

# Analysis of Socioeconomic and Industrial Development and its Impact on Environmental Quality and Unemployment in Indonesia

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## ABSTRACT

The research objective is to study socio-economic and industrial development and its impact on environmental quality and unemployment in Indonesia before and during the Covid-19 period. Secondary data was used for analysts in the 2017-2022 period with a cross section of 34 provinces.

The result of analysis show that the industrial developments had a significant negative influence on environmental quality both before and during the pandemic, and so did on wages. Beside that it was shown that industrial developments have a positive and significant impact on education, both in the pre-pandemic and during the Pandemic. The Industry have a significant positive effect on unemployment, both before and during the pandemic. Wages did not have a significant effect on unemployment, both during the pre-pandemic and during the pandemic.

Education has a positive influence on unemployment significantly in the pre-pandemic period, but did not during the pandemic. Furthermore training institutions in prior to the pandemic had not influence on unemployment, both in before and during the pandemic. Finally the wage had a negative influence significantly in both of the time

**Keywords:** Industrial development, Unemployment, Environment quality, Wages, Education and Training

## INTRODUCTION

Indonesia is the largest archipelagic country in Southeast Asia with the largest population. Official data from the Central Statistics Agency's Population Census, in 2020, Indonesia's population reached 270.20 million people and in 2022 increased to 275.77 million people. The composition dominated by the productive age group 15–64 years. This shows that the population composition in Indonesia is dominated by people of productive age. If this population group can be allocated optimally in terms of having jobs, it will be able to encourage economic development and improve community welfare. On the other hand, if the productive age population is not allocated optimally what will happen is an abundance of unemployment. Apart from its relatively high population, Indonesia also has abundant natural resources, thus attracting investors into the country to build and develop the manufacturing industrial sector which absorbs the workforce. Investment in the small and medium scale industrial sector can be used as a solution to the problem of unemployment in Arab countries (Trabulsi, 2019).

The problem of unemployment is a classic problem that is always inherent and characterizes most countries, including Indonesia. Meanwhile (Muin, 2020) stated that the high economic growth and a sufficient percentage of IT mastery do not guarantee a decrease in most provinces' unemployment rates in Indonesia.

This study also concluded that the factor that could reduce the unemployment rate is the average school

duration. Furthermore (Gross, 2006) stated that the main factor causing high unemployment in France was the slowing demand for labor caused by high labor and energy costs in the early 1980s and tight aggregate demand during that period.

Unemployment in Indonesia continues to experience developments showing a downward trend, although it is still not in line with expectations. According to BPS data in 2017, unemployment in Indonesia reached 5.5%, the following year in 2018 it fell to 5.34 and in 2019 it fell again to 5.28%. On the other hand, in 2020 budgeting experienced a sharp increase reaching 7.07%, but after this year unemployment continued to decline so that in 2022 it was only 5.65%, Table 1. This fact shows that the development of unemployment is in line with the first development of Covid-19 emerged and became very serious in 2020 in Indonesia.

Meanwhile, in contrast to the environment quality in Indonesia which always shows an increase from year to year. According to data from the Ministry of Environment, the environmental quality score in 2017 was 67.29 points and this continues to increase every year until it reaches 73.19 points in 2022, so on average there is an increase of 1.18 points every year, promises that the quality of Indonesia’s environment is getting better, even though Indonesia was hit by the pandemic which started in 2020, Figure 1.

#### Development of 4 research variables

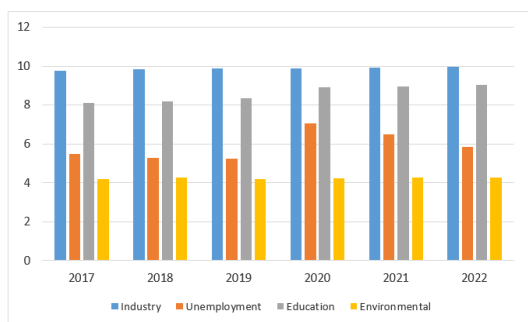


Figure 1. Development of 4 research variables

The impact of Covid-19 was felt by Indonesia in all aspects, resulting in a decline in economic growth (Sadiyah, 2021). The Central Statistics Agency stated that in 2017, Indonesia was able to achieve economic growth of 3.79%, and in the following year it rose to 3.93%, and in 2019 it reached 4.27%. It can be seen that before the pandemic, Indonesia experienced an increase in economic growth from year to year and the highest increase was in 2019. Furthermore, during the pandemic, it experienced a sharp contraction with minus growth, -3.03% in 2020, but only this year Indonesia experienced minus growth even in 2022 it managed to achieve growth above 5%, 6.16%. It can be seen that Covid-19 has a negative impact on economic growth, but only for 2 years and the worst will be in 2020. Decreased economic growth will have an impact on increased unemployment, Okun’s law.

One of the economic sectors that is of concern to the government and society to become a leading sector is industrial sector so that the sector plays a key role as a development engine because it has several values of excellence compared to other sectors (Pratomo, 2019). Furthermore, Trabulsi, 2019 stated that Industry is the primary measure of development and progress of countries, and industry is the mainstay of economic and social development. It also plays a distinct role in achieving economic, social and development goals. Referring to data from the Central Statistics Agency, the non-oil and gas processing industry is the sector that consistently provides the largest contribution to national GDP. In the third quarter of 2022, the contribution of the manufacturing sector reached 16.10 percent, an increase compared to the second quarter of 2022 at 16.01 percent. The industry made the largest contribution to the increase in Indonesia’s economic growth, which reached 7.07% in the second quarter of 2021. This sector was the source of the highest growth, namely 1.35%. In this period, the industrial sector itself recorded growth of

6.91% despite experiencing pressure due to the Covid-19.

