AFFECTORS ON THE MANUFACTURING SECTOR'S LABOR ABSORPTION

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Abstract

Economic development that focuses on the industrial sector is a major driving force of economic growth, including in providing employment for the workforce. Therefore, this study aims to determine the effect of industrial sector investment, industrial sector wages, industrial sector GRDP, and the number of industries on labor absorption in the manufacturing industry sector in West Sumatra. The analysis method used in this study is Multiple Regression Analysis using time series data from 1996-2012. The independent variables used in this study are industrial sector investment, industrial sector wages, industrial sector GRDP, and the number of industries, while the dependent variable is labor absorption in the manufacturing sector. The results of this study show that simultaneously all four independent variables in this study have an effect on the dependent variable. However, partially, the industrial sector investment variable does not have a significant effect on labor absorption, and the industrial sector GRDP variable has a negative and significant effect on labor absorption, while the wage and number of industries variables have a positive and significant effect on labor absorption in the manufacturing industry sector in West Sumatra.

Keywords: *Investment, wages, industrial sector GRDP, number of industries, labor force.*

1. INTRODUCTION

Economic development is one of the most important aspects of a nation's progress. It encompasses all activities and endeavors aimed at increasing the income per capita of the population of a developing country within the shortest possible timeframe.

The industrial sector is a major driving force behind economic growth in various countries, including Indonesia. It has stimulated economic growth over the past decade. In 2001, the manufacturing industry sector's contribution to GDP formation was estimated to exceed a quarter (26.11 percent). Meanwhile, the agricultural sector contributed around 16.39 percent. While in 2012, the manufacturing industry had managed to contribute 23.97 percent to GDP, making it the largest contributor (Statistik Industri Manufaktur, BPS 2012).

The economic structure of West Sumatra is still dominated by five economic sectors, one of which is the manufacturing industry sector, which contributed 12.01 percent to GRDP in 2006 and declined to 11.14 percent in 2012. Meanwhile, the agriculture sector

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remains the largest sector contributing to GRDP, namely 23.32 percent in 2012 (BPS West Sumatra).

Typically, the progress of a country or region is marked by an increase in the contribution of the manufacturing industry sector and a decrease in the role of the agricultural sector. However, the phenomenon that occurs in West Sumatra is different, where the contribution of the industrial sector is decreasing, the role of the agricultural sector is also decreasing, while the service, trade, hotel and restaurant, and transportation and communication sectors are increasing.

Economic development in the region focuses on reducing poverty, increasing job creation, improving overall public welfare, reducing inter-regional disparities, and most importantly for the region, creating jobs (Syaukani, et al 2002). The success of local governments can be seen from the extent to which local governments can provide jobs for their people. High job creation will increase labor absorption, which indirectly will improve the standard of living of the people towards a better direction.

The more advanced the economic growth, the number of workers in the manufacturing industry tends to increase. Based on Sakernas 2012 data, in 2005 labor absorption in this sector reached 8.18 percent, in 2006 it decreased to 7.14 percent, and in 2008 and 2009 it fell again to 6.56 percent, until in 2010 it reached 6.78 percent and 7.39 percent in 2011 and increased to 7.81 percent in 2012 (BPS West Sumatra).

The growth of the manufacturing industry sector is expected to be able to create jobs and absorb labor so that the unemployment problem can be overcome. Therefore, the effect of the growth of the manufacturing industry sector needs to be studied so that economic growth can develop well, unemployment problems can be reduced, and the standard of living of the people can increase.

The following are the research problems based on the preceding description:

a. How is the development of labor absorption in the manufacturing industry sector in West Sumatra?
b. What is the effect of investment in the manufacturing industry sector, wages of industrial workers, output value (GRDP) of the manufacturing industry, and the number of manufacturing industries on labor absorption in the manufacturing industry sector in West Sumatra?
c. What policies are needed to increase employment opportunities?

