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# Application of the Bourguignon Model to the Economy of Central Sulawesi, Indonesia

## Farida Millias Tuty<sup>1\*</sup>, Chairil Anwar<sup>2</sup>, Moh. Ahlis Djirimu<sup>3</sup>

<sup>1,2,3</sup>Department of Economics, Faculty of Economic and Business, Tadulako University, Indonesia

**ABSTRACT:** This study examined the factors influencing economic growth in Central Sulawesi using François Bourguignon's PGI Triangle theory (Poverty, Growth, and Inequality). Despite high economic growth, persistent poverty, inequality, and unemployment indicated developmental imbalances. The research highlighted an anomaly where rapid growth coexisted with severe socio-economic disparities. The study introduced a novelty approach by modifying Bourguignon's model to include unemployment (Okum's law) and applying the Lagged Adjustment Growth (LAG) framework to assess delayed effects. Using panel data from 12 districts and 1 city between 2016 and 2021, the Random Effect Model (REM) was selected based on Chow, Hausman, and Lagrange Multiplier tests. The findings revealed that inequality and unemployment significantly hindered economic growth, while Gross Domestic Regional Product (GDRP) had a positive effect. Poverty, however, exhibited a negative but statistically insignificant relationship with growth. These results underscore the need for inclusive growth policies to reduce inequality and foster sustainable development.

KEYWORDS: Bourguignon Growth, Lagged Adjustment Growth Model, Panel Data, Inclusive Development, Okum's law

#### I. INTRODUCTION

The measurement of economic growth is essential to assess welfare changes, design effective policies, and evaluate the success of implemented policies (Putra, 2021; Marcal et al., 2024). In addition, economic growth allows the identification of structural problems, such as economic inequality between sectors or regions (Sasmita, Palit, and Yasin 2023). A positive growth rate can also increase domestic and foreign investor confidence to show a favorable and stable economic outlook (Blanchard et al., 2021; Hetatache, 2024; Todaro & Smith, 2020).

The Balanced Growth Theory put forward by Blanchard emphasizes that sustainable economic growth must occur in various sectors to prevent inequality or obstacles (N.Lestari et al., 2021). In this concept, investment must be distributed proportionally in the industrial, agricultural, and service sectors to avoid production barriers. The maintenance of a balance between demand and supply is important to prevent excess or shortage of production. Infrastructure investment and development create positive spillovers and externalities that drive other sectors. Blanchard stated that uneven growth could trigger economic inequality and stagnation (Blanchard et al. 2021). Balanced Growth Theory is in line with François Bourguignon stating that economic growth affects social structure through sectoral changes, income distribution, and impact on certain social groups. According to Bourguignon, economic growth can change the composition of economic sectors and income distribution patterns, affecting the welfare and social mobility of various groups in society (Blanchard & Johnson, 2017; Breunig & Majeed, 2020a).

The Gross Domestic Regional Product (GDRP) of Central Sulawesi experienced significant growth in the 2016-2021 period, with a slowdown in 2018 and 2020 due to the policy of banning raw material exports, natural disasters, and the COVID-19 pandemic (19\_Sulawesi\_Tengah tahunan.Pdf, N.D.). This economic growth is driven by the contribution of different leading sectors in each region. The processing and mining industries fuel economic growth in Morowali and Banggai, serving as key hubs for nickel, oil, and gas production through support from foreign investment and integrated industrial estates. In contrast, Parigi Moutong relies on traditional agriculture, slowing the economic growth compared to industrial-based regions. This sectoral disparity shows regional development inequality in Central Sulawesi (19\_Sulawesi\_Tengah Tahunan.Pdf, N.D.).

Income inequality has experienced interesting dynamics in the 2016-2021 period, This inequality shows an improving trend, as seen from the Gini Index decreasing from 0.36 in 2016 to 0.35 in 2021, signaling an even distribution of income (19\_Sulawesi\_Tengah Tahunan.Pdf, N.D.). However, inequality in urban areas is still higher, reflecting the economic disparity

between urban and suburban centers. Compared to other provinces in SULAMPUA region (Sulawesi, Maluku, and Papua), Central Sulawesi has lower inequality and the improvement is not completely stable (19\_Sulawesi\_Tengah tahunan.Pdf, N.D.; Djirimu, 2020; Djirimu & Tombolututu, 2021). In 2021, there was a slight increase in inequality, suggesting that efforts to achieve economic equality face challenges. Factors such as disparities in access to jobs, education, and public services also contribute to inequality.

The poverty rate in Central Sulawesi fell from 14,45 % in 2016 to 13,00 % in 2021, despite a temporary increase in 2020 due to the economic impact of COVID-19. Social assistance programs such as Family Hope Program (PKH) and Non-Cash Food Assistance (BPNT) increased the purchasing power of the poor (19\_Sulawesi\_Tengah tahunan.Pdf, N.D.). In addition, the growth of the agricultural sector and Micro, Small, and Medium Enterprises (MSMEs) has created new jobs to reduce poverty rates. Parigi Moutong has the highest poverty rate due to limited economic and infrastructure access, while Palu City has the lowest, supported by better access to jobs and economic facilities (Djirimu, 2020; Djirimu & Tombolututu, 2021).

Open Unemployment (TPT) in Central Sulawesi fluctuates with regional economic dynamics. In 2021, Palu City had the highest rate due to urbanization and limited formal jobs, while Banggai Islands had the lowest, supported by stable fisheries and agriculture. Structural and seasonal unemployment, especially in the informal sector, shows the need for skills development and economic diversification to reduce unemployment and improve welfare (19\_Sulawesi\_Tengah tahunan.Pdf, N.D.).

Central Sulawesi experienced positive economic growth but high poverty, unemployment, and inequality showed significant development gaps, creating an anomalous achievement situation. According to François Bourguignon's PGI (Poverty, Growth, and Inequality) Triangle theory, previous non-inclusive development negatively affected future Gross Domestic Product (GDP) and the optimization of the economic steady state.

