Research article

Gender Inequality in Education and Regional Economic Growth in Indonesia

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Abstract: Gender equality, particularly in the areas of education, health, and employment, also serves as a stimulant for faster growth. In Indonesia, attempts to integrate gender equality into development are yielding positive outcomes, with national gender equality indicators improving. However, Indonesia's global standing remains poor, as judged by the Woman, Business, and Law (WBL) Index for 2021, which ranks it 149th out of 190 countries. To promote growth, initiatives to increase the number and quality of human resources, including providing persons with the chance to obtain the broadest possible education, are continuing. This study explores the attainment of gender equality in education, as well as how it relates to economic growth as a metric of progress, using district/city fixed effect panel data for the period 2011-2020.The study's findings show that during the observation period, there was still a gender gap in educational achievement, particularly outside of the Java-Bali region. Increasing gender equality through the ratio of women's years of schooling, as well as the ratio of women to the workforce with a junior high school education that is in line with the needs of the workforce, especially in the industrial sector, contributes positively and significantly to regional economic growth.

Keywords: gender equality, education, economic growth, workforce

JEL Classification: J16, F43, O4

Abstrak: Peningkatan kesetaraan gender terutama dalam aspek pendidikan, kesehatan, dan lapangan kerja turut memberikan kontribusi sebagai katalisator percepatan pembangunan. Upaya sinergi kesetaraan gender dalam pembangunan di Indonesia menghasilkan capaian indikator kesetaraan gender nasional yang terus meningkat. Namun pada tingkat dunia, posisi Indonesia masih terbilang cukup rendah seperti WBL Index tahun 2021 menunjukkan Indonesia berada pada peringkat 149 dari 190 negara. Peningkatan kuantitas dan kualitas sumber daya manusia terus dilakukan untuk mendorong pertumbuhan, termasuk dengan pemberian kesempatan untuk memperoleh pendidikan yang seluas-luasnya kepada warga negara. Penelitian ini melihat bagaimana capaian kesetaraan gender dalam bidang pendidikan, serta bagaimana hubungannya dengan pertumbuhan ekonomi sebagai indikator pembangunan, dengan menggunakan fixed effect panel data kabupaten/kota selama periode tahun 2011-2020. Hasil penelitian menunjukkan masih adanya ketimpangan gender dalam capaian pendidikan selama periode observasi, terutama di luar wilayah Jawa Bali. Di sisi lain, peningkatan kesetaraan gender melalui rasio lama bersekolah perempuan berkontribusi positif dan signifikan terhadap pertumbuhan ekonomi daerah, begitu pula dengan rasio perempuan pada tenaga kerja yang berpendidikan setingkat SMP sesuai dengan kebutuhan tenaga kerja terutama di sektor industri.

Kata Kunci: kesetaraan gender, pendidikan, pertumbuhan ekonomi, tenaga kerja

1. INTRODUCTION

Gender equality has long been prioritized in Indonesia, as evidenced by the government's participation in the signing of the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) in 1980, as well as policies centered on Gender Mainstreaming (PUG) and Gender Responsive Budgeting (ARG) in planning and development processes at the national and regional levels. The rising values of the Gender Development Index (GDI) and Gender Empowerment Index (GEI) indicate that national gender development is progressing. Nonetheless, when it comes to measuring women's equality on a global scale, one of which is the Woman, Business, and Law (WBL Index), Indonesia is currently ranked 149th out of 190 countries, with a total score of 64.4 (World Bank, 2021). This places Indonesia below the global average and even lower than several other Southeast Asian countries, including Cambodia, Thailand, the Philippines, Vietnam, and Singapore. This condition also demonstrates that there are many unmet conditions in achieving equality for Indonesian women, particularly in the economic field.

On the other hand, the quantity of workers, including both men and women, is a key component in accomplishing growth. At the national level, Indonesian women's engagement in the formal labor force is consistently lower than that of men. According to the 2020 BPS statistics, just 34.65 percent of women are employed, compared to 49.50 percent of all females in the country based on Population Survey data. The percentage of female employees is much lower than it was in 2019, when it was 39.19 percent. The WBL Index's measurement of the workplace component also reveals that Indonesia scored only 50 out of 100, which suggests that there are no legal protections for Indonesian women seeking to enter the job market, including protection from sexual harassment and discrimination.

Gender equality efforts in a country's development are important because gender inequality can be a barrier to achieving several development goals. Klasen & Minasyan, (2017) states that gender inequality in education, in general, has the potential to exclude groups of highly bright females, lowering society's average level of human capital. Gender inequality also affects the loss of externalities associated with women's education, such as lower fertility rates, lower child mortality rates, and greater children's education in the following generation. Furthermore, in certain countries, gender inequality is exploited as a competitive advantage in women's labor-intensive businesses, therefore women's education must be continually encouraged to stimulate the establishment of a competitive industry. As a result, efforts to increase equality in the quantity and quality of human resources must always be made to achieve growth as a development indicator.

Altuzarra et al. (2021) also states that by increasing productivity and, consequently, economic growth, the decrease of gender inequality in education raises average levels of both quantity and quality of human capital. By lowering fertility rates, which will change the age structure by fewer children and more young workers, education for women can also have a positive indirect impact on economic growth. As a result, more savings and investments will be made, which will promote economic growth. To demonstrate the impact of several aspects of gender inequality, such as education, the labor market, and institutional representation, they use panel data from World Bank Development Indicators of 105 developing nations and Sub-Saharan African (SSA) countries over the period of 1990–2017 is used. The analysis discovers that, across all samples, gender equality in education significantly contributes to economic growth, with a bigger effect in the SSA region than across all samples of developing countries. While not statistically significant, the ratio of male to female workers is present in the labor market. In a sample of all developing nations, there is a strong correlation between women's participation in parliament, but in SSA nations, where women still face considerable impediments to entering politics, the correlation is negative.