Therefore, the following are the study's objectives:

a. To outline the evolution of workforce absorption in West Sumatra's manufacturing industry sector
b. To examine how labor absorption in the manufacturing sector in West Sumatra is impacted by investment in the sector, industrial worker pay, the manufacturing industry's output value (GRDP), and the number of manufacturing industries
c. To formulate policies needed to increase employment opportunities

The result of this research are expected to provide benefits as study material and knowledge, as well as insights into the application of economic labor theories in the manufacturing sector, serving as additional information related to the findings of this study, to enrich the scientific and non-scientific insights of the author in the discipline of

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science that the author is pursuing and applying it contextually and textually, and as input for academics and researchers who are interested in discussing the problem of labor absorption in the manufacturing industry.

2. LITERATURE STUDY

Labor

Labor (manpower) is the population who have worked and are employed at the moment, who are doing other things like going to school and taking care of the household in addition to looking for work (Simanjuntak, 1998). According to Nacrhowi (2004), skilled labor is a potential human resource that is very much needed by every company to achieve its goals. The large number of population and workforce on the one hand is a potential human resource that can be relied on, but on the other hand it is also a big problem that has an impact on various sectors.

Job Opportunities

The Central Statistics Agency defines "job opportunities" as the total number of individuals who can be employed by an organization. If there are enough employment available to match the quantity of workers, then all workers will have access to these job opportunities.

Investment

From the point of view of the use of goods, investment is the value of all new capital goods that can produce one unit of output and possess a lifespan of more than a year. On the other hand, goods or manufacturing instruments with a one-year or shorter useful or are consumed in the production process are not classified as investment goods, but rather as intermediate input goods.

Output (GRDP of the industry sector)

The total value of all products and services that a business unit produces and ultimately sells to customers is known as output.

Wages

According to Law No. 13 of 2003 concerning manpower, wages are understood to be a receipt as compensation from employers to laborers or workers for work or services that have been or are being performed, stated or valued in monetary terms that are decided upon in accordance with a contract or laws, and paid in accordance with an employment contract between the employer and the worker.

Efficient wage theory explains that efficient wages will be equal to the marginal product, which can be derived based on sufficient conditions to maximize profits in a company (Sugiyono, 2001). According to this theory, companies tend to set wages higher than the equilibrium wage in a perfectly competitive market.

Based on the wage equalization theory, the level of satisfaction of each worker with a job is not the same, so there can be differences in wage levels that reflect differences in tastes or preferences for each type of work.

Industry

The Central Statistics Agency (BPS) defines a business unit or industry as a unit that carries out activities undertaken by individuals or households or an organization and has

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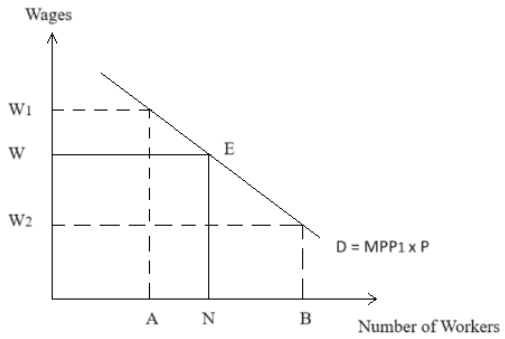
the authority determined based on the correct location of the physical building and its operational area.

Labor Demand Theory

The labor demand function is used to determine how much a sector's absorption capacity is for labor input factors. In microeconomic theory, it is stated that the demand for an input (in this case labor) is a derived demand, while the parent demand is the demand for output produced by an economic activity (Kuncoro, 1999).

Figure 1. Labor Demand Function Curve



The diagram above shows the vertical axis representing worker placement at points A, N, and B. The horizontal axis represents the wage rate (w). Line D represents the labor demand function. When the wage is high, the number of workers demanded is low, and vice versa. This line also shows the value of the marginal physical product of labor (VMPPL), which is equal to MPPL x P = w. Suppose the number of workers employed is 0A = x people. The value of the marginal product of labor for the x worker is called VMPPL-x. This value is greater than the prevailing wage rate (w). The employer can continue to increase the number of workers employed up to point N. Adding more workers beyond 0N, to point 0B, will reduce the company's profit because the VMPPL is less than the prevailing wage.

3. RESEARCH METHODOLOGY

Data and Sources

This study employs a quantitative methodology. A quantitative approach primarily focuses on the statistical processing of numerical data, or numbers, through analysis.. With a quantitative method, significance of difference between groups or significance of relationship between the variables being researched will be obtained.