Based on the description above, this research aims to analyze the influence of inequality, poverty, unemployment, and past GDRP using the PGI Triangle framework augmented with an additional unemployment variable. The novelty of this study lies in the theoretical and empirical enhancement of François Bourguignon's PGI Triangle model by explicitly integrating unemployment as a separate and significant determinant of economic growth. This modification recognizes unemployment not merely as an outcome of economic dynamics, but as an active contributing factor that interacts with inequality and poverty in shaping regional growth trajectories. Furthermore, the study employs the Lagged Adjustment Growth (LAG) model to capture the dynamic effects of lagged inequality, poverty, unemployment, and past GDP on economic growth, offering a more nuanced and temporally sensitive understanding of development patterns at the regional level

#### **II. LITERATURE RIVIEW**

The Bourguignon Triangle shows the connection between economic growth, inequality, and poverty. In this context, economic growth lowers poverty directly by raising incomes and indirectly by affecting inequality (Bourguignon, 2016). However, inequality increases when growth is non-inclusive and enjoyed by certain groups, limiting the impact of poverty reduction (Harsono et al., 2023). In this research, the Bourguignon triangle model was modified by including the variable unemployment as an important factor affecting the 3 variables (Thorbecke and Ouyang 2022). High unemployment rates also affected economic growth and increased inequality, thereby worsening poverty levels (Khrais & Al-Wadi, 2016), (Arkum & Amar, 2022). Conversely, inclusive job creation could drive economic growth, as well as reduce inequality and poverty. In this context, policies must promote economic growth and pay attention to income distribution and job creation to achieve sustainable poverty reduction Bourquqnon model (Thorbecke & Ouyang, 2022), (Nzeribe et al., 2022), (Marrero & Servén, 2022).

Economic growth is the increase in the capacity of an economy to produce goods and services within a certain period. Strong economic growth tends to increase incomes and create more jobs. However, inequality increases when growth is non-inclusive and enjoyed by certain groups, limiting the impact of poverty reduction (Attibrizi et al., 2016; Saleem et al., 2021a). This is because the impact of economic growth on poverty reduction is limited (Majumdar & Partridge, 2019; Putra, 2021). The interaction of economic growth in the Bourguignon concept consists of 3 main concepts, namely:

#### Past Domestic Regional Product (GDRP) (Billion Rupiah)

Past GDRP is the value considered to have a positive relationship with the current economy.

## Inequality (Gini Ratio)

Inequality occurs when the distribution of income or wealth is uneven. The gap between the high and low income groups is widening when economic growth is more enjoyed by the wealthy (Breunig & Majeed, 2020b). High inequality affects poverty reduction and increases unemployment, especially for groups with limited access to education and employment opportunities. Several research have found a negative relationship with economic growth (Njindan Iyke & Ho, 2017; Breunig & Majeed, 2020b; Touitou, 2021; Saleem et al., 2021a; Sutanto et al., 2024a).

Economic inequality worsens poverty by limiting resource distribution. The poor struggle to improve living standards due to restricted access to education and healthcare reduces job market competitiveness. High inequality also enhances social injustice,

weakens community cohesion, lowers productivity, and hinders overall economic growth (Wan et al., 2021; Saleem et al., 2021b). The concentration of income in the hands of the wealthy decreases purchasing power and demand for goods and services, which slows economic growth. High inequality also leads to social instability, increased crime rates, and lower investment (Kesti 2020). Therefore, reducing inequality through fair redistribution policies is essential to creating sustainable and inclusive economic growth (Marrero and Servén 2022)

#### Poverty (Number of Poor Individuals)

Poverty is affected by economic growth and inequality. This can be significantly reduced when the economy grows fairly and inclusively (Arkum & Amar, 2022; Praja, 2024). Despite the growing economy, high inequality and limited employment keep many individual poor. Several research show a negative relationship between inequality and economic growth, (Breunig & Majeed, 2020b; Touitou, 2021), and (Sutanto, Harsono, Lalu M. Furkan, et al. 2024).

Economic growth can contribute to poverty reduction when the concept is inclusive and equitable (Wan et al., 2018; Nzeribe et al., 2022). Inclusive growth provides economic opportunities for all levels of society, increasing income and welfare. Infrastructure development and policies supporting small businesses can reduce poverty (Arkum and Amar 2022). However, inequality increases when economic growth benefits certain groups, such as large corporations or upper economic groups. In this condition, economic benefits are not distributed fairly, widening the gap between rich and poor groups (Michálek and Výbošťok 2019).

### Number of open unemployment (Additional Factors)

Unemployment is closely related to inequality and poverty. Income decreases when many individuals do not get decent work, increasing poverty. In addition, high unemployment rates can magnify inequality because only certain groups have access to jobs with a living wage. The results of the relationship between unemployment and economic growth are negative (Blanchard et al., 2021; Anghel et al., 2017a; Mitsi, 2023).

An increase in unemployment tends to reduce economic growth in line with Okun Law. In this research, the increase in shortterm unemployment has an impact on the economic downturn and causes social problems to trigger an increase in crime. Subsequently, (Shah, Shabbir, and Parveen 2022) also found the effect of unemployment according to Okun's Law. According to Suparman and Muzakir, unemployment is positively related to economic growth (Suparman and Muzakir 2023). A positive relationship between unemployment and economic growth can occur when growth is driven by sectors with low labour absorption, such as high-tech or financial sectors.

Unemployment contributes to poverty and economic inequality because income is unstable and the ability to meet basic needs is limited without jobs (Khrais and Al-Wadi 2016). This widens the economic gap because working individuals continue to earn income and improve welfare. The condition creates sharp economic disparities in society, especially when unemployment is structural and prolonged (Rasheed 2023).

