

A Study of Economic Growth, Labor Force, and the Open Unemployment Rate in Sigi Regency During 2011-2024

Ein Blesia Nela^{1*}, Calvin A. Parinding², Rita Yunus³, Mohamad Ichwan⁴, Rita Suirlan⁵, Suparman⁶

^{1,2,3,4,5,6}Department of Economics and Development Studies, Tadulako University, Indonesia

*e-mail: einblesianela@gmail.com¹

(Received: July 23, 2026; Revised: July 26, 2026; Accepted: August 23, 2026)

ABSTRACT

The movement patterns among economic growth, labor force, and unemployment in Sigi Regency are not always aligned, raising questions about how sensitive changes in economic growth and the labor force are to unemployment, and about the causal relationships among these variables. This study aims to analyze the causal relationships between economic growth and unemployment and between the labor force and unemployment, and to analyze the elasticity of economic growth and the labor force with respect to unemployment in Sigi Regency during 2011-2024. The data used are secondary annual time series data sourced from Statistics Indonesia, comprising Gross Regional Domestic Product at Constant Prices, the number of the labor force, and the open unemployment rate. The analytical methods used are the Granger causality test and elasticity analysis with the aid of EViews 13 software. The results indicate that no bidirectional causality was found between economic growth and unemployment, nor between the labor force and unemployment in Sigi Regency, although a one-way causality was found from economic growth to the labor force. The elasticity of economic growth with respect to unemployment fluctuated, ranging from -14.9893 to 24.2146, with most years showing negative values consistent with Okun's Law. The elasticity of the labor force with respect to unemployment also varied widely, from -26.0182 to 1460.3663, dominated by negative values reflecting the labor market's capacity to absorb additional labor. These findings affirm that the relationship between economic growth and unemployment at the regional level is contextual and influenced by the local economic structure.

Keywords: Economic growth, Elasticity, Granger causality, Labor force, Unemployment

This is an open access article under the CC BY-SA license



INTRODUCTION

Unemployment is one of the fundamental problems in economic development, particularly in developing countries such as Indonesia. Open unemployment refers to that part of the labor force that is actively seeking work but has not yet obtained it. This condition is closely related to the working-age population (15 years and over), which is divided into the labor force and those not in the labor force; the labor force consists of those who are working and those who are seeking work, while those not in the labor force include students, homemakers, and retirees. A high unemployment rate reflects the suboptimal absorption of labor in a region's economy.

Economic growth plays an important role in efforts to create jobs and reduce unemployment. Sukirno (2002) states that high and sustained economic growth can raise the standard of living of society through the expansion of employment and the equalization of income. Positive economic growth indicates an increase in the production of goods and services, which is reflected in the rise of Gross Regional Domestic Product (GRDP). However, the relationship between economic growth, the labor force, and unemployment at the regional level does not always move in tandem, making it interesting to examine empirically.

Sigi Regency faces employment dynamics reflected in the fluctuations of the Open Unemployment Rate (OUR) during 2011-2024. Data from Statistics Indonesia show that the OUR of Sigi Regency reached its highest point in 2018 at 3.73 percent, then fell to its lowest point in

2021 at 2.38 percent, and rose again to 2.60 percent in 2023. This condition occurred alongside a consistent increase in the Labor Force Participation Rate (LFPR), from 69.36 percent in 2018 to 70.94 percent in 2023 (BPS Sulawesi Tengah, 2024).

Meanwhile, the economic growth of Sigi Regency also shows significant fluctuations. After experiencing a contraction to -1.50 percent in 2020 due to the Covid-19 pandemic, Sigi's economy rebounded, recording its highest growth of 5.66 percent in 2021, but then slowed to 3.33 percent in 2022 and 3.37 percent in 2023 (BPS Sulawesi Tengah, 2024). The phenomenon of fluctuating unemployment amid a rising trend in the LFPR and diverse economic growth dynamics raises the question of how these three variables are causally related.

Structurally, the economy of Sigi Regency is still dominated by the agriculture, forestry, and fisheries sector, with an average contribution of about 41.53 percent to GRDP during 2019-2023, while the manufacturing industry sector contributes only about 2 percent (BPS, 2024). The dominance of a traditional agricultural sector that is labor-intensive but less productive may cause aggregate economic growth to be less effective in driving the absorption of formal labor and reducing unemployment. It is this structural characteristic that makes the study of the relationship among economic growth, the labor force, and unemployment in Sigi Regency relevant and important.

