the added value produced, and the higher the growth. The rate of economic growth achieved by each country or region is different because it depends on the country's ability to explore and encourage its resources, which can lead to either positive or negative economic growth.

Since the COVID-19 outbreak, economic growth in almost all countries has decreased, including Indonesia and its provinces and regencies or municipalities. In fact, economic growth was predicted to continue to slow down until 2024 (World Bank, 2023). Economic growth in the East Asia and Pacific (without China) from 2020 to 2022 was -3.7% and 5.8%, while in Indonesia the economic growth rate was -2.7% and 5.3%. Meanwhile, in Banten, the economic growth achievements in 2020 and 2022 were -3.08% and 5.03%, respectively (BPS Provinsi Banten, 2023). High and low economic growth in Banten is caused by local government political reforms that do not support budget efficiency or facilitate effective decision-making processes. In other words, the implementation of economic decentralization remains suboptimal. Decentralization policy can improve public sector efficiency, accelerate economic growth, and stimulate competition between local governments regarding public sector provision (Martinez-Vazquez & McNab, 2003; Qiao et al., 2008).

Many previous researchers have investigated the correlation between fiscal decentralization policies and economic growth. Several studies by Aulia (2014) and Rustan (2013) have shown a positive and significant correlation between fiscal decentralization and economic growth. Latest studies also confirm previous findings at both national and subnational levels (Ebadi, 2018; Gisore, 2022; Hung & Thanh, 2022; Mendoza-Velázquez et al., 2022; Thanh et al., 2020; Thanh & Canh, 2020). Additionally, a study in Indonesia demonstrated that fiscal transfers and the development of human resources boosted regional economic growth (Sofilda et al., 2023). On the contrary, other studies showed that fiscal decentralization increased macroeconomic instability, reduced cooperative relations between the central and district governments, and potentially led to a lack of fiscal discipline and corrupt practices by local elite leaders (Boex & Kelly, 2013). It was also found to hamper economic growth (Davoodi & Zou, 1998; Jin & Rider, 2020; Saputra & Mahmudi, 2012). Fiscal decentralization can reduce government spending and central government taxes that should be used to perform a stabilization function.

Fiscal decentralization policies may also improve education. Previous empirical studies have shown that fiscal decentralization has a significant impact on improving education in local areas (Faguet & Sánchez, 2008; Kristiansen & Pratikno, 2006). Meanwhile, Letelier & Ormeño (2018) asserted that increased fiscal decentralization allowed for staff management in accordance with local provisions, thereby improving educational performance. Human development and education in the regions were highly dependent on the application of fiscal decentralization in the regions (Jasmina & Oda, 2022; Rauf et al., 2017; Sandjaja et al., 2020; Singh et al., 2024) because it can improve the quality of education (Zallé & Bakouan, 2024). In addition, even though more people in Indonesia are able to access education, numerous studies have revealed that issues remain with both the educational quality and the ability of local government to decrease the gap of resources (Al-Samarrai & Cerdan-Infantes, 2013; del Granado et al., 2007).

Furthermore, education also plays an essential role in increasing economic growth. Education can improve labor productivity because it can raise the human capital that has already been established in the labor force (Psacharopoulos & Patrinos, 2004), leading to neoclassical growth theory-style transitional growth towards greater output levels (Mankiw et al., 1992). Early research by Nelson & Phelps (1966), Lucas (1988), and Aghion et al. (2009) focus on examining the importance of human capital in driving technological innovation and economic growth. In this regard, education can help diffuse the knowledge essential for understanding and analyzing new information as well as successfully apply newly created technologies developed by others, all of which support growth in the economy (Goczek et al., 2021; Hanushek & Wößmann, 2007). Other studies have also shown similar results, such as (Deme & Mahmoud, 2020; Ishchy, 2020; Rafaj & Rehák, 2017; Sabur et al., 2021).

Previous research on the use of mediating variables is still limited, especially in Indonesia, at both national and subnational levels. Martinez-Vazquez & McNab (2003) conducted a preliminary study on the potentially diverse indirect impact of the decentralization of fiscal on economic growth through the variables of resource distribution, corruption, and elite control. Previous studies have also noted that the decentralization of fiscal policy boosted economic growth which was mediated by public services, such as education, and democracy (Li & Khalid, 2023; Stojcic & Tolic, 2021). Other findings also suggest a non-linear pattern of direct and indirect relationships between government spending in the education sector and economic growth through social inclusion (Asadullah, 2019). However, another study found that economic growth did not mediate the connection between the decentralization of fiscal and regional inequality in income (Triyono et al., 2021). In addition, previous studies on the relationship between fiscal decentralization and economic growth have shown diverse findings. Some researchers found that fiscal decentralization positively contributes to economic growth through better resource allocation and improved public services. However, other studies present opposite results. Meanwhile, the relationship between fiscal decentralization and economic growth, mediated education variables, continues to evolve. Prior findings indicate that increasing fiscal decentralization can enhance the quality of education at the regional level, which in turn contributes to human capacity development and economic growth. There is a research gap that needs to be addressed regarding the correlation between fiscal decentralization and economic growth.

First, studies on the use of mediating variables, especially at subnational level (such as provinces and regencies or municipalities in Indonesia), remain limited. Existing research primarily focuses on the direct relationship between fiscal decentralization and economic growth without considering the role of mediating variables, such as the quality public services, including education or the impact of policies on income inequality. Second, although fiscal decentralization can influence regional government spending in the education sector, few studies have examined the direct and indirect impact of education budget allocation on economic growth in Indonesia, particularly in regions with varying degrees of decentralization. The study contributes by filling the gap in the especially in regions facing significant challenges in the psot-Covid-19 era. Its main contribution is investigating the direct and indirect relationship between fiscal decentralization and economic growth, mediated by the education sector. Additionally, this research introduces a subnational analysis focusing on Banten province, providing deeper insights into how fiscal decentralization effects economic growth in different regions. The authors also propose an analytical model that is rarely used by Indonesia researchers, namely the panel cointegration model in the form of a FMOLS panel. The findings of this study are expected to provide more precise policy recommendation to improve the efficiency of regional budget management in order to promote sustainable economic growth.

2. Literature review

2.1. Fiscal decentralization and education

The implementation of the central government's fiscal policy in the regions is vital to help improve education performance (Falch & Fischer, 2012; Letelier S., 2010). Previous research found that the connection between the decentralization of fiscal policy and education improvement was positive and significant in the Philippines (Behrman et al., 2003) and in Indonesia (Muttaqin et al., 2016). However, a study by Hanushek (2013) found a negative effect of subnational autonomy and the quality of education (PISA score test) in developing countries, but a positive impact in developed countries. Other studies also indicated that the impact of fiscal transfers on the provision of public goods for education was not significant in China (Wang et al., 2012). The findings of the studies vary depending on the sample size, the national or subnational scope of the study area, and the analytical approach used.

