Exploring the Relationship Between Manpower and Economic Indicator in Indonesia: A 30-Year Analysis

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ABSTRACT: This research investigates the relationship between manpower and economic Indicator in Indonesia over a 30-year period from 1992 to 2022. Specifically, it examines the influence of Gross Domestic Product (GDP), Education, Age, Final Consumption Expenditure, Foreign Direct Investment, and Inflation on Wages, alongside the effects of employment and economic growth instruments. This study using Error Correction Model (ECM) along with unit root test, cointegration test, and Autoregressive Distributed Lag (ARDL) dependent test approach with the result that all of variables are stationary at the 1st difference level, this study aims to see the long-run and to know short-run relationship among the variables. The findings reveal a significant long-term relationship between wages and factors such as GDP (0.0000), higher education level (0.0006), secondary education level (0.0009) government spending (0.0149), and inflation (0.0312), while other variables such as basic education (0.0751), age of labour (0.3256), and Foreign Direct Investment (0.3417) are insignificant, while the short-run impact is seen to be less significant. This research proves that economic growth will always affect wages and the importance of controlling inflation as well as stabilising economic conditions to influence wages positively. Through rigorous statistical testing, this study contributes to understanding the dynamics affecting wages in Indonesia, highlighting the critical role of economic and demographic factors.

KEYWORDS: Labour, Wage, Gross Domestic Product (GDP), Education, Inflation, Error Correction Model (ECM).
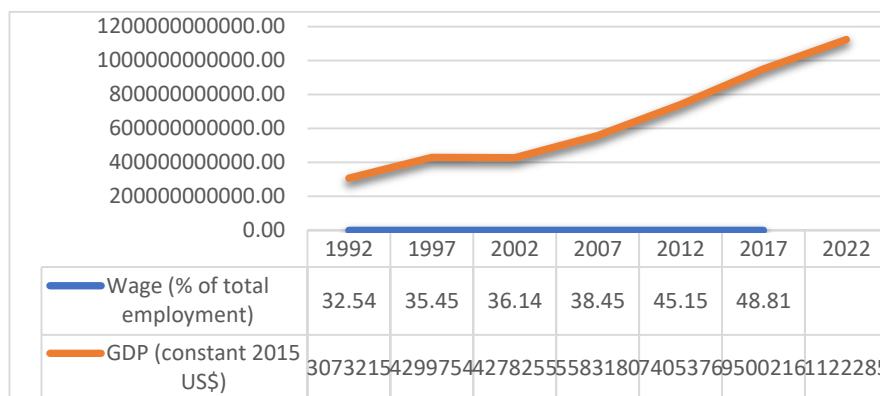
I. INTRODUCTION

Labour wages contribute greatly to a country's economic growth, especially in developing countries. In Indonesia, wage levels are generally the first thing that is used to assess the welfare and prosperity of a region. The wages set by the government in each region vary according to certain factors.

Determining the minimum wage in accordance with convention number 130 concerning the minimum wage of the International Labour Organization (ILO), Indonesia applies this reference with certain adjustments. (Izzaty & Sari, 2013). The minimum wage is compared based on three indicators, namely GDP per capita, GDP per worker, and average wage. (Saget, 2006). The influence of the employment sphere, GDP, investment, government spending and inflation on wages can be understood through the lens of Keynesian economics, which emphasises the importance of aggregate demand in driving economic activity. John Maynard Keynes (1936) theory on wages and prices is contained in three chapters 19-21 of his book "The General Theory of Employment, Interest and Money". Where prices, especially wages are sticky and respond slowly to changes in supply and demand, leading to periodic shortages and surpluses of labour, especially labour.

In accordance with the World Development Indicator data presented by the World Bank, the percentage increase in wages received by workers in Indonesia in the last 30 years every 5 years has a fixed and stagnant position, but the GDP obtained has fluctuated and has not been stagnant for more than 5 years. This is a phenomenon that must be straightened out with theory and field facts, because the development of labour wages has a reciprocal relationship, both in the short-term and long-term with several aspects of employment such as the level of education and age of the workforce that adjust the nominal wages received by workers. However, in the figure above, it can be seen that every fluctuating increase in GDP does not give a big change to wages.