The research gap in this study stems from differences in previous empirical findings. Some studies found bidirectional causality consistent with Okun's Law, while others, such as Nisa (2023) and Cendana (2019), found no bidirectional causality between economic growth and unemployment. In addition, studies that specifically combine the Granger causality test and elasticity analysis to examine the relationship among economic growth, the labor force, and unemployment at the regency level with an agriculture-based economic structure, particularly Sigi Regency, are still limited. The novelty of this study lies in combining the Granger causality approach and annual elasticity for the 2011-2024 period, which covers the times before, during, and after the Covid-19 pandemic. To fill this gap, this study aims to analyze the causal relationships between economic growth and unemployment and between the labor force and unemployment, and to analyze the elasticity of economic growth and the labor force with respect to unemployment in Sigi Regency during 2011-2024.

LITERATURE REVIEW

Economic growth is the process of increasing the real output or income of an economy in the long run, commonly measured through the development of Gross Regional Domestic Product. Boediono (1999) views economic growth as the process of increasing per capita output in the long run, whereas Sukirno (2013) emphasizes that economic growth reflects an increase in an economy's capacity to produce goods and services. Regional economic growth is measured through GRDP at Constant Prices, which removes the effect of price changes so that it reflects the change in real production volume.

The labor force is the working-age population that is working or seeking work. Simanjuntak (2001) explains that the quantity and quality of the labor force are important factors determining an economy's production capacity. Growth of the labor force that is not matched by an expansion of employment opportunities can generate unemployment pressure, as Malthus explained that when the labor population grows faster than production, real wages tend to fall and unemployment rises (Azizah, 2016).

Unemployment is defined as the condition of a person who belongs to the labor force and wants work but has not yet obtained it. Sukirno (2013) distinguishes unemployment by its causes, namely frictional, structural, and cyclical unemployment. In developing countries, unemployment tends to be dominated by the structural and frictional types, which stem from a mismatch between the skills of the workforce and market needs, so that it is not always cyclical in following the movement of output (Moosa, 2008).

Okun's Law (Okun, 1962) is the main theoretical foundation linking economic growth and unemployment. This law states that there is a negative relationship between output growth and the unemployment rate, namely that an increase in economic growth tends to be followed by a decline in unemployment. However, the magnitude of the Okun coefficient is contextual; Moosa (2008) shows that the Okun coefficient tends to be higher in developed countries than in developing countries because of differences in the structural characteristics of the economy, so that the relationship is not always confirmed in regions with an economic structure based on the primary sector.

This theoretical foundation is supported by a number of empirical findings. Nisa (2023) and Cendana (2019) found that there is no bidirectional causality between economic growth and unemployment, explaining that an increase in GRDP does not necessarily reduce unemployment when growth is supported by sectors that are not labor-intensive. Kartika and Muslim (2021) and Nurinnisa (2024) examined the effect of the labor force on unemployment with varied results depending on regional characteristics. This diversity of findings affirms that the relationships among employment variables are contextual, so that causality and elasticity approaches at the regency level become relevant for revealing the actual pattern of the relationship.

Hypotheses

Based on the theoretical and empirical review, the research conjectures are formulated as follows. Ha_1 : there is a causal relationship between economic growth and unemployment in Sigi Regency during 2011-2024. Ha_2 : there is a causal relationship between the labor force and unemployment in Sigi Regency during 2011-2024. In addition, this study analyzes the elasticity of economic growth and the labor force with respect to unemployment to measure the degree of sensitivity of unemployment to changes in these two variables.

METHOD

This study uses an associative research type, namely research that aims to determine the relationship between two or more variables (Sugiyono, 2017). The research location is Sigi Regency, with the research object being economic growth, the labor force, and unemployment during 2011-2024. The choice of location is based on interesting employment dynamics, reflected in the fluctuations of the OUR amid a rising trend in the LFPR and diverse economic growth dynamics, particularly after the Covid-19 pandemic, as well as the availability of reliable data from Statistics Indonesia.

The type of data used is secondary data in the form of annual time series for the 2011-2024 period (Ahyar et al., 2020), comprising GRDP at Constant Prices as a proxy for economic growth, the number of the labor force, and the open unemployment rate of Sigi Regency. The data are sourced from official reports and documents of the Statistics Indonesia offices of Central Sulawesi Province and Sigi Regency. Data collection was carried out through library research and documentation of relevant official publications (Zed, 2004).

