Analysis of Educated Unemployment Rate in Indonesia: Panel Data Regression Approach

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Abstract—The equitable distribution of educational facilities throughout Indonesia is not proportional to the increase in fundamental skills needed in the working world. It can be seen from the high level of educated unemployment. This study aims to determine and analyse the effect of labour force quality, foreign direct investment, labour productivity, and provincial minimum wages on the level of educated unemployment in Indonesia using panel data estimation with a fixed effect cross-section weight model method with robust covariance cross-section SUR (PCSE) with a cross-section of 34 provinces and time series for seven years from 2013-2019. This study obtained the data from Statistics Indonesia (BPS). The results showed that the workforce quality and foreign direct investment have negative and significant effects on Indonesia's educated unemployment rate. Meanwhile, labour productivity has a positive and significant effect on the educated unemployment rate in Indonesia. In contrast to the provincial minimum wage, it does not significantly affect the educated unemployment rate with a confidence level of 95 percent. Simultaneously, all independent variables affect Indonesia's educated unemployment rate. The coefficient of determination is 88.44 percent, indicating the variation of the educated unemployment rate in Indonesia, which the independent variable of 88.44 percent can explain. In comparison, other factors outside the model explain 11.56 percent.

Keywords—Educated Unemployment Rate, Workforce Quality, Minimum Wage, Labor Productivity, Foreign Direct Investment, SUR

I. INTRODUCTION

The educated unemployment rate is an indicator that illustrates the ratio of the number of job seekers with secondary education, including those with a tertiary education background (college/university) who are considered to be educated groups, to the size of the workforce in that group [1]. Recently, increasing numbers of private colleges and universities are emerging in Indonesia. The easier access for each educational institution to open new study programs in each region has supported this trend. This phenomenon has resulted in an increasing number of young graduates with higher education levels, but Indonesia's employment opportunities do not match this.

Based on data from the National Labor Force Survey, August 2020, the number of educated unemployed reached 6.27 million people or 64.24 percent of Indonesia's total open unemployment. Young people (aged 15-24 years) dominated open unemployment in Indonesia by 44.84 percent. The higher a person's education level, the higher the acceptance or reservation wage so that the longer someone looks for work, the longer someone is unemployed [2]. This situation gives rise to a supply-induced symptom. A large enough educated workforce puts intense pressure on job opportunities in the formal sector, which are relatively small in number, resulting in suboptimal utilization of educated personnel [3]. This shows that the labor force's growth is not directly proportional to Indonesia's absorption of employment.

There is a benchmark from the International Labour Organization (ILO); every one percent of economic growth will create about 400 thousand new jobs [3]. This assumes that the economy's level must increase to accommodate the workforce explosion, especially among the educated. Education is an essential indicator in measuring the human development index and fostering human resources to become a source of a quality workforce. The level of education will result in the better-skilled workforce. If the workforce's quality is high, the workforce's absorption will be higher, reducing educated unemployment.

This is in line with the level of labor productivity. The assumption is that the higher the workforce level produced by each workforce, the fewer human resources are needed to efficiently use labor input and optimize physical capital. This results in less labor recruitment, which impacts increasing open unemployment, especially among the educated. The aspect of foreign direct investment and the provincial minimum wage level also affect the educated unemployment rate. From time to time, it can be seen that the educated unemployment rate data fluctuates in each
region of the Indonesian province. In 2019, West Java and Maluku Provinces were the regions with the highest educated unemployment rates in Indonesia. Bali and DI Yogyakarta were the regions with the lowest unemployment rates in Indonesia. According to the level of education, the unemployment analysis is an indicator of the labor market's inability to take advantage of the educated workforce's supply. The educated unemployment rate is an indicator that shows the amount of educated unemployment in a country or region. The higher the population's education level categorized as the labor force, is to affect and increase productivity [1]. Graduates who have achieved more than the economically acceptable education standard are deemed over-educated from an economic standpoint [5]. Young people dominate the educated unemployment rate. This is in line with educated unemployment characteristics, namely the prevalence of youth and first-time job-seekers among the educated unemployed [6].