According to research by Rauf et al. (2017), fiscal transfers had an inadequate individual impact but were still consistent with the theory underlying the connection between fiscal decentralization and public services in Pakistan. Gross enrollment at primary education is boosted by the devolution of spending responsibility. Regarding human development funded by the central government, Sandjaja et al. (2020) found that the decentralization of fiscal policy had a significant effect on human development in Java Island of Indonesia. However, other empirical studies in Indonesia have also found that central and regional government spending does not contribute significantly to increasing school enrollment rates (Jasmina & Oda, 2022). In addition, Singh et al. (2024) revealed that fiscal decentralization, as a reformative intervention, had a good effect on the results of public service delivery and emphasized the influence of Indian governance and socio-economic accountability channels on these results. Lastly, Zallé & Bakouan (2024) revealed that the combination of decentralized capital expenditures and resources directly and indirectly led to an enhancement in the quality of education in Burkina Faso in the short and the long term.

Studies on the relationship between fiscal decentralization and education show varying results depending on the country and region. Some studies have found positive effects (Behrman et al., 2003; Muttaqin et al., 2016) in the Philippines and Indonesia, while others have reported negative or insignificant results (Hanushek, 2013; Wang et al., 2012). In Indonesia, findings are also mixed, with some studies indicating a positive impact on human resource development (Sandjaja et al., 2020), while others found no significant effect on school participation (Jasmina & Oda, 2022). This gap highlights the need for further research.

2.2. Education and economic growth

Many economists have previously studied the role of education in changes of economic growth. Generally, scholars found that education drove economic growth (de la Fuente & Doménech, 2006; Pegkas & Tsamadias, 2014; Schultz, 1972; Tsamadias & Prontzas, 2012). In contrast, previous literature by Bils & Klenow (2000) and Pritchett (2001) have found a weak and negative nexus between education and economic growth. Both experts argue that although education can enhance workforce skills, not all education leads to a significant increase in productivity. This occurs because the focus is often on the quantity of education rather than its quality, and there is a lack of supporting infrastructure (especially in developing countries). Additionally, countries and regions with higher average educational levels may have higher economic growth rates than countries and regions with lower educational levels. These findings may vary due to the wage policy of the country

or region, the conditions of development, the budget policies of the central and local governments, and the characteristics of the country or region. Consequently, the research findings will show that education can have different impacts on growth (Anastasios et al., 2019).

The role of education in fostering greater economic growth has been indicated in a study by Anastasios et al. (2019). They found that secondary and higher education has been proven effective in increasing long-term regional economic growth in Greece, but primary education was found to be ineffective. Deme & Mahmoud (2020) found that the quantity of education contributed positively to the enhancement of economic growth in African countries. Another study by Ishchy (2020) also found that secondary and higher education contributed to growth in output in the short and long run in Turkey. Goczek et al. (2021), who extended and modified Hanushek and Woessmanns' approach based on the PISA test results, confirm the relevance of early education quality as a significant growth factor. It is important to note that improving educational skills also contributes to GDP growth. Likewise, Sabur et al. (2021) also showed the urgency of equity for Indonesia's economic growth, apart from income inequality and poverty in Indonesia. Previous theoretical and empirical literature has shown that education plays a crucial role in either boosting or weakening economic growth. However, there is still a gap in understanding the interaction of these factors, particularly in the context of Indonesia.

2.3. Direct-indirect effect of fiscal decentralization on economic growth

For a long time, economists have pay attention to the influence of the decentralization of fiscal on economic growth. For instance, Oates (1999) argues that effective fiscal decentralization can significantly impact a nation's economic growth. In China (Ding, 2007; Jalil et al., 2014), Indonesia (Saputra & Mahmudi, 2012), and the United States (Akai & Sakata, 2002), there was strong evidence that greater fiscal decentralization in government expenditure stimulates provincial economic growth. According to Thiessen (2004), countries with a medium degree of decentralization exhibited slightly higher rates of growth in total factor productivity and investment compared to countries with low or high levels of decentralization. It is interesting to point out that certain investigations correlate with the decentralization of fiscal on economic growth in an indirect manner.

A recent study in Vietnam's provinces found that the decentralization of fiscal significantly correlated to economic growth (Thanh & Canh, 2020). On the contrary, Jin & Rider (2020) found that economic growth was not significantly determined by decentralization of expenditure in the short term in India and China. Meanwhile, fiscal equalization had a significant impact on economic growth in India in the long run, but had no significant effect in China. Another study by Mendoza-Velázquez et al. (2022) confirmed a previous finding that federal transfers contributed to the enhancement of economic growth. Azizah et al. (2022) also confirmed that the indicator of the ability of fund transfers to form local revenue had a positively significant relationship in Indonesia. Hung & Thanh (2022) confirmed a significant nexus between the decentralization of fiscal and economic growth from different directions in Vietnam. Meanwhile, Sofilda et al. (2023) found that regional economic growth is significantly determined by central government grants and regional income in Indonesia.

The pattern of indirect relationship shown in previous research findings indicates that economic growth is indirectly determined by decentralization through consumer efficiency, producer efficiency, macroeconomic stability, corruption, and elite control (Martinez-Vazquez & McNab, 2003). Stojcic & Tolic (2021) found that fiscal decentralization has direct and indirect effects on economic growth mediated by quality of life, government efficiency, government size, and control of corruption. Bye & Fæhn (2022) have found that sectors, including human capital, and research

& development tend to grow the fastest in small and open economies. Li & Khalid (2023) show that the capacity of fiscal improves economic growth through the positive effect of democracy in 22 OECD countries. Studies on the indirect relationship between fiscal decentralization and economic growth remain debatable, with some findings indicating positive effects (Ding, 2007; Li & Khalid, 2023; Stojcic & Tolic, 2021), while others reporting insignificant results (Jin & Rider, 2020). Although many researchers have examined this topic, the indirect relationship mediated by factors such as education is still rarely discussed, especially in Indonesia.

