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SIMULTANEOUS ANALYSIS OF ECONOMIC GROWTH AND UNEMPLOYMENT IN INDONESIA

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Abstract

The research aims is simultaneously analyze economic growth and unemployment. The research object is Indonesia using time series data. The variables being examined in this research are economic growth and unemployment. The exogenous variables are the exchange rate, net export, inflation, foreign direct investment, and population. This research has shown that: 1) inflation and exchange rates have a significant influence on economic growth. A depreciation of the native currency versus foreign currencies will lead to a contraction in economic growth, whereas higher inflation rates in a nation would result in a decline in economic growth. 2) Both population and direct investment influence unemployment. Increased foreign direct investment has the potential to decrease unemployment rates, whereas a greater population might lead to an increase in unemployment. This research examines economic growth and unemployment simultaneously from an economic law perspective.

Keywords: *economic growth; unemployment; exchange rate; export; inflation; foreign direct investment; population*

INTRODUCTION

Economic growth and unemployment are crucial metrics for evaluating an economy's success (Ngubane et al., 2023; Niken et al., 2023), particularly when analyzing the outcomes of a country's economic development efforts. According to (Tawiah et al., 2023), the economy is considered to be growing when there is an increase in the output of products and services compared to the previous year. Economic growth measures the capacity of economic activity to produce greater money or enhance societal well-being within a certain time frame (Alsamara et al., 2024). the sustained increase in economic growth of a nation or area indicates that its economy is progressing favorably (Goh et al., 2023; Fabrice et al., 2024; Ngubane et al., 2023).

Indonesia, as a developing country, faces challenges in managing the escalation of unemployment. This phenomenon occurs due to a high growth rate of the labor force that is not matched by the rise of work possibilities. Consequently, the increasing number of jobless individuals poses a significant challenge for this country.

The relationship between economic growth and unemployment remains a compelling subject of study, as evidenced by recent research conducted by (Ngubane et al., 2023; Niken et al., 2023; Tawiah et al., 2023; Goh et al., 2023; Alsamara et al., 2024; Fabrice et al., 2024). This is because certain countries or regions experience both high economic growth and high unemployment rates, as highlighted by (Porras-Arena & Martín-Román, 2023). The occurrence of this event catalyzed the development of Okun's Law, a concept extensively studied by Arthur Melvin Okun himself. Okun's

Law demonstrates an inverse relationship between unemployment and economic growth (Astari et al., 2019; Elhorst & Emili, 2022). As economic growth increases, the unemployment rate decreases (Porras-Arena & Martín-Román, 2023).

This research aims to investigate the correlation between economic growth and unemployment, providing empirical evidence for Okun's rule. Economic growth and unemployment are macroeconomic variables that are subject to the impact of several causes. the exchange rate (Ramos-Herrera, 2023; Hordofa, 2023; Hítalo et al., 2023), net exports (Raiher et al., 2017; Al-abdulkader et al., 2018; Filimonova et al., 2020; Zaman et al., 2021; Murshed, 2022; David et al., 2024), inflation (Mohseni & Jouzaryan, 2016; Asafo-adjei et al., 2023; Niken et al., 2023) will have an impact on economic growth. Unemployment is affected by several variables, one of which is inflation. Inflationary pressures may lead to a decrease in economic growth and a rise in unemployment (Lahcen et al., 2022; Niken et al., 2023). Foreign direct investment (FDI) and population have an impact on unemployment (Schmerer, 2014; Sadikova et al., 2017; Holmes et al., 2022; Jo et al., 2023).

The aim of this research is: 1) the effect of unemployment, exchange rates, net exports, and inflation on economic growth, and 2) the effect of economic growth, inflation, foreign direct investment, and population on unemployment.

METHODS

The first analysis method is carried out using bibliometric analysis involves utilizing data on the quantity and authors of scientific publications and articles, as well as the citations within them. Its purpose is to quantify the productivity of individuals, research teams, institutions, and countries. Additionally, it aims to identify both national and international networks and provide a visual representation of the advancement of new scientific and technological fields (multidisciplinary).

