The Nexus Between Poverty, Unemployment, Economic Growth, and Agriculture in Indonesia

ABSTRACT

Aims: This paper aims to examine the dynamic linkage between poverty, economic growth, unemployment, and agriculture in Indonesia
Study design: Mention the design of the study here.
Place and Duration of Study: The object of the study is Indonesia.
Methodology: This paper relies on annual data from 2000 to 2021, collected from the World Bank. The Autoregressive Distributed Lag (ARDL)-Bounds testing is applied to examine dynamic relationships. Additionally, the Granger Causality (GC) test is employed to unravel the causal direction between poverty, unemployment, economic growth, and agricultural productivity.
Results: The cointegration connection among the variables is evident. Economic growth and agricultural productivity are negatively associated with poverty in the long run. Economic growth and the agriculture sector are verified to have a beneficial role in assisting poverty alleviation. In contrast, unemployment is positively associated with poverty. Additionally, the GC test signifies a bidirectional causality between agricultural productivity and poverty rates, unemployment and poverty, as well as farm productivity and economic growth
Conclusion: enhancing agricultural productivity and fostering economic growth are pivotal instruments for addressing poverty in Indonesia.

Keywords: Poverty, Unemployment, Economic Growth, Agriculture

1. INTRODUCTION

Promoting sustainable growth by reducing the number of people living below the poverty line is one of the major challenges for emerging countries such as Indonesia. It is globally agreed that eradicating extreme poverty is part of the Sustainable Development Goals (SGD) principles that must be achieved in the year 2030 [1]. As of 2023, the number of Indonesians who are classified as poor and vulnerable groups remains significant, posing concerns for policymakers and scholars to promote appropriate policies and programs. Although the poverty rate is experiencing a downward trend, 2% of the population in Indonesia still lives below the extreme threshold of $2.15 [2]. Furthermore, 18% of the population is categorized as moderate poverty [3].

Numerous aspects have been linked in order to identify poverty dynamics such as economic growth and unemployment [4]. Economic growth and its composition is supposed to play a vital role in assisting poverty alleviation [5]. Conversely, unemployment is argued as a key driver of poverty. As Diao et al. [6] mentioned, economic growth is a necessary condition for

a nation to move from a traditional to a modern economy. Hence, economic growth tends to be followed by poverty reduction since it can create employment both in formal and informal sectors. Total output growth increases economic capacity and national income, which in turn can be used for developing infrastructure that supports poverty eradication. Nonetheless, Škare & Druže [4] emphasized that the role of growth in addressing poverty is widely accepted, but it is not a sufficient tool.

Agrawal [7] examined the nexus between economic growth and poverty in Kazakstan using provincial-level data. The findings noted that regions with higher growth rates achieved a faster decline in poverty. Michálek & Výbošťok [8] found that economic growth negatively affects poverty rates. However, as income inequality increases, poverty tends to scale up. In another study, Dauda [9] noticed that lowering the income gap and fostering employment generation are critical in reducing poverty in developing countries.

Amar et al. [10] recorded that economic growth is negatively linked to poverty whereas unemployment is positively linked to poverty in West Sumatra Province, Indonesia. Karo and Yusnida [11] found that higher levels of unemployment tend to experience higher levels of poverty. Similarly, Murjani [12] recorded that economic growth supports poverty reduction while unemployment and inflation positively contribute to poverty. Fosu [13] found that economic growth significantly impacts poverty reduction. Nonetheless, high initial levels of income disparity limit the effectiveness of economic growth in supporting poverty alleviation. Surprisingly, empirical evidence from developing countries noted that economic growth does not impact poverty [14].

Another factor that is linked to poverty is the agriculture sector, including forestry, crops, livestock, and fisheries subsectors [15]. Agriculture is the source of income and livelihood for a billion people in Indonesia, and its performance impacts to national welfare [16]. It can assist in addressing both rural and urban poverty through several channels such as income generation, rural development, employment, and food security. Therefore, agriculture contributes to both economic growth and poverty alleviation [17]. An empirical study from Thailand found that agricultural productivity has a negative effect on poverty rates [18]. Furthermore, Oseni et al. [19] unraveled that a 1% improvement in agricultural productivity leads to a decrease in the likelihood of being poor by 0.25 - 03%.

