Research article

Regional Convergence between Western and Eastern Indonesia

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Abstract: This article aims to investigate the existence and determinants of regional convergence of western and eastern Indonesia. Regional convergence itself is a condition where eventually, all regions will grow into one similar level of income. Previous studies seem to verify the existence of regional convergence. Based on previous regional economic scholarship. the regional convergence is signified with the significant relationship of past lag real GDP per capita with current GDP per capita. However, the increasing gap between western and eastern Indonesia in terms of GDP per capita brings into the critical issue of the possible attainment of the existence of regional convergence in Indonesia. In this paper, the fixed effect panel data regression method was utilized to determine the current state of Indonesia's regional convergence process and to figure out the relationship of education, mining, and financial development to regional economic growth. From the study, regional convergence is found to be insignificant from 2010 to 2019. This study also managed to determine that financial development, mining contribution, the elementary, and high school enrollment rate is positively correlated with economic growth.

Keywords: convergence, disparity, education, financial development, mining

JEL Classification: I21, L72, P34, R12, R58

Abstrak: Tujuan penelitian ini adalah untuk mengkaji kemungkinan beserta faktor penyebab konvergensi regional antara kawasan Indonesia timur dan barat di Indonesia. Konvergensi regional adalah kondisi dimana seluruh daerah akan tumbuh dan memiliki level pendapatan yang sama. Beberapa studi terdahulu menyatakan bahwa konvergensi regional sedang terjadi di Indonesia, akan tetapi data beberapa tahun terakhir menunjukan peningkatan ketimpangan antara Indonesia barat dan timur dalam PDRB per kapita. Maka dari itu, studi ini menggunakan metode panel efek tetap untuk menjelaskan keadaan konvergensi regional di Indonesia saat ini dan mencari tau hubungan antara Pendidikan, pertambangan, dan perkembangan finansial terhadap pertumbuhan ekonomi daerah. Studi ini menemukan bahwa konvergensi regional tidak terdeteksi pada periode selama 2010–2019. Selain itu, peneliti ini menemukan korelasi positif antara perkembangan finansial, kontribusi pertambangan, angka partisipasi sekolah dasar (SD) dan menengah atas (SMA) terhadap pertumbuhan ekonomi.

Kata Kunci: konvergensi, ketimpangan, pendidikan, perkembangan finansial, pertambangan

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How to Cite:
Aurelia, V., Permana, L., Hasudungan, A., & Desfiandi, A. (2021). Regional Convergence between Western and Eastern Indonesia. *Jurnal Ekonomi Pembangunan, 19*(2), 183-192. DOI: 10.29259/jep.v19i2.15366

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1. INTRODUCTION

Economic inequality has been a heightening issue in some emerging economies in Southeast Asia. This economic inequality has prevailed in the Indonesian economy (Hasudungan & Raeskyesa, 2021). Despite the significant economic growth, the regional convergence debates in Indonesia have been a vivid discussion among national and even global economists (Raeskyesa, 2020). With these

heightening concerns, the paper aims to investigate the existence of regional convergence and determine factors of regional economic growth in Indonesia.

The gap of regional economic growth among eastern and western Indonesia has been prevalent in the Indonesian economy. Indonesia, with over 17,500 islands, is the largest archipelago country in this world, and a highly diverse one at that, with over 580 languages and dialects, 5 religions, and more (Embassy of the Republic of Indonesia - Washington, 2020). This is bound to lead to some interesting differences inside the economy, specifically at the regional level. According to Presidential Decree 44 from 2002, the government divides Indonesia into Western Indonesia Region (WIR), which includes Sumatra, Java, Bali, and Eastern Indonesia Region (EIR) which includes the Islands of Kalimantan, Sulawesi, Nusa Tenggara, Maluku, Papua. The increasing gap between WIR and EIR in terms of average GDP per capita. While the right-side measures regional disparity using the Coefficient of Variation (CV). The CV is stagnant for a few years at around 0.75, indicating high regional disparity in Indonesia. The pertinent regional disparity and its determinants will be discussed in the following sub-section.