The Vosviewer program offers three graphical displays for bibliometric analysis: network visualization, overlay visualization, and density visualization (Patra et al., 2023; Deste et al., 2024). the purpose of the network is to illustrate the connections between depicted words. If the trajectory or network in bibliometric analysis is pronounced, it indicates a substantial and robust association between one term (term) and another term (term). Conversely, if the link between words is represented by a tiny circle, it indicates a poor connection between the observed terms (Abdelwahab et al., 2023).

For this research, bibliometric analysis was carried out using specific keywords, namely economic growth and unemployment. The network visualization result is seen in Figure 1.

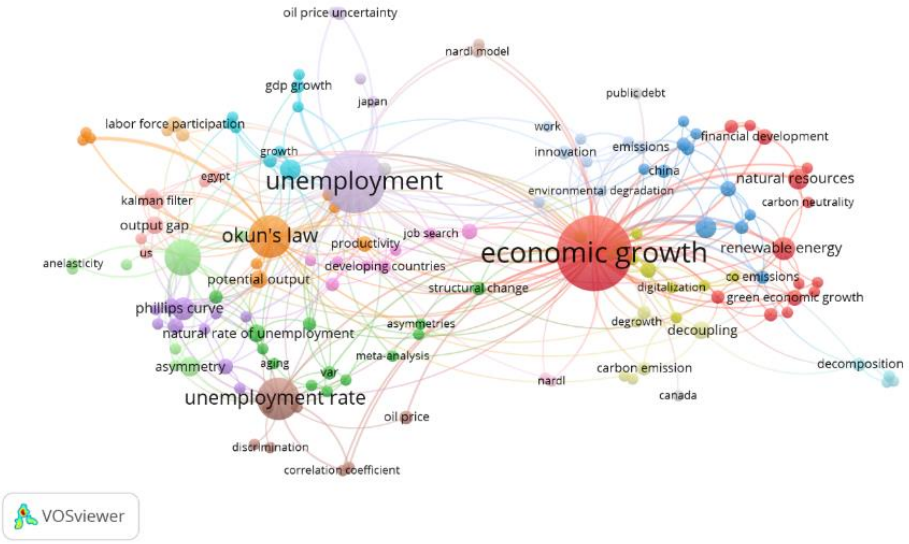

Figure 1. Network Visualization

The Network Visualization output reveals extensive studies conducted on the topics of economic growth and unemployment. Nevertheless, despite the many performed studies, there is a scarcity of research examining the execution of Okun's rule as empirical evidence for the correlation between these factors. Hence, there is enough opportunity for scholars to investigate the correlation between economic expansion and joblessness via the lens of Okun's Law.

The output overlay visualization is shown in Figure 2. The purpose of an overlay is to present the historical evidence of research activities (Deste et al., 2024). A darker visualization in bibliometric analysis indicates that the research has been conducted for a longer period. Conversely, lighter colors in the visualization suggest that the research is more recent.