Against the background above, this paper intends to examine the dynamic nexus between poverty, unemployment, economic growth, and agricultural productivity in Indonesia using annual data collected from the World Bank. The poverty rate relies on the poverty headcount ratio of $3.65. This paper performs the Autoregressive Distributed Lag (ARDL)-Bounds test for providing dynamic connections. Furthermore, the Granger Causality (GC) test is included to ascertain the causal direction between the study variables.

2. MATERIAL AND METHODS

2.1 Model Specification

The objective of this research is to unravel the dynamic relationship between poverty rates, agricultural productivity, unemployment rates, and economic growth. Following a past study by Osinubi [20], therefore, the empirical model is specified as follows:

$$POV_t = \gamma_0 + \gamma_1 AGRIP_t + \gamma_2 UNEM_t + \gamma_3 GDPG_t + \varepsilon_t$$

where POV shows the poverty rate, AGRIP denotes agricultural productivity, UNEM depicts unemployment rates, and GDPG stands for economic growth. ε is the error term. γ_0 is the constant term. γ_1, γ_2, and γ_3 are parameters to be estimated.

2.2 Method

This paper consists of three types of estimation methods namely the stationary test, ARDL-Bounds test, and the GC test.

2.2.1 Stationary test

A stationary test is required before an application of the ARDL-Bounds testing. Hence, this uses the Augmented Dickey-Fuller (ADF) test. Previous time-series studies also applied the ADF test [21][22]. It should be noted that the ARDL is no longer proper for application if the series are level I(0) or first-order I(1) integration. A general equation for the ADF test can be written as follows

$$\Delta y_t = \pi_0 + \pi_1 y_{t-1} + \sum_{m=0}^{m} \pi_2 \Delta y_{t-1} + \pi_3 T + u_t$$

where ∆y signifies the first difference variable, including POV, AGRIP, GDPG, and UNEM. π_0 is the constant term, $\pi_3 T$ is the time trend, and $\pi_1 y_{t-1}$ is the lagged level of the variable. $\pi_2 \Delta y_{t-1}$ is lagged differences of the variable. u_t is the error term. The null hypothesis (H0) of the non-stationary variable ($\pi_1 = 0$) is checked against the alternative hypothesis ($\pi_1 < 0$). To provide reliable findings, this paper includes an alternative approach namely Phillips-Perron (PP) test. The PP approach adopts a non-parametric approach in investigating the presence of unit roots.

2.2.2 ARDL-Bounds test

The ARDL-Bounds testing is applied to examine the nexus between poverty and its set of determinants. It is developed by Pesaran et al. [23]. The ARDL-Bounds testing is employed since it has the ability to provide short- and long-run parameters, as well as can be applied to small sample [24] [25]. Numerous past studies have also worked on the ARDL-Bounds testing [26][27][28]. The ARDL (p,q) model can be specified as follows:

$$\Delta POV_t = \theta_0 + \sum_{i=1}^{p} \theta_1 \Delta POV_{t-i} + \sum_{i=0}^{q} \theta_2 \Delta AGRIP_{t-i} + \sum_{i=0}^{q} \theta_3 \Delta UNEM_{t-i} + \sum_{i=0}^{q} \theta_4 \Delta GDPG_{t-i} + \vartheta_1 POV_{t-1} + \vartheta_2 AGRIP_{t-1} + \vartheta_3 UNEM_{t-1} + \vartheta_4 GDPG_{t-1} + \varepsilon_t$$

The long-run connection between poverty and its set of independent variables is evident only if there is a cointegration. Therefore, this paper employs the Bounds test to investigate the

presence of the cointegration relationship. The null and alternative hypotheses are written as follows:

H0: $\theta_0, \dots, \theta_3 = 0$ (no cointegration)
H1: $\theta_0, \dots, \theta_3 \neq 0$ (cointegration)

There are two types of critical values to examine the presence of cointegration namely lower and upper bounds. Of the cointegration is evidence, the dynamic short-run model is written as follows:

$$\Delta POV_t = \vartheta_0 + \sum_{i=1}^{p} \vartheta_1 \, \Delta POV_{t-i} + \sum_{i=0}^{q} \vartheta_2 \, \Delta AGRIP_{t-i} + \sum_{i=0}^{q} \vartheta_3 \, \Delta UNEM_{t-i} + \sum_{i=0}^{q} \vartheta_4 \, \Delta GDPG_{t-i} + \phi ECM_{t-1} + \varepsilon_t$$

where the parameter ϕ represents the speed of adjustment toward long-run equilibrium. It must be a negative sign and is statistically significant