There are many unemployment and underemployment in developing countries [7]. Underemployment happens when an employee works less than 35 hours a week and is still looking for jobs [4]. According to an economic hypothesis of rural-urban migration, many uneducated, unskilled migrants will either become unemployed or pursue casual and part-time jobs in cities where entry is easy, operations are limited, and expenditures and wages are relatively competitive. Opportunities are much higher for migrants with significant human resources in the form of a secondary or university degree, and many can find formal-sector employment relatively easily [7]. Indonesia is one of the developing countries experiencing underemployment problems. Moreover, poverty causes them to be forced to work short hours in order to survive. In developing countries, underemployment is higher than open unemployment.

The quality of the workforce through the educational level approach has a strong influence on reducing the unemployment rate. Quality education will create a quality workforce so that the greater the absorption of labor. Based on research [8], the impact of education on the Southern European model's unemployment rate uses a panel data model. The Southern European model countries have experienced in the last 10 years an upward trend in the unemployment rate. The impact of educational attainment, the rate of early school leaving, and the graduation of tertiary education negatively affect the Southern European countries' unemployment rate. The relationship between education level and the unemployment rate is also reflected in reference [9]. Research on determinants of graduate youth unemployment shows the inverse and significant relationship between education and unemployment levels. Apart from the quality of education, there is an influence between foreign direct investment and the unemployment rate. Based on [10] with the title impact of foreign direct investment and foreign remittances on unemployment in Pakistan using the ARDL time series data model. The results show that both FDI and foreign remittances have an important role in reducing Pakistan's unemployment in the long run. According to relevant studies, the rate of foreign direct investment has a negative effect on the unemployment rate [8]. As predicted, a higher degree of foreign direct investment leads to a decrease in

Source: BPS, compiled.

Figure 1. The level of educated unemployment at the provincial level in Indonesia 2013-2019 (in percent)

This research is therefore aimed at examining educated unemployment levels in Indonesia using workforce quality variables, foreign direct investment, labor productivity, and provincial minimum wages. The benefits of this research include: (1) obtaining an estimated model for the educated unemployment rate, (2) obtaining information on variables that significantly influence the educated unemployment rate, and (3) this research can be used as a consideration by stakeholders in making policies to overcome unemployment problem.

II. RELATED WORK

Statistics Indonesia (BPS) uses a concept that refers to an ILO manual on concept and methods to measure the unemployment rate. This unemployment concept states that unemployed looking for a job, unemployed preparing a business, unemployed not looking for a job because they feel it is impossible to get a job, and already employed but have not started working [4].
unemployment. Southern European countries have seen less FDI inflow in the post-crisis era than Western countries, which has resulted in either the non-creation of jobs or the restructuring of those that have already been developed, both of which have fueled unemployment and put pressure on the social insurance budget.

According to Alani’s research on the effects of productivity growth on employment formation, capital accumulation, and economic growth in Uganda, productivity growth can result in unemployment and capital depletion [11]. Furthermore, both labor and resource productivity increases may have led to unemployment, as well as a reduction in capital accumulation and economic growth.

A study by Putri [12] used panel data analysis to analyse the effect of inflation, economic growth, and wages on educated unemployment in Central Java, showing that inflation and wages have a negative and significant effect while economic growth is not significant. In contrast, Rayhan & Yanto [13] applied regression analysis and ANOVA with a single classification followed by post hoc analysis regarding influencing factors, the unemployment rate compares among five ASEAN Countries. Simultaneously, factors such as wage, economic growth, and education effect are not significant for ASEAN countries’ unemployment.

III. METHODOLOGY

Data source
This study used educated unemployment rate data as the dependent variable with a ratio approach between the number of unemployed with upper secondary education background (Senior high school, Diploma, University) divided by the number of workforces with upper secondary education background percent (EDUNEMPLOY). The independent variables consist of: (1) the quality of the workforce with a ratio approach between the workforce of middle and upper graduates and the total workforce (LQ), (2) foreign direct investment (Ln_INVEST), (3) labor productivity through the ratio approach between GRDP with labor (Ln_LP), (4) provincial minimum wage (Ln_MINWAGE). The data are from the Indonesian-BPS Statistics and the National Labor Force Survey-BPS. The research period from 2013-2019 was in 34 provinces in Indonesia.