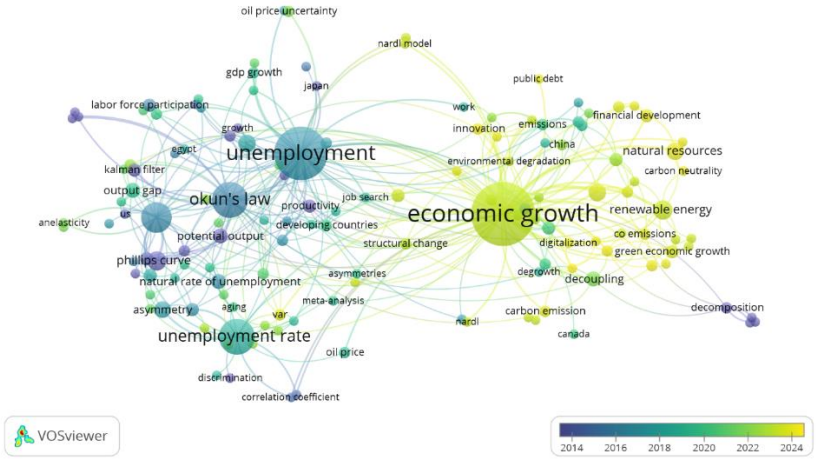

Figure 2. Output Overlay Visualization

The Network Overlay result reveals that recent research on economic growth and unemployment in 2024 focuses on many factors such as digitization, carbon emissions, environmental metal deterioration, and the green economy. The number of studies examining the effect of foreign investment on unemployment is still limited, so further research is still needed to examine the effect of foreign investment on unemployment

Figure 3 is focused on density, which is used to represent the concentration or highlight the study group. This bibliometric analysis visualization may be used to identify the areas of study that are either underexplored or extensively studied. The intensity of the red hue indicates the amount of study conducted on the issue under analysis. A deeper shade of red signifies a scarcity of literature on the research subject (Sarker & Bartok, 2024). For researchers, this is undeniably beneficial while doing the study.

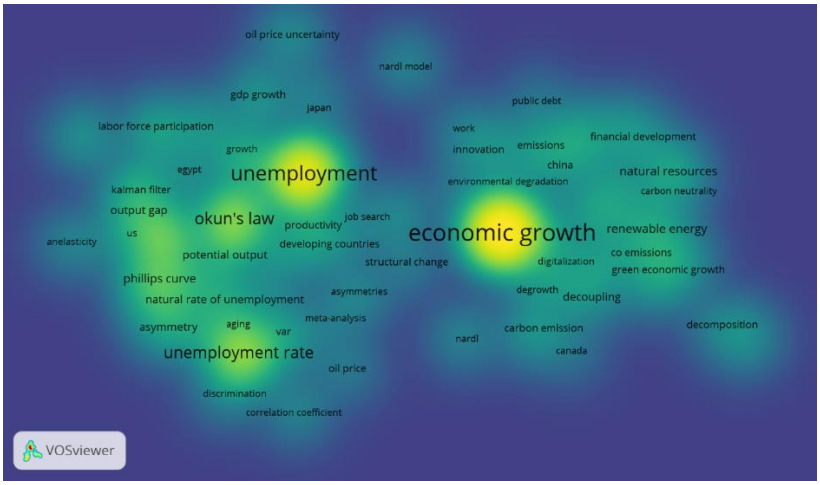

Figure 3. Density Visualization

The output density visualization reveals that the variables of economic growth and unemployment are shown in yellow, rather than red. There is currently little research on the link between economic growth and unemployment using Okun's law. This presents an opportunity for the author to perform a study that explores this relationship.

The research is specifically focused on Indonesia as the subject of study. The data type consists of time series data spanning from 1980 to 2022. the reason the researcher took data from 1980 to 2022 was so that he could see the pattern of change in each variable so that the information was more complete in analyzing each variable. The factors being studied in this study are economic growth (growth) and unemployment (unemployment). The exogenous variables in this context are the exchange rate (Kurs), net exports (Expn), inflation (Inf), FDI (Foreign Direct Investment), and population (Pop). Economic growth refers to the annual percentage increase in Indonesia's gross domestic product (GDP), a measure of the country's overall economic performance. Unemployment refers to the yearly rate of unemployment in Indonesia, expressed as a percentage. The exchange rate refers to the value of the Indonesian rupiah to the United States dollar. Net export refers to the disparity between the value of exports and imports in Indonesia's international trade balance, quantified in billions of United States dollars. Inflation in Indonesia refers to the gradual and ongoing increase in prices, calculated as a percentage. Foreign direct investment refers to the investment made by foreign entities in Indonesia over a significant period, often measured in billions of US dollars. The population refers to the total number of people in Indonesia, measured in millions.