2.2.2 Data

This paper utilizes yearly data on poverty rates, unemployment rates, economic growth, and agricultural productivity, in the context of Indonesia. The series used spans from 2000 to 2021, collected from World Development Indicators of the World Bank. The poverty rate is the explained variable, while agricultural productivity, economic growth, and unemployment rates are explanatory variables.

The poverty rate is measured by a poverty headcount ratio of $3.65 a day (2017 PPP). The $3.65 poverty line is derived from typical national poverty lines in countries classified as middle-income such as Indonesia. This figure represents a moderate poverty threshold. Agricultural productivity is estimated manually. It is agricultural value added (constant 2015 US$) divided by the number of people working in the agricultural sector. The unemployment rate is proxied by the share of the labor force who are unemployed. Lastly, economic growth is proxied by Gross Domestic Product (GDP) growth.

3. RESULTS AND DISCUSSION

3.1 Trend of Variables

To begin with the results and discussion, this study displays the trends of the variables, i.e., poverty rates, agricultural productivity, unemployment rates, and economic growth over the period 2000 – 2021 in Figure 1. Poverty rates decline gradually, showing a negative trend. Conversely, agricultural productivity is found to have an upward trend. From 2000 to 2008, the unemployment rate followed an upward trend, but it switched to a downward trend for the subsequent years. From 2000 to 2019, GDP growth experienced steady growth, indicating economic stability and development. Nonetheless, a sharp decline occurred in 2020, likely due to the pandemic outbreak.