Panel Regression
Panel data regression is different from time-series and cross-section regression. Panel data regression has a double subscript for each variable, where \( i \) denotes individual and cross-sectional aspects, while \( t \) represents time and time series aspects [14]. Panel data regression can be modeled as follows:

\[
y_{it} = \alpha + X'_{it}\beta + \epsilon_{it} \tag{1}
\]

where \( \alpha \) is a scalar number which is the model's intercept, \( \beta \) is a vector of size \( k \times 1 \), which is the slope in the model, \( y_{it} \) is the value of the dependent variable, and \( X_{it} \) is the vector of the explanatory variable measuring \( k \times 1 \), which means that there are as many explanatory variables as \( k \) in the equation with \( i = 1,2,...,n \) and \( t = 1,2,...,T \). While \( \epsilon_{it} \) is an error component of the regression that occurs in \( i \) individual in \( t \) period.

The procedures or stages of analysis in the panel data regression method are as follows:

1. The first step taken before selecting the best model in the panel data regression technique is to test each variable's stationarity. The stationarity test is carried out by considering the significance of the LLC probability value (Levin, Lin & Chu) and Breitung, which assumes a common unit root process.
2. The next step is to estimate the model using three estimation models in panel data: common effects, fixed effects, and random effects.

   a. Common Effect Model
   The regression equation in the common effect model can be written as follows [15]:
   \[
   Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + \epsilon_{it} \tag{2}
   \]
   This model ignores individual or time dimensions so that it is assumed that the intercept and slope between individuals remain constant over time and individually. Thus, this approach assumes the same behavior between individuals over time.

   b. Fixed Effect Model
   The regression equation in the fixed effects model, in general, is as follows [15]:
   \[
   Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + \epsilon_{it} \tag{3}
   \]
   With differences in the individual intercept, the fixed effects model technique is also called the panel data estimation technique using dummy variables to capture individual-specific effects or often called the Least Square Dummy Variable (LSDV). Based on the assumption of the residual variance-covariance matrix, in the fixed effects model, three estimation methods can be used, namely:
   1) Ordinary Least Square (OLS), if the residual variance-covariance matrix structure is assumed to be homoscedastic and there is no cross-sectional correlation.
   2) Weight Least Square (WLS) if the residual covariance variance matrix structure is assumed to be heteroscedastic and there is no cross-sectional correlation.
   3) Seemingly Unrelated Regression (SUR), if the residual covariance variance matrix structure is assumed to be heteroscedastic and there is a cross-sectional correlation.

   c. Random Effect Model
   The random effects model equation can be written as follows [15]:
   \[
   y_{it} = \alpha + X'_{it}\beta + \epsilon_{it} \tag{1}
   \]
\[ Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + \epsilon_{it} \]  

(4)

Where: \( \alpha_i = \alpha + u_i \), by substituting equation (4), the following equation is obtained:

\[ Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + w_{it} \]

(5)

where: \( w_{it} = \epsilon_{it} + u_i \).

In this model, panel data estimates will be selected where the residuals may be interrelated over time and between individuals. Therefore, in this model it is assumed that there are differences in the intercept for each individual and that the intercept is a random (stochastic) variable.

3. Model Selection Test

a. Chow Test

The fixed-effects model's significance test is carried out by using the Chow test to determine whether the panel data regression technique with the fixed-effect model is better than the common effects regression model. The following hypotheses are used:

- \( H_0: \) the CEM model is better than the FEM model
- \( H_1: \) the FEM model is better than the CEM model

The statistical F test is formulated as follows [14]:

\[ F_{count} = \frac{(RSS_1 - RSS_2) / (n - 1)}{RSS_2 / (nT - n - k)} \sim F_{(\alpha; (n - 1); (nT - n - k))} \]

(6)

Where, \( RSS_1 \) is the residual sum of squares common effects model, and \( RSS_2 \) is the residual sum of squares fixed effects model. If the \( F_{count} \) value is greater the \( F_{table} \) value at a certain level of significance (\( \alpha \)), then the null hypothesis is rejected, which means that the assumption of the intercept coefficient is different, so the panel data regression technique with the fixed-effects model is better than the common effects panel data regression model.

b. Lagrange Multiplier (LM) Test

To determine whether the random-effects model is better than the common effects model, the Lagrange Multiplier (LM) test developed by Breusch-Pagan is used. The statistical hypothesis was:

- \( H_0: \) the CEM model is better than the REM model
- \( H_1: \) the REM model is better than the CEM model

The test statistics used are as follows [14]:

\[ LM = \frac{nT}{2(7-1)} \left[ \frac{\sum_{t=1}^{T} \epsilon_{it}^2}{\sum_{t=1}^{T} \epsilon_{it}^2} - 1 \right] \sim \chi^2_{\alpha,1} \]

(7)

\( \epsilon_{it} \) is the residual common effects model. The LM test follows the chi-square distribution with degrees of freedom of 1. If the LM statistical value is greater than the chi-square statistical value at a certain level of significance (\( \alpha \)), then the null hypothesis is rejected, which means that the correct estimate for panel data regression is a random effect model rather than the common effects model.

4. Structure of Residual Covariance Variance Panel Data Regression Model

After finding the best panel data regression model, the next step is to choose the appropriate estimation method according to the residual variance-covariance structure. Various possible estimation methods are adjusted to the residual variance-covariance structure that can only be applied to fixed effects models and common effects models.

- Homoscedastic Assumption Testing on Residual Variance-Covariance Structure.

A Lagrange Multiplier test (LM test) was carried out on the residual variance-covariance structure to determine the estimation method with the following hypothesis:

- \( H_0: \sigma_i^2 \leq \sigma^2 \) (the residual variance-covariance structure is homoscedastic)
- \( H_0: \sigma_i^2 \neq \sigma^2 \) (the residual variance-covariance structure is heteroscedastic)

The statistical test used can be formulated as follows [16]:

\[ LM = \frac{n}{2\sum_{i=1}^{n} \left( \frac{\epsilon_{it}^2}{\sigma_i^2} - 1 \right)^2} \sim \chi^2_{\alpha,n-1} \]

(9)

The residual variance of the \( i \) equation at homoscedastic conditions is represented in \( \sigma_i^2 \), and sum square residual of the system equation in the fixed effects model in homoscedastic conditions is represented in \( \sigma^2 \).

The LM statistical test follows the chi-square statistical distribution with \( n-1 \) degrees of freedom. If the LM statistical value is greater than the chi-square statistic's critical value with a significance level (\( \alpha \)), the null hypothesis will be rejected. This means that the residual variance-covariance structure is heteroscedastic. The estimation method used for the residual variance-covariance structure that is heteroscedastic is Weighted Least Squares (WLS). However, if the null hypothesis is not rejected, it means that the residual variance-covariance structure is homoscedastic, so that the OLS estimation method can be used.
Heteroscedastic Assumption Testing without Cross-Sectional Correlation on the Structure of Residual Covariance Variances.

This test is carried out if the LM test results indicate that the residual variance-covariance structure is heteroscedastic. In this test, the null hypothesis used is that the residual variance-covariance structure is heteroscedastic, and there is no cross-sectional correlation. While the alternative hypothesis \((H_A)\) is that the residual variance-covariance structure is heteroscedastic, and there is a cross-sectional correlation.

\[ H_0: \text{ Cov} (u_i, u_j) = 0 \quad \text{There is no cross-sectional correlation} \]

\[ H_0: \text{ Cov} (u_i, u_j) \neq 0 \quad \text{if} \ i \neq j \quad \text{(There is cross-sectional correlation)} \]

The following equation is the Lambda LM \((\lambda_{LM})\) statistical test used [16]:

\[
\lambda_{LM} = T \sum_{i=2}^{n} \sum_{j=1}^{n} r_{ij}^2 - \frac{\chi^2_{\alpha,\frac{n(n-1)}{2}}}{2}
\]

Where \(r_{ij}^2 = \text{ residual correlation coefficient, } n \text{ is the number of individuals, and } T \text{ is the number of periods.} \)

The \(\lambda_{LM}\) statistical test follows the chi-square statistical distribution with as many degrees of freedom as \(\frac{n(n-1)}{2}\). Suppose the \(\lambda_{LM}\) statistical value is greater than the chi-square statistic's critical value with a significance level (\(\alpha\)). In that case, the null hypothesis will be rejected, which means that the residual variance-covariance structure is heteroscedastic, and there is a cross-sectional correlation. Thus the weight used is the SUR cross-section. Meanwhile, suppose the null hypothesis is not rejected, which means that the residual variance-covariance structure is heteroscedastic, and there is no cross-sectional correlation. In that case, the weight used is the cross-section weight.