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	1992	1997	2002	2007	2012	2017	2022
Wage (% of total employment)	32.54	35.45	36.14	38.45	45.15	48.81	
GDP (constant 2015 US$)	307321	542997	544278	255558	318074	053769	5002161122285

Figure 1. 5-year Comparison of Wages and GDP in Indonesia from 1992-2022
Source: World Bank, 2023

The level of education from basic to advanced levels is a strong catalyst for gaining socioeconomic mobility. With educated and trained skills, the wage rate earned will be higher. Education serves as a signal of inherent productivity, with the return of labour to education reflecting the basic capabilities demonstrated by education. (Retno et al., 2018). The effect of education is also in line with the age of the workforce, which can affect wage levels through the aspect of productive age with varied experience. Wages are influenced by factors such as health, professional education, and computer skills. (Vasilyeva & Tyrsin, 2021).

There are various economic instruments, such as GDP, Consumption Expenditure, Foreign Direct Investment, and Inflation that influence each other directly or indirectly, which can serve as a benchmark for whether the wage level is in line with economic growth and turmoil. GDP growth signals economic expansion. When GDP increases and the economy expands, it often leads to an increase in labour demand and creates labour productivity that can support total output, thus raising the trend of GDP itself.

The pattern of government spending follows the increase in GDP which directly affects the demand for goods and services, so that to meet demand, firms must increase total production, which begins with an increase in labour and technological improvements. (Driffield & Girma, 2003; Onaran & Obst, 2015). This can be fulfilled with one of them, namely Foreign Capital Receipts.

On the other hand, in the event of inflation that could destabilise the economy, workers will demand for an increase in their wages in order to maintain their purchasing power and lead to a potential wage-price spiral. (Blanchard, O. J. & Fischer, 1989; Mishkin, 2007; Onaran & Obst, 2015). Thus, the implementation of Keynesian economics suggests that government intervention, such as fiscal stimulus packages, can help moderate the ups and downs of economic activity.

Overall, this research will focus on a 30-year (1992-2022) analysis of how the effects of Employment Instruments (Education Level of Labour and Age of Labour) and Economic Growth Instruments (GDP, Government Consumption Expenditure, Foreign Investment, Inflation) on wages earned by labour in Indonesia. This research will use statistical testing using time series data, by implementing long-term and short-term tests or Error Correction Model (ECM) on each variable of employment and economic growth on wage changes.

II. LITERATURE REVIEW
The Effect of Labour Instruments on Wages

Boring's (2021) study emphasises that wages increase with age and peak at a certain point before declining as retirement approaches. The study also noted that age-related wage differentials are more pronounced among highly educated occupations, indicating a "wage increase with ability" in certain education and occupational groups. These findings underscore the importance of considering both age and education when analyzing wage dynamics, pointing to a gap in research on the interplay between these two factors.

The research presented by Nogueira (2023) introduces an interesting perspective on the wage gap, showing that the workers with some intermediate skills can achieve higher wages through work experience or vocational training, even without higher education. This challenges the conventional wisdom that higher education is the main pathway to better wages and suggests a new area of research on alternative pathways to skill acquisition and wage enhancement.

The multidimensional statistical analysis conducted by Vasilyeva and Tyrsin (2021) further investigates the reasons behind the significant age differentiation in wages in the Russian labour market. By testing hypotheses related to age discrimination and the impact of human capital accumulation (education, skills, health) on older workers' wages. Their research highlights the systemic

undervaluation of older workers' contributions, regardless of their accumulated human capital. The research underscores the need for policies that reduce age discrimination and promote fair wage practices across all age groups.

The Effect of Economic Growth Instrument on Wages

When the economy expands, labour demand usually increases, leading to upward pressure on wages. This relationship is justified by the findings of Duja & Supriyanto (2019) which indicate that macroeconomic factors, including GDP, are significantly related to wages. According to Kuznets (1955), as cited in Nogueira (2023), an increase in GDP per capita should be accompanied by a decrease in a wage inequality. That's because economic growth allows more to be invested in education, leading to a more skilled workforce.