Despite being under pressure due to the Covid-19 pandemic which entered Indonesia since 2020, industrial sector also made the largest contribution to the national Gross Domestic Product (GDP) in the second quarter of 2021, namely 17.34%. The top five contributors to GDP in this period were the food and beverage industry at 6.66%, the chemical, pharmaceutical and traditional medicine industry at 1.96%, the metal goods, computer, electronic goods, optics and electrical equipment industry at 1.57%, transportation equipment industry 1.46%, and textile and apparel industry 1.05%. This shows that the industry has an important role in national economic growth (Ministry of Trade and Industry Office, 2022)

Industrialization brings both positive and negative effects. During industrialization, the industrial sector enjoyed a rapid increase in output. It also creates more jobs and income in the economy as it increases the value-added of primary sector output. However, industrialization has also resulted in more population, urbanization, and pressure on social and environmental problems (Nasution, 2022). Furthermore, the relationship between the environment and unemployment is explained by Kondohn, 2011. However, basically industry aims to increase the added value of all economic sectors with the processing industry sector as the leading sector, meaning that with industrial development it will spur and elevate the development of other sectors (Arsyad, 2004). Apart from the impact on the environment, to date, industry has developed into the 4th revolution which continues to require improvements in education, including products and learning processes to produce quality graduates who are able to face future challenges (Elyyan, 2021). Industrialization is also marked by the development of electricity use, where the electrification ratio has a significant negative influence on the environmental quality index in Indonesia. With the existence of this electricity industry, learning and teaching activities can be improved, especially in rural areas.

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential (Law Concerning the National Education System 2013 chapter 1 article 1: 1). The potential that pupils and students have is basically closely related to the individual and their environment. Environmental education in schools plays an important role in forming students' attitudes to care about the environment, human relations with nature and its surroundings which includes population relations, pollution, resource allocation, transportation technology and urban and rural planning towards the human environment as a whole (Dhara, 2022). Knowledge, life skills and values related to the social, cultural, environmental and economic aspects of life are vital components of education, where most developing countries find it difficult to accommodate these concepts. The challenge facing many developing countries is to incorporate these aspects of sustainable development into the curriculum in an effective way, from primary to tertiary level. Furthermore, Zaidi, 2021 stated that the causes and consequences of unemployment in Pakistan can be found in the country's educational system that provides less skills and technical exposure. Pakistan has less industrial growth among the developing countries because of the less collection of taxes, shortage of energy, trained labor and the policy gap by the government.

The level of education in Indonesia can be measured by years of schooling. According to Central Bureau of Statistics' data, the average length of school for the Indonesian population in 2017 was 8.1 years and in 2020 it rose to 8.9 years and in 2022 it will reach more than 9 years or to be precise, 9.03 years. This fact shows that education as measured by years of schooling is not affected by the pandemic which started in 2020. This increase in education, which consistently increases every year, is expected to have an impact on reducing unemployment and encouraging economic growth, including the manufacturing industrial sector.

The relationship between education and the environment can be reciprocal, either directly or indirectly. It can be directly explained as: Education is the result or asset of the results of several years of struggle through formal education, more or less, which has led a person to become a superior human being, because he has knowledge, attitude and character which are his main capital. The higher the level of education, the more sensitive an individual is to himself and his environment, including the cleanliness of his environment.

Indirectly, it can be explained through the findings of (Xin, 2022) which shows that the importance of human capital shows that variables such as literacy levels and average years of schooling curb CO<sub>2</sub> emissions in the long term. Moreover, empirical findings reveal that unemployment significantly increases CO<sub>2</sub> emissions in the long run. However, short-run estimates that the education and unemployment coefficients provide similar results.

According to Meyer, 2016 environmental quality is a public good that has the potential to be influenced by everyone. As a good, environmental quality can become a monetary asset so that it can also affect income, so that not everyone can be involved in this demand, thus unemployment occurs. So unemployment can affect environmental quality. On the other hand, environmental quality can be a means to work and generate income so that a poor quality environment can reduce interest and hope in working, thus worsening unemployment. Improved environmental quality can also be created due to increased awareness and rational thinking about the importance of preserving the environment.