To achieve even spatial development, the Indonesian government has implemented various efforts. At first, the centralization effort was heavily emphasized by the new order regime, utilizing trickle-down economics. This assumes that benefits gained from the system would also reach the poor (Trinugroho et al., 2015). The problem of centralization is the vertical conflicts between the regional and central government, especially in regions with abundant natural resources but low income per capita; they argued that they were only exploited for the benefit of the more developed region (Tadjoeddin et al., 2021).

Considering the problems brought by economic centralization, and the enforcement of donors to erect more local economic independence, Indonesia then shifted to decentralization, focusing on regional autonomy in several sectors and fiscal decentralization. Despite the changing spatial economic policy, the regional disparity still increased, and the widening gap is followed by the rapid increase of growth and income in some regions (Talitha et al., 2020). According to Hill & Vidyattama (2016), the pre-existing disparity in natural and human resources, also governing and financial capabilities will lead to widening regional disparity.

Talitha et al (2020) suggested that governments should improve the capacity of local governments to govern and boost economic development in the underperforming region. Thus, the government will need to map out the areas that are crucial in supporting regional development, and ultimately, regional convergence. However, the relationship between education levels and economic growth seems to be complicated. Kasri (2011) suggested that enhancing the secondary education enrollment rate would lead to better economic growth. Mendy & Widodo (2018) found that primary education enrollment rate to be insignificant for economic growth in Indonesia, due to the disparity in quality, materials, and accessibility of education that persist between regions. The latter mentioned that middle school graduates tend to work in a low-skill/productivity sector. Wang & Liu (2016) elaborated that primary and secondary graduate doesn't have the necessary skills to significantly promote economic growth. Meanwhile, Azzizah (2015) stated that decentralization has given the Indonesian regional government greater authority over education management, disparity still exists in educational indicators. Suryahadi et al., (2018) suggested that this was due to unequal access to educational facilities and unequal income of parents. Up until 2019, WIR still has a lot more schools relative to EIR (Kementerian Pendidikan, 2021). The language barrier, quality difference, and economic growth also seem to contribute to education disparity (Azzizah, 2015). It is important to also note that Indonesians have average educational attainment of only 8.9 years, which equates to middle school (Badan Pusat Statistik, 2020).

Unequal economic among different provinces became the prevalent issue to bottlenecks the regional economic convergence in Indonesia. Pertinent unequal economic development among people is obvious in the province to own rich mining resources (Suaib et al., 2020). The driver for such a problem is uneven resource distribution from the reap that is attained from the mining sector. While the mining sector can be a driver for some eastern provinces, while the local revenue from mining is not distributed efficiently to boost social infrastructure that can sustain human capital development. Some previous studies have shown how the mining contribution exacerbates

regional inequality. For instance, Alam et al., (2017) examined that the utilization of natural gas will bring forth output growth. However, it brings as well unequal distribution of natural resources endowment among its citizens. Oil and gas production is mainly concentrated in four natural resource-rich provinces of Aceh, Riau, East Kalimantan, and Papua, where public expression of dissent is also the strongest. Setyawan (2020) named resource disparities as one of the causes behind the inter-regional disparity, claiming that those abundant in oil and gas will prosper compared to regions that are lacking.

Over the years, various studies have portrayed financial development as a significant factor in increasing economic growth (Guru & Yadav, 2019; Lestari et al., 2020). One aspect of financial development would be financial deepening, which is defined as the growth of financial transactions related to the real economy (Hamori & Hashiguchi, 2012). Trinugroho et al., (2015) argued that financial deepening is greatly affected by institutional factors. For instance, banks are less willing to expand their operations in poorly governed regions. On the other hand, borrowers are less willing, or even unable to use financial services due to their poor socioeconomic conditions.