In the case study of government final consumption as an important factor affecting GDP, which in turn, has direct implications for wage levels. The theoretical foundation in Paunica's (2021) research suggests that higher government spending can stimulate economic activity, potentially leading to higher labour demand and, consequently, upward pressure on wages. If broken down more clearly, government public investment, spending on unemployment benefits, and public consumption (including wages) are explored, and show that government spending decisions directly impact the wage level described in Grenier & Flaschel's (2010) article. This can also be attributed to Onaran & Obst's (2015) article showing that a domestic demand-led recovery, supported by government spending that increases the wage share, can restore workers purchasing power and contribute to economic growth, thus attracting foreign investors.

Zhao (1998) provides a theoretical framework to understand the impact of FDI on wages and employment through the lens of bargaining between labour and management. Findings suggest that FDI can reduce negotiated and unionised wages under certain conditions, highlighting the potential for FDI to exert downward pressure on wages in industries with strong unions. Yasin's (2022) research article provides empirical evidence from the Indonesian manufacturing industry and the Vietnamese wholesale and retail industry. Lipsey and Sjöholm (2004) find that FDI in the Indonesian manufacturing sector leads to higher education and wages, suggesting a positive spillover effect. A study by Yasin (2022) shows that FDI depresses wages in FDI-receiving provinces in Indonesia, especially in technology-intensive subsectors. This is contrary to the general expectation that FDI will increase wages through technology transfer and productivity improvements.

Several articles examine the impact of one of the case studies of economic growth instruments that will be examined in this research, namely, Inflation. Onaran & Obst (2015) discuss how a simultaneous 1% point increase in the wage share can lead to annual inflation, suggesting a feedback loop between wages and inflation. This loop suggests that wage adjustments in response to inflation can trigger further inflationary pressures, creating a challenging environment for monetary policy.

Duja & Supriyanto (2019) highlighted the importance of understanding the dynamic relationship between wages, inflation, and other macroeconomic factors to analyse their impact on residential property prices, where it is argued that inflation affects wages and then leads to individual purchasing power especially on primary needs such as housing. This research also emphasises the need for full control of factors affecting inflation, including wages, to stabilise economic conditions.

III. METHODOLOGY

The method used in this study is the Error Correction Model (ECM) to find out how the relationship between variables in the long-term and short-term analysis using the E-Views 12 software. The World Development Indicators Indonesia, available on the World Bank website, provide the data used in this study, arranged into time series data from 1992-2022. The variables used are listed in Table 1.

Tabel 1. Measurement Variables

Variable Name	Description and Measurement	Source
WAGE	"Wage and salaried workers, total (% of total employment) (modelled ILO estimate)"	World Bank
GDP	"GDP (constant 2015 US$)"	World Bank
LOG(GDP)	"LOG GDP (constant 2015 US$)"	World Bank
ADV_EDU	"Labour force with advanced education (% of total working-age population)"	World Bank
INT_EDU	"Labour force with intermediate education (% of total working-age population)"	World Bank
BASIC_EDU	"Labour force with basic education (% of total working-age population)"	World Bank

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LAGE	"Labour force participation rate, total (% of total population aged 15+) (modelled ILO estimate)"	World Bank
EXPEND	"Final consumption expenditure (annual % growth)"	World Bank
FDI	"Foreign direct investment, net (BoP, current US$)"	World Bank
INF	"Inflation, GDP deflator (annual %)"	World Bank

Source: World Bank, 2023

This study uses variables that are divided into two indicators, namely Employment and Economic Growth on Wages. One of the nine variables used will be converted into natural logarithms by transforming GDP data to LOG GDP. The Augmented Dickey-Fuller (ADF) test is used to determine the unit roots in WAGE, GDP, ADV_EDU, INT_EDU, BASIC_EDU, LAGE, EXPEND, FDI, and INF. Mathematically, the model used in this study is as follows.

Based on the collection of research variables in this article, an analytical model is needed that can measure the relationship between several years of research, therefore in this study the appropriate analysis is taken in accordance with statistical modelling. The Error Correction Model was introduced by Sargan, further developed by Hendery and popularized by Engle-Granger.