This research uses secondary data in the form of time-series data, with observation period of year 1996-2012 (seventeen years). Secondary data is used to complement researcher's data obtained from publications or reports of a relevant institution such as Central Bureau of Statistics (BPS) West Sumatra.

The variables used in this research are investment of industrial sector, wage of industrial sector, GRDP of industrial sector, and number of industries as the independent

variables and labor absorption as the dependent variable. In this research, investment, GRDP, wage are measured in rupiah unit, number of industries are measured in unit. Labor absorption meant here is the number of workforce who are employed working in the industrial sector.

Analysis Methods

To determine the influence of industrial sector investment, industrial sector wages, industrial sector GRDP, and the number of industries on labor absorption in the manufacturing industrial sector in West Sumatra, hypothesis testing is carried out using the Multiple Linear Regression Model proposed by Carl Friedrich Gauss, a German mathematician (Gujarati, 2003) with the formula:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

The next equation is transformed into logafigurerithmic form as:

$$\ln Y = \ln\beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + e$$

Where:

Y = Labor absorption (people)
β_0 = Constant/ intercept
X_1 = Investment (rupiah)
X_2 = Wages (rupiah)
X_3 = Value of output (rupiah)
X_4 = Number of industries (unit)
β_1 = Regression coefficient of investment
β_2 = Regression coefficient of wages
β_3 = Regression coefficient of output value
β_4 = Regression coefficient of number industries
e = Standard error

To determine the validity of the hypotheses, statistical tests are required in the form of the Coefficient of Determination R^2 (Goodness of Fit), the F-test, and the t-test.

Coefficient of Determination R^2 (*Goodness Of Fit*)

The degree to which the independent factors influence the development of the dependent variable is evaluated using the Coefficient of Determination (R^2). Given that the independent variables may account for a greater percentage of the dependent variable, a higher R^2 value suggests a better fit for the regression model. A part of the variance in the dependent variable can be explained by the independent variables when the R^2 value is close to 0. A higher proportion of the variation in the dependent variable may be accounted for by the independent variables as the R^2 value approaches 1. When the dependent variable's variation cannot be explained by the independent variables, the estimated R^2 value of 0 is indicated. (Gujarati, 2003).

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Statistical F-test

The F-test is conducted to determine the significance of the combined effect of the independent variables on the dependent variable.

Langkah-langkah pengujiannya sebagai berikut :

1 Ho: $\beta_1 = \beta_2 = 0$, It means that the independent variables, collectively, do not have a significant impact on the dependent variable.

2 Ha: $\beta_1 \neq \beta_2 \neq 0$, It means that the independent variables, collectively, have a significant impact on the dependent variable. The F-table value can be found using the degrees of freedom :

F-table : F α : n-k : k-2.

α = Significance level

n = Number of samples (observations)

k = Number of parameters / regression coefficients plus constant

3. The F-statistic is obtained using the formula (Nachrowi, 2006) :

$$F = \frac{R^2/(k-1)}{(1-R^2)/(n-k)}$$

R^2 = coefficient of determination

n = number of samples (observations)

k = number of parameters/regression coefficients plus the constant

Testing Criteria:

1. If F-count < F-table, then H_0 is accepted, meaning that the independent variables, collectively, do not have a significant effect on the dependent variable.
2. If F-count > F-table, then H_0 is rejected, meaning that the independent variables, collectively, have a significant effect on the dependent variable.

Statistical T-test

T-test is a test of regression coefficient individually and to know the influence of each variable on the dependent variable, by assuming other variables are constant or fixed.

The testing steps are as follows:

1. Ho : βi = 0, means the independent variable individually does not have a significant influence on the dependent variable.
2. Ha : βi ≠ 0, means the independent variable individually has a significant influence on the dependent variable.
3. The t-table value can be found with degrees of freedom:

t-table = t a : n k

Where:

a = significance level

n = number of samples (observations)

k = number of parameters / regression coefficients plus constant

a. T-count can be found using the formula (Nachrowi, 2006) :

$$t = \frac{\beta_i}{Se(\beta_i)}$$

where :

β_i = regression coefficients

$Se(\beta_i)$ = Standard Error of the Regression Coefficient

b. testing Criteria:

1) If t-count < t-table, then H_0 is accepted, meaning that the individual independent variable does not have a statistically significant effect on the dependent variable.
2) If t-count > t-table, then H_0 is rejected, meaning that the independent variables individually have a significant effect on the dependent variable.