Previous discussions have highlighted the existence of regional disparities in terms of economic growth and other socio-economic indicators. Kuncoro & Murbarani (2016) found significant conditional growth convergence between the provinces of Indonesia. This indicates that the poorer provinces were growing faster than their richer peers and regional disparity should decrease until they are on a similar level of growth. However, the increasing disparity in terms of GDP per capita and the ever constant, relatively high CV brings into question the existence of regional convergence in Indonesia. Kurniawan et al., (2019) suggested that instead of regional convergence, provinces are converging in clusters, where several provinces are catching up and the others falling behind. Considering those aforementioned factors, the paper aims to correspond to the pertinent study question: What is the impact of education, financial development, and mining on the growth of income convergence across regions?.

The existence of regional disparity will lead to higher overall inequality and various socio-political-economic problems. Thus, reaching regional convergence will be imperative. It will be important to figure out whether the relevance of previously researched factors behind regional growth. With that, the government will be able to benefit from determining the focus of its disparity-reducing policies. Thus, the following would be the study objectives that are proposed in this paper: (1) determining the current state of Indonesia's regional convergence process; and (2) determining the relationship of education, financial development, and natural resources to regional economic growth.

2. RESEARCH METHODS

2.1. Data

The data processed in this paper came from various publications published by the Indonesia Bureau of Statistics (BPS) and Bank Indonesia (BI). This study acknowledges its population as the whole Indonesian population divided into a regional classification based on its provincial origin. North Kalimantan is excluded from the dataset since the province was just recently established in 2012 and resulted in a lack of information in most of the variables used in this study during and before that period. The decision to use data only from 2010 to 2019 was also due to data limitation, where several variables are unavailable before the year 2010.

The study would like to determine the existence of regional convergence and figure out the determinants of regional GDP per capita growth. Thus, the study will include gross capital formation, financial development, foreign direct investment, trade openness, mining contribution, and net education enrollment ratio (elementary, middle, and high school) as the independent variables.

Table 1. Description Data and Source

Variables	Description	Measurement Unit	Source
lnGDP	Economic Growth	Regional GDP Growth (%)	BPS
LAGGDP	Regional Convergence	Lag form of lnGDP	BPS
ELE	Net Elementary Enrollment	Net Elementary Education Enrollment Rate	BPS
MS	Net Middle School Enrollment	Net Middle School Enrollment Rate	BPS
HS	Net High School Enrollment	Net High School Enrollment Rate	BPS
TRD	International Trade	Export and Import (Total Trade) (%) of Total GDP	BPS
MIN	Mining Contribution	Contribution of Mining Sector (%) of Total GDP	BPS
FDI	Foreign Direct Investment	Foreign Direct Investment (%) of Total GDP	BPS
FIN	Financial Development	Total Savings and Credits (%) of Total GDP	BI
GCF	Gross Fixed Capital Formation	Gross Fixed Capital Formation (%) of Total GDP	BPS

2.2. Model

This study will utilize the model developed by elaborating on different studies that observed the conditional β convergence using the general specification growth model (Giacomelli, 2019; González Gordón & Resosudarmo, 2019; Kuncoro & Murbarani, 2016; Resosudarmo & Vidyattama, 2006). To be specific, the model will observe the existence of conditional β convergence, and the model will control the variation of growth variables and variables of interest, which will be listed below. This method will also determine the correlation of regional growth with several growth variables. The model utilized is as follows:

$$\frac{Y_{it} - Y_{it-1}}{Y_{it-1}} = y_1 + y_2 lny_{it-1} + X'_{it} y_x + Z'_{it} y_z + D'_{it} y_d + \eta_i + u_{it} \qquad (1)$$

Where: *Y* is output per capita, lny_{it-1} is proxy of regional convergence or conditional β convergence, X'_{it} is the independent variables that are commonly used in growth studies, Z'_{it} is the vector of variables of interest, D'_{it} is a vector of year dummy, η_i are regional specific effects, u_{it} represents a random error, *i* will act as the index for the region, while *t* as the index for time. Considering this, the model will be reiterated as follows:

$$lnGDP_{it} = \alpha + \beta_1 lnGDP_{it-1} + \beta_2 GCF_{it} + \beta_3 FIN_{it} + \beta_4 FDI_{it} + \beta_5 TRD_{it} + \beta_6 ELE_{it} +$$
$$\beta_7 MS_{it} + \beta_8 HS_{it} + \beta_9 MIN_{it} + \mu_{it} + v_{it} \qquad (2)$$