5. The next stage is to test the classical assumptions. The following are the assumptions that need to be fulfilled in this study: testing the normality assumption and testing the non-multicollinearity assumptions. After fulfilling the assumption test, the best regression model estimation results are obtained. In addition to fulfilling the assumption test, the model must also look at the values generated from statistical testing, including the coefficient of determination \((R^2)\), simultaneous test \((F\) test), and partial test \((t\)-test). The research model specifications are as follows:

\[ EDU\text{NEMPLOY}_{it} = \alpha_i + \beta_1 \text{ LQ}_{it} + \beta_2 \text{ Ln_INVES}_{it} + \beta_3 \text{ Ln_LPRO}_{it} + \beta_4 \text{ Ln_MINWAGE}_{it} + \varepsilon_{it} \]

IV. RESULTS AND DISCUSSION

Panel Unit Root Test Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Levin, Lin &amp; Chu (t^*) (LLC)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU\text{NEMPLOY}</td>
<td>-10.5554</td>
<td>0.0000</td>
</tr>
<tr>
<td>LQ</td>
<td>-7.47290</td>
<td>0.0000</td>
</tr>
<tr>
<td>Ln_INVES</td>
<td>-11.0813</td>
<td>0.0000</td>
</tr>
<tr>
<td>Ln_LPRO</td>
<td>-4.39642</td>
<td>0.0000</td>
</tr>
<tr>
<td>Ln_MINWAGE</td>
<td>-6.71759</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Source: author processing.

Based on the unit root test results, the p-value is <0.05, so it can be concluded that all variables are stationary. This test is performed to avoid spurious regression.

Panel Data Regression Model Estimation

This study uses panel data that combines cross-section data from 34 provinces in the 2013–2019 timeframe. There are three models of panel data analysis that can be used, namely the standard effect model (CEM), the fixed-effect model (FEM), or the random effect model (REM). Table 4.2 shows the results of the panel data for the CEM, FEM, and REM models. Based on the CEM model, each variable of the workforce's quality, foreign direct investment, labor productivity, and minimum wages does not significantly affect the educated unemployment rate in Indonesia with a confidence level of 95 percent. The F stat value of CEM is significant, so it can be concluded that CEM is a valid model but not the best model.

<table>
<thead>
<tr>
<th>Variables</th>
<th>CEM</th>
<th>P-value</th>
<th>FEM coef.</th>
<th>REM coef.</th>
<th>(P)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>14.971</td>
<td>0.103</td>
<td>62.38*</td>
<td>0.04</td>
<td>0.93</td>
</tr>
<tr>
<td>LQ</td>
<td>0.0212</td>
<td>0.338</td>
<td>0.137*</td>
<td>0.01</td>
<td>-0.06</td>
</tr>
<tr>
<td>Ln_INVES</td>
<td>0.0806</td>
<td>0.486</td>
<td>0.2070</td>
<td>0.08</td>
<td>-0.16</td>
</tr>
<tr>
<td>Ln_LPRO</td>
<td>0.1858</td>
<td>0.659</td>
<td>5.667*</td>
<td>0.00</td>
<td>2.00*</td>
</tr>
<tr>
<td>Ln_MINWAGE</td>
<td>0.8011</td>
<td>0.206</td>
<td>1.733*</td>
<td>0.03</td>
<td>1.7*</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>238</td>
<td>238</td>
<td>238</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Square</td>
<td>0.0161</td>
<td>0.7749</td>
<td>0.14</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-Square</td>
<td>-0.0007</td>
<td>0.7332</td>
<td>0.12</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>F-Statistics</td>
<td>0.9570</td>
<td>0.431</td>
<td>18.609</td>
<td>0.00</td>
<td>9.79*</td>
</tr>
</tbody>
</table>

Note: * indicate significant with \(\alpha=0.05\)

Source: author processing.