Some other studies from Karoui & Feki (2018) and Bedir Kar & Coskun (2020) use cross-country data to estimate the impact of gender inequality in education on long-term economic growth, to view gender equality as a secondary goal, where gender inequality in education has a negative impact on economic growth. The study's findings indicate that gender inequality in education contributes significantly to growth inequality in developing countries, similar to study from Ahang (2014) that gender equality in education and health, as well as political empowerment and economic

engagement, will have a favorable impact on overall wellbeing. Similarly, variable gender inequality in labor force participation has a negative relationship with economic growth. Study from Zeng et al., (2014) using meta-regression analysis shows that gender inequality has been on the decline for some time, with gender disparities in schooling decreasing differently in urban and rural areas. With China's economic progress, girls' access to school has improved dramatically. Licumba et al., (2015) also study the relationship of gender inequality in education and economic growth, using the ratio of women to men in primary enrollment, especially in Southern Africa countries. The findings show that gender equality in education has beneficial, meaningful, and resilient benefits to changes in specification. In addition to fostering growth, reducing gender inequality in education will assist to advance other important development objectives.

Aktaria & Handoko (2012), Mulasari (2015), Sitorus (2016), Arifin (2018), Nazmi & Jamal (2018), and Pertiwi et al. (2021) conducted research in Indonesia on the relationship between gender inequality and economic growth. The study employs panel data at the provincial and district/city levels in one province, which is regressed using the fixed effect method, with a proxy for gender inequality measured by the GDI and Gender Inequality Index (GII), also the ratio of women to men in education, health, and labor output. Based on those ratios and the index, gender equality has improved in Indonesia during the research period in all regions, but gender inequality has a significant negative relationship with economic growth, according to the findings.

Providing each group with a thorough education is one way to improve the workforce's quality, which will promote growth in addition to boosting the number of workers. The government of Indonesia's policy such as *Wajib Belajar* is anticipated to broaden the range of education that Indonesian human resources pursue. In Indonesia, the education participation rate has improved over the past ten years, for example by using Net Enrollment Ratio (NER), it is increasing by 7.27 percent for elementary school, 17.20 percent for junior high school, and 27.42 percent for high school, among other indices of educational accomplishment. This serves as an example of how initiatives to boost educational chances will improve when more people reach higher educational levels. Expanding opportunities, however, is considered in terms of how these opportunities can be experienced equally by each demographic group, including for each different gender, as well as the overall population that is studying (Hibatulmedina & Rambe, 2021)

Back to gender inequality issue, several previous studies about gender inequality in Indonesia, only looked at gender equality in education at the provincial or district/city levels within a province, with the indicator of equality most used being years of schooling, which sees the positive externalities of women's education on development. The authors of this study employ data on education indicators at the district/city level across Indonesia to better illustrate the disparities that exist between regions, especially between islands. In addition, the authors include the workforce's education ratio as an indicator for measuring gender disparities in educational attainment and their direct influence on the economy via the labor market.

2. RESEARCH METHODS

Panel data produced from all districts and cities data in Indonesia from 2011 to 2020, including National Labour Force Survey (Sakernas) and National Sosio-economic Survey (Susenas) data, as well as articles and macro data from the Statistics Indonesia and the Ministry of Finance, will be used in the research. The model utilized is an adaptation of the endogenous growth model, in which capital elements such as physical and human capital, labor, and technology drive economic growth (Todaro & Smith, 2015). The following is the generic model that was employed in this study:

$$log\_grdp_{i,t} = \beta_0 + \beta_1(education\ gender\ ratio)_{i,t} + \beta_2\ workforce_{i,t} + \beta_3 Z_{i,t} \tag{1}$$

Gender inequality in education is the key independent variable in this study, which explains the state of human capital and how it influences economic growth as the dependent variable, with labor factors and other variables serving as controls.

Based on the findings of the literature review, the relationship between gender inequality in education and economic growth may be divided into two models, each of which is based on two

types of variables used to measure inequality. Model 1 use the ratio of years of schooling as an inequality measure, to determine how the externalities caused by women's educational attainment can indirectly impact regional economic growth. While model 2 uses the education levels of the workforce to show how women's education can directly impact the labor market and produce output, which in turn impact economic growth. The first model is presented in equation (2) as follows:

$$log\_grdp_{i,t} = \beta_0 + \beta_1\, yos\_ratio_{i,t} + \beta_2\, log\_population_{i,t} + \beta_3\, tpak_{i,t} + \\ \beta_4\, log\_industry_{i,t} + \beta_5\, log\_government_{i,t} + \beta_6\, internet_{i,t} + \in_{i,t} \quad (2)$$

First model is used to examine how gender inequality, as defined by the ratio of years of schooling (yos ratio) as a general education output, can produce positive externalities that improve human resource quality and contribute to increased growth. Except for the observation data for 2016, which was filled in using the interpolation technique due to the lack of data on years of schooling at the district/city level from BPS, the ratio of years of schooling is data on years of schooling for women divided by years of schooling for men.

$$log\_grdp_{i,t} = \beta_0 + \beta_1\, sd\_ratio_{i,t} + \beta_2\, smp\_ratio_{i,t} + \beta_3\, sma\_ratio_{i,t} + \\ \beta_4\, log\_population_{i,t} + \beta_5\, tpak_{i,t} + \beta_6\, log\_industry_{i,t} + \\ \beta_7\, log\_government_{i,t} + \beta_8\, internet_{i,t} + \in_{i,t} \quad (3)$$

Second model is used to show how the inequality ratio, as defined by the workforce's educational level, can directly contribute to the economic creation. The workforce education ratio is calculated using statistics on women and men with elementary (SD)[1], junior high (SMP)[2], and high school education (SMA)[3].