GDP is the growth of GDP per capita by Province which acts as the dependent variable. $lnGDP_{it-1}$ or lag GDP is a proxy for conditional β convergence or regional convergence. X'_{it} will be *GCF* acting as a proxy for capital and control variables. Z'_{it} will be *FIN* as a proxy of financial development by province, *FDI* as Foreign Direct Investment by province, *TRD* as a proxy of trade openness by province, *MIN* as a proxy of the role of oil and gas by province, and *ELE*, *MS*, *HS* as a proxy of education variables by province, $\in$ acts as the error term, *i* acts as the provincial notation and *t* acts as the time notation. It must be noted that this study will not include population growth, human capital investment, inequality, and year dummy due to data limitations. Instead, this study will add the net enrollment rates of elementary, middle, and high schools.

This study utilized STATA to do the entire data processing and analysis. The goodness of fit of the model and classic linear regression model (CLRM) assumptions are tested before regressing. This study utilized the Variance Inflation Factor (VIF) Test for multicollinearity, Breusch Pagan/Cook Weisberg (BP/CW) for heteroskedasticity, and modified wald-test for Groupwise heteroskedasticity. The high degree of multicollinearity will require a re-examination of the model and heteroskedasticity issues will be treated with robust standard error.

The next step would be to detect the presence of unobserved heterogeneity. To do this, the Breusch-Pagan Lagrange Multiplier (BP-LM) test for random effects will be used. If significant (p-value < 0.05), then the existence of unobserved heterogeneity is confirmed, invalidating the use of POLS. From there, the test of overidentifying restrictions will be used to determine the correlation

between unobserved heterogeneity and independent variables. This is because the usual Hausman test will be invalid in the presence of heteroskedasticity. If significant, the fixed effect method with robust standard errors should be used, and if not, the random effect method with robust standard errors should be used.

On the regression analysis, if an independent variable is significant, it can be concluded that the variable has a positive or negative correlation with the dependent variable. $lnGDP_{it-1}$ is included as a proxy for convergence. If significant with a negative coefficient, conditional β convergence is happening, vice versa. This means that the poorer regions are growing at a much faster rate than their richer counterparts and all regions will eventually have a similar growth rate.

3. RESULTS AND DISCUSSION

3.1. Findings

Table 2 reports the correlation matrix shown does not show worrying correlation numbers, the matrix shows that almost every independent variable is positively correlated with the dependent variable except GCF (gross capital formation). There is some understandable correlation between ELE (net elementary enrollment rate), MS (net middle school enrollment rate), and HS (net high school enrollment rate), but this is to be expected because students who enrolled and graduated from elementary school, will typically enroll in middle school, and from there, high school.

Table 2. The correlation matrix between variables

Variable	lnGDP	GCF	FIN	FDI	ELE	MS	HS	MIN	TRD
lnGDP	1.000								
GCF	-0.026	1.000							
FIN	0.175	0.304	1.000						
FDI	0.039	0.227	0.050	1.000					
ELE	0.026	0.111	0.240	-0.174	1.000				
MS	0.246	0.130	0.333	-0.041	0.752	1.000			
HS	0.249	0.107	0.287	0.037	0.592	0.839	1.000		
MIN	0.462	-0.291	-0.471	0.168	-0.346	-0.198	-0.133	1.000	
TRD	0.360	0.006	0.085	0.166	0.137	0.350	0.402	0.139	1.000

Source: Authors' calculations

Table 3 reports that the VIF test for multicollinearity shows no multicollinearity problem. Both the BP/CW and modified wald-test for heteroskedasticity is significant, showing signs of heteroskedasticity. Furthermore, the BP-LM test for random effects is significant, hinting at the existence of unobserved heterogeneity and invalidating the use of pooled OLS. As there exists heteroscedasticity in the model, the use of a Hausman test would be ineffective. Therefore, the test of overidentifying restrictions will be used instead. The test result is significant, indicating that the use of fixed effects would be more appropriate, rather than random effects. Therefore, the model will be regressed using a fixed effect panel regression method with robust standard error.