3. Research method

3.1. Research design

This research utilized a quantitative approach with a causal relationship design and used mediating variables. The main design of this research is explanatory research, which tries to explain existing phenomena (Kothari, 2004). A mediating variable was an intervening or intermediate variable that was between the predictor variable and the predicted one, indicating that the predictor variable did not directly influence the change or emergence of the predicted variable. This study aims to empirically test fiscal decentralization, investment, and mediating variables in the long run in regional economic growth in Banten using the FMOLS Panel model. This research was conducted eight regencies and municipalities in Banten Province.The population in this study was 8 regencies and municipalities in Banten Province from 2010 to 2022. Secondary data was obtained from the Central Bureau of Statistics of Banten Province, so 8 x 13 = 104. Banten Province is among the ten most populous provinces in Indonesia. It is a newly autonomous region with rapid economic growth, an industrial area, and a buffer province for the nation's capital.

3.2. Variables

The indicator used in measuring the dependent variable construct was in the form of regional economic growth. The main independent variables included fiscal decentralization and regional investment. The designated mediating variable was education. This variable was chosen because education enhances labor productivity and enables regional autonomy in managing decentralized funds for education. Additionally, there is a direct interaction between education, including innovation, technology adaptation, and skills, and economic growth. The control variables include foreign investment, domestic investment, labor, and government size. More details on the conceptual and operational definitions of this research can be seen in the following table:

Table 1 – Description of Variables

Variables	Description	Proxy used	Unit	Source	Expected sign
Dependent variable: Economic growth (*lngrdp*)	Natural log of GRDP of regencies and municipalities at constant prices in 2010 in Banten	GRDP (Constant 2010 IDR)	Ratio	Central Bureau of Statistics of Banten	
Economic growth (*lngrdpcap*)	Natural log of annual GRDP per capita of regencies and municipalities	GRDP per capita (Constant 2010 IDR)	Ratio	Central Bureau of Statistics of Banten	
Independent variable: Fiscal decentralization (*fd*)	The ratio of the realization of total transfer funds (excluding revenue sharing funds) to total regency and municipality expenditure	Transfer fiscal	%	Central Bureau of Statistics of Banten	Positive
	The ratio of the realization of total original local government revenue to the total expenditure of regencies and municipalities	Original local government revenue	%	Central Bureau of Statistics of Banten	Positive
Mediator variable: Education (*mys*)	Average years of education for each resident over 15 years of age.	Score	Year	Central Bureau of Statistics of Banten	Positive
Control variable: Foreign direct investment (*fdi*)	The ratio of foreign private investment to GRDP of regencies and municipalities.	Foreign private investment (IDR)	%	Central Bureau of Statistics of Banten	Positive
Domestic investment (*domi*)	The ratio of the domestic investment to GRDP of regencies and municipalities.	Domestic investment (IDR)	%	Central Bureau of Statistics of Banten	Positive
Labor (*lnl*)	Natural logarithm of population over 15 years of age working in regencies and municipalities.	Working population > 15 years old	Ratio	Central Bureau of Statistics of Banten	Positive
Government size (*gs*)	The ratio of the realization of revenue or expenditure of regency and municipality governments to the GRDP of regencies and municipalities.	Revenue of regency and municipality (IDR)	%	Central Bureau of Statistics of Banten	Positive

3.2. Static panel model

The panel data regression model is one linear regression model that has several advantages, such as the use of larger data, a reduction in collinearity between predictor variables, an increase the degree of freedom, the capacity to address subject heterogeneity, and the provision of information, that is more extensive, varied, and efficient (Baltagi, 2005). There are 3 methods of panel data regression models, namely the PLS or common effect (CE), the fixed effect (FE), and the random effect (RE) models. This study applied an FE model. The advantage of the model is its ability to distinguish individual effects and time effects, and it does not require the assumption of uncorrelated error components (Baltagi, 2005). Additionally, the FE model addresses endogeneity issues arising from the influence of unobserved variables that may affect estimation results. However, it has its drawbacks. It ignores variance across units and reduces the degrees of freedom due to the elimination of time-invariant variables. The outcomes of the Chow and Hausman tests, which were employed to select models, support the utilization of the FE model. The FE model (see Table 7) was chosen based on the findings of the Chow and Hausman tests.

The FE model is the empirical model used to test the effect of the decentralization of fiscal on regional economic growth which is mediated by the education variable. The empirical model can be expressed by:

$$lngrdp_{it} = \beta_0 + \beta_1 fd_{it} + \beta_2 mys_{it} + \beta_3 fdi_{it} + \beta_4 domi_{it} + \beta_5 lnl_{it} + \beta_6 gs_{it} + \varepsilon_{it} \quad (1)$$

where $lngrdp_{it}$ is economic growth of regencies and municipalities in region i year t, fd_{it} is fiscal decentralization in region i year t, mys_{it} is average years of schooling in region i year t, fdi_{it} is foreign investment in region i year t, $domi_{it}$ is domestic investment in region i year t, lnl_{it} is labor force in region i year t, gs_{it} is size of regency and municipality government in region i year t, ε_{it} is estimation error of region i year t, i is regency and city 1, 2, …, 8., β_0 is a constant, and β_i is the regression coefficient of panel 1, 2, …, 6.

3.3. Unit root test

The unit root test is applied to assess the stationarity of the data and ensure that no spurious regression occurs. If the time series data is not stationary, it faces a unit root that violates the OLS assumption by variables with constant mean and time variance. The results from the unit root test indicate that the hypothesis holds in the panel unit root test. The unit root panel tests consist of either "first generation" or "second generation" tests (Hossfeld, 2010). Panel unit root testing widely uses LLC and IPS (Im et al., 2003; Levin et al., 2002).

The researchers tested cross-sectional dependence (CD) to identify the presence of contemporaneous correlation across the sample regions. Pesaran (2004) outlines the equation for the CD statistic as follows:

$$CD = \left(\frac{TN(1-N)}{1}\right)^{1/2} \bar{\hat{\rho}} \quad (2)$$

where $\bar{\hat{\rho}} = \left(\frac{2}{N(N-1)}\right) \sum_{i=1}^{N} \sum_{j=1+1}^{N} \hat{\rho}_{ij}$ and $\bar{\hat{\rho}}$ is the pairwise cross-sectional correlation coefficient of the residuals from the traditional ADF regression. N and T are the panel and sample sizes, respectively. The cross-sectional dependence test determines the presence of cross-sectional dependence in the panel model. In essence, the cross-sectional augmented Dickey-Fuller (CADF) regression is used to reformulate the equation as indicated below:

$$\Delta y_{it} = \alpha_{it} + \theta_i t + \beta_i y_{it-1} + \gamma_i \bar{y}_{t-1} + \varphi_i \Delta \bar{y}_t + \varepsilon_{it}, \quad t = 1, \ldots, T \text{ and } i = 1, \ldots, N \tag{3}$$

where $\bar{y}_t = N^{-1} \sum_{i=1}^{N} y_{it}$ is the cross-section average of y_{it}. Pesaran (2007) states that the main purpose of including cross-sectional averages in the equation is to identify contemporaneous correlations between y_{it}.