The Augmented Dickey-Fuller (ADF) test for unit roots was introduced in econometrics as an extension of the Dickey-Fuller (DF) test to overcome the problem of error terms that are unlikely to be white noise in the DF test. The ADF adds a lag to the dependent variable in order to obtain better unit root test results (Dickey and Fuller 1979). The lag length of the additional variable is achieved in this study using the Schwarz Information Criterion (SIC). The SIC is considered to be the most effective model selection criterion (Cavanaugh and Neath 1999). The ADF test can be carried out in the following three ways:

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^{p} \beta i \, \Delta y_{t-i} + u_t \tag{1}$$

$$\Delta y_t = \alpha_0 + \delta y_{t-1} + \sum_{i=1}^{p} \beta i \, \Delta y_{t-i} + u_t \tag{2}$$

$$\Delta y_t = \alpha_0 + \delta y_{t-1} + \alpha_2 t + \sum_{i=1}^{p} \beta i \, \Delta y_{t-i} + u_t \tag{3}$$

After the unit root test, a cointegration test is carried out using the cointegration test approach. The purpose of this test is to empirically establish the long-run relationship between the variables of interest. This test is chosen based on the results of the unit root test. The ARDL cointegration test is considered more robust and appropriate when applied to data sets with small sample sizes. In addition, this procedure simultaneously provides estimates for short-run and long-run parameters (Haug, 2002). The ARDL(p,q) method developed by Pesaranetal. (2001) is used in this study and is presented as follows:

$$\Delta y_t = \alpha_0 + \propto_1 y_{t-1} + \beta_1 x_{t-1} + \sum_{i=1}^{p} \delta_i \, \Delta y_{t-j} + \sum_{i=1}^{q} \theta_j \, \Delta x_{t-j} + \varepsilon_t \tag{4}$$

Then equation (4) was adjusted with the research variables, so that it was obtained as follows:

$$\Delta WAGE_t = \alpha_0 + \propto_1 WAGE_{t-1} + \propto_2 GDP_{t-1} + \propto_3 ADV\_EDU_{t-1} + \propto_4 INT\_EDU_{t-1} + \propto_5 BASIC\_EDU_{t-1} + \propto_6 LAGE_{t-1} + \propto_7 EXPEND_{t-1} + \propto_8 FDI_{t-1} + \propto_9 INF_{t-1} + \sum_{j=1}^{k} \beta_j \, \Delta WAGE_{t-i} + \sum_{j=1}^{k} \gamma_j \, \Delta GDP_{t-j} + \sum_{j=1}^{k} \delta_j \, \Delta ADV\_EDU_{t-j} + \sum_{j=1}^{k} \varepsilon_j \, \Delta INT\_EDU_{t-j} + \sum_{j=1}^{k} \epsilon_j \, \Delta BASIC\_EDU_{t-j} + \sum_{j=1}^{k} \zeta_j \, \Delta LAGE_{t-j} + \sum_{j=1}^{k} \eta_j \, \Delta EXPEND_{t-j} + \sum_{j=1}^{k} \theta_j \, \Delta FDI_{t-j} + \sum_{j=1}^{k} \vartheta_j \, \Delta INF_{t-j} + \varepsilon_t \tag{5}$$

Based on the above equation, 0 represents drift, 1, 2, 3, 4, 5, 6, 7 and 8 represent long-term clients, and ET represents white noise error. Cointegration between variables is done by performing an F-test to test the significance of variables 1, 2, 3, 4, 5, 6, 7 and 8 in equation (5). The null hypothesis of no cointegration (H0: 1= 2= 3= 4=5=6=7=8=0) is then tested against the alternative hypothesis (H0: 1 2 3 4 5 6 7 8 0). Pesaranetal (2001) proposed two asymptotic critical values used to test for cointegration when the independent variables are considered as I(m), where 0 m 1. The lower bound indicates that the regressors are I(0), while the upper bound indicates that these variables are I(1).