Table 1. Definition of variables operationalization

Variables	Definition	Source
log_grdp	Log form of GRDP based on constant prices	Statistics Indonesia
yos_ratio	The ratio of women's to men's average years of schooling	Susenas
sd_ratio	The ratio of women to men in the employment who have completed elementary education	Susenas
smp_ratio	The ratio of women to men in the employment who have completed junior high education	Susenas
sma_ratio	The ratio of women to men in the employment who have completed high school education	Susenas
log_population	The log form of the total population	Susenas
tpak	Labor force participation of the total working age population (%)	Sakernas
log_industry	The log form of GDP from manufacturing Sector	Statistics Indonesia
log_government	The log form of the realization value of local government expenditures for all functions	Ministry of Finance
internet	The ratio of the level of internet use to the total population of districts/cities	Susenas

The dependent variable in this study is district/city economic growth using a proxy log of GRDP based on constant prices from 2011 to 2020. The control variables in all models are the same, and they are additional factors that influence GRDP growth. Log population is a sort of population elasticity to changes in total regional GRDP in which the population influences demand through public and government consumption, resulting in an increase in overall output. TPAK, or labor force participation rate, is the proportion of people aged 15 and up who worked in the preceding week as a percentage of the total labor force population. Log industry is the elasticity of changes in GRDP

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[1] SD or Sekolah Dasar means Primary Education in Indonesia
[2] SMP or Sekolah Menengah Pertama means junior High Education in Indonesia
[3] SMA or Sekolah Menengah Atas means High School Education in Indonesia

from the manufacturing sector to changes in overall GRDP, which indicates private sector capital usage, is one of the elements that affects a region's economic growth. While log government is the elasticity of changes in total local government spending to changes in total GRDP, which is a proxy for the government's use of capital and is calculated in the log form of the total realization of all regional expenditure functions, due to a lack of realization of data, some regions use budget data. The last variable is internet, which is assessed by the proportion of the population who used internet technology in the previous three months for each municipal area.

3. RESULTS AND DISCUSSION

3.1. Descriptive statistics

The data utilized in this study comes from all of Indonesia's districts/cities from 2011 to 2020. Because there were multiple divisions of Indonesian provinces during the research period, the data used in this study are unbalanced and have been left this way, because there were gaps in the data before the expansion. Additionally, to local government spending information, DKI Jakarta province does not break down its local government budget by city.

Table 2. Descriptive statistics

Descriptive	N	Mean	SD	Min	Max
Dependent variable					
grdp (in Billion IDR)	5,105	18,210	39,690	93.07	452,500
Independent variables					
yos_ratio	5,103	0.872	0.106	0.153	1.200
sd_ratio	5,022	0.634	0.221	0.000	2.223
smp_ratio	5,022	0.537	0.212	0.000	3.970
sma_ratio	5,022	0.471	0.145	0.000	1.218
Control variables					
population	5,105	502,868	615,290	6,356	6,057,000
tpak	5,022	63.24	8.436	33.24	100
industry (in Billion IDR)	5,097	4,354	13,460	0.00	196,700
government (in Billion IDR)	4,995	1,230	875.90	0.362	10,320
internet	5,045	0.213	0.159	0.00	0.806

Source: Shynthesized by authors

Because the dependent variable GRDP has too much variance for each district/city and the standard deviation much surpasses the average value, the regression model will be transformed into logarithmic form. Furthermore, by using the log_grdp, we will be able to understand firsthand how the elasticity of GRDP changes when the independent variable changes. Pegunungan Arfak Regency, West Papua Province, had the lowest GRDP of IDR.93.07 B in 2012, while Central Jakarta City, DKI Jakarta Province, had the highest GRDP of IDR.452,500 B in 2019.

The independent variable in this study is ratio of year of schooling, and the workforce education ratio for each level of education. The use of these two types of variables to quantify inequality reveals that there is still significant gender discrepancy in education and regional employment in Indonesia, with the average ratio value still well below 1. The average ratio of female to male years of schooling is 0.872, indicating that equality has not been attained and that women's schooling is still shorter than men's, but there appears to be an upward tendency every year (Figure 1). This disparity is present in practically all geographies and time periods, with a ratio value of less than one in 95 percent of the observation data. With this ratio of years of schooling still being low, the increase in the ratio is projected to continue, resulting in continued inequality in women's years of schooling.
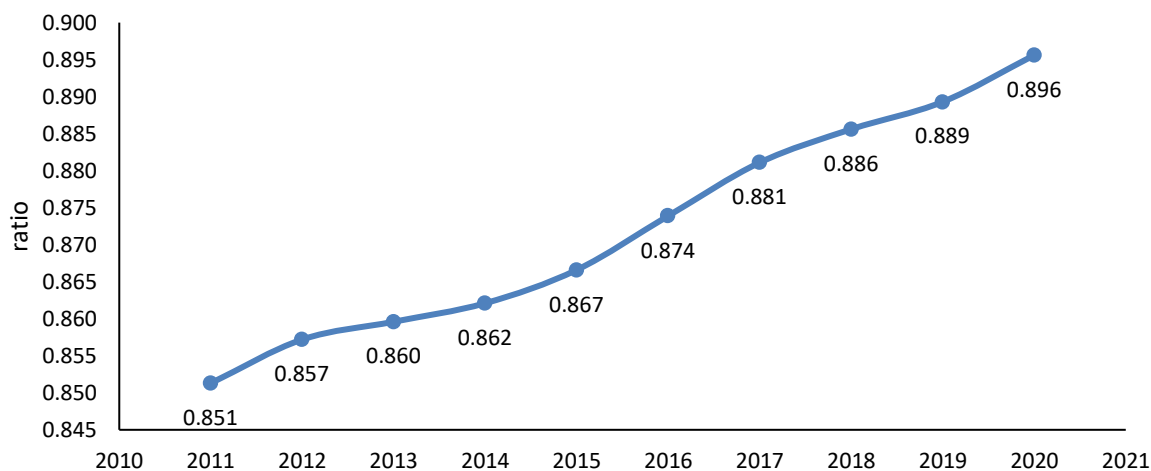
Figure 1. The average of school length ratio, 2011-2020
Source: Shynthesized by authors