Classical Assumption Testing

The regression equation must be BLUE (Best Linear Unbiased Estimator). This means that the decisions made through the F-test and t-test should not be biased. Therefore, multiple linear regression must meet four basic assumptions that cannot be violated (Almilia & Utomo, 2006), which are:

a. No multicollinearity
b. No serial autocorrelation
c. No heteroscedasticity
d. No normality

After performing regression analysis, statistical model testing is conducted. This includes:

1. Multicollinearity Test

This calculation method is used to assess whether there is correlation among the independent variables. If correlation occurs, then it is said that multicollinearity is present. One way to detect the presence or absence of multicollinearity is by looking at the correlation coefficient values between each of the independent variables. If these values are less than 0.80, then it means that multicollinearity is not present, and vice versa (Gujarati, 2003). This method can also reveal similarities between the independent variables in a model, which can lead to a very strong correlation between one independent variable and another.

2. Autocorrelation Test

This autocorrelation test is conducted to determine whether there is correlation between the disturbing error in period t and the disturbing error in period t-1 (previously). If correlation occurs, it is called an autocorrelation problem. In a good regression model, there is no autocorrelation. If a regression model contains autocorrelation, it will have the consequence that the regression model does not have a minimum variance. A non-minimum variance will make it impossible to evaluate the regression results through either the t-test or the F-test.

The LM test (Bruesch Godfrey approach) is one way for detecting autocorrelation. This approach is based on the F and Obs*R-Squared; H_0 is acceptable if both the probability value and Obs*R-Squared are greater than the confidence level. This indicates that the autocorrelation issue is resolved.

3. Heteroscedasticity test

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Using the heteroscedasticity method, one can determine if the variance of residuals in a regression model is unequal between observations, or to see whether the OLS estimator produces a BLUE (Best Linear Unbiased Estimator) estimator or not. The test can be performed using the White heteroscedasticity no cross-term test where if the chi-squared probability (Obs*Rsquared) > α, it means that there is no heteroscedasticity (Ajija, et al 2011). Good regression results are results that do not have heteroscedasticity.

4. Normality test

The normality test is used to assess the assumption that the sampling distribution approximates or follows the normality of the population. In other words, it is used to determine whether the sample or data is not normally distributed. Good data is data that has a normal distribution.

The normality test can be performed using the Jarque-Bera test (JB test) and graphical methods. If the JB test probability is greater than α = 5% (0.05), then H_0 is accepted, which means that the data is normally distributed. Conversely, if the JB test probability is less than α = 5% (0.05), then the data is not normally distributed.

4. RESULTS AND DISCUSSION

From the results of the multiple linear regression analysis using OLS, a model equation can be derived to analyze the effect of investment, wages, industrial GDP, and the number of industries on labor absorption. Based on the multiple linear regression, the following estimation results were obtained:

Table 1. Estimation Output

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INVESTMENT	0.216054	0.191494	1.128258	0.2813
WAGES	0.338677	0.076086	4.451255	0.0008
INDUSRIAL GDRP	-0.653628	0.204427	-3.197359	0.0077
NUMBER OF INDUSTRIES	0.725370	0.268681	2.699740	0.0193
C	4.440160	2.327438	1.907746	0.0806
R-squared	0.664288	Mean dependent var		4.248478
Prob(F-statistic)	0.007137			

Source: data processed

The following formula can be used to create a multiple linear regression model based on regression coefficient testing:

ln Y= 4,4401 + 0,2160 ln X1 + 0,3386 ln X2 – 0,6536 ln X3 + 0,7253 ln X4

From the regression results, it was found that the R^2 value is 0.6643. This indicates that the independent variables—investment, wages, industrial GDP, and the number of

industries—are able to explain the labor absorption variable by 0.6643 or 66% in West Sumatra. The remaining 34% can be accounted for by the error term (μ) or other factors not included in the model.

The variable that most influences labor absorption in the manufacturing industry in West Sumatra is the number of industries. This variable has a significant influence and the highest coefficient value among the other variables, which is 0.7253.