Regardless of the order of integration, the null hypothesis (H0) is rejected if the estimated F-statistic is greater than the critical value of the upper bound. Conversely, this study fails to reject H0 if the estimated F-statistic falls below the lower bound critical value. Finally, for F-statistic estimates that fall between the two critical values, the regression results are inconclusive. Once cointegration between variables is established, the ARDL error correction model (ARDL-ECM) must also be determined. Equation (6) specifies the error correction model associated with the estimation of (long-run) cointegration:

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$$\Delta WAGE_t = \alpha_0 + \sum_{j=1}^{k} \beta_j \, \Delta WAGE_{t-j} + \sum_{j=1}^{k} \gamma_j \, \Delta GDP_{t-j} + \sum_{j=1}^{k} \delta_j \, \Delta ADV\_EDU_{t-j} + \sum_{j=1}^{k} \varepsilon_j \, \Delta INT\_EDU_{t-j} +$$
$$\sum_{j=1}^{k} \epsilon_j \, \Delta BASIC\_EDU_{t-j} + \sum_{j=1}^{k} \zeta_j \, \Delta LAGE_{t-j} + \sum_{j=1}^{k} \eta_j \, \Delta EXPEND_{t-j} + \sum_{j=1}^{k} \theta_j \, \Delta FDI_{t-j} + \sum_{j=1}^{k} \vartheta_j \, \Delta INF_{t-j} + \lambda ECT_{t-j} + \varrho_t$$

(6)

where ECT denotes the error correction term and is the coefficient of ECT used to measure the speed of adjustment of the model towards long-run equilibrium.

IV. RESULT AND DISCUSSION

Unit Root Test

Table 2 shows that the Augmented Dickey-Fuller (ADF) estimation results, Probability variables at the level are not all significant, only ANV_EDU, INT_EDU, and EXPEND variables are below α 0.05 and other variables are not significant. Furthermore, the probability at the 1st Difference level of all variables is significant below α 0.05.

Furthermore, in the root test at the level, only ADV_EDU and EXPEND are stationary at the level. So continued Augmented Dickey-Fuller (ADF) testing at the 1st Difference level, obtained perfect and stationary values for all variables in this study. All variables fulfil the ARDL cointegration prerequisites of ARDL cointegration in the absence of 2nd Difference.

Tabel 2. Unit Root Test

Variable	Prob		ADF	
	Level	1st Difference	Level	1st Difference
GDP	0.9999	0.0117	0.9926	0.0002
ADV_EDU	0.0115	0.0000	0.0566	0.0000
INT_EDU	0.0126	0.0000	0.0609	0.0000
BASIC_EDU	0.0723	0.0001	0.2391	0.0000
LAGE	0.1132	0.0002	0.3297	0.0000
EXPEND	0.0016	0.0000	0.0106	0.0000
FDI	0.8701	0.0000	0.9704	0.0000
INF	0.0690	0.0000	0.2309	0.0000

Lag Length Selection

The variables in a study must contain an appropriate lag order before testing to ensure the ARDL dependent test is successful. This test uses the optimum lag of the Vector Autoregression (VAR) model by selecting an acceptable lag order and is recommended by the E-Views software automatically which lag is more optimum. Table 3 illustrates the lag selection criteria, with the results stating that the ARDL test works more effectively at Lag 1 for both models.

Tabel 3. Lag Length Selection Output

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1710.496	NA	1.67e+44	127.3700	127.8020	127.4985
1	-1510.022	252.4480*	3.35e+40*	118.5202*	122.8396*	119.8046*

Note: * indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

ARDL Cointegration and Bound Test

The ARDL model was used for integration and the results are presented in Table 4. The Bound Test estimates that the F-value is 3.491142 which is greater than the lower and upper bound values, which are 2.11 and 2.62.

Tabel 4. ARDL Bound Test

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.491142	10%	1.85	2.85
k	8	5%	2.11	3.15
		2.5%	2.33	3.42
		1%	2.62	3.77

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The significant estimated F value in table 5 indicates the existence of cointegration among variables at 5% significance level when connected between tables 4 and 5. Therefore, there is evidence of a long-run relationship between Wage, GDP, Level of Education, Age of Labour, Government Expenditure, Foreign Direct Investment, and Inflation. The cointegration value in the output also fulfils the requirement of having a value of -1.001180, which indicates that the cointegrate is between 0 and -1 with a probability value of $0.000 < \alpha\ 0.05$.