Apart from triggering environmental degradation, industrial development is also expected to have a positive impact in the form of creating and increasing employment opportunities, thereby reducing unemployment. According to the Central Statistics Agency, 2020, the number of labor force in February 2021 was 139.81 million people, increasing to 144.01 in the same month in 2022 or an increase of 3.31% from the previous year, while the labor force participation rate increased by 0.98 %. Meanwhile, the working population in the same period was 135.61 million people, an increase of 4.55 million people from February 2021. Employment that experienced the largest percentage increase was the Agriculture, Forestry and Fisheries Sector (0.37 percentage points). Meanwhile, employment that experienced the largest decline was the Other Services Sector (0.51 percentage points). 1. The percentage of underemployed people fell by 0.85 percentage points, while the percentage of part-time workers fell by 0.15 percentage points compared to February 2021. The number of commuter workers in February 2022 was 7.07 million people, the number of commuter workers has continued to decline in three years final. The Open Unemployment Rate (TPT) for February 2022 was 5.83 percent, down 0.43 percentage points compared to February 2021

The wages received are only to fulfill daily life. The theory that explains this situation is called the iron wage theory. Furthermore, John Stuart Mill, as has been stated, states that the level of wages is determined by the availability of the amount of capital used in paying wages. The same thing also happens, if the company experiences a decrease in profits. This is explained by the wage fund theory. Apart from that, the ethical wage theory is also known, where the Utopians state that the wages received by workers must be able to bring workers to experience a decent life. The decrease in production targets resulted in a reduction in the required workforce. The decrease in the number of workers due to a decrease in the scale of production is called the scale effect. The decrease in the use of the amount of labor needed due to the replacement or addition of the use of machines is called the substitution effect (capital intensive).

According to Keynes, voluntary unemployment, 1). Intentional unemployment is unemployment that occurs because a job is offered but the unemployed person does not want to accept the job at the prevailing wage 2). Involuntary Unemployment, namely unemployment that occurs when someone is willing to accept work at the prevailing wages but the job is not available. According to (Dhanani 2004) there are 8 paradoxes in the unemployment phenomenon in Indonesia. These eight paradoxes show the characteristics of unemployment in Indonesia: 1. Unemployment in urban areas is three times greater than unemployment in rural areas. The logic used by job seekers should be that because there are more unemployed people in urban areas, there are fewer job opportunities in cities than in villages. This point is reinforced by research from Byrne and Strobl (2004) which suggests that in urban areas work is considered more meaningful than in rural areas. 2. The unemployment among young people is greater than among adults. This fact is supported (Axelrad, 2018) which states that workers aged 30–44 were significantly more likely than those aged 45–59 to find a job a year after being unemployed, 3. The unemployment among women is greater than men, even

though companies and all sectors Modern industries recruit more female workers. This fact is supported by (Don, 2014) which states that women's job search efforts are handicapped by lack of access to social networks, social stereotyping and wage discrimination in the post-restructuring labor market, 4. Unemployment among educated workers is greater than uneducated workers. One of the reasons for higher unemployment among the educated is that the educated are not willing to join in low-grade informal jobs, but at the same time, sufficient regular salaried jobs are also not available for them. Another reason is that in job searches, the higher the level of education, the longer it takes to get a job (Andolfatto, 2006; Setyadi, 2015), 5. At the high school graduate level, the open unemployment rate is higher than at junior high school. However, in employment there is no significant difference in wages between high school and middle school graduate workers, 6. Indonesia's economic growth since the mid-1970s has reached 7-8 percent per year, however the open unemployment rate has always reached 2-6 percent per year. This fact is in accordance with research (Rafika, 2023) which conducted research on unemployment in 1980-2010, even though the periods were different, stating that economic growth had a positive relationship with unemployment. Meanwhile (Aulia, 2020) found that the effect of economic growth on unemployment was not significant in the 2001-2017 period. So these findings contradict Okn's theory, 7. The open unemployment rate is almost the same at all levels of income, job seekers from poor families cannot afford to be openly unemployed, meaning they have to work at any wage level. Ramadhani, 2019 stated that poor people do not have the privilege of not working, they inevitably have to work to earn income. But the income from the work they do is of low value, so it is unable to meet their needs, especially basic needs, and 8. The open unemployment rate in several provinces such as South Sumatra, Aceh, East Kalimantan, East Nusa Tenggara, Maluku and Papua are three times larger than neighboring provinces such as Lampung, West Nusa Tenggara and Central Kalimantan without any definite explanation. One of the reasons is that the first mentioned region has relatively higher growth than the second mentioned region. Some researches founded that economic growth has a positive relationship with the unemployment rate In Indonesia (Rafika, 2023; Aulia, 2020).

Meanwhile, according to Okun's Law (Mankiw, 2003), there is a close relationship between the unemployment rate and real GDP (Gross Domestic Product), where there is a negative relationship between the unemployment rate and real GDP. To determine the impact of direct investment on labor demand, the labor coefficient and output multiplier are used to determine the labor demand multiplier. A.W. Phillips managed to find a close relationship between the unemployment rate and the rate of change in nominal wages. This discovery was obtained from the results of processing empirical data on the British economy for the period 1861-1957. The curve that describes the relationship between the inflation rate and the unemployment rate is called the Phillips curve.