Table 3 exhibits the result of the panel model regression using fixed-effect methods. As per the initial study objectives, the panel regression result will determine the existence of regional convergence and the correlation of growth variables to the growth of regional GDP per capita. Regarding the growth variables, the variables financial development (FIN), mining as a share of GDP (MIN), the net enrollment rate for elementary school (ELE), and the net enrollment rate for high school (HS) are highly and positively significant at 99.9 percent confidence level, while the other variables are found to be insignificant. This means that as the four variables increase, the growth of Regional GDP per capita will also increase.

Table 3. The result of model estimation

Dependent Variable: lnGDP

Variable	Descriptions	Coefficient	Std. error	t-stat
lagGDP	Regional Convergence	0.022	0.022	1.02
GCF	Gross Capital Formation	0.175	0.327	0.53
FIN	Financial Development	0.402***	0.069	5.82
FDI	Foreign direct investment	0.163	0.131	1.25
TRD	International Trade	0.005	0.018	0.29
MIN	Mining Contribution	1.491***	0.264	5.64
ELE	Net Elementary Enrollment Rate	0.012***	0.003	4.15
MS	Net Middle School Enrollment Rate	0.002	0.002	0.83
HS	Net High School Enrollment Rate	0.006***	0.314	3.02
Obs.	329			
R^2	0.470			
Prob. F-test	0.000			
Selection Method: Test for overidentifying restrictions = 2981.849 (0.000); LM-test = 90.21 (0.000)				
Diagnostic test	Statistics test	Prob.		
VIF-test	2.37			
Modified Wald-test	203.41	0.000		
BP-CW-test	39.32	0.000		

Note: Sign *, ** and *** represent significance at 0.1%, 1% and 5% levels respectively
Source: Authors' calculations

Comparing the result to previous literature, it is important to note that (Resosudarmo & Vidyattama, 2006) found the accumulation of physical capital, trade openness, and the share of oil and gas to be positively significant factors of regional economic growth. It is imperative to note that while the role of natural resources (MIN) stays significant. Yet, in the inferential regression result in Table 3, trade openness (TRD) and accumulation of capital (GCF) are found to be not significant. With the addition of new variables and the exclusion of several variables, it made sense that the result would be different. In addition, the use of newer periods and more provinces in this study, which was intended to provide an updated picture of the drivers behind regional economic growth, might also contribute to the differences in result.

Underscoring to the past academic rule of thumb, the conditional β convergence exists only when the proxy is significant with a negative coefficient. In our regression, as in table 2, the variable lag GDP is insignificant with a positive coefficient. This indicates that regional conditional β convergence cannot be found in the sample. This result is substantially different from the study of past studies (Giacomelli, 2019; González Gordón & Resosudarmo, 2019; Kuncoro & Murbarani, 2016), as most of them seem to suggest that regional convergence is indeed happening.

3.2. Discussions

This study has resembled findings as the study made by Kurniawan et al. (2019). Their study did not find regional convergence. Instead, Kurniawan et al., (2019) suggested that provinces are converging in clusters, where several provinces are catching up and the others falling behind. In this study, regional convergence is also not found at the regional level, embarked by insignificant regional convergence variable in table 2. Thus, this serves as an indication that poorer regions are not necessarily growing faster than their richer counterparts, and that regional disparity will continue to exist or even increase. As regional disparity increases, poorer regions will not be able to catch up on their own. Meanwhile, this study demonstrates that elementary and high school enrollment rates are highly positively significant, while middle school enrollment rates are found to be insignificant. The result of the elementary enrollment rate was against our initial hypothesis (negative correlation). This was not surprising, considering previous studies also painted a mixed

picture on the relationship between education levels and economic growth. This result is like the result of a previous economic development study. For instance, Kasri (2011) found that elementary school has positive effects on economic growth, which aligns with the findings of this study. A possible explanation was that the government may have been able to increase the effectiveness of this level.