The analytical methods used are the Granger causality test and elasticity analysis with the aid of EViews 13 software. The Granger causality test is used to examine whether a variable has a two-way or only a one-way relationship with another variable (Widarjono, 2018). The causality model in this study links unemployment with economic growth and unemployment with the labor force, placing each variable as a function of its own lagged values and the lagged values of the other variable, formulated as follows.

Economic growth and unemployment causality model:

$$\begin{aligned} Unemployment_t &= \alpha_0 + \sum \alpha_{1i} Unemployment_{t-i} + \sum \alpha_{2i} EG_{t-i} + \varepsilon_t \\ EG_t &= \beta_0 + \sum \beta_{1i} EG_{t-i} + \sum \beta_{2i} Unemployment_{t-i} + \varepsilon_t \quad (1) \end{aligned}$$

Labor force and unemployment causality model:

$$Unemployment_t = \gamma_0 + \sum \gamma_{1i} Unemployment_{t-i} + \sum \gamma_{2i} LF_{t-i} + \varepsilon_t \quad (2)$$

$$LF_t = \delta_0 + \sum \delta_{1i} LF_{t-i} + \sum \delta_{2i} Unemployment_{t-i} + \varepsilon_t \quad (3)$$

where $Unemployment_t$ is the number of unemployed, EG_t is economic growth proxied by GRDP, LF_t is the number of the labor force during 2011-2024; α , β , γ , and δ are the regression coefficients; i is the lag length; and ε_t is the error term.

Before the Granger causality test, three stages of testing were conducted to ensure the validity of the time series data analysis. First, a stationarity test using the Augmented Dickey-Fuller (ADF) test, with the criterion that data are stationary if the ADF probability is smaller than 0.05, in order to avoid spurious regression. Second, the determination of the optimal lag length using the Akaike Information Criterion (AIC) by selecting the smallest AIC value. Third, Vector Autoregressive (VAR) estimation to observe the relationships among variables in the system of equations before the causality test is carried out (Gujarati, 2015; Widarjono, 2018).

Elasticity analysis is used to measure the degree of sensitivity of unemployment to changes in economic growth and the labor force. Elasticity is calculated as the ratio of the percentage change in the number of unemployed to the percentage change in GRDP for the elasticity of economic growth, and to the percentage change in the labor force for the elasticity of the labor force, formulated as follows.

$$E_{(EG-Unemployment)} = (\Delta Unemployment / Unemployment) / (\Delta GRDP / GRDP) \quad (4)$$

$$E_{(LF-Unemployment)} = (\Delta Unemployment / Unemployment) / (\Delta LF / LF) \quad (5)$$

An elasticity value greater than one is classified as elastic, a value between zero and one is classified as inelastic, while a negative sign indicates an opposite-direction relationship consistent with Okun's Law, namely that an increase in economic growth or in the absorption of the labor force is followed by a decline in unemployment.

RESULTS AND DISCUSSION

Research Results

The initial stage of the Granger causality analysis is the data stationarity test using the Augmented Dickey-Fuller test. The test results show that all variables, namely economic growth, the labor force, and unemployment, are not stationary at the level, but become stationary after the differencing process. The probability values of all variables after differencing are smaller than 0.05, for example the probability of unemployment at 0.0000, so that the null hypothesis of a unit root is rejected and the data are declared stationary and suitable for further analysis.

The determination of the optimal lag length was carried out using the Akaike Information Criterion. Although the lowest AIC value was found at lag 0, that lag cannot be used because Granger causality analysis requires at least one lag period. Based on the support of all lag selection criteria (AIC, SC, HQ, FPE, and LR), lag 2 was chosen as the optimal lag that meets the technical requirements for VAR estimation and the Granger causality test. The VAR estimation subsequently becomes the basis for conducting the Granger causality test.

The results of the Granger causality test are presented in Table 1. No causal relationship was found between economic growth and unemployment, because the probability of the effect of economic growth on unemployment is 0.6393 and of unemployment on economic growth is 0.4187, both greater than 0.05. Likewise, no causal relationship was found between the labor force and unemployment, with the probability of the labor force on unemployment at 0.5855 and of unemployment on the labor force at 0.7253. Conversely, a one-way causal relationship was found from economic growth to the labor force, indicated by the probability of economic growth on the labor force of 0.0459 (< 0.05), while the reverse direction is insignificant (probability 0.6761).