The ratio of years of schooling close to 1 is not dominated by regions in the western part of Indonesia, as evidenced by the fact that the islands of Java and Bali still have an average ratio below the general average in the ratio analysis by island region (Figure 2), while Papua Island has the lowest average score out of all the observations.
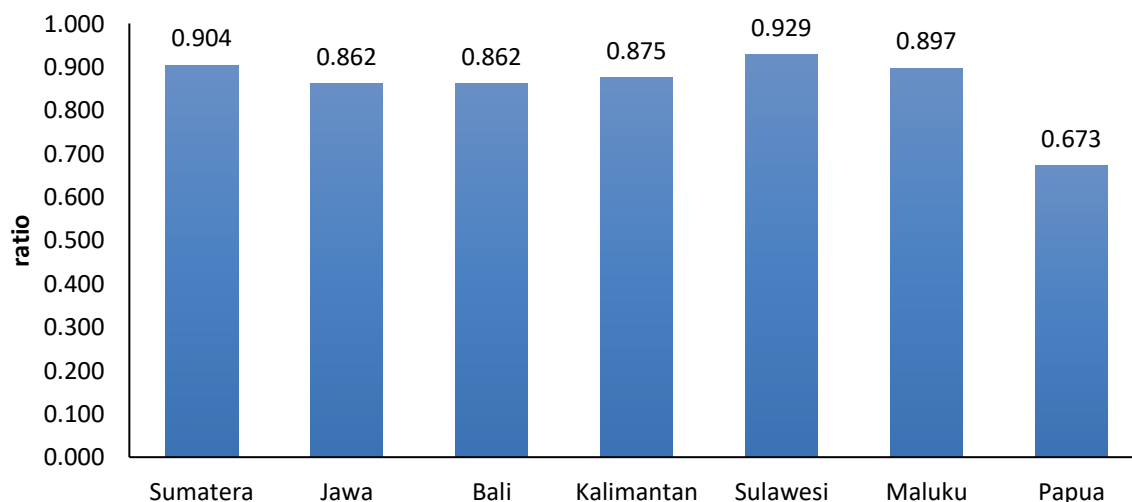

Figure 2. The average of school length ratio by Island
Source: Shynthesized by authors

Several factors can contribute to the trend of reducing gender disparities in schooling length. Afkar et al., (2020) found that based on National Sosio-economic Survey (Susenas) 2017 data, insufficient cash, the need to work, and discomfort due to poor economic conditions were the most common causes for men compared to women in the same situation. Female residents, on the other hand, are more likely to drop out of school due to early marriage and the need to care for the household. As a result, coupled with the reducing trend of early marriage rates among Indonesian women (Blaser, 2016), the tendency of women to drop out of school is also declining, resulting in an increase in the number of years that women have spent in school.

Meanwhile, using the workforce education ratio to look at educational attainment disparity, it can be shown that the average value for each level of education is still well below 1. The trend of the ratio through time (Figure 3) demonstrates that there is an increasing trend at the elementary and junior high school levels, however it is not steady. Meanwhile, even if the increase was the smallest, the rising trend was relatively more stable at the high school education level. Figure 3 also

demonstrates that as one's level of education increases, the average value of the ratio declines, implying that the higher one's degree of education, the fewer female workers there are compared to men.
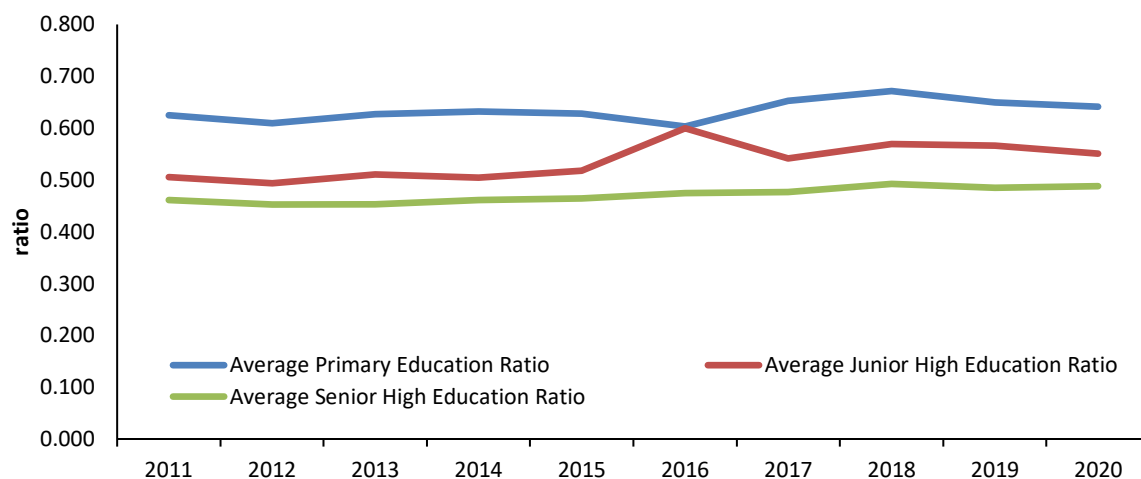