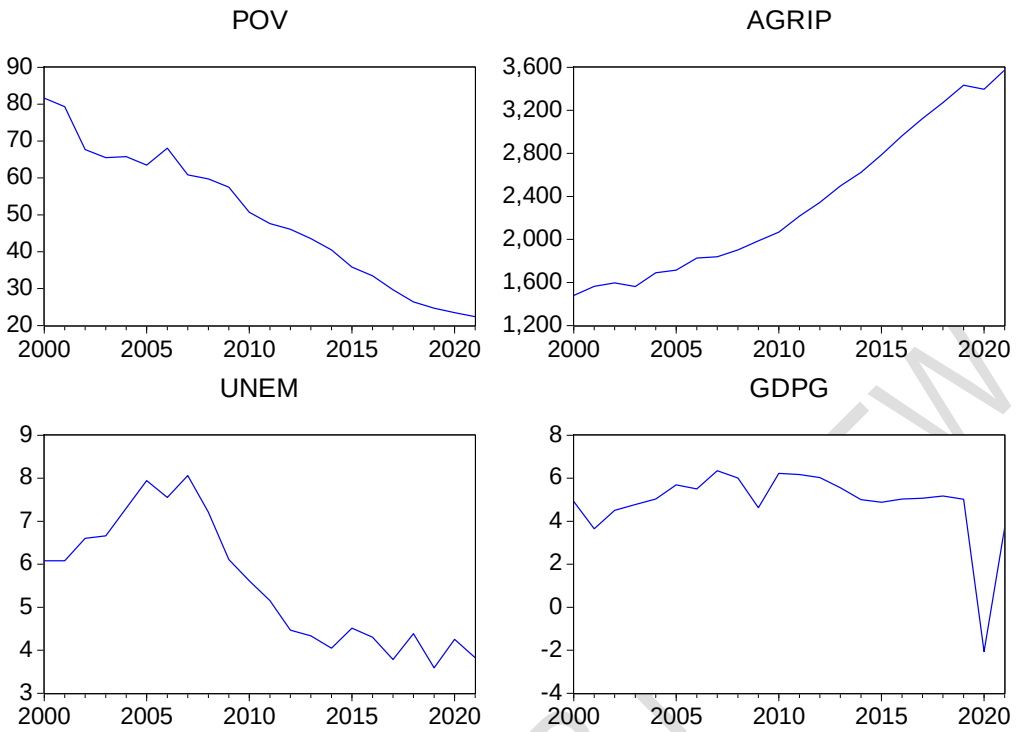

Figure 1. Trend of Variables

3.2. Stationary Test

Table 1 depicts the results of the stationary test for all the study variables. The results of the ADF test denote that UNEM and GDP are stationary at their level, I[0]. Conversely, POV and AGRIP are non-stationary at their level. Instead, they are stationary at their first difference, indicating first-order integration, I[1]. Similarly, the PP test shows that all the variables are non-stationary at their level except for GDPG. However, POV, AGRIP, and UNEM switch to become stationary variables after the first difference is taken into account. Given that none of the variables are I[2]; therefore, the ARDL is suitable for application.

Table 1. ADF and PP test results

	level		fd	
	statistic	p-value	statistic	p-value
ADF test				
POV	-2.8895	0.1850	-5.1761	0.0026
AGRIP	-1.6206	0.7496	-4.9863	0.0038
UNEM	-4.3481	0.0152	-4.3636	0.0130
GDPG	-3.5995	0.0544	-8.0082	0.0000
PP test				
POV	-2.8895	0.1850	-5.1761	0.0026
AGRIP	-1.6206	0.7496	-4.9793	0.0039
UNEM	-2.1182	0.5069	-4.4030	0.0121
GDPG	-3.5995	0.0544	-10.8488	0.0000

3.3 Model Selection

The necessary stage before using the ARDL is the optimal lag length test. Hence, this paper employs the Akaike Criteria Information (AIC) approach to check the maximum lag length. The results are presented in Table 2. The results from AIC denote that the optimal lag length is two. Next, Figure 1 depicts the results of the model selection for the ARDL-Bounds testing. This paper also utilizes the AIC for determining the ARDL (p,q) lag structure. By specifying two as the maximum lag length as suggested by the IAC, ARDL (1,1,2,0) is found to be the most fit model.

Table 2. The Optimal Lag Length Test Results

Lag	FPE	AIC	HQIC	SBIC
0	3.30E+06	26.3596	26.3985	26.5588
1	6481.23	20.0849	20.2792	21.0806*
2	4129.83*	19.3999*	19.7498*	21.1922

*denotes the optimal lag length

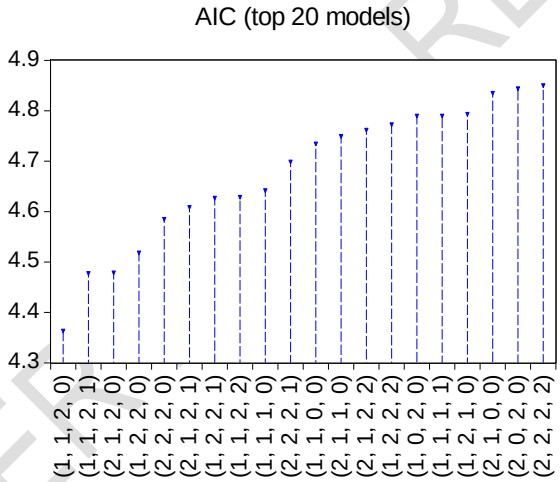

Figure 2. ARDL Model Selection

3.4 Cointegration Test

Having determined the ARDL lag structure, this paper examines the presence of long-run connections among the study variables using the Bounds test. The results of the Bounds test are presented in Table 5. The estimated F-statistic (14.634) exceeds the upper bound (5.61) at a 1% critical value. Thus, there is a cointegration relationship between poverty, economic growth, agricultural productivity, and unemployment rates in Indonesia. In other words, there is no spurious regression.

Table 3. The Bounds Test Results

Test Statistic	Value	Sign.	I(0)	I(1)
F-statistic	14.634	10%	2.72	3.77
k	3	5%	3.23	4.35
		2.5%	3.69	4.89
		1%	4.29	5.61

I(0) and I(1) denote upper and lower bounds, respectively

3.5 Dynamic ARDL Estimates

Table 4 displays the results of the short-run and long-run ARDL estimates. In the long run, agricultural productivity is negatively associated with the extreme poverty rate at a 1% critical value. The estimated parameter of AGRIP is -0.029. This finding verifies the presence of a strong connection between agriculture and poverty in Indonesia as expected. In other words, the agriculture sector is confirmed to have a pivotal role in addressing poverty in Indonesia. This finding suggests that an increase in agricultural productivity leads to a decrease in poverty rates. Importantly, this finding is consistent with the vast majority of past studies.