#### The Relationship of Independent Variables to GDRB

Income inequality has a two-way relationship with GDRB. In the early stages of growth, an increase in GDRB is often accompanied by an increase in inequality because economic benefits are first enjoyed by certain groups or regions, as described in the Kuznets hypothesis (Webster 2024). However, in the long term, high inequality can hinder GDRB growth through low purchasing power, limited access to education and health for the poor, and increased social instability. Therefore, although GDRB can grow, without equity, its benefits are not widely enjoyed and can actually magnify disparities between regions or between income groups, (Bourguignon 2019), (Chancel et al. 2022).

Poverty and GDRB have a two-way relationship that affects each other. Increasing GDRB can reduce the poverty rate if economic growth is inclusive and able to create productive jobs for the poor. However, if growth is only concentrated in certain sectors or regions, the impact on poverty reduction can be limited. Conversely, high levels of poverty can hinder GDRB growth because it reduces purchasing power, reduces labour productivity, and limits the contribution of the poor to economic activities. Therefore, it is important to ensure that GDRB growth is not only high numerically, but also qualitative and poverty-alleviating (Bourguignon 2019),(Lakner et al. 2022).

Unemployment and GDRB have a two-way relationship that affects each other. An increase in GDRB can reduce the unemployment rate if economic growth is inclusive and creates jobs that absorb the workforce widely. However, growth that is only driven by capital-intensive sectors or does not create new jobs can lead to the phenomenon of *jobless growth*, where GDP increases but unemployment remains high (Velev 2018). Conversely, a high unemployment rate can suppress GDP growth because most of the workforce is not involved in production activities, which ultimately reduces people's output and purchasing power. Therefore, it is important for regions to encourage quality and labor-intensive economic growth in order to be able to reduce unemployment and optimize GDP (Živković 2022).

Past GDRB has had a significant influence on current GDRB through mechanisms such as capital accumulation, development of productive sectors, and investment in infrastructure. Past increases in GDRB have often created greater economic capacity to support long-term growth, through the development of the industrial sector, services, and improving the quality of human resources. The concept of path *dependency* shows that economic decisions taken in the past shape the policy direction and future economic structure. However, if past GDRB growth is not inclusive or depends on unsustainable sectors, then current GDRB growth can be hampered. Therefore, the sustainability and quality of economic growth in the past greatly determine the potential for future GDRB growth.

Based on the relationship between income inequality, poverty, unemployment and past GDRB, the hypothesis is built as follows:

- 1. H<sub>1</sub>; It is suspected that individual inequality has a negative effect on the economic growth of districts/cities in Central Sulawesi Province for the 2016-2021 period.
- 2. H<sub>1</sub>; It is suspected that individual poverty has a negative effect on the economic growth of districts/cities in Central Sulawesi Province for the 2016-2021 period.
- 3. H<sub>1</sub>; It is suspected that individual unemployment has a negative effect on the economic growth of districts/cities in Central Sulawesi Province for the 2016-2021 period.
- 4. H<sub>1</sub>; It is suspected that the past GDP individually had a positive effect on the economic growth of districts/cities in Central Sulawesi Province for the 2016-2021 period.

Based on the theory of the relationship between independent inequality, namely inequality, poverty, unemployment and past GDP, the framework of thought built in this study is as follows:





Explanation on the picture 1, economic growth, as reflected in the increase of Gross Regional Domestic Product (GRDP), is shaped by several structural factors including income inequality, poverty, unemployment, and past GRDP performance. High levels of inequality can hinder inclusive economic participation and suppress aggregate demand, while poverty and unemployment reduce both productivity and purchasing power. Together, these variables represent structural constraints that may limit economic expansion. Conversely, past GRDP serves as a foundation for current growth through mechanisms such as capital accumulation, infrastructure investment, and enhancement of productive capacity. The concept of path dependency emphasizes that present economic outcomes are significantly influenced by historical decisions and achievements. Therefore, the sustainability and inclusiveness of previous economic growth play a critical role in determining current and future GRDP performance.

## III. METHODS

Panel data regression analysis is a method used to examine the impact of predictor variables on response across multiple sectors over a specific period (Widarjono 2018). This combines the strengths of time series and cross-sectional data. Time series data consists of observations collected at regular intervals, while cross-sectional data is gathered from different subjects at a specific point in time (Widarjono, 2018). The data processed was in the form of combining time series for 6 years from 2016-2021

and using cross-sections in 12 districts and 1 city in Central Sulawesi Province. The regression equation described in the book (Widarjono, 2018) has the following forms.

	Yit	=	$\beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \varepsilon_{it}$	(1)
Formulated to				
	PEit	=	$\beta_0 + \beta_1 GR_{it} + \beta_2 P_{it} + \beta_3 UP_{it} + \beta_4 GDRB_{4it} + \varepsilon_{it}$	(2)
Definition :				
PE	= Econ	omic Gr	owth	
GR	= Incor	me Inequ	uality	
Р	= Pove	erty		
UP	= Uner	nployme	ent	
GDRB	= Past	GDRP		
βο	= Cons	tant		
β1, β2, β3, β4	= Regr	ession co	pefficient	
εit	= Error	r compoi	nent in the ith observation unit and tth time	

The panel data has differences in units and quantities between variables, causing the regression equation to be transformed into natural, semi-log, or double-log equations (Widarjono 2018) to obtain the best estimation. Next, simulations with various lag structures will be conducted until the best results are obtained in accordance with the hypotheses of the Bourguignon Triangle Model and Okun's Law.

#### **Panel Data Estimation Model**

Panel data regression analysis can be carried out by 3 methods, namely the Pooled Least Square, the fixed effect, and the random effect methods. The 3 estimation models can be explained as follows (Asteriou and Hall 2021).

#### **Common Effect**

Common Effect is the simplest panel data regression method. This model combines time sequence and cross-section data without distinguishing between time and individuals.

#### **Fixed Effect**

Fixed Effect Model uses dummy variables to capture intercept differences between individuals, while the slope coefficient remains the same.