The introduction of this paper has made it clear that disparity still exists in the educational sector of Indonesia, with WIR having a lot more schools compared to EIR (Kementerian Pendidikan, 2021). Azzizah (2015) cites inequality, be it of access, parent's income, educational quality, among others to be the factors behind the educational disparity. This strengthens the necessity to increase education quality and better access to education across all regions in Indonesia. Educational access in this sense means financial access and accessibility to educational facilities. This would be beneficial in inducing a more equal growth across regions. Although our study shows that mining contribution is significant towards economic growth, regional convergence is still not achieved. (Sakamoto, 2007; Setyawan, 2020; Tadjoeddin, 2016) states that regional growth disparity in economic output is created from the unequal distribution of natural resources endowment in Indonesia, especially in terms of oil and natural gas. Unfair conduct and share of benefits are likely to be a recurring issue as that much of the value added by a resource-rich region through extracting activities does not necessarily lead to benefits reaped by those who live there, it will mostly be enjoyed by other regions or even countries abroad (Sakamoto, 2007; Setyawan, 2020).

The result of the panel regression shows that financial development goes accordingly with the previous study (Guru & Yadav, 2019; Lestari et al., 2020; Rousseau & Wachtel, 2011). This steady increase in financial development is effective and optimal for stable economic growth since a sudden surge in financial development and financial deepening could lead toward some issues for the economy such as inflation and weaken the banking system (Rousseau & Wachtel, 2011). Concerning regional convergence, Trinugroho et al. (2015) argued that financial deepening is greatly affected by institutional factors. For instance, banks are less willing to expand their operations in poorly governed regions. On the other hand, borrowers are less willing, or even unable to use financial services due to their poor socioeconomic conditions. Thus, in addition to equal financial development across regions, this study also urges that intensified improvement in financial education and literacy, as it is still essential to improve efficiency and achieve regional convergence. Furthermore, this study discovered the non-significant of other variables as in this contextual economic basis, suggesting that those variables may not fit to explain the variation of the dependent variable. As this is a quantitative study, a more qualitative explanation can augment these relationships. Yet, with the limited study scope, this study cannot explain qualitative causes for the insignificant relationships.

4. CONCLUSIONS

This study answers the question regarding the impact of education, mining, and financial development on the growth of income convergence across regions. More specifically, the study objectives are to first, determine the current state of Indonesia's regional convergence process and secondly, to figure out the relationship of education, financial development, and trade openness to regional income growth. The analysis section has managed to determine that regional conditional convergence is found to be insignificant from 2010 to 2019. This goes against the initial hypothesis of regional convergence. This might be due to the difference in period used, additional indicators used, and changing regional dynamics. It also managed to achieve to identify a significant relationship between financial development, educational variables, and mining contribution with GDP per capita growth, respectively. Financial development, mining contribution, and school enrollment rates at both high school level are all positively correlated, which is in line with the initial hypothesis of this study. Elementary enrollment rates are also positively significant, against our initial hypothesis.

The academic contribution of this study is to underline the importance of education, mining, and financial development to heighten local or regional economic growth. These academic findings

of non-existent regional convergence mark the importance of a more inclusive regional development policy to ensure a more equal development of regions. In the practical aspect, just decentralization and democratization alone will not be sufficient to achieve that goal, central government and regional governments must work together and form policies that will be most beneficial for each region to deter the creation of even larger regional disparity. The significant growth variables also serve as a compass for the government in forming a more comprehensive policy mix. As this study only focuses on determining the current state of Indonesia's regional convergence, further study will be needed to complement the findings of this study. Firstly, a more detailed look into the causes of regional convergence/ divergence, spanning beyond mere correlation and more into causal relationships. This will serve as a compass for the government or related stakeholders to figure out the aspects they need to focus on, instead of spending resources on unproductive efforts. Further study will also benefit from using a longer time frame to get a more accurate result with the conditional convergence method. As was mentioned previously, endogeneity might still become a problem with the fixed-effect method. Therefore, using the Generalized Methods of Moments for future study might be able to eliminate said endogenous issues.

ACKNOWLEDGEMENT

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