The approach used to analyze data is simultaneous analysis. A simultaneous equation model is an equation model that consists of more than one dependent variable and more than one interrelated equation. Thus, the variables exchange rate, net exports, inflation, foreign direct investment, and population are allowed to be in the second research model. This research will conduct a simultaneous analysis of economic growth and unemployment in Indonesia, using the Okun Law as a framework. This research uses a simultaneous equation model, which is a mathematical model that represents a mutual interaction between variables. In this model, the variables may influence each other, creating a two-way cause-and-effect relationship (Lee & Mesters, 2024). The first challenge in doing simultaneous equation analysis is selecting the appropriate simultaneous equation models.

The reduced form analysis reveals that the exogenous variables in this economic development model are Inf (inflation), FDI (foreign direct investment), Pop (population), Exchange Rate (Rupiah exchange rate), and Expn (net export). The findings of the reduction form analysis reveal that the exogenous variables in this unemployment model include the exchange rate (Rupiah exchange rate), exp (net export), inflation (inflation), foreign direct investment (FDI), and population (population).

RESULTS

This section will provide a detailed explanation of each study variable, as shown in Table 1.

Table 1. Descriptive Variables

	GROWTH	UN	KURS	EXPN	INF	FDI	POP
Mean	4.952791	4.514884	7027.190	7.180000	8.872326	7.194419	215.6447
Median	5.310000	4.340000	8770.430	4.080000	6.760000	2.110000	217.1100
Maximum	9.880000	8.060000	14849.85	47.38000	58.45000	25.12000	275.5000
Minimum	-13.13000	2.140000	626.9900	-11.14000	1.560000	-4.550000	148.1800
Std. Dev.	3.466555	1.681859	4992.077	10.86498	8.672520	9.179814	38.59932
Skewness	-3.520381	0.552568	0.032233	1.307763	4.515027	0.800997	-0.094015
Kurtosis	18.69801	2.193699	1.493340	5.841387	26.19669	2.049928	1.795250
Jarque-Bera	530.3333	3.353007	4.074575	26.72174	1110.167	6.215325	2.663809
Probability	0.000000	0.187027	0.130382	0.000002	0.000000	0.044705	0.263974
Sum	212.9700	194.1400	302169.2	308.7400	381.5100	309.3600	9272.720
Sum Sq. Dev.	504.7143	118.8033	1.05E+09	4958.008	3158.930	3539.297	62576.10
Observations	43	43	43	43	43	43	43

The data analysis revealed that the average economic growth rate of Indonesia from 1980 to 2022 was 4.95%. The lowest growth rate of 13.13% was observed in 1998, while the maximum growth rate of 9.88% was recorded in 1980. This suggests that Indonesia had an economic shock resulting in negative economic growth, namely in 1998, coinciding with a financial crisis in the country. Moreover, in 2020, Indonesia saw a negative economic growth of 2.07%, showing a worldwide economic disruption caused by the COVID-19 epidemic affecting all nations.

The unemployment rate mentioned in this research is quantified in percentage units. The data analysis reveals that the average unemployment rate in Indonesia from 1980 to 2022 was 4.51%. The highest recorded rate was 8.06% and the lowest recorded rate was 2.14%. The standard deviation of the unemployment rate was 1.68%. The exchange rate discussed in this paper pertains to the valuation of the Indonesian rupiah to the United States dollar, quantified in terms of rupiah units. The mean exchange rate is Rp. 7,027.19, with the maximum value being Rp. 14,849.85. The minimum exchange rate is Rp. 626.99, while the variability is measured by the standard deviation of Rp. 4992.08.

Net exports in Indonesia's international trade balance are calculated as the disparity between exports and imports, quantified in billions of United States dollars. The maximum net export value was 47.38 billion US dollars, while the lowest value was -11.14 billion US dollars. This indicates that there was formerly a trade imbalance with a deficit of 11.14 billion US dollars.