Tabel 5. Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ADVANCED_EDUCATION)	0.318420	0.107562	2.960326	0.0130
D(INTERMEDIATE_EDUCATION)	-0.843155	0.129803	-6.495629	0.0000
D(BASIC_EDUCATION)	-1.156743	0.404818	-2.857441	0.0156
D(LABOR_AGES)	1.403416	0.486994	2.881795	0.0149
D(EXPENDITURE)	0.250006	0.062168	4.021448	0.0020
D(INFLATION)	0.032972	0.014453	2.281340	0.0434
CointEq(-1)*	-1.001180	0.125664	-7.967139	0.0000

Long-term and Short-term

The tests in this section indicate the existence of a long-run relationship among the variables, the simplest being the error correction model, which indicates the speed of adjustment towards the long-run equilibrium. Based on table 6, it can be explained that the variables that have a positive influence on wage changes are GDP (1% increase in GDP, wages increase by 3.62%), Advance Education (1% increase in Advance Education, wages increase by 1.29%), Basic Education (1% increase in Basic Education, wages increase by 1.27%), Government Expenditure (1% increase in Goverment Expenditure, wages increase by 0.73%), Inflation (1% increase in Inflation, wages increase by 0.14%). This result is consistent with John Maynard Keynes' (1936) Wage and Price Theory where prices, especially wages are sticky and respond slowly to changes in supply and demand, leading to periodic shortages and surpluses of labour, especially labour.

In the labour variables used in this study, only Advance Education and Basic Education have a positive relationship with Wage with a small difference. This corroborates research by Nogueira (2023) who explains that skills and higher education have a huge influence on wages, even without higher education (Basic Education). There is also research that is in line with the output of this study on Intermediate Education which is negative on Wage, this is described by Boring (2021), Vasilyeva and Tyrsin (2021) emphasise that wages increase with age and peak at a certain point before declining as retirement approaches and they highlight the systemic undervaluation of the contribution of older workers, regardless of their accumulated human capital. Then in the Economic Growth Instrument, many studies are in line with the results of this study, especially the increase in wages which is fully correlated with GDP. Tested by the findings of Duja & Supriyanto (2019) which indicate that macroeconomic factors, including GDP are significantly related to wages. According to Kuznets (1955), as cited in Nogueira (2023), an increase in GDP per capita should be accompanied by a decrease in wage inequality. This is because economic growth allows for more significant investment in education, which leads to the supply of skilled labour. Goverment Expenditure has a positive value in this study which corroborates research from Paunica (2021), Grenier & Flaschel (2010), Onaran & Obst (2015) showing that higher government spending can stimulate economic activity, potentially leading to higher labour demand and, consequently, upward pressure on wages.

Several articles examine the impact of one of the case studies of economic growth instruments that will be examined in the research, namely Inflation. Onaran & Obst (2015), Duja & Supriyanto (2019) discuss how a simultaneous 1% point increase in the wage share can lead to annual inflation, suggesting a feedback loop between wages and inflation, then highlight the importance of understanding the dynamic relationship between wages, inflation and other macroeconomic factors to analyze their impact on residential property prices.

The only negative macroeconomic relationship to wages in this study is Foreign Direct Investment, as many studies corroborate the positive effect of Foreign Investment such as research by Yasin (2022), Lipsey and Sjöholm (2004), Habanabakize (2019). However, there are theories that support this research, Zhao (1998) findings suggest that FDI can reduce negotiated and unionised wages under certain conditions, highlighting the potential for FDI to exert downward pressure on wages in industries with strong unions.

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Tabel 6. Long-term Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	3.62E-11	4.83E-12	7.489045	0.0000
ADVANCED_EDUCATION	1.282945	0.272213	4.713023	0.0006
INTERMEDIATE_EDUCATION	-1.548460	0.343552	-4.507212	0.0009
BASIC_EDUCATION	1.270304	0.646398	1.965204	0.0751
LABOR_AGES	-0.564203	0.548284	-1.029035	0.3256
EXPENDITURE	0.726295	0.251992	2.882213	0.0149
FDI	-1.15E-10	1.16E-10	-0.993702	0.3417
INFLATION	0.139142	0.056353	2.469104	0.0312

In the short-term effect, it is found that almost all research variables have no short-term relationship with Wage. This is reflected in the output results below which do not have a probability value < α 0.05 with a positive coefficient, only the variables of GDP, Labour Age, and Government Expenditure. So that in this study it is more likely to lead to a long-term relationship, this is influenced by macro variables so that having a short-term relationship is very unlikely.