Figure 3. Average workforce education ratio, 2011-2020
Source: Shynthesized by authors

The analysis of gender inequality was also done by grouping by island (Figure 4). Bali and Nusa Tenggara have the highest average ratio of female to male workforce with primary school education, whereas Sumatra, Kalimantan, and Sulawesi still have lower average ratios, with the Papua region having the highest standard deviation of all regions. Sumatra, Kalimantan, and Papua had the highest inequality in the workforce with a junior high school degree, with average ratio values below the total observation average. Like the state of the workforce with elementary school education, the Papua and Maluku areas have the greatest discrepancy between regions and times at the equivalent of junior high school. Almost every region has a similar standard deviation for high school education, while Kalimantan, Maluku, and Papua still have the highest levels of inequality. What's more, there are no observations in Java and Maluku with a ratio greater than 1, implying that the number of female workers with a high school education in Java and Maluku is always lower than male workers during the research observation period.
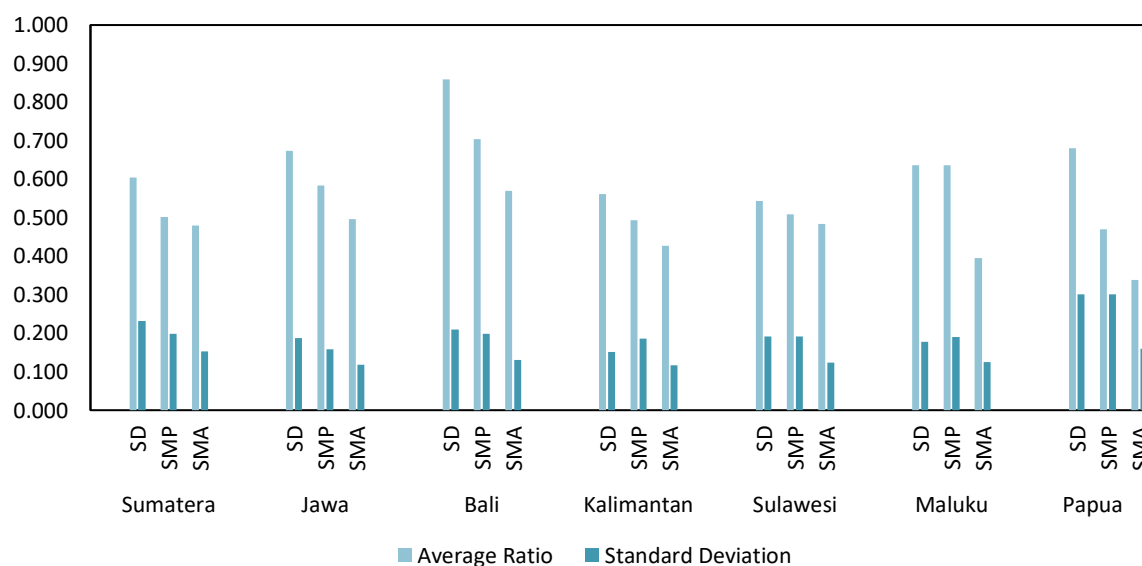

Figure 4. Average workforce education ratio by Island
Source: Shynthesized by authors

Figure 4 reports that there are locations where the education level of women is far below that of men by looking at the minimum value of each gender inequality ratio. Some area even has a workforce education ratio of 0.00, indicating that no female employees with an elementary, middle, or high school education were employed in that year. When looking at the greatest value of the inequality ratio in the two categories of variables, the reverse may be seen. To achieve equality, it is vital to emphasize that the optimum ratio is 1 or near to 1. If a ratio is significantly below or far above 1, it indicates that there is a significant disparity in the educational attainment of the population in that area. In this descriptive analysis, women's educational achievement is up to 2 or 3 times that of males in certain places, indicating that men's educational attainment should be the focus of reform.

3.2. Empirical result analysis

This study will apply the fixed effect model in the regression estimation by looking at the features of observations utilizing district/city level data. Each district/city in Indonesia has unique traits that differ from those of other districts/cities, yet which remain consistent year after year. Traditional assumption testing on both regression models reveals the presence of heteroscedasticity issues as well as autocorrelation, allowing the regression to be performed using robust standard error.