3.4. Cointegration test

One type of cointegration test is the Kao residual test (Kao, 1999). The panel cointegration test seeks to provide results that are more reliable in their testing and robustness than those obtained with individual tests. Pedroni (2004) proposed a scheme for developing panel cointegration tests based on the Engle-Granger (EG) scheme. Hossfeld (2010) stated that the advantage of Pedroni's approach was that it filters short-term parameters and individual "specific deterministic trends". Based on the residual estimation, Pedroni derives seven test statistics, which can be divided into some assumptions. They are a general process usually referred to as a "pooled" or "within-dimension" test and an individualized process referred to as a "grouped" or "between-dimension" test. The panel unit root test is based on ADF.

This study used a test statistic that uses the residuals from the following cointegrating lattice regression assumption based on Equation (1). With the null hypothesis test, no cointegration is set at residual $\hat{\varepsilon}_{it}$ that utilizes:

$$\hat{\varepsilon}_{i,t} = \rho \hat{\varepsilon}_{it-1} + \mu_{it} \tag{4}$$

In addition, Pedroni (1999, 2004) developed a seven-panel cointegration test based on cointegrating residual values ε_{it}. Three of the seven tests are based on the between-dimensions and are regarded as group average panel cointegration tests. The numerators and denominators are added separately across the N dimensions to create the remaining four tests, which are panel cointegration tests based on the within-dimensions.

3.5. FMOLS model

In this study, the panel FMOLS estimation was used (Pedroni, 2000). By adding the Phillips & Hansen semi-parametric correction to the OLS estimator, this method effectively addresses the bias resulting from regression endogeneity (Phillips & Hansen, 1990). Additionally, this model is adaptive to non-stationarity and cointegration issues, producing consistent and efficient estimates while supporting the analysis of intervening variables. The general model is written as:

$$y_{it} = \beta_0 + x_{it}\beta_1 + \vartheta_{it} \tag{5}$$

and

$$x_{it} = x_{iit-1} + \varepsilon_{it} \tag{6}$$

where the vector error process $\xi_{it} = (\vartheta_{it}, \varepsilon'_{it})$ is stationary with the covariance matrix represented by Ω_i. Pedroni (1996, 2001) suggested the use of FMOLS estimator for panel cointegration. The pooled approach of the FMOLS estimator as a modification of standard OLS is expressed as:

$$\hat{\beta}_{FM} = \left(\sum_{i-1}^{N} \hat{L}_{22i}^{-1} \sum_{t=1}^{T} (x_{i,t} - \bar{x}_i)^2 \right)^{-1} \sum_{i=1}^{N} \hat{L}_{11i}^{-1} \hat{L}_{22i}^{-1} \sum_{t=1}^{T} (x_{i,t} - \bar{x}_i)^2 \, (y_{i,t}^{*} - \hat{\delta}_i) \tag{7}$$

where $y_{i,t}^{*} = (y_{i,t} - \bar{y}_i) - \left(\frac{L_{21i}}{L_{22i}}\right)\Delta x_{i,t} + \left(\frac{L_{21i}-L_{22i}}{L_{22i}}\right)\beta(x_{i,t} - \bar{x}_i)$ and $\hat{\delta}_i \equiv \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^{0} - \left(\frac{L_{21i}}{L_{22i}}\right)\left(\hat{\Gamma}_{22i} + \hat{\Omega}_{22i}^{0}\right)$. Pedroni (2001) revealed that heterogeneity issues involving individual mean differences and individual responses to short-term disturbances of the cointegrating equilibrium are the primary causes of dynamic cointegrated panel estimates. By including individual-specific regression intercepts and enabling the serial correlation characteristics of the error process to differ among members of the panel, the proposed FMOLS addresses these two problems.

4. Results and discussion

4.1. Statistical summary

In summary, the GRDP value of regencies and municipalities in Banten during the study period was 31,290 or IDR 48,235,683.58 million or an average economic growth of 5.1%. The mean value of the fiscal decentralization variable was 36,063. This means that the ratio of the realization of transfer funds and local revenue to the realization of total expenditure was 33.06% (see Table 2).

Table 2 – Statistical Description

Variables, n=104	Mean	Std. dev.	Max	Min
lngrdp	31.290	0.691	32.356	30.139
fd	33.063	16.622	72.530	8.180
fdi	12.618	4.785	14.964	0.000
domi	10.959	5.423	16.393	0.000
lnl	13.173	0.636	14.415	11.926
Mys	8.496	1.820	11.840	5.340
gs	6.208	3.499	14.131	1.535

As shown in Table 2, the average value of the mean years of schooling variable indicates the average educational attainment of the population in regencies and municipalities in Banten of 8.49 years. This suggests that the average educational level of residents in Banten is equivalent to grade 3 of lower secondary education or grade 9. The average value of foreign investment was IDR 301,945.95 million, and the average domestic investment was IDR 57,468.95 million. The labor variable had an average value of 13,173. This indicates that the average number of workers in the regional economy of regencies and municipalities in Banten is 525,970 people, while the average value of government size is 6,208. This figure suggests that the ability of local revenue to produce the output of goods and services in the economy reaches 6.21% on average. The higher the size of the government, the greater the contribution of local revenue in Banten in producing the output of goods and services.

4.2. Results of the unit root test

This study employed the common and frequently used types of cross-section dependence tests. The results of the four tests clearly indicate the presence of moderately strong to very strong cross-sectional dependence (sig. 1%, 5%, and 10%). This also indicates that the second generation of

panel unit root tests should provide more reliable inference. Details of the results of the test presented in Table 3:

Table 3 – Results of the Cross-section Dependence Test

Variables, *d.f*=208	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
lngrdp	361.512***	44.567***	44.234***	19.013***
fd	263.024***	31.406***	31.073***	16.141***
inv	44.739**	2.237**	1.904*	1.977**
fdi	55.729***	3.705***	3.372***	3.732***
domi	128.152***	13.383***	13.050***	10.312***
lnl	202.313***	23.294***	22.960***	13.722***
mys	302.074***	36.624***	36.291***	17.353***
gs	285.282***	34.381***	34.047***	16.857***