Table 1. Granger Causality Test Results

Null Hypothesis	F-Statistic	Probability	Decision
Economic growth does not cause unemployment	0.23356	0.6393	Fail to reject H0
Unemployment does not cause economic growth	0.71134	0.4187	Fail to reject H0
Labor force does not cause unemployment	-	0.5855	Fail to reject H0
Unemployment does not cause labor force	-	0.7253	Fail to reject H0
Economic growth does not cause labor force	-	0.0459	Reject H0
Labor force does not cause economic growth	-	0.6761	Fail to reject H0

Source: Secondary data processed with EViews 13 (2025)

Based on the test results in Table 1, the estimated Granger causality equations can be expressed by inserting the resulting test statistics as follows. For the economic growth and unemployment model, the F-statistics and probabilities are obtained as in equation (5), while for the labor force and unemployment model and the relationship between economic growth and the labor force, equations (6) and (7) are obtained.

$$\begin{aligned}
 EG \rightarrow Unemployment: F = 0.23356; p = 0.6393 \quad Unemployment \rightarrow EG: F = 0.71134; p = 0.4187 \quad (6) \\
 LF \rightarrow Unemployment: p = 0.5855 \quad Unemployment \rightarrow LF: p = 0.7253 \quad (7) \\
 EG \rightarrow LF: p = 0.0459 \text{ (significant)} \quad LF \rightarrow EG: p = 0.6761 \quad (8)
 \end{aligned}$$

The Vector Autoregressive (VAR) estimation underlying the causality test shows that, in the unemployment equation, the coefficient of the logarithm of the labor force is negative at -5.708, meaning that an increase in the labor force tends to be followed by a decline in unemployment in logarithmic form. The probability values in equations (5) and (6), all greater than 0.05, confirm the absence of bidirectional causality between economic growth and unemployment and between the labor force and unemployment, while the probability of 0.0459 in equation (7) confirms the presence of one-way causality from economic growth to the labor force.

The elasticity analysis of economic growth with respect to unemployment during 2011-2024 produced values that fluctuate from year to year, as presented in Table 2. There are eleven years showing an elastic relationship (absolute value greater than one) and three years that are inelastic. The negative elasticity values in 2011, 2012, 2017, 2018, 2019, 2020, 2021, and 2023 show a relationship consistent with Okun's Law, namely that an increase in economic growth is followed by a decline in unemployment. For example, in 2020 the elasticity value was -14.9893, meaning that every one percent increase in economic growth is estimated to reduce unemployment by about 14.99 percent.

Table 2. Elasticity of Economic Growth with Respect to Unemployment in Sigi Regency, 2011-2024

Year	Elasticity Value	Interpretation
2011	-3.4329	Elastic
2012	-8.6890	Elastic
2013	24.2146	Elastic
2014	0.2108	Inelastic
2015	9.1443	Elastic
2016	0.0000	Inelastic
2017	-0.6322	Inelastic
2018	-5.9384	Elastic
2019	-7.8926	Elastic
2020	-14.9893	Elastic
2021	-4.8235	Elastic
2022	9.5067	Elastic
2023	-2.4545	Elastic
2024	1.8627	Elastic

Source: Secondary data processed (2025)

The elasticity analysis of the labor force with respect to unemployment during 2011-2024 also produced widely varying values, as presented in Table 3. Ten years are classified as elastic and four years as inelastic. The negative elasticity values in 2011, 2018, 2019, 2021, and 2023 show that an increase in the number of the labor force is followed by a decline in unemployment, reflecting effective labor absorption. The very high elasticity value in 2013 of 1460.3663 is caused by a large change in unemployment relative to a very small change in the labor force in that year, resulting in an extreme elasticity figure.

Table 3. Elasticity of the Labor Force with Respect to Unemployment in Sigi Regency, 2011-2024

Year	Elasticity Value	Interpretation
2011	-4.0092	Elastic
2012	9.8896	Elastic
2013	1460.3663	Elastic
2014	0.2786	Inelastic
2015	71.1215	Elastic
2016	0.0000	Inelastic
2017	-0.7569	Inelastic
2018	-8.2569	Elastic
2019	-26.0182	Elastic
2020	10.1710	Elastic
2021	-10.2641	Elastic

2022	8.2749	Elastic
2023	-1.3127	Elastic
2024	0.7279	Inelastic

Source: Secondary data processed (2025)

Discussion

The Granger causality test results show no bidirectional causality between economic growth and unemployment in Sigi Regency, because the probabilities of both directions of effect are greater than 0.05. This finding differs from Okun's Law, which generally states that there is a relationship between the two variables, but it is consistent with the findings of Nisa (2023) and Cendana (2019), who also found no bidirectional causality between economic growth and unemployment. This indicates that an increase in economic growth does not necessarily reduce unemployment, because other factors, such as investment and the structure of employment, also determine the employment situation.