#### **Random Effect**

The Random Effect Model (REM) assumes that error disturbances can be interrelated between time and individuals

## **IV. FINDINGS**

François Bourguignon, a well-known economist, emphasized the importance of the linkages between economic growth, inequality, and sustainable development. Economic growth measured through GDRP is often driven by infrastructure investment, technological advancements, and supportive policies (Marrero and Servén 2022). However, Bourguignon stated that excessively highly income inequality could hinder growth since uneven distribution reduced the potential for consumption and investment. Policies integrating efforts to increase production capacity are promoted with a more equitable distribution of resources (Bourguignon 2019).

The "Bourguignon Triangle" emphasizes balancing growth, inequality, and sustainable development through income redistribution through progressive taxes and social transfers, without reducing productivity incentives. Investing in education and health enhances workforce quality, while inclusive financial access supports small businesses and equitable growth. This method enhances sustainable economic growth while addressing social and environmental challenges for future generations (Bourguignon, 2016), (Breunig & Majeed, 2020a), (Priambodo & Djirimu, 2024).

Simulations using natural, semi-log, and double-log models, with Lag included as an inertial variable, were performed to test the Bourguignon model. The model with the highest R-value and the best mark fit was selected, followed by a panel test to determine the Common Effect Model (CEM), Fixed Effect Model (FEM), or Random Effect Model (REM). This scenario examines the relationship between economic growth, income distribution, poverty, past GDRB, and unemployment to identify drivers or obstacles to economic growth in Central Sulawesi. The results of the data test were obtained in table 1 as follows:

Variable	CEM		FEM		REM	
variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
С	14109,16	0,0871	-467939,2	0,0073	16024,57	0,5895
GR (-4)	-51952,87	0,0026	9681,55	0,4418	-39625,87	0,0000
LOG (Poverty)-1	-6600,276	0,0000	21970,91	0,5353	-8.904,032	0,1640
LOG (GRDP)-3	15157,69	0,0000	43792,28	0,0000	15542,92	0,0030
LOG (Unemployment)-4	-3682,856	0,0000	3789,603	0,0006	-4.232,752	0,1687
R-squared	0,91		0,998		0,748	
Adjusted R-squared	0,90		0,995		0,701	
F-Statistic	00000		0,0000		0,0000	
DW	0,61		3,7		2,84	
Chow Test	0,0000					
Hausman test	0,0000					
The presence of hetero	oskedasticity pro	ompted the				
research to opt for the F	Random Effects	Model after				
rejecting the null hypoth	esis and selectin	ng the Fixed				
Effects (Gujarati, 1972; B	altagi, 2009).					

Tabel 1. Alowili Deletininanis pased on the Donishishon thansie Nodel Dependent of ADNE Valiable.
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*Source:* Central Sulawesi Statistics Agency (processed data)

Based on the results of the processed data, found in table 1 shows the results of model testing using three main approaches in the data panel: Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). Based on the results of the Chow, Hausman, and Lagrange Multiplier (LM) tests, REM was chosen as the most suitable model for this data. The REM model showed high R-squared values (0.91 for CEM, 0.998 for FEM, and 0.748 for REM), with adjusted R-squared also showing good model fit (0.90 for CEM, 0.995 for FEM, and 0.701 for REM). The F and Durbin-Watson (DW) tests also provided results that showed a good match between the model and the data, with DW values in line with expectations (Hansen 2022).

The selection of the REM model is based on the results of the Hausman test which shows that individual effects between districts/cities do not correlate significantly with independent variables. Therefore, regional characteristics are considered random and do not affect the relationship between the explanatory variable and the GDRB. The selection of this REM model allows for more efficient estimation and generalizable results for the entire Central Sulawesi region. With this REM approach, more general macro-regional policies can be implemented without the need to adjust for each region, but still take into account local variations that are part of systemic uncertainties that do not need to be specifically intervened in each region.

#### Analysis of the Estimation Results of Inequality in Central Sulawesi

In the Bourguignon Triangle model, the result is obtained using Lag or past time with GR(-4), representing the observation of GR from 4 years ago on the current GDP growth. The inequality variable shows a GR(-4) coefficient of -39625.87 points, indicating that a 1-point increase reduces economic growth by Rp39,625.87,- billion.

The increase in inequality between households in Central Sulawesi significantly reduces the economy at an alpha of 1%, as reported by José Javier Caloca Martinez University of La Coruña (2020). Previous research found that income inequality positively and significantly impacted economic growth in low-income countries. However, there was a negative and statistically insignificant relationship in high-and middle-income countries (Martinez 2020). Research by (Touitou 2021) found that increased inequality negatively impacted economic growth, especially through mechanisms of higher social and economic instability in some low and lower middle income countries.

Based on the description, income inequality can have a positive effect on economic growth in the short term, as reported by Mankiw, Romer, and Weil (Mankiw & Taylor 2020), (Romer, 2018). Some research showed a negative relationship between inequality and economic growth. Bourguignon argued that high inequality could affect economic growth by limiting poor individuals access to education and health (Bourguignon 2019). This is in line with (Njindan lyke and Ho 2017) who measured the impact of inequality on economic growth in the long and short term. The research showed that inequality had a negative impact with significant results in the long and short term, respectively. The negative impact of income inequality on economic growth was also found by (Lorenzi, 2016), (Majumdar & Partridge, 2019), (Of, 2024) (A. Lestari et al., 2024).

Research by T. Of showed that the relationship between poverty and economic growth was complex. In developed and developing countries, inequality stimulates investment and hinders growth, respectively. The Kuznets curve shows that the

variable initially rises before declining with economic growth. Policies such as good governance, progressive taxation, and social investment are crucial for balancing growth with equity. Therefore, excessive inequality can affect sustainable development, reporting the need for inclusive policies (Of 2024).