Notes: ***sig.=1%, **sig.=5%, *sig=10%, *d.f. = degree of freedom*

Meanwhile, the test results of the five panel unit roots (Breitung & Pesaran, 2008; Dickey & Fuller, 1979; Im et al., 2003; Levin et al., 2002; Phillips & Perron, 1988) are shown in Table 4. The assumption is to use only "intercept" and "intercept and trend" at the "level" and the "first difference". The results of the unit panel test are summarized in the following table:

Table 4 – Results of the Panel Unit Root Test

Variables	Test types	Level		First difference	
		Intercept	Intercept and trend	Intercept	Intercept and trend
lngrdp	LLC	-2.608***	-0.212	-7.315***	-8.258***
	Breitung	-	2.077	-	-5.708***
	IPS	-1.406	3.211	-3.818	-3.236***
	ADF	13.134	2.457	40.984***	35.906***
	PP	28.382**	2.098	40.932***	67.139***
fd	LLC	-3.429***	-9.687***	-11.050***	-7.814***
	Breitung		-1.552*	-	-4.204***
	IPS	-0.382	-4.639***	-9.215***	-7.099***
	ADF	15.577	48.269***	90.264***	68.979***
	PP	23.900*	74.809***	166.172***	143.056***
mys	LLC	-0.539	-4.048***	-5.659***	-3.004**
	Breitung	-	-3.004***	-	1.572
	IPS	-2.335	-2.234**	-4.021***	-1.344*
	ADF	7.639	32.128***	46.495***	29.873***
	PP	23.264	45.53***	62.428***	49.241***
fdi	LLC	-7.028***	-3.283***	-4.637***	-17.594***
	Breitung	-	-2.359***	-	-4.841***
	IPS	-4.059***	-1.107	-6.069***	-8.586***
	ADF	43.136***	21.602	61.376***	54.626***
	PP	30.161**	21.784	91.118***	79.504***
domi	LLC	-1.585*	-5.343***	-13.621***	-12.472***
	Breitung	-	1.688	-	-4.724***
	IPS	-0.379	-1.995**	-11.100***	-9.533***
	ADF	29.319**	36.113***	102.801***	85.243***
	PP	28.652**	41.193***	121.404***	135.577***
lnl	LLC	0.278	-4.774***	-10.500***	-10.349***

	Breitung	-	-0.399	-	-3.416***
	IPS	2.200	-2.492***	-8.733***	-6.862***
	ADF	7.787	30.977***	83.629***	64.491***
	PP	7.823	39.189***	119.345***	100.746***
gs	LLC	-6.349***	-1.501*	-3.723***	-10.574***
	Breitung	-	0.848	-	-3.465***
	IPS	-4.540***	1.749	-2.362***	-7.851***
	ADF	49.143***	9.236	32.897***	70.839***
	PP	74.387***	21.824	56.157***	90.874***

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

The results of the unit root panel test show that partially all variables were stationary at the 1%, 5% and 10% significance levels in the "first difference" (see Table 4). However, only the Breitung test produced an education variable (*mys*) that was stationary at "level" but not at "first difference". In addition, researchers can continue to the next stage, namely the cointegration panel test.

4.3. Results of the panel cointegration test

The panel cointegration test is utilized to detect the nexus between the decentralization of fiscal policy and economic growth in Banten in the long run. For the Panel cointegration test, this study used 7 types of panel tests (Pedroni, 2000) and Kao residual (Kao, 1999). In this test, the researchers set the assumption of "no intercept" and only "individual intercept".

Table 5 – Results of the Panel Cointegration Test

Model	Dimension	Stat.	No Intercept		Individual Intercept	
			Unweighted	Weighted	Unweighted	Weighted
Model 1	Within-dimension	Panel v stat.	-2. 111	-2.133	-0.458	-0.213
		Panel rho stat.	0.321	0. 625	0.012	-0.071
		Panel PP stat.	0.146	0.469	-2.542***	-2.465***
		Panel ADF stat.	0.264	0.565	-2.083**	-2.037**
	Between-dimension	Group rho stat.	2.364	-	1.244	-
		Group PP stat.	1.257	-	-2.073**	-
		Group ADF stat.	1.485	-	-1.830**	-
Model 2	Within-dimension	Panel v stat.	-2.177	-2.184	0.403	0.339
		Panel rho stat.	0.267	0.303	1.236	0.937
		Panel PP stat.	-2.035**	-2.191**	0.237	-0.489
		Panel ADF stat.	-1.808**	-2.074**	0.739	-1.401*
	Between-dimension	Group rho stat.	1.628	-	1.913	-
		Group PP stat.	-2.014**	-	-1.620*	-
		Group ADF stat.	-1.825**	-	-2.120**	-
Model 3	Within-dimension	Panel v stat.	-0.959	-1.052	-0.982	-0.818
		Panel rho stat.	2.622	2.474	3.036	3.079
		Panel PP stat.	0.476	-0.039	0.033	-2.629**
		Panel ADF stat.	-2.504***	-1.644**	-1.653**	-2.180**
	Between-dimension	Group rho stat.	3.914	-	4.329	-
		Group PP stat.	-0.772	-	-4.386***	-
		Group ADF stat.	-2.586***	-	-3.115***	-
Model 4	Within-dimension	Panel v stat.	-3.389	-3.540	-0.861	-0.974
		Panel rho stat.	2.289	2.215	3.300	3.356
		Panel PP stat.	-9.136***	-6.828***	-2.450**	-2.578**
		Panel ADF stat.	-4.715***	-4.337***	-1.526*	-2.100**
	Between-dimension	Group rho stat.	3.808	-	4.493	-
		Group PP stat.	-13.785***	-	-2.890**	-
		Group ADF stat.	-5.965***	-	-2.286**	-

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

The hypothesis of cointegration among the variables under investigation is strongly supported by the results of the Pedroni test shown in Table 5, and as evidenced by comparison with other statistics. The panel and group rho statistics were found to have less power. At the 1%, 5%, or 10% significance levels, the majority of the statistics were consistent with the presence of a cointegrating connection. The test results shown above support the hypothesis of the correlation between the variables used in this study across all regencies and municipalities in Banten in the long run.

Table 6 – Results of the Kao Residual Test

Model	ADF t-test	Sig.
Model 1	-3.999	0.000
Model 2	-2.569	0.005
Model 3	-3.422	0.000
Model 3	-4.722	0.000

Table 6 shows the results of the Kao residual cointegration test in the ADF statistics of the four models producing *ADF* sig. = 0.000-0.005 < 0.05. These results indicate that there is a long run equilibrium or relationship between the predictor variables and the regency and municipality economic growth variables in Banten in the long run with a significance level of 1%.