Table 3. The first model results

Dependent variable: log_gdrp		
Variables	(1)	(2)
yos_ratio	3.410***	0.655***
	(0.176)	(0.153)
log_population	-	0.290***
		(0.056)
tpak	-	0.001***
		(0.000)
log_industry	-	0.291***
		(0.087)
log_government	-	0.034***
		(0.005)
internet	-	0.565***
		(0.079)
Constant	26.65***	16.42***
	(0.154)	(2.042)
Observations	5,101	4,925
R-squared	0.305	0.823
Number of regions	514	507

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Shynthesized by authors

Table 3 reports that the likelihood *F*-statistic for regression model 1 is 0.000 indicating that the independent variables have a combined effect on the dependent variable. In the baseline model, the coefficient of determination or R^2 is 0.305, but after adding control, it rises to 0.823. This suggests that independent factors in Model 1 can explain 82.3 percent of the variation in the dependent variable, with the balance explained by variables not included in the model. In Model 1, all the key independent variables and control variables have a significant positive influence on the significance level of 1 percent.

The independent variable ratio of years of schooling has a positive coefficient, implying that increasing the ratio of years of schooling will raise GRDP. An increase in the ratio of years of schooling is an expected condition, given that almost all regions still have a ratio below 1, implying

that there is still a significant disparity in years of schooling success between men and women. To reach equality where the ratio is equal to 1, this condition necessitates an increase in the achievement of women's years of schooling.

This finding supports the author's premise that the ratio of women's years of schooling to men has a positive association with economic growth, and that women's education has positive externalities in a variety of disciplines, contributing to the improvement of human resource quality. It is envisaged that as more women enroll in school, more educated women with potential will have access to educational opportunities and provide beneficial externalities for development, such as lower fertility rate, lower child mortality rates, and greater children's education in the following generation. Finally, the efficiency and level of production created will be affected by the quality of these human resources, hastening the increase in regional revenue. The study's findings are also consistent with Arifin (2018) who found that the ratio of women to men in years of schooling has a direct and positive impact on economic growth, with increased education increasing workers' knowledge and skills, resulting in increased productivity.

The log_population variable has a positive and significant coefficient of 0.290, which suggests that a 1 percent increase in a district's/city's population will result in a 0.29 percent rise in the GRDP regions. The big population will contribute to rising demand, both through private and public consumption, resulting in a new equilibrium in which output will rise. However, it should be highlighted that a large population's contribution runs counter to global efforts to slow population increase, necessitating a trade-off between economic contribution and the large population's limited resources. This finding contradicts research by Pangestuty & Prasetiya (2012) who found that population growth has a negative and significant effect on GDP growth in Indonesia during the years 2006-2008.

Table 4. The second model result

Dependent variable: log_gdrp		
Variables	(1)	(2)
sd_ratio	0.071***	0.007
	(0.021)	(0.011)
smp_ratio	0.131***	0.025***
	(0.018)	(0.007)
sma_ratio	0.207***	0.012
	(0.030)	(0.014)
log_population	-	0.290***
		(0.056)
tpak	-	0.000**
		(0.000)
log_industry	-	0.299***
		(0.091)
log_government	-	0.037***
		(0.007)
access	-	0.617***
		(0.093)
Constant	29.43***	16.68***
	(0.021)	(2.197)
Observations	5,022	4,925
R-squared	0.041	0.816
Number of regions	514	507

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Shynthesized by authors

According to Huang et al. (2019), there is also a positive and significant association between labor force participation and economic growth, where a big number of workers will improve the

amount of output produced and boost regional income. Furthermore, the positive and significant coefficient of the control variable log_industry, or the value of the industrial sector GRDP, suggests that the higher the industrial sector GRDP, the higher the total GRDP. The manufacturing sector's contribution is a proxy for the private sector's level of investment, which is thought to influence economic growth on the demand side. The private sector contributes to the economy through growing the industry's physical capital, either directly or indirectly through employment.

The level of government investment, which in this model is measured by the total realization of local government spending, with a positive and significant relationship to GRDP, is also a growth-forming factor from the demand side, according to research by Pangestuty & Prasetiya (2012) that government spending is primarily in the health sector. and education will have a favorable impact on the economy. Finally, the control variable used is the level of technology use in the form of internet access by residents of the district/city in the previous three months, which has a coefficient of 0.565, implying that an increase in the use of internet technology by the community by 1 point will increase the GRDP of district/cities by 75.94 percent. This outcome is also consistent with Musa & Bako, (2021) prediction that increased internet use will boost economic growth.

The main independent variable in Model 2 (Table 4) is the ratio of educated workers at the junior high school level, which has a positive and significant effect on increasing regional GRDP at the 1 percent significance level, whereas the ratio of educated workers at the elementary, high school, and higher education levels has a positive but insignificant effect on GRDP growth. According to the research hypothesis, the education workforce ratio has a positive coefficient, implying that the higher the ratio or the greater the number of educated female employees, particularly at the junior high school level, the higher the regional GRDP. This increase in the education ratio is needed in Indonesian regions where the average number of female workers at each level of education is still lower than the number of male workers, to attain equality or a ratio of one.