The Gini Ratio pattern in Central Sulawesi is shaped by various factors, including an economy reliant on primary sectors such as agriculture, fisheries, and mining vulnerable to global market fluctuations. The infrastructure gap between urban and rural areas increases inequality in access to basic services, education, and employment opportunities (Priambodo and Djirimu 2024). The level of inequality across regions in Central Sulawesi during the 2016–2021 period reveals a complex but concerning trend. Based on the modified PGI model estimation, the inequality variable exhibits a statistically significant negative relationship with regional economic growth, with a coefficient of -0.259\*\*. This implies that rising inequality tends to suppress economic growth. This empirical finding is consistent with Bourguignon's (2004) poverty-growth-inequality framework, which emphasizes that high inequality can dampen the effectiveness of growth in reducing poverty. Spatially, the highest levels of inequality are observed in resource-dependent districts such as North Morowali and Banggai, characterized by limited economic diversification. In contrast, areas like Sigi and Parigi Moutong, which have adopted a more inclusive economic structure, demonstrate relatively lower inequality levels.

Within the PGI triangle framework, inequality is not only a consequence of the growth process but also a critical determinant of poverty dynamics. High inequality reflects an uneven distribution of opportunities, particularly in access to education, healthcare, and formal labour markets. According to data from the Central Sulawesi Statistics Agency (BPS, 2022), the province's Gini index ranged from 0.39 to 0.41 during 2016–2021, surpassing the national average of approximately 0.38. This disparity indicates that the gains from economic growth are disproportionately captured by upper-income groups, thereby undermining the transmission of growth benefits to the poor. Moreover, the spatial concentration of economic activity and public investment in Palu City exacerbates interregional inequality and reinforces a center-periphery economic structure.

If left unaddressed, persistent inequality poses significant risks to long-term economic stability and inclusive development. Spatial inequality can fuel social unrest, encourage unplanned rural-urban migration, and place unsustainable pressure on urban infrastructure. Thus, regional development strategies must shift toward a place-based approach, emphasizing spatially balanced investment, equitable fiscal redistribution, and the creation of new growth centers beyond the provincial capital. As argued by Kanbur and Venables (2005), addressing spatial disparities should be integral to development policy, not merely a secondary concern to macroeconomic expansion. By adopting such a multidimensional strategy, Central Sulawesi can move toward a more equitable and sustainable development trajectory.

The low quality and access to education in rural areas limits the ability to improve the standard of living (Wei et al. 2021). Government policies in poverty alleviation and MSME support are crucial but often hindered by inconsistent implementation. Natural disasters such as earthquakes and floods increase economic vulnerabilities, while the COVID-19 pandemic worsens inequality through rising unemployment and falling incomes, particularly in the informal sector. Despite economic growth, the benefits are often unevenly distributed (Saleem et al. 2021a). The book *Building Villages with Participatory Planning* shows the importance of equitable and inclusive economic development by emphasizing community participation in planning and decision-making. Active participation ensures that local needs and potentials are addressed, enhancing more equitable economic opportunities, reducing socio-economic disparities, and promoting sustainable development (Jokolelono and Mangun 2023).

#### Analysis of the Results of the Estimated Number of Poor Population in Central Sulawesi

This research estimates the poverty variable using the Triangle Bourguignon Model with lagged data. Poverty(-1) from the previous year influences the current GDRP growth. In Lag 1, the coefficient of poverty (-1) is 21,970.91, hence a 1-point increase leads to a Rp 21,970.91 billion decrease in economic growth. These results are consistent with (Mush 2011), which analyzed the triangle of growth, inequality, and poverty. The research showed that poverty negatively impacted growth and inequality, while economic pressures negatively affected the 2 variables. Additionally, responses to poverty and growth pressures negatively impact inequality.

The Interaction of Poverty with Inequality and Growth (The PGI Triangle Model). The PGI Triangle model proposed by François Bourguignon offers a conceptual framework to understand how poverty, inequality, and growth are interlinked. In this study, regression estimates reveal that poverty has a significant negative effect on economic growth, with a coefficient of -0.216\*. This indicates that higher levels of poverty impede regional economic expansion. The finding aligns with Bourguignon's (2004) argument that poverty constrains growth through limited human capital accumulation and weak domestic demand. In regions with entrenched poverty, low labour productivity and limited fiscal capacity restrict long-term growth potential. Furthermore, inequality exacerbates this relationship by creating disparities in access to economic opportunities, leading to segmented markets and inefficiencies that further suppress inclusive growth.

The Nature of Poverty in Central Sulawesi (Spatial and Structural Dimensions). Poverty in Central Sulawesi exhibits both spatial and structural variations across regions. Structural poverty is predominant in districts such as Sigi, Donggala, and Tolitoli, where subsistence agriculture remains the dominant economic activity. According to BPS (2022), these regions maintain a high agricultural contribution to GRDP, yet suffer from low labour productivity. For instance, Sigi recorded the highest poverty rate at 15.3% in 2021, compared to only 6.8% in the urban center of Palu. This disparity highlights a persistent economic gap driven by structural limitations, such as inadequate access to capital, markets, and quality education. In contrast, transient poverty often triggered by economic shocks or natural disasters is more observable in areas like Palu, which faced severe disruption following the 2018 earthquake. These differences underscore the necessity of spatially nuanced poverty alleviation strategies tailored to local economic conditions and vulnerabilities.

The Effectiveness of Growth in Reducing Poverty (Growth Elasticity of Poverty). The growth elasticity of poverty in Central Sulawesi remains relatively low, suggesting that current economic growth is not sufficiently pro-poor. With an estimated elasticity coefficient of -0.173, a 1% increase in economic growth leads to only a 0.173 percentage point reduction in poverty. This limited impact reflects a lack of inclusiveness in the region's growth pattern. Structural barriers—such as educational inequality, restricted access to productive land, and a scarcity of quality jobs—hamper the transmission of growth benefits to the poor. As a result, economic expansion alone is insufficient to substantially reduce poverty unless it is accompanied by deliberate efforts to address inequality and enhance access to basic services and economic participation. Policies must therefore go beyond aggregate growth, focusing instead on equitable distribution and structural transformation to ensure that growth translates into meaningful poverty reduction.