Wages and the unemployment rate have a positive relationship. The size of the wages offered will influence people's interest and desire to enter the job market. If wages rise, then someone will tend to enter the job market (Mankiw, 2011). The size of wages will affect the unemployment rate. Wage rigidity is one of the causes of unemployment. Wage rigidity is the failure of wages to adjust until the supply of labor equals demand (Mankiw, 2000). Meanwhile, according to Okun's Law (Mankiw, 2003), there is a close relationship between the unemployment rate and real GDP (Gross Domestic Product), where there is a negative relationship between the unemployment rate and real GDP. But long before that, A.W. Phillips managed to find a close relationship between the unemployment rate and the rate of change in nominal wages. This discovery was obtained from the results of processing empirical data on the British economy for the period 1861-1957. The curve that describes the relationship between the inflation rate and the unemployment rate is called the Phillips curve, which connects the percentage change in the nominal wage rate with the unemployment rate as described above, usually called the Phillips curve in its original form. Apart from that, there is also a new version of the Phillips curve, usually called the revised Phillips curve, which is used to measure the level of inflation. From the Phillips curve it can be concluded that the higher the unemployment rate, the faster the increase in wages and prices; and the higher inflation expectations, the

faster wage levels will rise. So, in macroeconomic theory, there is a classic debate on the issue of inflation and unemployment which is widely known as the Phillips Curve (which has not actually been proven to be wrong or true in general in all economies/countries). The curve illustrates the negative relationship between the inflation rate and unemployment: High inflation rate, low unemployment (and high output). However, the opposite can also happen, namely an increase in prices in general, which, seen from the inflation rate, will reduce output (national production) and automatically increase unemployment.

The relationship between inflation, output and unemployment (three things that are very central in macroeconomic policy) is largely determined by the aggregate supply and demand for goods and services. If aggregate demand increases, demand for labor will increase (which will automatically reduce unemployment) and national production will also increase (which will automatically increase economic growth). However, on the contrary, an increase in aggregate demand will increase prices (Branson, 1992). This is what is called the negative relationship between inflation and unemployment. In the 50s and 60s, this negative relationship was widely found in developed countries such as England and America.

Industrial development causes an increase or growth in output which causes demand for labor to increase which in turn has a positive impact on increasing employment opportunities or reducing Okun’s law unemployment (Mankiw, 2003 and Satrio, 1010). However, this could happen otherwise because of the pandemic which causes a decrease in economic activity, so that unemployment increases (Handanagic, 2022). Industrial development can also worsen environmental quality because industrial management does not comply with existing regulations, such as regulations set by the government.

Apart from industrial development, there are several socio-economic factors that have a positive impact that can reduce abortion and environmental damage. Among them are education and training which produces skilled workers created from educational and training institutions. Furthermore, improving the quality of human resources through education and training will result in human resources having broad insight, in-depth knowledge and high awareness of the importance of protecting and maintaining the environment (Dhara, 2022). Education and training produce skilled people or workers so they can enter a wider labor market which in turn will narrow the area of unemployment. The increase in wages spearheaded by the government means that industry will inevitably pay higher wages. This will encourage the workforce to improve performance which in turn will have an impact in the form of increasing industrial productivity. Increasing productivity will lead to an increase in business scale which in turn will reduce unemployment.

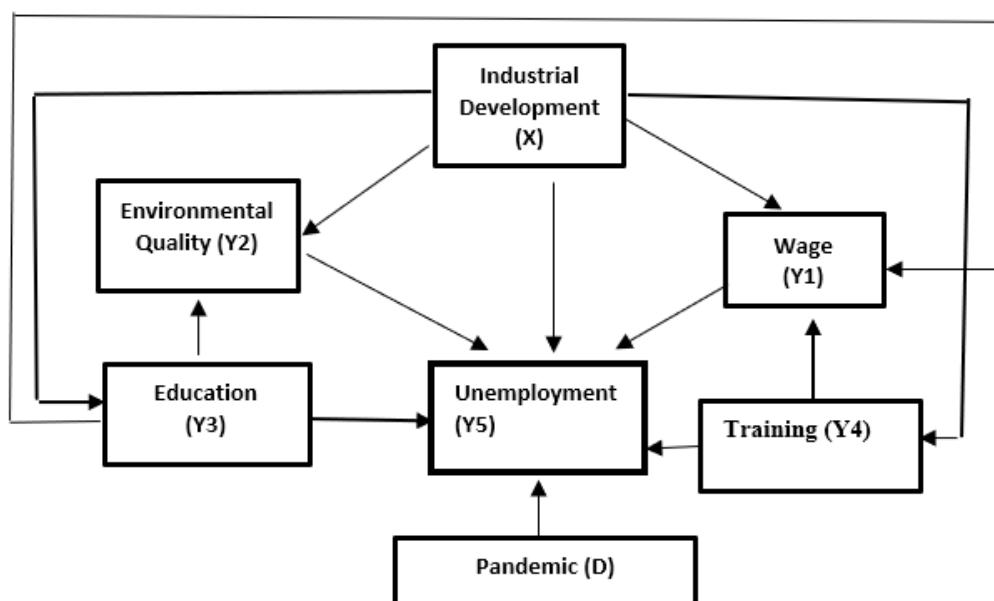


Figure 1. Framework

Before formulating hypothesis, several apriori expectations are put forward that limit the scope of the hypothesis: 1. Industrial development encourages economic growth, if industry is capital incentive, 2. Industrial development can have a negative influence on abortion if the industry is labor intensive 3. Wages have a negative influence on unemployment if the industry is labor intensive, 4. Covid-19 causes a decline in economic activity in regions.