Tabel 7. Short-term Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(GDP))	11.56990	31.55426	0.366667	0.7223
D(ADVANCED_EDUCATION)	-0.059708	0.289175	-0.206479	0.8410
D(INTERMEDIATE_EDUCATION)	-0.404834	0.311003	-1.301703	0.2253
D(BASIC_EDUCATION)	-1.807680	1.164273	-1.552625	0.1549
D(LABOR_AGES)	1.967303	1.345852	1.461753	0.1778
D(EXPENDITURE)	0.144015	0.244831	0.588223	0.5708
D(FDI)	-1.63E-10	1.26E-10	-1.293011	0.2282
D(INFLATION)	-0.006178	0.070331	-0.087842	0.9319

Classical Assumption Test

In the output results of table 8 illustrates the diagnostic test results, where the Jarque-Bera test found that the data is normally distributed. Then to see the serial correlation of this study, the Breusch-Godfrey test was conducted, which did not reveal that there was serial correlation. Finally, the Breusch-Pagan-Godfrey test was conducted to determine the presence of heteroscedasticity, which showed that no indication of heteroscedasticity was found. In summary, both models tested were normally distributed with no serial correlation and heteroscedasticity problems. And successfully followed the requirements of the classical assumption test.

Tabel 8. Diagnostic Test Result

Diagnostic Test	Test Statistics	Probability (p-Value)	Decision
Normality	Jarque-Bera Test	0.798	Normally distributed
Serial Correlation	Breusch-Godfrey Test	0.775	Serially uncorrelated
Heteroscedasticity	Breusch-Pagan-Godfrey Tesr	0.116	Residuals are homoscedastic

CONCLUSIONS

In this study, will focus on a 30-year (1992-2022) analysis of how the effects of Employment Instruments (Education Level of Labour and Age of Labour) and Economic Growth Instruments (GDP, Government Consumption Expenditure, Foreign Investment, Inflation) on wages earned by labour in Indonesia. This research will use statistical testing using time data, by implementing long term and short-term tests or Error Correction Model (ECM) on each variable of employment and economic growth on wage changes.

This research is based on the grand theory of the influence of the scope of employment, GDP, investment, government spending, and inflation on wages can be understood through the lens of Keynesian economics, which emphasises the importance of aggregate demand in driving economic activity. John Maynard Keynes (1936) theory on wages and prices is contained in three

chapters 19-21 of his book "The General Theory of Employment, Interest and Money". Where prices, especially wages are sticky and respond slowly to changes in supply and demand, leading to periodic shortages and surpluses of labour, especially labour.

The research conducted various analyses to understand the relationship between different variables, focusing on their distribution, correlation, heteroscedasticity, cointegration, and both long-term and short-term effects on wages.

1. Classical Assumption Test:

The diagnostic test results indicated that the data is normally distributed according to the Jarque-Bera test. The Breusch-Godfrey test showed no serial correlation, and the Breusch-Pagan-Godfrey test found no indication of heteroscedasticity, suggesting that the models tested were normally distributed with no serial correlation and no heteroscedasticity issues.

2. ARDL Cointegration and Bound Test:

The Autoregressive Distributed Lag (ARDL) model was utilized for cointegration analysis. The results presented in the study indicated that there is a bound suggesting the presence of a cointegration relationship among the variables analyzed.

3. Long-term and Short-term Effects:

The research found evidence of a long-run relationship among the variables, with the error correction model indicating the speed of adjustment towards long-run equilibrium. It was found that a 1% increase in GDP leads to a 3.62% increase in wages, and a 1% increase in Advanced Education results in a 1.29% wage increase. However, in the short term, almost all variables showed no significant relationship with wages, except for GDP and Labour Age, which did not have a probability value < 0.05 with a positive coefficient.

The research emphasized the importance of controlling factors affecting inflation, including wages, to stabilize economic conditions. It suggested that the variables studied are more likely to have a long-term relationship due to their macroeconomic nature, making a short-term relationship less likely.

In summary, the research provided comprehensive insights into the dynamics affecting wages, highlighting the significance of GDP and education in the long run, while also noting the challenges in establishing short-term relationships for most variables studied.

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