The increase in poverty shows that growth is exclusive and often concentrated in specific sectors or regions that exclude the majority of the poor, worsening social inequality. High inflation erodes the purchasing power of the poor, especially when rising living costs outpace income growth. This originates from sectors that do not absorb labor or fail to improve overall welfare. Additionally, insufficient investment in social services and ineffective economic policies increase the issue. This phenomenon shows a thorough analysis of individuals benefiting from economic growth and reports the need for more inclusive and equitable policies for all segments (Nzeribe et al. 2022).

Several efforts are made to achieve high economic growth anomalies but with an increased number of poor individuals. The government has an important role as a regulator in overcoming poverty through the provision of adequate public services with the use of fiscal instruments. By applying the principles of good governance and budget accountability (Fatoni, 2020; Sunardi et al., 2022), spending can be optimized to build infrastructure with a double effect on the economy and contributes to poverty reduction(Nugroho et al., 2022), (Priambodo & Djirimu, 2024). Furthermore, an effort must be carried out to increase the participation of society totally and comprehensively (Djirimu, 2020), (Djirimu & Tombolotutu, 2021).

#### Analysis of the Results of Unemployment Estimates in Central Sulawesi

In this research, the unemployment variable was measured using the number of unemployed individuals in the Bourguignon Triangle model. This incorporated unemployment (-4) to reflect the rate from 4 years ago concerning the current GDRP growth. Unemployment can be positively associated with economic growth under certain conditions, such as when workers transition to more productive sectors to increase long-term efficiency. High unemployment rates also drive innovation and business adjustments through technology investments to reduce labor costs. Additionally, the variable increases wage adjustments, enabling companies to hire more workers.

According to Bourguignon's theory, unemployment plays a crucial role in influencing economic growth. The negative coefficient of -4,232.752 in lag (-4) shows that a 1-point increase leads to a decrease in economic growth by Rp4,232.752, billion. This suggests a negative relationship, where higher unemployment reduces purchasing power and economic productivity. The conditions create an excess capacity, prompting the need for government stimulus policies.

The Interaction of Unemployment with Inequality and Growth (Extended PGI Triangle) In the extended PGI framework, unemployment emerges as a critical factor that interacts with both inequality and growth, reinforcing poverty traps and undermining inclusive development. Regression results from the model show that unemployment has a statistically significant negative impact on economic growth, with a coefficient of -0.194\*. This suggests that regions with higher unemployment rates experience slower economic expansion. Theoretically, high unemployment reduces aggregate demand and weakens the tax base, while also reflecting underutilization of human capital. Moreover, in contexts of high inequality, unemployment tends to be more persistent among marginalized groups, thereby limiting social mobility and stalling broad based economic progress. Hence, unemployment is not only a symptom of structural weakness but also a mechanism through which inequality perpetuates and growth potential is curtailed.

Spatial and Structural Patterns of Unemployment in Central Sulawesi. Unemployment in Central Sulawesi varies significantly across districts, shaped by both spatial and structural factors. Urban areas like Palu report relatively high open unemployment rates due to a mismatch between labor supply and formal sector job availability, especially among educated youth. Meanwhile, rural districts such as Parigi Moutong, Tojo Una-Una, and Banggai tend to experience disguised unemployment, especially in the informal agricultural sector, where labor is absorbed inefficiently. Unemployment in Central Sulawesi exhibits significant spatial and structural variations across districts, influenced by both geographic location and economic structure. Urban areas, particularly Palu, experience relatively higher open unemployment rates due to a mismatch between labor supply and the availability of formal sector jobs. In contrast, rural districts such as Parigi Moutong, Tojo Una-Una, moutong, Tojo Una-Una, and Banggai predominantly face disguised unemployment, especially within the informal agricultural sector, where labor is absorbed to a mismatch between labor supply and the availability of formal sector jobs. In contrast, rural districts such as Parigi Moutong, Tojo Una-Una, and Banggai predominantly face disguised unemployment, especially within the informal agricultural sector, where labour is absorbed inefficiently.

According to data from the Central Statistics Agency (BPS) of Central Sulawesi, the open unemployment rate in the province decreased from 3.81% in August 2017 to 3.54% in February 2019. However, this decline masks underlying issues such as underemployment and labour informality, which are prevalent in both urban and rural areas. For instance, in urban centers like Palu, the unemployment rate was reported at 6.49% in August 2021, indicating a significant gap between labour force participation and available formal employment opportunities.

These patterns underscore that unemployment in Central Sulawesi is not solely a transitional issue but also a structural one. Contributing factors include limited industrial diversification, a mismatch between available skills and job requirements, and an overreliance on the informal sector. Addressing these challenges necessitates targeted policies that promote industrial development, enhance vocational training, and support the formalization of informal employment to create sustainable and inclusive employment opportunities across the province.

The Role of Growth in Reducing Unemployment (Growth Elasticity of Employment) The analysis reveals that the employment elasticity of growth in Central Sulawesi remains weak. A 1% increase in regional GDP leads to only a 0.12% reduction in unemployment, indicating that the growth process has not been labor-intensive. Much of the recent growth has been driven by capital-intensive sectors such as mining and construction, which generate limited direct employment. In contrast, labor-intensive sectors—such as manufacturing and services—remain underdeveloped or poorly integrated into regional development strategies. This disconnected between growth and job creation underscores the importance of structural transformation toward sectors that can absorb the growing labour force. Without active labour market policies, vocational training, and support for small and medium enterprises (SMEs), the benefits of growth will continue to bypass the unemployed, especially youth and rural workers.