Table 4. ARDL-Estimates

	Coeff.	Std. err.	t	P>t
Long run				
AGRIP	-0.02190***	0.00177	-12.39	0.000
UNEM	2.68997***	0.85695	3.14	0.009
GDPG	-1.50139**	0.55767	-2.69	0.020
Short run				
ECM	-0.72098***	0.12036	-5.99	0.000
∆AGRIP	0.01152	0.00954	1.21	0.250
∆UNEM	0.55984	0.75806	0.74	0.474
LD.	1.62383**	0.66181	2.45	0.030
∆GDPG	-1.08248***	0.33671	-3.21	0.007
Constant	62.97867***	13.55898	4.64	0.001

The adverse linkage between agricultural productivity and poverty implies that the agriculture sector, including crops, livestock, fisheries, and forestry subsectors, can be applied as an instrument for achieving one of the Sustainable Development Goal (SDG) principles namely poverty eradication. In practice, the agriculture sector supports poverty eradication through several pathways. First, agriculture is associated with income generation and rural livelihood, especially in developing countries such as Indonesia. An improvement in productivity leads to an increase in farmers' income. Second, an increase in farm productivity will be beneficial for the nation's food security target. A sufficient supply of food is critical to ensure affordable prices so the poor can access it. Lastly, strong agricultural performance is required to supply raw materials for manufactural industries

The unemployment rate is found to have a positive effect on the extreme poverty rate at a 1% significant level. The estimated parameter of UNEM is 2.690. This result indicates that

unemployment relates to poverty in Indonesia. Theoretically, a lack of job opportunities will result in a growth in the number of people living below the poverty line. In other words, an increase in unemployment leads to an increase in poverty rates. This finding is consistent with earlier studies [29][12]. The positive nexus between unemployment and poverty should be navigated by policymakers to draft appropriate policies. It is discussed that the presence of unemployment and poverty issues can generate a poverty trap. Unemployment is argued as a mutual friend of poverty [29].

Furthermore, economic growth is found to have a negative influence on the extreme poverty rate at a 5% level of significance. The estimated parameter of GDPG is -1.501. This finding implies that economic growth is verified to have a beneficial role in addressing poverty rates in Indonesia. Economic growth is a signal for overall economic condition. A negative nexus between economic growth and poverty rates is consistent with past studies in Indonesia [12], West Sumatra [10], and South Africa [29]

Total output growth will be followed by an increase in government revenue which in turn can be used for social programs and infrastructure that benefit the poor. In addition, economic growth can be positively associated with job creation which can be accessed by people, including the poor. Nonetheless, it should be noted that economic growth is not a sufficient condition for poverty eradication [30]. To tackle this issue, inclusive growth is firmly required in order to ensure that all groups, including the poor, have the same opportunities to participate and benefit from economic growth.

In terms of short-run estimates, this paper focuses on the ECM coefficient. The lagged value of the ECM is found to have a negative sign and is statistically significant at a 1% level. The process of adjustment toward long-run equilibrium is verified. The estimated parameter is -0.72. Annual correction of a deviation from the long-run equilibrium is around 72% given any shock in the economy.

3.6. Diagnostic and Stability Tests

To check the reliability results, this paper integrates diagnostic and stability tests. The results in Table 7 signify that the issues of serial correlation and heteroscedasticity are not evident given that the Bresuch-Godfrey and Glesjer tests do not reject their null hypotheses. Next, the Ramsey RESET also does not reject the null hypothesis. Thus, the functional form of the estimated model is appropriate. Furthermore, the JB test signifies that the error terms have a normal distribution.

Table 5. Diagnostic Test Results

Tests	Statistic	p-value
Breusch-Godfrey	0.097	0.761
Harvey	0.929	0.519
Ramsey RESET	1.707	0.218
Jarque-Bera test	1.167	0.558

The Cumulative Sum (CUSUM)- and square (CUSUMQ) of recursive residuals tests are applied to check the stability of parameters. This study employs both the CUSUM and CUSUMSQ tests in order to mitigate potential issues namely the natural structural break of the series [31]. The results of the CUSUM and CUSUMQ tests are presented in Figures 3 and 4, respectively. The estimated parameters (blue plots) are stable since they fluctuate between upper and lower critical values.