Inflation in Indonesia refers to the gradual and ongoing rise in prices, measured in percentage units. In Indonesia, the average inflation rate is 8.87%. The greatest inflation rate recorded is 58.45%, while the lowest is 1.56%. The standard deviation of inflation is 8.67%. Foreign direct investment refers to the investment made by foreign entities in Indonesia over a significant period, quantified in billions of United States dollars. The mean value of foreign direct investment is 7.19 billion US dollars, with the maximum value being 25.12 billion US dollars and the minimum being -4.55 billion US dollars. The total population refers to the count of Indonesian individuals expressed in millions. Indonesia has an average population of 215 million, with a maximum of 275 million individuals and a minimum of 148 million individuals.

The stationary test is a crucial step in evaluating time series data to see whether there are any unit roots present among the variables, hence ensuring the validity of the connection between variables in the equation (Bian & Chen, 2024). the findings of the stationary test data from the investigation are shown in Table 2.

Table 2. Stationary Test Results

Group unit root test: Summary
Series: GROWTH, UN, KURS, EXPN, INF, FDI, POP
Date: 01/14/24 Time: 11:53
Sample: 1980 2022
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 4
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.09853	0.0179	7	290
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.50307	0.0062	7	290
ADF - Fisher Chi-square	40.9074	0.0002	7	290
PP - Fisher Chi-square	58.2928	0.0000	7	294

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

The stationary test conducted at the specified level yielded a probability value of 0.01 for Levin, Lin, and Chu. The probability value is less than the alpha level (0.01 < 0.05), suggesting that the data is stable at the given level. Table 3 is the result of data analysis of economic growth models.

Table 3. Results of Economic Growth Model Analysis

Dependent Variable: GROWTH
Method: Two-Stage Least Squares
Date: 01/13/24 Time: 20:08
Sample: 1980 2022
Included observations: 43
Instrument specification: INF FDI POP KURS EXPN
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.681443	1.458848	6.636360	0.0000
UN	-0.050240	0.423167	-0.118723	0.9061
KURS	-0.000276	9.87E-05	-2.797955	0.0080
EXPN	0.001587	0.037462	0.042360	0.9664
INF	-0.290010	0.043148	-6.721312	0.0000
R-squared	0.616281	Mean dependent var		4.952791
Adjusted R-squared	0.575889	S.D. dependent var		3.466555
S.E. of regression	2.257552	Sum squared resid		193.6686
F-statistic	15.42876	Durbin-Watson stat		1.336136
Prob(F-statistic)	0.000000	Second-Stage SSR		190.1811
J-statistic	0.799493	Instrument rank		6
Prob(J-statistic)	0.371245			

Source: Processed data, 2024

The data analysis of the economic growth model using the Two-Stage Least Squares (TSLS) approach results in the following equation:

Growth = 9,68 – 0,0502 Un - 0,0003 Kurs + 0,0016 Expn - 0,2900 Inf ..... (1)

Moreover, this study examines the impact of economic growth, inflation, direct investment, and population on unemployment. the unemployment data analysis findings are shown in Table 4.

Table 4. Results of Unemployment Model Analysis

Dependent Variable: UN
Method: Two-Stage Least Squares
Date: 01/13/24 Time: 20:11
Sample: 1980 2022
Included observations: 43
Instrument specification: KURS EXPN INF FDI POP
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.568257	4.894739	-1.750503	0.0881
GROWTH	0.177039	0.282412	0.626884	0.5345
INF	0.081426	0.089303	0.911801	0.3676
FDI	-0.168313	0.034768	-4.840992	0.0000
POP	0.058869	0.014163	4.156498	0.0002
R-squared	0.587677	Mean dependent var		4.514884
Adjusted R-squared	0.544274	S.D. dependent var		1.681859
S.E. of regression	1.135381	Sum squared resid		48.98538
F-statistic	12.38280	Durbin-Watson stat		0.664227
Prob(F-statistic)	0.000002	Second-Stage SSR		54.95316
J-statistic	0.011848	Instrument rank		6
Prob(J-statistic)	0.913321			