4.4. Results of the Granger causality test

The Granger causality test was used to identify causal relationships between fiscal decentralization, education, and economic growth. The researchers used a lag length of 2-6 and found that three variables - fiscal decentralization, education, and economic growth - did not have a bidirectional relationship. The observed relationship pattern is therefore unidirectional (see Table 7).

Table 7 – Results of the Granger causality test

Direction of causality	Number of lags	Prob.	Decision
mys → lngrdp	2	0.238	Do not reject
lngrdp → mys		0.333	Do not reject
fd → lngrdp	2	0.175	Do not reject
lngrdp → fd		0.128	Do not reject
fd → mys	2	0.019	Reject
mys → fd		0.924	Do not reject
mys → lngrdp	4	0.936	Do not reject
lngrdp → mys		0.056	Reject (at 6%)
fd → lngrdp	4	0.000	Reject
lngrdp → fd		0.134	Do not reject
fd → mys	4	0.084	Reject (at 9%)
mys → fd		0.469	Do not reject
mys → lngrdp	6	0.859	Do not reject
lngrdp → mys		0.074	Reject (at 8%)
fd → lngrdp	6	0.001	Reject
lngrdp → fd		0.310	Do not reject
fd → mys	6	0.042	Reject
mys → fd		0.643	Do not reject

4.5. Results of the fixed effect GLS

The results of the model selection test show that the FE model was the selected model. Given the problems of heteroscedasticity and autocorrelation, this study applied a panel regression with the Fixed Effect Generalized Least Square (FE-GLS) approach. Although the results of the model estimation showed R^2 and adjusted R^2, they have been validated with a VIF value of 1.267-3.099. Additionally, this model controls for variance across units by utilizing within-unit variance over time, resulting in a tendency for high R^2 values. This study divided the panel regression results into two: without control variables and with control variables.

Table 8 – Results of the Fixed effect GLS method

Variables, n=104	Model 1: *mys*	Model 2: *lngrdp*	Model 3: *mys*	Model 4: *lngrdp*
Fd	0.021***	0.002**	0.009***	0.002**
	(0.001)	(0.001)	(0.0008)	(0.001)
Mys	-	0.409***	-	0.203***
		(0.028)		(0.029)
Fdi	-	-	-0.011**	0.004
			(0.005)	(0.003)
domi	-	-	0.009*	0.005***
			(0.005)	(0.002)
lnl	-	-	1.080***	0.549***
			(0.279)	(0.103)
gs	-	-	0.118***	0.037***
			(0.017)	(0.008)
Constant	7.805***	27.728***	-6.711*	21.949***
	(0.052)	(0.214)	(3.621)	(1.272)
R^2	0.9824	0.9894	0.9930	0.9936
Adjusted R^2	0.9809	0.9883	0.9921	0.9926
F-stat	661.795	971.602	1076.810	1068.095
Prob(F-Stat)	0.000	0.000	0.000	0.000
Chow test	339.896***	337.525***	362.764***	285.069***
Hausman test	7.529***	19.016***	306.346***	48.908***

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

The coefficient of fiscal decentralization variable was 0.021 and significant at 1%. This indicates that for every 1% increase in fiscal decentralization, the average education level of the residents in regencies and municipalities in Banten increases by 0.021 years (see Table 8). As shown in Model 2, the coefficient values of the fiscal decentralization and education variables were 0.002 and 0.409, respectively, and significant at 1% and 5%. These results suggest that for every 1% increase in fiscal decentralization and one year of schooling, the economic growth of Banten's regencies and municipalities increases by 0.002% and 0.409%, respectively.

By including control variables, as given in Table 8, the coefficient of the decentralization of fiscal was 0.009 and significant at 1%. This indicates that for every 1% increase in fiscal decentralization, the years of schooling increase by 0.009 years (see Model 3). Meanwhile, all control variables of foreign investment, domestic investment, labor, and government size were found to be significant in influencing the average education of the population of regencies and municipalities in Banten. Model 4, the coefficient values of fiscal decentralization and education were 0.002 and 0.203, respectively, and significant at 1% and 5%. All control variables exhibited a significant impact on economic growth except for the foreign investment variable. In addition, the Sobel test is needed

to identify the effect of fiscal decentralization mediated by education on the economic growth of regencies and municipalities in Banten.

4.6. Results of the FMOLS panel

The following data analysis is an FMOLS panel estimation with a pooled approach, and the trend specification assumption is constant. This approach also assumes that all regencies and municipalities have the same characteristics, resulting in the same regression coefficients. This model also corrects errors, improves estimation, and enhances model fit with the data, ultimately increasing the R^2 value. This study identified the long-term effect of decentralization mediated by education, regional investment, and control variables on the economic growth in Banten. This model has fulfilled the assumptions of non-multicollinearity and stationary error in the first degree.

Table 9 – Results of the Panel FMOLS Regression (Pooled Method)

Variables, n=104	Model 1: *mys*	Model 2: *lngrdp*	Model 3: *mys*	Model 4: *lngrdp*
fd	0.023***	0.005***	0.009***	0.002**
	(0.003)	(0.002)	(0.003)	(0.001)
mys	-	0.340***	-	0.142***
		(0.056)		(0.043)
fdi	-	-	-0.016	0.004
			(0.010)	(0.003)
domi	-	-	0.014*	0.009***
			(0.007)	(0.002)
lnl	-	-	1.119***	0.601***
			(0.396)	(0.126)
gs	-	-	0.117***	0.029**
			(0.034)	(0.012)
R^2	0.9865	0.9864	0.9917	0.9929
Adjusted R^2	0.9853	0.9849	0.9905	0.9919
Chi-Square	68.701	159.841	123.862	504.518
Wald (Prob)	0.000	0.000	0.000	0.000

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

As shown in Model 1 in Table 9, the coefficient value of the fiscal decentralization was 0.005 and significant at 1%. This suggests that for every 1% increase in fiscal decentralization, the average education level of the residents in regencies and municipalities in Banten increases by 0.023 years in the long run. Meanwhile, as shown in Model 2, the fiscal decentralization and education coefficients were 0.005 and 0.340, respectively, and were statistically significant at 1% and 5%. This indicates that for every 1% increase in fiscal decentralization and one year of schooling, the economic growth regencies and municipalities in Banten increase by 0.005% and 0.340%, respectively, in the long run. Model 3 produced a coefficient value of fiscal decentralization of 0.009 and was significant at 1%. This suggests that for every 1% increase in fiscal decentralization, the years of schooling increase by 0.009 years in the long run. As indicated in Model 4, the fiscal decentralization and education coefficients were 0.002 and 0.142 and were statistically significant at 1% and 5%. This indicates that 1% increase in fiscal decentralization and education, results in an increase in the long-term economic growth in Banten by 0.002% and 0.142%, respectively. The control variables, namely domestic investment, labor, and government size, partially showed a significant effect on economic growth in Banten in the long run, while foreign investment was not significant.