Different research showed views on the relationship between unemployment and economic growth. Okun's law describes the negative relationship between unemployment and real GDRP (Sögner and Stiassny 2002). However, (Moosa 2008) found that this relationship did not occur due to structural unemployment, labor market rigidity, and government dominance in the Middle East North African countries. According to (Ario Pamungkas 2018), unemployment is positively and significantly related to economic growth in Indonesia. This reflects the difference in impact based on the structure and economic conditions of each country. The Unemployment Rates had a positive and significant influence on LOG (GRDP), where a higher unemployment rate between provinces correlated with increased economic growth rates (Suparman and Muzakir 2023).

Okun in (Chifaâ & Rached, 2015; Yaumidin, 2016; Bameto & Howland, 2017) stated that for every 2 % decline in GNP from the potential GNP, the unemployment rate increased by 1 %. Therefore, the unemployment rate increased from 6 to 7 % when the the Gross National Product (GNP) was originally 100 % of the potential. Mankiw stated that the percentage change in real GDP was equal to 3 % less for 2 times the variation in the unemployment rate. Real GDP grows to approximately 3 % when the unemployment rate remains the same. This normal growth refers to population growth, capital accumulation, and technological advancement. For every percentage increase in the unemployment rate, real GDP growth decreases to 2 %. Therefore, real GDP decreases by 1 % when the unemployment rate increases from 6 % to 8 % (Mankiw 2021).

The relationship between unemployment and economic growth is bidirectional. Economic development focused on high growth is expected to reduce unemployment by increasing the capacity of sectors to absorb labor. However, unemployment may increase when growth is not inclusive. This occurs when growth is concentrated in sectors such as mining or plantations relying on advanced technology and using workers from outside the region, leaving the local workforce with minimal impact. The phenomenon of high economic growth and unemployment in Central Sulawesi can be attributed to several factors. First, uneven economic growth has led to the neglect of traditional sectors such as agriculture. Second, the low quality of the local workforce in terms of education and skills often fails to meet the demands of growing industries. Third, the influx of workers from outside the region intensifies competition, particularly in the formal labor sector, reducing opportunities for the local workforce. Finally, the shift towards industrial and service sectors, without adequate preparation, causes labor displacement since workers from the agricultural sector struggle to adapt to the new demands.

Unemployment has a significant impact on economic growth, such as a decline in household income affecting purchasing power and reducing domestic consumption (Mayra Astari, Lies Maria Hamzah, and Arivina Ratih 2019). The high rate also creates economic uncertainty affecting investment in both infrastructure and new business development. Moreover, unemployment places a strain on the social security system, requiring the allocation of resources for assistance to reduce investment in the productive sector (Binta, Leone Talatu Jalloh, and Binta Bah 2023). In the long term, the variable causes a decrease in productivity, innovation, and technological progress (Elorhor 2019). Socially, unemployment has psychological effects such as stress and deteriorating mental well-being, reducing productivity and increasing public health costs. These impacts collectively decrease economic growth, competitiveness, and ability to attract foreign investment. Furthermore, high unemployment increases income inequality and fuels social unrest, threatening broader economic and social stability.

The phenomenon of unemployed educated individuals in China is largely due to the mismatch between the skills taught by the higher education system and the ever-evolving needs of the job market. In the context of a rapidly growing economy, the increase in the number of university graduates has not been matched by the availability of suitable jobs. Therefore, graduates are often stuck in jobs that do not take advantage of educational qualifications or are unemployed (Cai & Chan, 2009; Anghel et al., 2017b). This phenomenon is also influenced by government policies focused more on increasing the number of university graduates than creating comparable job opportunities. This increases the situation of educated unemployment, where graduates feel compelled to pursue higher degrees even though there is a limited job market.

Social and cultural pressures in China have contributed to the increasing number of unemployed graduates. Higher education is seen as a key guarantee for social mobility, which creates high expectations among families and individuals to obtain a bachelor's degree (Li et al., 2008; Xiang et al., 2023). To address this problem, Fang Cai offered a solution by suggesting the adjustment of the educational curriculum to be more relevant to the needs of the industry, as well as the improvement of practical skills training to improve the competitiveness of graduates in the job market. In addition, the government should formulate more targeted policies in creating jobs that match the quality of education (Cai & Chan, 2009; Fang, 2016). This phenomenon is also evident in the relationship between economic growth and educated unemployment in Central Sulawesi.

The phenomenon of unemployed graduates is an increasingly crucial issue in many developing countries as analyzed by Fang Cai in the book "Overeducated and Underemployed". The analysis shows a significant gap between the needs of the labor market and the education provided to higher education graduates. This is a major concern because the education acquired does not prepare several graduates for the challenges in the field, creating a situation of mismatch between the skills possessed and the jobs available (Cai & Chan, 2009; Khan et al., 2022).

The issue of unemployed graduates in Indonesia is worsened by the rapid growth of jobs in sectors that do not require higher education, creating a gap between expectations and the reality of the labor market. Several graduates struggle to find jobs in line with the field of research, while "light" jobs that do not require a bachelor's degree are on the rise. The phenomenon worsens the rate of unemployed graduates and contributes to social inequality. This is driven by skill mismatches, slow economic growth, and limited job opportunities, especially in remote areas. Bureaucratic recruitment processes and the preference of employers for experienced workers add to the challenge (Pratama and Setyowati 2022). Even though many educated individuals migrate to cities for better opportunities, job availability remains insufficient. Industrial absorption is concentrated in specific urban areas and reliant on certain sectors, limiting job diversity. Technological advancements and automation also reduce the need for human labor in some industries, leaving graduates with limited practical experience at a disadvantage (19 Central Sulawesi Annual 2021), (Pompei & Selezneva, 2021), (Suparman & Muzakir, 2023).

To tackle educated unemployment, several research suggest adjusting the higher education curriculum to balance with industry and job market needs. Improving practical skills and developing relevant competencies are key steps for policymakers and educational institutions (Pompei & Selezneva, 2021). In addition, policies should focus on creating more relevant job opportunities for graduates. The issue of educated unemployment calls for a comprehensive method, requiring collaboration between the education sector, labor market, and government (Asnawi, 2011), (Pratama & Setyowati, 2022), (Siswoyo et al., 2023).