From the regression equation above, the constant value is 4.4401, meaning that when investment, wages, industrial GDP, and the number of industries are zero, the labor absorption value is 4.4401. This indicates that other variables outside the model still have the potential to influence labor absorption by 4.4401 percent.

Based on the statistical test results, the t-statistic value for investment is smaller than the t-table value (1.1282 < 1.761), indicating that investment in the manufacturing sector does not significantly affect labor absorption. This is because capital-intensive industries are more developed, and most labor-intensive industries cannot survive in West Sumatra. The reasons include low worker productivity and the preference of the people of West Sumatra to start home-based industrial products, trade, and other businesses.

The wage level has a positive and significant effect on labor absorption in West Sumatra. From the regression results in the table, it can be explained that the labor wage coefficient is 0.3386 with a t-statistic value of 4.4512. A regression coefficient value of 0.3386 means that if labor wages increase by 1 percent, labor absorption will also increase by 0.33 percent, assuming ceteris paribus.

The industrial GDP has a significant effect on labor absorption. From the regression results in the table, it can be explained that the coefficient for industrial GDP is -0.6536 with a t-statistic value of -3.1973. The negative regression coefficient value of -0.6536 means that if industrial GDP increases by 1 percent, labor absorption in the manufacturing industry will decrease by 0.65 percent, assuming ceteris paribus.

The number of manufacturing industries contributes significantly to labor absorption. From the regression results in the table, it can be explained that the coefficient for the number of manufacturing industries is 0.7253 with a t-statistic value of 2.6997. A regression coefficient value of 0.7253 means that if the number of industries increases by 1 percent, labor absorption in the manufacturing industry will also increase by 0.72 percent, assuming ceteris paribus.

Multicollinearity Test

Multicollinearity is a condition when one or more independent variables are correlated or related to other independent variables, can also means when one or more independent variables are a linear function of other independent variables. If the correlation between independent variables is less than 0.8 (correlation < 0.8), then the data are considered free of multicollinearity.

Table 2. Multicollinearity Test

Correlation

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	Labor Force	Investment	Wages	GDRP of Industri	Number of Industry
Labor Force	1	-0,2230	0,5333	0,0663	0,2826
Investment	-0,2230	1	-0,0981	0,2389	-0,2371
Wages	0,5333	-0,0981	1	0,6919	-0,0088
GRDP of Industry	0,0663	0,2389	0,6919	1	0,1812
Number of Industries	0,2826	-0,2371	-0,0088	0,1812	1

Source: data processed

From the correlation table above, it can be concluded that there is no multicollinearity issue in the multiple regression equation. This is because the correlation matrix values of all variables are less than 0.8.

Autocorrelation Test

Autocorrelation indicates the correlation among observations ordered by time or space. According to Ajija (2011), to determine whether there is autocorrelation in the model, the LM test (Bruesch Godfrey method) is conducted. This testing method involves examining the values of F and Obs* R-Squared. If the probability value of Obs* R-Squared exceeds the confidence level α=5%, then H0 is accepted, meaning there is no autocorrelation. Conversely, if the probability of Obs* R-Squared is less than α=5%, then H0 is rejected, and H1 is accepted, indicating that there is autocorrelation.

Table 3. Autocorrelation Test

Breusch-Godfrey Serial Correlation LM test:			
F-statistic	1.5152	Prob. F(2,10)	0.2662
Obs* R-Squared	3.9537	Prob. Chi-Square(2)	0.1385

Source: data processed

From the table of autocorrelation test results, it can be seen that the probability value of Obs*R-square = 0.13 > 0.05, hence H_0 is accepted. Therefore, it can be concluded that with a confidence level of 95%, there is no autocorrelation in the regression model.

Heteroskedasticity Test

Heteroskedasticity is a condition where all disturbances that arise in the population regression function do not have the same variance. To test for heteroskedasticity, it can be done in two ways. The first way is to look at the residual pattern from the regression estimation results. If the residuals move constantly, then there is no heteroskedasticity. However, if the residuals form a certain pattern, it indicates the presence of heteroskedasticity.

Figure 1. Heteroskedasticity Test

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Source: data processed

By looking at these results, we can speculate that there is no heteroskedasticity in the estimation output, as the residuals do not form a pattern. In other words, the residuals tend to be constant.