Based on the theoretical description and previously existing facts as well as the apriori that have been made, hypotheses can be formulated as:

1. Industrial development has a positive influence on wages but has a negative influence on environmental quality and unemployment
2. Industrial development has a positive influence on education and training
3. Education has a positive influence on environmental quality and wage levels but has a negative influence on unemployment
4. Training has a positive influence on wages but has a negative influence on unemployment
5. Wages have a negative influence on unemployment
6. The influence of industrial development on unemployment before the pandemic was smaller than during the pandemic

## THE METHOD

The data analysis method used in this study is path analysis. Path analysis is the statistical technique based upon a linear equation system used to examine causal relationships between two or more variables (Murti, 2016). Furthermore, path analysis is close to multiple regression. In other words, multiple regression is a special form of path analysis. This technique is also known as causal modeling, allows users to test theoretical propositions regarding causal relationships without manipulating variables (Sarwono, 2007; Streiner, David L. 2001). Furthermore, the path analysis in this study was developed using path analysis with dummy variable and interaction between the two period of Covid-19.

The equations used to determine the effect of industrial development on unemployment which is mediated by wages, education, training and environmental quality both before the pandemic and during the pandemic, which the study uses panel data analysis as a data processing tool using the Amos 18 program. The relationship between variables in this study is based on the framework, Figure 1, expressed in a mathematical functional relationship as

$$Y_1 = f(X, Y_2, Y_4)$$

$$Y_2 = f(X, Y_3)$$

$$Y_3 = f(X)$$

$$Y_4 = f(X)$$

$$Y_5 = f(X, Y_1, Y_2, Y_3, Y_4, D, DX)$$

Whereas:

X = Industrial development (added value of the manufacturing industry sector)

$Y_1$  = Wage (minimum wage of provinces)

$Y_2$  = Environmental quality (score of indices of improvement quality)

$Y_3$  = Education (the average length of schooling of the population aged 15 years and over)

$Y_4$  = Training (number of training institutions, including the government and the private sector)

$Y_5$  = Unemployment (open unemployment rate)

D = Dummy variable, D = 0, the time before Pandemic or COVID-19, and D=1 the time of Pandemic).

The structural equation can be rewritten:

$$Y_1 = f(X, Y_3, Y_4)$$

$$Y_2 = f(X, Y_3)$$

$$Y_3 = f(X)$$

$$Y_4 = f(X)$$

$$Y_5 = f(X, Y_1, Y_2, Y_3, Y_4, D, DX)$$

$$\ln Y_1 = \alpha_0 + \alpha_1 \ln X + \alpha_2 \ln Y_3 + \alpha_3 \ln Y_4 + \mu_1 \dots\dots\dots(3.1)$$

$$\ln Y_2 = \beta_0 + \beta_1 \ln X + \beta_2 \ln Y_3 + \mu_2 \dots\dots\dots(3.2)$$

$$\ln Y_3 = \delta_0 + \delta_1 \ln X + \mu_3 \dots\dots\dots(3.3)$$

$$\ln Y_4 = \phi_0 + \phi_1 \ln X + \mu_4 \dots\dots\dots(3.4)$$

$$Y_5 = \varphi_0 + \varphi_1 \ln X + \varphi_2 \ln Y_1 + \varphi_3 \ln Y_2 + \varphi_4 \ln Y_3 + \varphi_5 \ln Y_4 + \varphi_6 D + \varphi_7 D \ln X + \mu_5 \dots\dots\dots(3.5)$$

Substituting the value of dummy variable

D=0 in the equation (3.5), unemployment before the pandemic can explained

$$Y_{51} = \varphi_0 + \varphi_1 \ln X + \varphi_2 \ln Y_1 + \varphi_3 \ln Y_2 + \varphi_4 \ln Y_3 + \varphi_5 \ln Y_4 + \mu_5 \dots\dots\dots(3.6)$$

and D=1 in the same equation, the equation unemployment during the pandemic

$$Y_{52} = (\varphi_0 + \varphi_6) + (\varphi_1 + \varphi_7) \ln X + \varphi_2 \ln Y_1 + \varphi_3 \ln Y_2 + \varphi_4 \ln Y_3 + \varphi_5 \ln Y_4 + \mu_5 \dots\dots\dots(3.7)$$

## RESULTS AND DISCUSSIONS

### Model fit test

Chi-square statistic, as stated earlier, is the most fundamental test to measure overall fit, it is very sensitive to the size of the sample used. The model is considered good if the Chi-square value is small. The smaller the value, the more feasible the research, meaning that the more it describes the match between the variance of the sample taken and the research population. The results of data processing that have been carried out using the AMOS 18 program are as shown in Table 1.



Table 1. Goodness of Fit Index

No.	Goodness of fit Measure	Cut-off Criteria	Estimation (cut off Value)	Fit Situation
1	Chi-Square ( $\chi^2$ ) Significance Probability (p)	smaller the better 0.05	13.981 0.03	Marginal
2	RMSEA (the Root Mean Square Error of Approximation)	$\leq 0.05$	0.041	Fit
3	NFI (Normed of Fit Index)	0.95	0.969	Fit
4	IFI (Incremental Fit Indices)	0.95	0.992	Fit
5	CMIN/DF (the minimum Sample Discrepancy Function)	$\leq 2.00$	2.335	Marginal
6	TLI (Tuckler Lewis Index)	0,95	0.956	Fit
7	CFI (Comparative Fit Index)	0,95	0.950	Fit
8	Hoelter's Index	200	319	Fit

Sumber: Malkanthie, 2015; Wan, 2002. and Amos Result

Furthermore, the analysis results show:

Before the pandemic: Group I

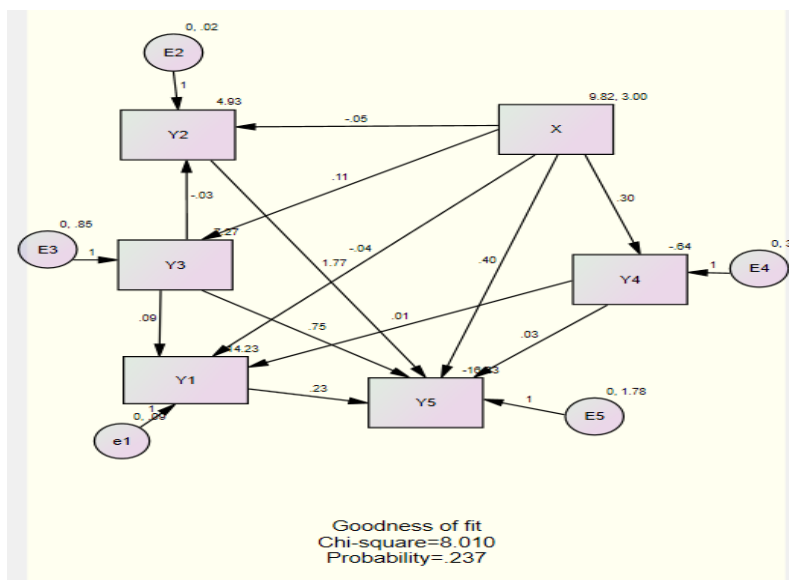


Figure 2. Variable Coefficients before the Pandemic

The estimation results shown in Figure 2 can be written as a regression equation in the pre-pandemic period:

$$\ln \hat{Y}_{11} = 14.228 - 0.038 \ln X + 0.086 \ln Y_3 + 0.007 \ln Y_4 \dots\dots\dots(3.1)$$

$$\ln \hat{Y}_{12} = 4.928 - 0.045 \ln X - 0.031 \ln Y_3 \dots\dots\dots(3.2)$$

$$\ln \hat{Y}_{13} = 7.265 + 0.115 \ln X \dots\dots\dots(3.3)$$

$$\ln \hat{Y}_{14} = -0.637 + 0.299 \ln X \dots\dots\dots(3.4)$$

$$Y_{15} = -16.232 + 0.402 \ln X + 0.228 \ln Y_1 + 1.774 \ln Y_2 + 0.747 \ln Y_3 + 0.025 \ln Y_4 \dots\dots\dots(3.5)$$

$$\ln \hat{Y}_{21} = 14.237 - 0.021 \ln X + 0.087 \ln Y_3 - 0.019 \ln Y_4 \dots\dots\dots(3.6)$$

$$\ln \hat{Y}_{22} = 4.796 - 0.045 \ln X - 0.009 \ln Y_3 \dots\dots\dots(3.7)$$

$$\ln \hat{Y}_{23} = 8.136 + 0.103 \ln X \dots\dots\dots(3.8)$$

$$\ln \hat{Y}_{24} = -1.636 + 0.372 \ln X \dots\dots\dots(3.9)$$

$$Y_{25} = -9.422 + 0.415 \ln X + 0.710 \ln Y_1 - 1.793 \ln Y_2 + 0.854 \ln Y_3 + 0.096 \ln Y_4 \dots\dots\dots(3.10)$$

Pandemic period, Group 2

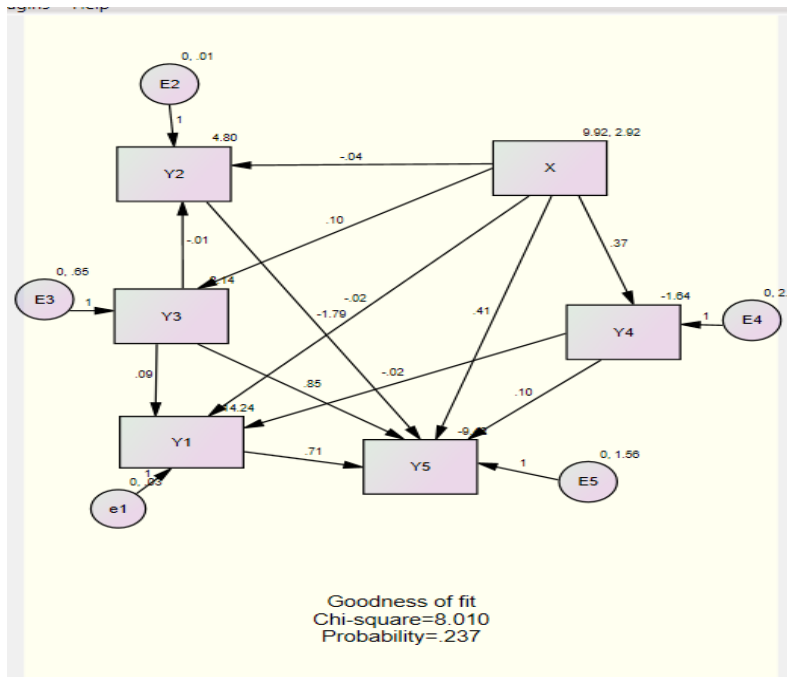


Figure 3. Variable Coefficient in The Pandemic Period

Meanwhile, from Figure 3, it is obtained

$$Y_{51} = 4.80 + 0.41 \ln X + 0.71 \ln Y_1 - 1.79 \ln Y_2 + 0.85 \ln Y_3 + 0.10 \ln Y_4 + \mu_{52}$$

**Research Findings**

The results of the analysis show the influence of one variable on another variable according to the research objectives, both before and during the pandemic, which can be summarized as shown in Table 2.