Source: Processed data, 2024

Data analysis using the Two-Stage Least Squares (TSLS) technique on the unemployment model, we can express the findings in the form of the following equation:

$$Un = -8{,}56 + 0{,}1777\ Growth + 0{,}0814\ Inf - 0{,}1683\ FDI + 0{,}0589\ Pop + e_2 \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

DISCUSSION

This research discovered that the variables of unemployment, exchange rates, exports, and inflation together have a substantial impact on the economic development of Indonesia. Additionally, it was seen that exchange rates and inflation partly contribute to the overall economic growth. This demonstrates that a depreciation of the local currency relative to foreign currencies may lead to a contraction in economic growth, while an increase in inflation inside a nation can also result in a decline in economic growth.

Unemployment in Indonesia is impacted by economic development, inflation, foreign direct investment, and population. However, foreign direct investment has a minor role in affecting unemployment. This demonstrates that more foreign direct investment in Indonesia has the potential to decrease unemployment, but a larger population may contribute to greater levels of unemployment in the country.

The link between unemployment and production has been a significant topic of study in economics since Okun (1962) first used estimating techniques to analyze the United States and determine the level of output that the economy might achieve while operating at full employment. Full employment is a crucial objective of economic policy. From a Keynesian economic standpoint, Okun believed it was important to determine the extent to which the actual economy was far from achieving full employment. This information would then assist in developing suitable fiscal and monetary policies to boost overall demand and, as a result, increase employment. Okun's study conducted a data analysis using quarterly US data from 1947:2 to 1960:4. The study revealed a significant and inverse correlation between unemployment and output in the US. The study concluded that for every percentage point of output growth exceeding the normal or potential growth, the US unemployment rate would decrease by approximately 0.3 percentage points. Understanding the accuracy and significance of Okun's rule is crucial for the formulation of economic policies, since it reveals information on how unemployment is affected by economic growth and the expenses associated with keeping labor resources unused. The significance of this parameter is seen in the vast number of research dedicated to its estimate. The economic literature on this topic has expanded over time, confirming its applicability to other countries and periods. Researchers have utilized one or multiple original models, examining the connection between output and unemployment, or unemployment and output. They have also made modifications to the original versions and attempted to elucidate any disparities (Porras-Arena & Martín-Román, 2023).

The literature discusses the concept of "Okun's Law" to estimate the relationship between output and unemployment. Some studies, such as (Elhorst & Emili, 2022) focus on estimating the effect of output on unemployment. on the other hand, other studies, including (Niken et al., 2023) and (Folorunso, 2021), examine the effects of unemployment on output. The issue pertains to the feasibility of comparing these two categories of outcomes and deriving any inferences on the "true value" of Okun's coefficient.

Applying Okun's rule to the Indonesian economy may elucidate the correlation between economic growth and the unemployment rate in Indonesia. Economic growth may serve as a policy instrument to decrease unemployment, and conversely, unemployment can be used as a means to stimulate economic growth (Ngubane et al., 2023). Okun's Law aims to aid the government in mitigating the elevated unemployment rate by fostering economic development. Conversely, reducing the number of jobless individuals may lead to an increase in economic growth (Astari et al., 2019).

The purpose of economic development is to enhance economic activity and raise living standards, expedite economic growth, generating employment possibilities, cultivate high-quality human resources, and mitigate unemployment (Bayraktar et al., 2023). Nevertheless, there are several impediments to enhancing the quality of human resources, with the primary problem being the difficulty in generating work opportunities. The issue at hand is the disparity between the demand for labor and the supply of labor, resulting in workers being unable to find employment in the labor market. Consequently, the imbalance leads to a rise in the unemployment rate.