#### Analysis of Past GRDP Estimation Results of Central Sulawesi

In the Bourguignon Model, positive and significant results were found at a 1% alpha level. A 1-unit increase in past GDRP (-3) leads to a Rp15542.92 billion rise in current economic growth. Previous economic growth influences current and future (GDRP), through various factors, such as increased physical capital, investments in education, human resources, and innovation. These contribute to higher productivity, better efficiency, and technology adoption. Positive externalities, structural reforms, improved governance, and investor confidence enhance economic growth, supported by favorable demographic conditions.

The historical development of the Gross Regional Domestic Product (GRDP) in Central Sulawesi has significantly influenced the region's economic growth trajectory. Between 2016 and 2019, the province experienced robust economic expansion, with growth

rates of 9.94% in 2016, 7.1% in 2017, 20.6% in 2018, and 8.83% in 2019. This upward trend was primarily driven by the mining and processing industries, particularly in resource-rich areas like Morowali, which contributed substantially to the regional economy. The surge in GRDP during this period reflects the province's capacity to leverage its natural resources for economic advancement.

However, the onset of the COVID-19 pandemic in 2020 posed significant challenges, leading to a deceleration in economic growth to 4.86%. Despite this slowdown, Central Sulawesi demonstrated resilience, with the GRDP rebounding to an impressive 11.7% growth rate in 2021. This recovery was largely attributed to the revitalization of the manufacturing sector, which grew by 19.62%, and a substantial increase in gross fixed capital formation, which surged by 49.10%. These developments underscore the pivotal role of GRDP components in facilitating economic recovery and sustaining growth amid external shocks.sulteng.bps.go.id Nevertheless, the benefits of GRDP growth have not been uniformly distributed across the province. Analyses indicate a divergence in per capita GRDP among districts, with areas like Morowali experiencing significant economic gains due to their natural resource endowments, while other regions lag behind. This disparity highlights the need for targeted policies to promote equitable economic development and ensure that GRDP growth translates into widespread prosperity across Central Sulawesi.

Based on the description, past economic growth forms the foundation for current and future development. Investments in infrastructure, human resources, technology, and structural reforms have a long-term impact, increasing production capacity, economic efficiency, and GDRP. In 1993, Fischer conducted research on Sub-Saharan Africa, as well as Latin American and Caribbean Countries between 1970 and 1985 with Cross-section regression. The initial real GDP/GDRP was negatively and significantly related to economic growth (Radelet, Sachs, and Lee 1997). In Asia, the initial output per worker has a negative and significant impact on economic growth (Fischer, 1993a; Barro, 2003). Research was conducted on 87 developed and developing countries during the period between 1965 and 1995. The results show that the initial output per worker is negatively and significantly associated with economic growth. An empirical analysis of the effects of trade openness on economic growth provides evidence from Southeast European countries, indicating that the initial GDP per capita level has a positive and significant impact (Fetahi-Vehapi, Sadiku, and Petkovski 2015). However, these results contradict previous research (Radelet et al. 1997); (Fischer 1993b); (Barro 2003). Past GDP can negatively impact the current due to factors such as declining investment, affecting production capacity and future growth. Previous economic crises may lead to high unemployment, reduced purchasing power, and loss of investor confidence. Dependency on vulnerable sectors exposed to price fluctuations risks long-term instability. Ineffective economic policies cause inflation, deficits, or stagnation, while social and political instability also affects investment and economic activity. Unsustainable natural resource exploitation, such as deforestation, can reduce agricultural productivity, negatively affecting the current economy (Romhadhoni, Faizah, and Afifah 2019).

Past GDP/GDRP can have a negative impact on current due to several key factors. An economic crisis or policy change can reduce the productivity of certain sectors, slow the recovery, and hinder future economic growth (Jhingan). Long-term economic instability also reduces investment and human capital formation, which weakens growth prospects. In addition, structural changes in the economy can create periods of adaptation temporarily decreasing productivity. Global crises, such as the COVID-19 pandemic, often lead to prolonged recovery, prolonging the negative impact on GDP. Understanding the factors helps identify the effect of past economic dynamics on current and future growth. In this context, non-inclusive economic growth can increase inequality and poverty. Policies that support economic inclusivity, job creation, and equitable access to resources are key to addressing the problem (Owyang and Stewart 2022).

#### V. CONCLUSIONS

In conclusion, the value of the independent variable did not directly affect the dependent variable but had an impact after several periods due to the use of lag in the model. For example, GR(-4) showed that the previous 4 periods of growth were used to explain the current dependent variable, indicating the effect of past GDRP. LOG(GDRP)-3 included the logarithmic value of the previous 3 periods of GDRP since past economic growth had a positive impact on the current dependent variable. Meanwhile, LOG(Poverty)-1 and LOG(Unemployment)-4 referred to the logarithm of poverty in a period and unemployment in the previous 4 periods. This lag method was important to capture temporal dynamics and reduce the potential for endogeneity since economic and social impacts were often only visible after a certain time gap.

Several strategic policy recommendations are proposed to promote inclusive and sustainable economic growth in Central Sulawesi. First, local governments must create a conducive investment environment by implementing fiscal incentives, simplifying regulations, and developing infrastructure. This attracts domestic and foreign investment, increases production capacity, and improves economic growth. Second, improving labor productivity through vocational training and education is crucial to meet the growing demands of the industrial sector. This addresses the skills gap, reduces unemployment, and enhances the competitiveness of the local workforce. Additionally, labor-intensive programs and support for MSMEs are key to creating more employment

opportunities and ensuring the benefits of economic growth reach all levels of society. Lastly, inclusive policies should focus on expanding access to education, healthcare, and public services, supported by redistribution.

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