In contrast to the FEM model (table 4.2), the variables of labor force quality, labor productivity, and provincial minimum wages each significantly affect the level of educated unemployment. With a \(p\)-value of F stat small than \(\alpha = 0.05\), all independent variables simultaneously affect the level of educated unemployment. The coefficient of determination shows the variation of the educated unemployment rate, which can be explained by the independent variable of 73.32 percent, while other
variables outside the model explain 26.68 percent. Based on the REM model (table 4.2), only the variable levels of labor productivity and the minimum wage level have a significant effect on Indonesia's educated unemployment rate with a confidence level of 95 percent. This REM model shows a p-value of a small F stat of α = 0.05, which indicates that all independent variables simultaneously affect the level of educated unemployment and is a valid model. The coefficient of determination shows the variation of the educated unemployment rate, which can be explained by the REM model's independent variable of only 12.9 percent.

In determining the best estimation model, the Chow test is conducted first to choose between CEM or REM. Based on table 4.3, the calculation results show the p-value is smaller than α = 0.05. Therefore, the decision taken is to reject H0 to conclude that REM is better than CEM. Then the Hausman test is carried out to select FEM or REM. The calculation results show that the p-value is smaller than α = 0.05; so the decision to reject H0 with the assumption that REM is better than REM.

<table>
<thead>
<tr>
<th>Table 4.3. Result of panel regression model selection testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Statistics Value</td>
</tr>
<tr>
<td>Chow test</td>
</tr>
<tr>
<td>Hausman test</td>
</tr>
</tbody>
</table>

Source: author processing.

The FEM model is the best model for estimating the level of educated unemployment in Indonesia. Furthermore, testing the residual variance-covariance structure of the selected model is carried out. Based on the Lagrange Multiplier (LM) test, the LM statistic's value is greater than the LM statistic's critical point value so that the decision to reject H0 is concluded that the residual variance-covariance structure is heteroscedasticity. The test is then conducted to determine whether the model uses a heteroscedasticity structure estimator without cross-sectional correlation or with a cross-sectional correlation. Based on the Lambda LM test results, the value of the LM statistic is greater than the critical point, so the decision to reject H0. It can be concluded that with a 95 percent confidence level, the best estimation model is Seemingly Unrelated Regression (SUR) with the MLE estimation method. The SUR method will solve the problem of autocorrelation and heteroscedasticity. However, the number of cross-sections is more than the time series period, so the estimator's direct use with the SUR weight cannot be done. The GLS weight used is the cross-section weight to solve the problem of the residual variance-covariance structure, which is heteroscedasticity. Using coefficient covariances with the SUR (PCSE) cross-section method could solve the problem of cross-section correlation.

Table 4.4. Estimation Results of Fixed Effect Model Cross Section Weight with Robust Coefficient Covariance Cross Section SUR (PCSE)

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Standard Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-18.94505</td>
<td>21.17570</td>
</tr>
<tr>
<td>LQ</td>
<td>-0.120595*</td>
<td>0.056061</td>
</tr>
<tr>
<td>Ln_INVES</td>
<td>-0.176219*</td>
<td>0.082162</td>
</tr>
<tr>
<td>Ln_LPRO</td>
<td>2.709775*</td>
<td>1.183435</td>
</tr>
<tr>
<td>Ln_MINWAGE</td>
<td>-1.096586</td>
<td>0.833942</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.902488</td>
<td></td>
</tr>
<tr>
<td>Adjusted R- squared</td>
<td>0.884449</td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>50.02806</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Note: *, indicate significant where α=0.05

Source: author processing.

The estimation concluded the best model for the fixed-effect model of cross-section weight with robust coefficient covariance cross-section SUR (PCSE) that meets normality and multicollinearity assumptions. Based on the model in table 4.4, it is known that the quality of the labor force and foreign direct investment has a negative and significant effect in influencing the educated unemployment rate in Indonesia. Meanwhile, the level of labor productivity has a positive and significant effect on the educated unemployment rate.

Despite the fact that the minimum wage rate is not significant, it does not mean that it does not affect the educated unemployment rate. The minimum wage level affects workers' welfare level, which positively impacts the unemployment rate. The high rate of inflation in urban areas also impacts the increase in Indonesians' standard of living—many factors and the resulting model influence the minimum wage level's insignificance.