Table 9 shows that the education variable significantly mediated the impact of fiscal decentralization on economic growth, indicating that for every 1% increase of the decentralization of fiscal policy, regional economic growth in Banten increases by 0.009% through education in the long run (without control variables). By utilizing control variables, a 1% increase in fiscal decentralization, results in an increase in regional economic growth by 0.0018% through education in Banten in the long run (significant at 1%).

Table 10 – Results of the Sobel Test

Correlation	Coefficient	Std. error	z-Sobel	Conclusion
Panel static: without control variables				
fd → *mys*	0.021	0.001	-	Sig. = 1%
mys → *lngrdp*	0.409	0.028	-	Sig. = 1%
fd→*mys* →*lngrdp*	0.009	0.0006	16.211	16.211 > 1.96, education as mediation sig.=1%
With control variables				
fd → *mys*	0.009	0.001	-	Sig. = 1%
mys → *lngrdp*	0.203	0.029	-	Sig. = 1%
fd→*mys* →*lngrdp*	0.0018	0.00033	5.525	5.525 > 1.96, education as mediation sig.=1%
Panel FMOLS: without control variables				
fd → *mys*	0.023	0.003	-	Sig. = 1%
mys → *lngrdp*	0.340	0.056	-	Sig. = 1%
fd→*mys* →*lngrdp*	0.008	0.0018	6.442	6.442 > 1.96, education as mediation sig.=5%
With control variables				
fd → *mys*	0.009	0.003	-	Sig. = 1%
mys → *lngrdp*	0.142	0.043	-	Sig. = 1%
fd→*mys* →*lngrdp*	0.0015	0.0006	2.221	2.221 > 1.96, education as mediation sig.=5%

Table 10 also shows that for every 1% increase in fiscal decentralization, regional economic growth in Banten increases by 0.008% in the long run (without control variables) through education. Meanwhile, the mediation test of the education variable, including control variables, yielded the same test result. Thus, with every 1% increase in fiscal decentralization, economic growth increases by 0.0015% through the education variable in Banten in the long run (significant at 5%).

4.7. Robustness check

For the robustness check, this study used the same model. Economic growth is proxied by the natural logarithm of the per capita income (lngrdpcap), while fiscal decentralization is proxied by the ratio of realized regional original revenue to the total expenditure of each regency or municipality (fd2). The estimation results are consistent with previous findings, except for Model 3. However, in general, it can be concluded that, in the long run, education significantly mediates the relationship between fiscal decentralization and economic growth in the regencies or municipalities of Banten (see Table 11).

Table 12 – Results of the robustness check

Variables, n=104	Model 1: *mys*	Model 2: *lngrdpcap*	Model 3: *mys*	Model 4: *lngrdpcap*
fd2	0.038***	0.010***	0.008	0.005**
	(0.005)	(0.002)	(0.007)	(0.002)
mys	-	0.226***	-	0.110**
		(0.045)		(0.050)
fdi	-	-	-0.002	-0.0007
			(0.001)	(0.0005)
domi	-	-	0.007	-0.0008
			(0.009)	(0.003)
lnl	-	-	1.595***	0.554***
			(0.433)	(0.164)
gs	-	-	0.092***	0.033***
			(0.033)	(0.012)
R^2	0.9849	0.9915	0.9906	0.9929
Adjusted R^2	0.9835	0.9906	0.9892	0.9918
Chi-square	57.336	158.991	97.704	209.450
Wald (Prob.)	0.000	0.000	0.000	0.000

4.8. Discussion

The success of transfer fund management of regions depends on the competence, regional resources, the accuracy of program targets, and compliance of regional administrators with financial management provisions for better community welfare. The results showed that fiscal decentralization had a direct effect on education in regencies and municipalities in Banten in the long run. A more in-depth interpretation of the results of the study is necessary because it can lead to multiple interpretations. There is an assumption of continuous dependence of regional budgets on the central government. An increase in fiscal decentralization is not merely an increase in the nominal budget allocated by the central government to the regions. However, more importantly, it is an increase in the quality of regional budget management that is better, accountable, and transparent. In addition, the share of transfer funds allocated to schools should be more equitably distributed, ensuring that these funds are channeled in accordance with its designation, such as building new facilities for secondary schools, renovating school buildings, and providing assistance for underprivileged students.

The results of this study support evidence from previous studies, which confirm that regions that have discretion in regional management, including finance, have better performance in managing schools (Letelier & Ormeño, 2018). These results are also consistent with previous findings (Jasmina & Oda, 2022). A regional development that has an orientation on human resources and basic education in the regions is mainly determined by the implementation of fiscal decentralization (Rauf et al., 2017; Sandjaja et al., 2020). Similar to a current study by Singh et al. (2024), fiscal decentralization generates an advantageous reformative intervention effect on public service delivery results, such as education. Both capital expenditures and cooperative resources decentralized to the regions are shown to result in both immediate short-term and long-term improvements in the quality of education (Zallé & Bakouan, 2024).

The assessment of the fiscal decentralization variables using the proxy of the realization of the transfer fund ratio (without general allocation funds) to the realization of total expenditure revealed an average value of 33.06% in Banten. This indicates that fiscal decentralization contributes to boosting economic growth in Banten in the long run. Granting of authority and budgetary control to local governments allow them flexibility to carry out their functions through appropriate budget

allocations, according to regional potential, and community needs. These findings indicate that local governments in Banten have been proven to be more sensitive to local economic conditions after the implementation of fiscal decentralization. Fiscal decentralization can also be utilized to support the improvement of public services and better community welfare are tax and non-tax revenue sharing funds.

These findings support the findings of a prior study by Sandjaja et al. (2020), which confirm that policy decentralization has an influence on human development and poverty alleviation. Therefore, these findings can be useful for developing targeted interventions aimed at increasing local government revenue and reducing unnecessary local government expenditure to increase fiscal space. Likewise, previous research confirms that fiscal decentralization is positively correlated to the economic growth of provinces in Vietnam (Thanh & Canh, 2020). According to Stojcic and Tolic (2021), governments ought to take proactive actions, such as implementing fiscal policy measures, to boost demand, avert a reduction in output and employment, and recover trust in institutions. The results of a Mexican study are also consistent with the findings of this study, which found that federal transfers have a positive impact on economic growth. However, its weak growth response and ambiguous response to investment shocks may indicate a weak budget issue (Mendoza-Velázquez et al., 2022). The work of Azizah et al. (2022) in Sulawesi Island broadly supports this finding. It shows that the ability of transfers to regions can stimulate economic growth. On the other hand, local own-source revenue (*Indonesian, PAD*) remains suboptimal in stimulating economic growth.