In terms of the labor market, graduates of elementary and junior high schools still make up most of the Indonesia's employment. According to data on the national unemployment rate over the last five years, high school and diploma graduates had the highest percentage of open unemployment, as shown in Figure 5, which is possible because elementary and junior high school graduates have more suitable criteria to meet Indonesia's labor demand.
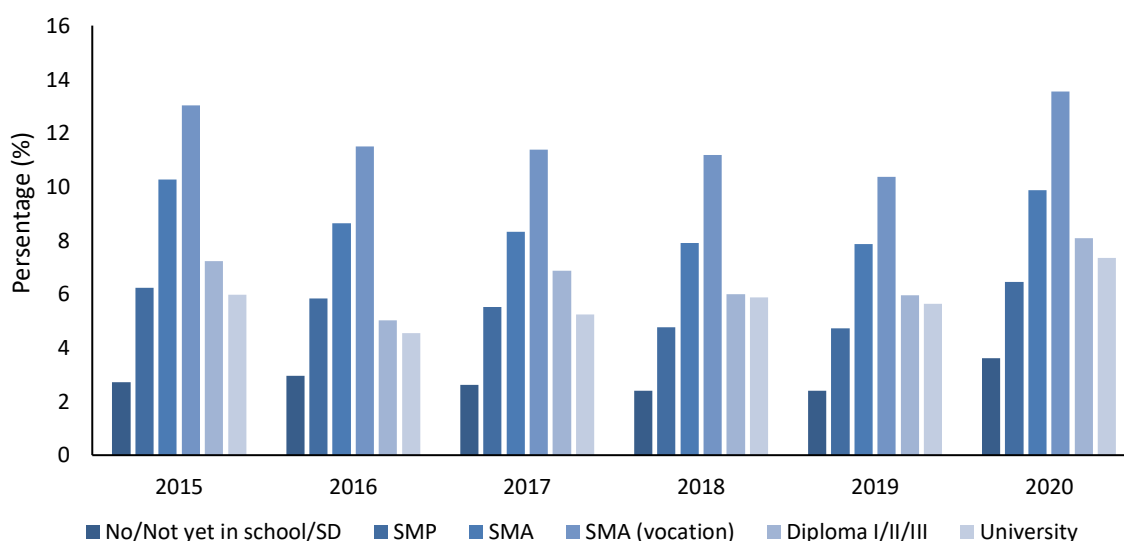

Figure 5. Percentage of Unemployment Rate by Education Attainment, 2015 - 2020
Source: Statistics Indonesia, Reshyntesized by authors

Then, based on the 2019 National sosio-economic survey data, the distribution of labor by business sector shows that the industrial and service sectors have the highest percentage of female workers in Indonesia, reaching more than 40 percent (Figure 6). Female workers are in high demand in the industrial sector, particularly for work that demands precision and care, such as the

fabrication of small industrial replacement parts. Female employees with a junior high school degree also rank first in the demand for labor in the industrial sector, particularly in industries with low skill levels and incomes. Female workers in the service sector, on the other hand, tend to be better at becoming frontline workers or dealing directly with consumers.

According to the estimation results of model 2, the labor market conditions where female workers have a junior high school education have criteria that are much needed by the industrial and service sectors, and an increase in the number of female workers will significantly contribute to an increase in GRDP. Due to the high demand for female workers with a junior high school education, the higher the ratio of female to male among junior high school educated workers, the higher their productivity, resulting in an increase in GRDP as a regional output level.
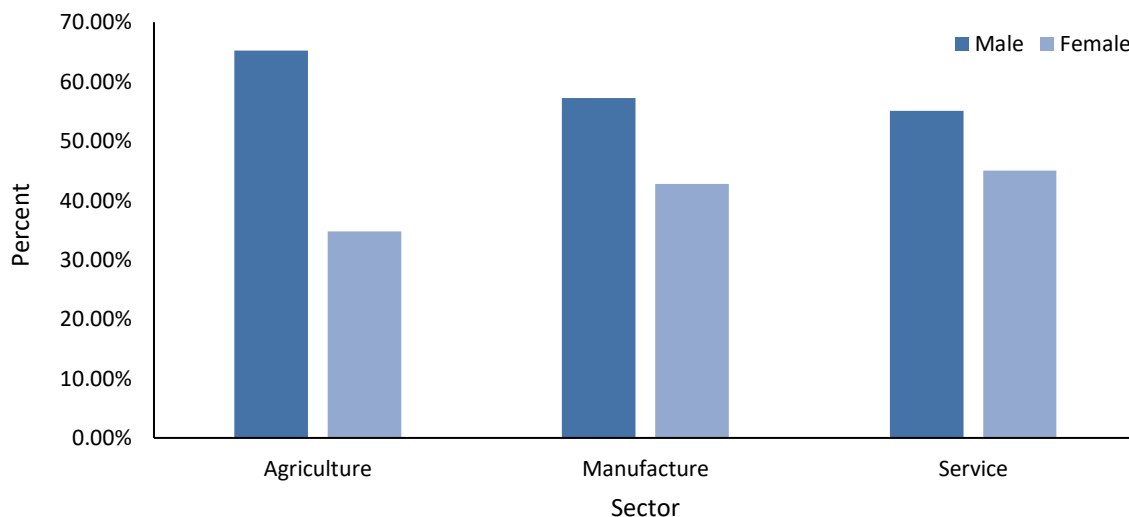

Figure 6. Percentage of Main Sector Workforce by Gender in 2019
Source: Statistics Indonesia, Reshyntesized by authors

Second model estimation result is consistent with Karoui & Feki's (2018) finding that the ratio of women at all levels of education is positively connected to GDP growth. In contrast to situations in Indonesia, where the manufacturing sector does not yet require a big number of people with higher education graduates who have a specific degree of expertise, this research reveals that graduates of higher education have the greatest influence in enhancing economic growth. The study's findings are also consistent with Bedir Kar & Coskun (2020) assertion that gender disparity, which has a negative association with economic growth, occurs in primary and secondary school. The findings are also consistent with the findings of Bertay et al. (2020) which found that a low index of gender disparity in the business combined with a significant contribution from women has ramifications for the industry's acceleration. Except for the labor force participation rate (tpak), which is significant at the threshold of 5 percent, all control variables in Model 2 exhibit positive and significant coefficients on the rise of GRDP in districts/cities, like the estimation results in first model.