Table 2. Coefficients of the variables before and during the pandemic

No	The Relation of the variables		Before the Pandemic		During The Pandemic	
	Independent variables	Dependent variables	Coefficient	Prob.	Coefficient	Prob.
1	Industrial Development (X)	1. Quality of environment	-0,045	0,000	-0,045	0,000
		2. Wage	-0,038	0,036	-0,021	0,079
		3. Education	0,115	0,030	0,103	0,028
		4. Training	0,299	0,005	0,372	0,000
		5. Unemployment	0,402	0,000	0,415	0,000
2	Quality of environment	unemployment	1,774	0,073	-1,793	0,080
2	Wage	Unemployment	0,228	0,666	0,710	0,286
3	Education	1. Quality of Environment	-0,031	0,032	-0,009	0,530
		2. Wage	0,086	0,008	0,087	0,000
		3. Unemployment	0,747	0,000	0,854	0,000
4	Training	1. Wage	0,007	0,666	-0,019	0,079
		2. Unemployment	0,025	0,723	0,096	0,194

Industrial and educational developments had a positive and significant influence on unemployment both before and during the pandemic. If industrial development increases by 1% then unemployment increases by 0.40% before pandemic and 0.42% in pandemic time. This fact shows that the influence of industrial development on unemployment before the pandemic was smaller than during the pandemic. Meanwhile, if education increases by 1% then unemployment will increase by 0.76% in the pre-pandemic period and 0.92% during the pandemic. Industrial development has a positive influence on unemployment related to the condition of Indonesian industry which is capital intensive so that the workforce is not in line with development expectations and desires, as it is known that capital intensive industry is industry built with large capital which tends to emphasize the use of machines rather than human power, this is in accordance with research conducted by Anakpo and Kollamparambil, 2021 which states that automation has a significant positive relationship with unemployment rate

Furthermore, education has a positive influence on unemployment. This fact is in accordance with research conducted by Ahmad Hasibuan, et al. 2001 which states that education has a positive effect on unemployment. In more detail, Hjazeen et. al, 2021 which stated that there was a positive relationship among the education, female population, and urban population and unemployment in Jordan. This fact shows that many college graduates do not have the work skills needed to participate in the world of work. Apart from that, many jobs in Indonesia are still controlled by foreigners, which can also reduce the opportunities for highly educated Indonesians. Apart from layoffs, it cannot be ignored as one of the causes of unemployment in Indonesia, including highly educated employees. One reason is that most foreign

companies entering Indonesia are capital and technology intensive, and require labor so they are unable to absorb more university workers (Kinasih and Nihayah, 2022). Thus, the higher the education, the more unemployment there is, due to capital and technology intensive industries.

Industrial development before the pandemic had a significant negative influence on wages, but during the pandemic it did not have a significant influence at the  $\alpha = 0.05$  confidence level. The coefficient has a negative sign, which means that increasing industrial development reduces wage levels. This fact shows that industrial development actually requires low wages because with low wages manufacturing industrial companies can reinvest and have greater opportunities to pay wages. Furthermore, wages also do not have a real influence on unemployment in Indonesia, both before and during this pandemic, according to research conducted by Leasiwal Cs, (2022). Every 1% increase in industrial development will cause a decrease of 0.04% before the pandemic and 0.02%, where during the pandemic the influence is not significant. So it is clear to see the influence of the pandemic on the relationship between industrial development and wages by comparing the two coefficients.

Industrial development has a negative influence on environmental quality. This finding is in accordance with Purti's research results, 2019, which stated that if there was an increase in the GRDP growth rate in the Industrial Sector, it would cause a decrease in the Environmental Quality Index in East Java Province. Research results show that every 1% increase in the processing industry will reduce environmental quality (score) by 0.05% in the pre-pandemic period and during the pandemic it decreases by 0.045%. This fact shows that there is a decreasing trend in environmental scores, which is caused by a decrease in company activity, reduced activity in the production process in general, as is generally known, marked by a decrease in national output, including manufacturing industry output. Hoque, 2018. Results of this study indicate that polluting industries' (e.g., tannery, pulp & paper, fertilizer, textile, and cement) unsustainable practices have enormous impact on human health and the natural environment, resulting in enormous socio-ecological problems that ultimately create huge social costs in countries.

The development of the industry has had a positive influence on education, both before the pandemic and during the pandemic. Every 1% increase in education (average years of schooling) will result in education increasing by 0.12% compared to the pre-pandemic period and 0.10%. The fact can be explained by the pandemic, the tendency for students to go to school or gain knowledge or study has decreased. This is not extraordinary because during the pandemic the transfer of knowledge from teachers to students was reduced compared to offline because there was indirect face-to-face contact between teachers and students. Industrial development, which is driven by capital input and domestic labor, is also strengthened by FDI, resulting in industry experiencing development that requires a workforce full of skills, resulting in industry tending to become Human capital deepening, which is immediately responded to by the world of education.