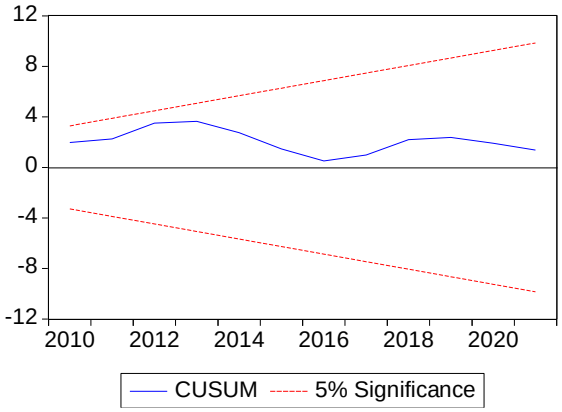

Figure 3. The CUSUM test

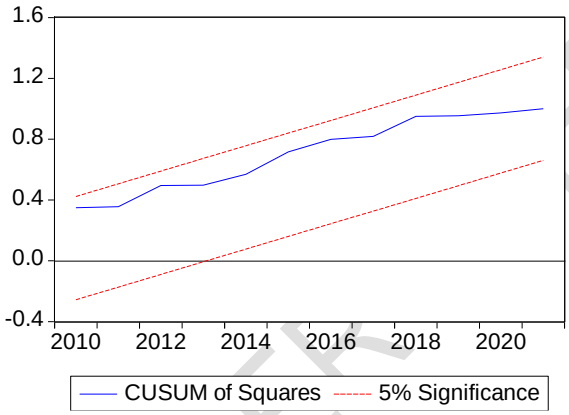

Figure 4. The CUSUMQ test

3.7. The Causality Test

The GC test is applied to unravel the causal direction since the regression analysis, i.e., the ARDL-Bounds test, does not necessarily imply causality. Table 6 jointly presents the results of the causality test. The results denote a bidirectional causality between POV and AGRIP, a unidirectional causality running from UNEM to POV, a unidirectional causality running from GDPG to UNEM, and a unidirectional causality running from AGRIP to GDPG. The findings denote that a change in unemployment rates and agricultural productivity causes a change in poverty rates. Since there is a causal direction flowing from GDPG toward POV, it can be inferred that economic growth has an indirect impact on poverty. Conversely, the agriculture performance has a direct influence on poverty

Table 6. Causality Test

Equation	chi2	P-Value

POV ← AGRIP	6.2092**	0.013
POV ← UNEM	7.0818***	0.008
POV ← GDPG	1.8840	0.170
AGRIP ← POV	12.0120***	0.001
AGRIP ← UNEM	12.4100***	0.000
AGRIP ← GDPG	1.7004	0.192
UNEM ← POV	0.0306	0.861
UNEM ← AGRIP	0.4656	0.495
UNEM ← GDPG	8.8730***	0.003
GDPG ← POV	1.3543	0.245
GDPG ← AGRIP	3.8272**	0.050
GDPG ← UNEM	0.4710	0.493

4. CONCLUSION

This paper empirically examines the nexus between poverty rates, unemployment, economic growth, and agricultural productivity in Indonesia for the period 2000 – 2021 using data collected from the World Bank. This paper employs the ARDL-Bounds testing to estimate the dynamic relationship, as well as the cointegration model. Additionally, the GC test is applied to ascertain the causal direction of study variables.

The long-run relationship between poverty rates, unemployment rates, economic growth, and agricultural productivity is verified since the Bounds test implies the presence of cointegration. In the long run, economic growth and agricultural productivity are negatively associated with poverty rates. The agriculture sector and economic growth, therefore, are verified to have pivotal roles in addressing moderate poverty in Indonesia. Conversely, the unemployment rate is positively connected with poverty rates. The GC causality test denotes a unidirectional causality flowing from unemployment toward poverty and a bidirectional causality between poverty and agricultural productivity. In the efforts to address poverty in Indonesia, this paper suggests fostering economic growth and increasing farm productivity while simultaneously declining unemployment rates.

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