Education is the key to success in educating the nation. Improving the workforce's quality through formal and non-formal education with various technical and managerial skills significantly impacts its ability to produce output. The workforce with university graduates has reliable abilities and skills in mastering technology and faster adaptation abilities, mostly the young educated unemployed. When the workforce's quality increases by 1%, ceteris paribus, the educated unemployment rate decreases by 0.12%. A quality workforce has an excellent opportunity to be accepted for work in public and private companies both domestically and abroad, impacting reducing the educated unemployment rate. The government must also encourage new jobs by providing business capital subsidies to small and medium enterprises in various sectors based on regional potential. The non-absorption of labor in the country is a serious consideration for exporting Indonesian workers abroad to reduce Indonesia's open unemployment rate [17].

A large amount of foreign direct investment in Indonesia has a positive impact on Indonesian workers' absorption so that the educated unemployment rate decreases. When Indonesia's foreign direct investment increased by 1%,
ceteris paribus, the educated unemployment rate decreased by 0.17%. The advantages of foreign direct investment include technology transfer, higher productivity levels, higher government tax revenues, enhancement of balance of payments ability, employment generation, diversification of the industrial base and expansion, modernization, and development of related industries [18]. The increase in foreign direct investment in several parts of Indonesia will allow the community to contribute to creating company output to increase the population's welfare. Besides, the entry of foreign direct investment will also create Corporate Social Responsibility (CSR), which positively impacts sustainable development.

Based on the research results, when labor productivity increases in percent, ceteris paribus, the educated unemployment rate also increases in percent. An increased level of labor productivity indicates an increase in output per worker. Increasing productivity is determined by human capital and is also influenced by physical capital, especially the machines and technology used. When labor productivity has produced abundant output, labor absorption will decrease to minimize the risk of overproduction. If this overproduction is not balanced with the demand, the product's price will free fall in the market. Indonesia is a country with abundant human resources. The Indonesian Financial Minister estimated that Indonesia would enjoy a demographic bonus from 2020 to 2035. This estimation is a challenge for the government to jointly take advantage of this opportunity to make the population of productive age more qualified to make a positive contribution to national development and sustainable development. Improvement of human quality is carried out through the development of the education sector, both formal and non-formal, in facing the world of work with high competition. This demographic bonus is also an opportunity for Indonesia to send workers abroad when Indonesia cannot stem a labor force explosion.

On the other hand, Indonesia's sizeable foreign direct investment opportunities will open up job opportunities for local people to improve their welfare. Investment companies in meeting work needs prioritize Indonesian workers and companies that employ foreign workers to organize training and transfer technology to Indonesian citizens by following laws and regulations [19]. The factors that influence the educated unemployment rate become a reference in formulating strategic policies to reduce Indonesia's unemployment rate.

V. CONCLUSION AND FUTURE SCOPE

Based on the research findings, the best model in estimating Indonesia's educated unemployment rate is the fixed cross-section weight effect model with robust coefficient covariance cross-section SUR (PCSE). The findings suggest that the quality of the workforce and foreign direct investment has a negative and significant impact on Indonesia's educated unemployment rate. Additionally, workforce productivity has a positive and significant impact on the rate of unemployed educated people.

Recommendations in this study include: (1) Improving the quality of human resources and foreign direct investment opportunities in Indonesia is necessary to minimize the rate of educated unemployment. Through increased education, mostly informal education that provides skills for the business world and the world of work, it will produce a reliable workforce needed by companies at home and abroad. (2) The level of labor productivity in the industrial era 4.0 has relied on advances in machines and technology. Hence, human resources quality needs to be improved in various fields to keep pace with the technology that has begun to shift the human workforce. The Indonesian government must develop the workforce's abilities through various scholarship activities, for instance, student and labor exchanges, to increase technology transfer. (3) The government must create a new strategy for the absorption of college graduates who make a significant contribution to educated unemployment, including making employee recruitment policy schemes, providing assistance to small and medium enterprises, and making investment easier to create jobs.

The limitation of this research is less lengthy time series data. The limited data on the unit cross-section in this study reduced the asymptotic argument for panel data characteristics. Therefore, the writer recommends further research to conduct a more in-depth study, especially other research models, and accommodate other variables that can affect the educated unemployment rate.

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