Recent findings from Hung & Thanh (2022) also support the findings of the current study, showing that there is a significant nexus between the decentralization of fiscal, economic growth and human development from various directions with expenditure-based decentralization. Other research also shows that central government grants, local own-source revenues, and human resource development determine regional economic growth, although the degree of decentralization has a negative effect (Sofilda et al., 2023). However, the research does not support the findings from Yushkov (2015), which confirm that government expenditure is a negatively correlated with regional economic growth. Research by Rauf et al. (2017), which found that the individual impact of fiscal transfers is insignificant in Pakistan, corroborates these results. Likewise, the findings of studies in India show a negative relationship between these two variables (Jin & Rider, 2020).

Education plays an essential role in directly driving economic change in a region. Regencies or municipalities in Banten with high average educational levels tend to have the ability to make innovations, inventions, and creativity through their competence. This has a major impact on improving the output growth of goods and services in the region. This study has confirmed that education has a direct and significant impact on boosting economic growth in Banten in the long run. The strong relation between education and economic growth suggests that policymakers can target the average years of schooling in regencies and municipalities in Banten as a policy tool for economic growth. The results of this study also confirm that almost all of the literature used, including that of Goczek et al. (2021), indicate that diffusion and transmission generated by education to promote education is needed. Other studies also show that there is a strong nexus between education and economic growth (Deme & Mahmoud, 2020; Ishchy, 2020; Sabur et al., 2021). The education discussed in this study is the equitable distribution of education and the quality of education that should be accelerated, ensuring that it can be accessed by all school-age populations.

Fiscal decentralization and economic growth also have an indirect relation because another variable mediates it, namely education. This study has confirmed the significant indirect effect of fiscal decentralization on the economic growth of regencies and municipalities in Banten through education variables in the long run. This finding introduces education proxied by average years of

schooling as a mediating mechanism (as human resources) that contributes to economic growth. Therefore, this result also supports education investment in various countries to develop and utilize human resources effectively and efficiently to achieve economic growth. The findings of this research are in line with those previous studies, which show that increased government spending contributes significantly to improving economic growth through social inclusion (Asadullah, 2019). A recent study by Stojcic & Tolic (2021) also confirmed these findings. They argue that public services are a significant mediating variable in the relationship between fiscal decentralization and economic growth. The use of democracy as a mediating variable also supports this finding that there is an indirect relation between fiscal decentralization and economic growth (Li & Khalid, 2023). However, other research has found significant outcomes when utilizing economic growth as a mediating variable in the relationship between income disparity and fiscal decentralization (Triyono et al., 2021).

The findings of this research strengthen previous research on the role of fiscal decentralization mediated by the education variable in encouraging the economic growth in Banten. From the aspect of the analysis model, the FMOLS approach to test fiscal decentralization mediated by the education variable in driving the economic growth in Banten does not adequately represent regencies and municipalities throughout Indonesia. Therefore, the population can be expanded to regencies and municipalities throughout Indonesia, making it easier to generalize the results. One of the weaknesses of quantitative research using secondary data is that it relies on observing the behavior of data published by other parties, making it difficult to obtain qualitative information. This condition makes it difficult for researchers to analyze and capture the viewpoint of others, such as policymakers, investors, or other required parties or institutions. In addition, this study has not been able to capture external shocks, such as the global crisis and the Covid-19 pandemic, making it difficult to determine their impact on the dynamics of economic growth, fiscal decentralization, and education in Banten.

5. Conclusion

This study has shown that fiscal decentralization becomes a significant determinant in encouraging the improvement of education for the residents of regencies and municipalities in Banten in the long run. This indicates that greater degree of fiscal decentralization, correlates with an increase in the mean years of schooling in the long run. In addition, education has been shown to have a significant effect on the economic growth of regencies and municipalities in Banten in the long run. Elevating the level of education of the population means increasing knowledge, attitudes, and skills, ensuring that the population's productivity in the long-term increases. Increased productivity can encourage the regional economy to grow positively. Fiscal decentralization significantly and directly increases the average economic growth in Banten in the long run. The increase in budget management obtained from the transfer of funds to the increasing total regional expenditure can encourage economic growth. Education can serve as a mediator between the decentralization of fiscal and the economic growth of regencies and municipalities in Banten in the long run. Education has been proven to be an essential instrument in encouraging the economic growth in Banten, both acting alone and as a mediating variable.

Based on the research results, this study has important policy implications for improving long-term economic growth in Banten. First, the provincial, regency, and municipality governments in Banten should reduce their dependence on transfer funds. Instead, they should increase their local own-source revenue, and maintain their expenditures, which will facilitate fiscal decentralization to provide long-term benefits to improve the welfare of their people. Furthermore, regional development priorities financed by transfer funds should also be the focus of policy according to

community preferences and needs. Given that transfer funds and local revenues increase the ability of regions to finance their expenditures, it is important to strictly monitor and evaluate them, ensuring that they are not directed to sectors that are not productive in boosting the economy. Second, the government is increasing the effectiveness of public programs and services to decrease the waste of limited economic resources. The utilization of the central government budget is prioritized to elevate the level of education of the population through various program mechanisms and activities that are accurate, precise, and have a direct impact on the school-age population and households. Third, the local government allocates more budget to the education sector, particularly to improve access to and the quality of sustainable education. This aims to increase the average years of schooling and the skill level of the population, which will have a direct impact on productivity and economic growth. Furthermore, policies to enhance skills through secondary and higher education have a direct effect on labor productivity and promote long-term regional economic growth.

The findings suggest that the fiscal decentralization variable from the revenue to the total expenditure adds to the consistency of previous research results, showing that budget variables have a significant influence on the economy. In addition, these findings also contribute to the advancement of the field of economics, especially regional economics. Future research should expand the population size, including regencies and municipalities in Java, Sumatera, and Sulawesi, or even regencies and municipalities throughout Indonesia. This will facilitate a more accurate generalization of results. This study has not been able to capture external shocks; future study can address this, enhance the quality and complement this study. In addition, future study also can use alternative dynamic panel models to complement and accommodate more variables, such as the Dynamic System model or Pseudo Panel.

Conflict of Interest

The authors declare that they have no conflict of interest.

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