Education had a negative influence on environmental quality in the pre-pandemic period at a confidence level of  $\alpha = 0.05$ . Every 1% increase in education will result in a decrease in environmental quality of 0.03%. Meanwhile, during the pandemic, education has no effect on environmental quality. So even though education has a negative influence, there is little change or improvement during the pandemic, where in the pre-pandemic period, prob. = 0.032 or significant at the confidence level  $\alpha = 0.05$ , while during the pandemic it rose to prob. = 0.530. So it no longer has a negative effect at that level. This means that the negative influence of education on environmental quality is due to the average decline in environmental quality before the pandemic every year. Meanwhile, during the pandemic, the environment actually improved as explained in the sub-background (Ministry of the Environment, 2022)

The influence of industrial development on environmental quality shows that there is a negative influence both before and during the pandemic. If the development of the manufacturing industry increases by 1%, environmental quality will decrease by 0.05% before and also during the pandemic, but the strength of the influence is different, namely; stronger during the pandemic (you can see the value, CR= -5.71 or the

probability value in Table 2. compared to before the pandemic with  $CR = -6.17$ . This fact shows that industrial development in Indonesia is increasingly worsening the living environment.

Training did not show a real effect on unemployment, both before and during the pandemic. This training should have a positive influence on unemployment, because with training new skills will be obtained, or additions to existing skills. However, there was an increase in the influence from negative to positive during the pandemic, although both were not significant.

The research results show that environmental quality did not have a significant influence on unemployment both before and during the pandemic at the confidence level  $\alpha = 0.05$ . The facts contradict the findings of Kondohn, 2011 which stated that environmental pollution followed by an increase in taxes and also a decrease in urban minimum wage levels would reduce unemployment. The living environment that individuals or groups live in does not have an impact on unemployment even though the living environment in Indonesia is of high quality. This is related to the increasing number of environmental quality figures during the research period, while unemployment fluctuated or tended to decrease during the pandemic (starting to decline in February 2021) as previously explained.

The effect of education on wages is positive and significant at  $\alpha = 0.05$  with a directional coefficient of 0.086 in the period before the pandemic. Meanwhile, during the pandemic, the direction coefficient was 0.087. So, both during the pandemic and before the pandemic, education always has a positive influence on wages. The results show also the most two factors that significantly affect the Saudi salaries for both males and females are educational qualifications and the sector either public or private (Alsulami, 2018). This coefficient means that for every one year increase in length of study for the Indonesian population there will be an increase in wages of 0.08%, both before and during the pandemic. So the pandemic that hit Indonesia did not change or reduce the magnitude of the influence of education on wages. During the pandemic, even though layoffs occurred, companies did not cut salaries or wages and were still able or forced to pay the provincial minimum wage. As is known, every regional government in Indonesia requires companies to pay a minimum wage and every year the nominal amount is determined.

As is known, training provides greater job opportunities for job seekers or employees, because it increases skills that can be used to get work opportunities and greater income after having higher skills. In this research, it was found that training had a significant positive influence at the confidence level  $\alpha = 0.05$ , in the pre-pandemic period, but during the pandemic the influence of training had a negative impact on wages. This suggests that there is a negative influence from the pandemic in the form of reduced activity or additional institutions during the pandemic. The coefficient of training on wages is 0.051, which means that if training increases by 1% then wages will increase by 0.05% assuming the variables included in the model are constant.

The study results showed that wages have no influence on unemployment in Indonesia, both before and during the pandemic. One reason is that the size of the wage variable in this study is the provincial minimum wage, which does not cover wages as a whole. This contradicts research conducted by (Kinasih, 2022) which states that wages have a negative influence on educated unemployment on the island of Java, Indonesia.

## CONCLUSION AND RECOMMENDATION

Based on the analysis and the results of the previous discussion, the following conclusions are drawn:

1. The result of analysis show that the industrial development has had a significant negative influence on environmental quality both before and during the pandemic.
2. The unemployment rate in Indonesia is positively influenced by education and also the development

of the industry both before and during the pandemic.

3. Environmental quality had a positive influence before the pandemic and during the pandemic it had a negative influence on abortion, but both were not significant.
4. Wages and training have no influence on unemployment in both periods.
5. The development of the manufacturing industry in Indonesia is increasingly deteriorating the quality of the environment, as shown by very significant negative impacts
6. The influence of education on wages is positive both before and during the pandemic.
7. The effect of education on wages is positive both before and during the pandemic
8. Education had a negative effect on environmental quality before the pandemic but had no effect during the pandemic
9. Training has no influence on wages either before or during the pandemic
10. The influence of industrial development in pandemic time was bigger than before in pandemic time.

## RECOMMENDATION

The suggestions to be put forward based on the discussion and conclusions that have been stated, among others:

1. The government continues to monitor waste disposal and tighten licensing, especially for large industries because it turns out that industrial development has a negative impact on the environment
2. The unemployment rate in Indonesia varies, so it is hoped that all provinces, will pay more attention to unemployment by intensifying programs that are productive, not consumptive.
3. It is hoped that there will be cooperation between the government and the private sector or all stakeholders, in the coming year training can contribute to preventing abortions, through cooperation between the government and all stakeholders
4. It is hoped that there will be more training to improve skills and abilities through increasing the capacity and frequency of training in all regions or provinces in Indonesia
5. Success in improving the quality of the environment from year to year should be maintained and maintained for future environmental improvement and comfort.

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