3.3. Estimation result analysis by Island

To anticipate differences in regional features that may affect the estimation findings, regression estimation analysis is also carried out by differentiating the estimation results based on the regency/city island area. That considering the ratio of years of schooling, gender equality only considerably boosts GRDP growth on the islands of Sumatra, Sulawesi, and Papua. In Java and Kalimantan, however, the ratio of female to male in employees with an elementary school education has a negative and substantial influence when utilizing the workforce education level ratio variable. An increase in the ratio of female to male employees at the junior high school education level will greatly boost the GRDP in Sumatra, Maluku, and Papua, as well as at the high school education level, which will only have a large beneficial effect in Sumatra.

Table 5. Regression estimation result by Island

Variables	Sumatera	Jawa	Bali	Kalimantan	Sulawesi	Maluku	Papua
yos_ratio	0.674***	0.128	0.348	0.363	0.495**	0.381	0.392*
	(0.153)	(0.118)	(0.308)	(0.269)	(0.197)	(0.392)	(0.207)
sd_ratio	-0.015	-0.026*	0.004	-0.048**	-0.013	0.080*	0.013
	(0.016)	(0.014)	(0.023)	(0.022)	(0.017)	(0.043)	(0.013)
smp_ratio	0.040***	-0.001	-0.013	0.004	0.020	0.051**	0.023**
	(0.013)	(0.011)	(0.023)	(0.016)	(0.015)	(0.018)	(0.011)
sma_ratio	0.044**	-0.010	0.024	-0.040	-0.022	0.070	0.047
	(0.021)	(0.015)	(0.024)	(0.030)	(0.032)	(0.056)	(0.039)
N	154	113	41	55	81	21	42
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$
Source: Shynthesized by authors

Looking at the regression estimation findings for the above-mentioned islands, the two regression estimation models are vulnerable to geographical factors, resulting in differing estimations. In the Java Region, the ratio of women's education, as defined by years of schooling and the workforce's education level, has no significant impact on GRDP growth. Even though gender equality in education has not yet been reached, in general, educational attainment in Java is more uniformly distributed, with a smaller standard deviation, when compared to other regions. It's also likely that other factors, such as infrastructure development, have a greater impact on economic growth in Java that aren't considered in this study.

Anomaly circumstances can also be found when considering the education level ratio, for example, at all levels of elementary, junior high, and high school education, Java Island shows a negative correlation with economic growth. Descriptive study of the education ratio variable reveals that while the areas of Java have a relatively high GRDP, the education ratio has not increased much. According to Klasen & Minasyan (2017), several studies with a negative coefficient of women's education level on economic growth happened because there were no time-invariant variables in the panel data regression estimation, such as the regional dummy.

What should also be addressed is the area where gender equality in schooling is still below the overall observation average, namely most of the regions outside of Java and Bali. The regression analysis reveals that gender equality in education has a favorable and considerable impact on regional economic growth in several of these places. As a result, it should be noted that gender discrepancy in educational and job results is crucial since it contributes considerably to GRDP reduction, necessitating government actions to eliminate inequality to achieve circumstances of equality. In addition to pursuing regional equity, the government must focus on initiatives to improve women's educational attainment, including tailoring policies to each region's unique characteristics.

4. CONCLUSIONS

In Indonesia, there is still gender inequality in education, as assessed by the ratio of school achievement and the ratio of the workforce's education level. Inequality exists in practically all locations, with varying degrees of gender equality, particularly outside of the Java-Bali region. Gender inequality, as assessed by the ratio of women's years of schooling to men, has a positive and substantial link with GRDP growth, according to this study. The increase in the ratio of years of schooling here shows a rise in the equality of attainment of years of schooling for women, resulting in positive externalities and so raising the quality of human resources that contribute to growth. Because the average number of years women spend in school is still lower than that of men, the government should concentrate on lowering the high dropout rate for women at the secondary education level by, for example, reducing causal factors like early marriage for women, difficulty accessing education in the regions, or high levels of poverty to encourage people to continue their

education at the next level.

Meanwhile, only an increase in the percentage of female employees in junior high school education is favorably and significantly associated to GRDP growth when assessed by the ratio of female to male for each level of workforce education. An increase in the ratio of female workers with junior high school education may indicate that a larger number of female workers with junior high school education is a necessary condition, particularly in Indonesia's industrial and service sectors, so that they can directly contribute to increasing the sector's output. Even if the demand for labor in the industry is still largely driven by women with junior high school diplomas, the government must seek to promote higher education to fulfill future labor demands and improve the Indonesian economy.

The calculation of the association between inequality and GRDP through the ratio of years of schooling or the ratio of workforce education to GRDP is subject to regional factors when utilizing an island-by-island approach, resulting in differing estimates between islands. Because some places outside of Java-Bali have a favorable and considerable impact on regional economic growth, gender inequality is an essential issue that must be addressed due to its significant contribution to the GRDP. Given that gender equality in education contributes positively and considerably to regional economic growth, the government should concentrate on raising women's educational attainment, especially in locations outside of Java and Bali. By adjusting policies that are tailored to regional features, efforts can be made to equitably raise educational attainment across areas.

Finally, due to the variables' limitations and the limited number of research observations, the author makes many recommendations for future research. The first model, measurement of gender inequality in education can be created using other education indicators such as Net Enrollment Ratio (NER) or Gross Enrollment Ratio (GER), with data availability at the district/city level taken into consideration. Furthermore, a longer research period will illustrate how gender inequality affects economic growth in the long run, however the constraints of numerous variables must be considered.

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