To confirm the speculation in the first heteroskedasticity test, the White Heteroscedasticity test is conducted. The results presented from this test are the F value and Obs* R-Squared. If the value of Obs* R-Squared is smaller than α (0.05), then heteroskedasticity occurs, vice versa.

Table 4. Heteroskedasticity White Test

Heteroskedasticity Test: White			
F-statistic	2.6156	Prob. F(4,12)	0.0882
Obs* R-Squared	7.9182	Prob. Chi-Square(4)	0.0946
Scaled explained SS	2.0376	Prob. Chi-Square(4)	0.7288

Source: data processed

From the table, it can be seen that the probability value of Obs*R-square is 0.094 > α = 5% (0.05), hence H_0 is accepted. Therefore, it can be concluded that there is no heteroskedasticity issue

Normality Test

Normality test can be conducted using the Jarque-Bera (JB test) and graphical methods. If the JB test probability is greater than α = 5% (0.05), then H0 is accepted, indicating that the data is normally distributed. Conversely, if the JB test probability is smaller than α = 5% (0.05), then the data is not normally distributed.

Figure 2. Normality Test

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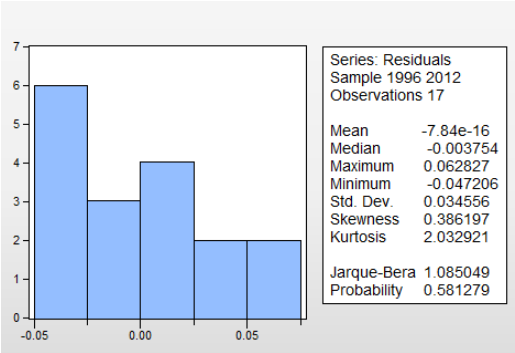

Source: data processed

The test results presented on the graph show that the probability of the JB test is 0.5812 > α=5% (0.05), indicating that the data is normally distributed.

5. CONCLUSION

From the regression test results, investment, wages, industrial GDP, and the number of industries have an influence of 66.43% on labor absorption. Or the independent variables used in the model can explain 66.43% of the dependent variable. Meanwhile, the remaining 33.57% is influenced by other variables not included in this study. The development of the labor force in the manufacturing sector is greatly influenced by the development of the number of industries, especially labor-intensive industries. The magnitude of the influence of each variable on labor absorption in the manufacturing industry in West Sumatra can be seen from the regression coefficient values, where the number of industries is the most influential variable on labor absorption in the manufacturing industry in West Sumatra with a regression coefficient of 0.72, which means that if the number of companies increases by 1 percent, it will result in an increase in labor absorption by 0.72 percent.

The investment variable in the industrial sector does not significantly affect labor absorption in the manufacturing sector in West Sumatra. This is due to the use of technology in production, which reduces the use of human labor. The wage variable in the industrial sector has a positive and significant effect on labor absorption in the manufacturing sector in West Sumatra. So when wages increase, labor absorption will also increase. Industrial GDP has a negative and significant effect on labor absorption, meaning that if the output value seen from industrial GDP increases, labor absorption will decrease, and vice versa. Furthermore, the number of industries has a positive and significant effect on labor absorption in the manufacturing industry, meaning that the number of industries affects people to work, where people who work need job opportunities to meet economic needs. The wider the job market or industry, the more labor can be absorbed.

Policies needed to be implemented to develop industries and increase job absorption include expanding job opportunities, especially labor-intensive industries, to increase the use of labor, and government intervention in limiting the use of technology so that labor utilization can be maximized. Furthermore, improving the quality of human resources by

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paying attention to education and providing training for workers to increase labor productivity.

Suggestions

From the discussions presented in this thesis, there are several suggestions that the author can convey, namely: It is hoped that the manufacturing industry in West Sumatra continues to develop so that with the increasing number of manufacturing industries, labor absorption in the manufacturing industry can expand and grow.

Companies are expected to be more effective and efficient in creating policies regarding labor expenditures, especially wages.

Improvement of education quality and provision of job training for workers so that the quality of workers improves and labor productivity increases.

Increasing labor productivity needs to be done as much as possible. However, it should be noted that in increasing productivity, there should be no reduction in labor. Therefore, output must be increased more than the increase in labor utilization.

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