Unemployment is a prevalent economic issue in Indonesia. The issue of unemployment is influenced by the inflation rate. A decline in people's buying power is a contributing factor to unemployment (Bhattarai, 2016). the community's diminishing buying power directly decreases the quantity of products and services produced by the corporation. Under such circumstances, the corporation will curtail the need for a workforce, leading to a decline in job prospects and a rise in unemployment (Niken et al., 2023).

Several variables influence the pace of economic expansion. The exchange rate is believed to be the variable that influences economic growth. The exchange rate represents the quantity of local currency required to acquire a single unit of foreign money (Hordofa, 2023). When the value of the rupiah decreases to the dollar (the dollar increases in value), it will lead to a drop in economic growth. Conversely, if the value of the rupiah increases to the dollar (the dollar decreases in value), it will increase in economic growth (Ramos-Herrera, 2023; Hordofa, 2023; Hítalo et al., 2023).

Exports refer to economic activity involving the exchange of goods and services across international borders. Exports refer to the whole output of a certain nation that is sold to other countries, including the sale of both commodities and services during a specific timeframe (Raiher et al., 2017; Zaman et al., 2021; Murshed, 2022). One of the factors Exports have a crucial role in stimulating economic development (Filimonova et al., 2020). Net exports refer to the disparity between the monetary worth of goods and services exported and imported. Exports enhance a nation's ability to spend by extending worldwide production and granting access to precious resources in different global marketplaces. Exports facilitate international business activities by promoting economic sectors with comparative advantages, such as abundant availability of specific production factors or efficiency advantages, particularly labor productivity (David et al., 2024). in addition, exports can surpass any nation in reaping economic advantages, as determined by the country's economic magnitude (Al-Abdulkader et al., 2018).

Inflation refers to the phenomenon of increasing prices within an economy (Asafo-Adjei et al., 2023). This phenomenon occurs due to the disparity in the circulation of money and the ability to make purchases. Individuals prefer to make consumption decisions depending on factors such as price and income levels (Niken et al., 2023). It is important to regulate inflation in order to ensure that the inflation rate has a beneficial effect on economic growth (Asafo-Adjei et al., 2023). A country's economic growth is adversely affected by a greater inflation rate (Mohseni & Jouzaryan, 2016).

Foreign direct investment (FDI) refers to the cross-border movement of capital when enterprises from one country start or extend their operations in other nations. This often entails investments in infrastructure, production equipment, land acquisitions for production purposes, and the acquisition of new machinery (Sadikova et al., 2017). the capital stock is anticipated to yield advantages that directly affect employment, such as the creation of new job opportunities that will engage a larger workforce, hence mitigating unemployment (Schmerer, 2014).

Typically, a resident refers to an individual who is legally established or lives inside the borders of a nation for an extended duration (Holmes et al., 2022). the term "number of inhabitants" refers to the overall human population residing in a certain place during a particular timeframe (Sadikova et al., 2017). Malthus posits that population growth has an impact on the unemployment rate due to the concurrent expansion of the labor force and workforce resulting from the population rise. The labor force requires work opportunities, and often, in emerging nations, the pace of population increase (including the labor force) surpasses the rate of employment expansion. Consequently, a portion of

the workforce is unable to get employment and consequently becomes jobless. The significance of the government's involvement is emphasized in contemporary growth theories (Jo et al., 2023).

CONCLUSIONS

The variables of unemployment, exchange rates, exports, and inflation together have a substantial impact on the economic development of Indonesia. Additionally, it was seen that exchange rates and inflation partly contribute to the overall economic growth. This demonstrates that a depreciation of the local currency relative to foreign currencies may lead to a contraction in economic growth, while an increase in inflation inside a nation can also result in a decline in economic growth. Unemployment in Indonesia is impacted by economic development, inflation, foreign direct investment, and population. However, foreign direct investment has a minor role in affecting unemployment. This demonstrates that more foreign direct investment in Indonesia has the potential to decrease unemployment, but a larger population may contribute to greater levels of unemployment in the country.

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