The absence of this causal relationship can be explained by the structural characteristics of the economy of Sigi Regency. The regional economic structure is still dominated by a traditional agricultural sector that is subsistence in nature and less reactive to macroeconomic growth; the distribution of GRDP at Current Prices for 2019-2023 shows that the agriculture, forestry, and fisheries sector consistently dominates, with an average contribution of 41.53 percent, while the manufacturing industry accounts for only about 2 percent (BPS, 2024). The dominance of a labor-intensive but less productive agricultural sector causes aggregate economic growth to be less effective in driving the absorption of formal labor and reducing unemployment.

Moosa (2008) proposes three reasons why the relationship between economic growth and unemployment may deviate from Okun's Law, particularly in developing countries. First, unemployment tends to be non-cyclical because it is dominated by structural or frictional unemployment resulting from a mismatch between the skills of the workforce and market needs. Second, rigidity in the labor market limits the flexibility of labor demand. Third, an economic structure centered on sectors that are not labor-intensive makes economic growth less impactful on reducing unemployment. These three factors are relevant to the condition of Sigi Regency, so that the Okun coefficient in this region tends to be weak.

The Granger causality test results also show no causal relationship between the labor force and unemployment, whether one-way or two-way, because the probabilities of both directions of effect are greater than 0.05. This finding does not align with the common assumption that a large labor force directly increases unemployment. This can be understood because the absorption of the labor force in Sigi Regency largely occurs in the agricultural and informal sectors, which can accommodate additional labor without being directly reflected as a change in open unemployment, so that the causal relationship becomes statistically weak.

Although there is no direct causality between economic growth and unemployment, a one-way causality from economic growth to the labor force was found. This shows that economic growth affects the dynamics of the labor force, for example through the expansion of economic activity that encourages labor force participation, even though that effect is not yet strong enough to directly reduce open unemployment. This finding reinforces the argument that the transmission from economic growth to the labor market in Sigi Regency operates through the channel of labor force participation, rather than directly through a reduction in unemployment.

The elasticity analysis reinforces the interpretation of the causality results. The elasticity of economic growth with respect to unemployment, which fluctuates between -14.9893 and 24.2146, shows that the sensitivity of unemployment to economic growth is inconsistent across years. The dominance of negative values in most years affirms that the direction of the relationship is generally consistent with Okun's Law, but the presence of positive values in some years, such as 2013, 2015, and 2022, shows that in certain periods an increase in economic growth

actually coincided with an increase in unemployment, which may be triggered by growth that is not labor-intensive or by the entry of additional labor force into the market.

The elasticity of the labor force with respect to unemployment, which varies from -26.0182 to 1460.3663, also reflects a non-uniform pattern. The dominance of negative values shows that an increase in the labor force is generally followed by a decline in unemployment, indicating the regional labor market's capacity to absorb additional labor, especially through the agricultural and informal sectors. The extreme elasticity value in certain years, such as 2013, is more a technical consequence of a very small change in the labor force as the denominator, so that it must be interpreted cautiously and not taken as a genuine surge in sensitivity.

Overall, the findings of this study affirm that the relationship among economic growth, the labor force, and unemployment at the regional level is contextual and strongly influenced by the local economic structure. In an economy dominated by the primary sector such as Sigi Regency, economic growth has not become a direct driver of reduced unemployment, so that employment policy cannot rely solely on aggregate growth. The practical implication is that efforts to reduce unemployment need to be directed toward economic diversification into more labor-intensive and productive sectors, increasing investment oriented toward job creation, and aligning the skills of the labor force with the needs of the local labor market.

CONCLUSION AND SUGGESTIONS

Based on the results and discussion, this study concludes that there is no bidirectional causal relationship between economic growth and unemployment, nor between the labor force and unemployment, in Sigi Regency during the observation period. Changes in economic growth do not directly cause changes in the unemployment rate, and vice versa, so that the pattern of their relationship differs from the common assumption in Okun's Law. Nevertheless, a one-way relationship from economic growth to the labor force was found, which shows that the dynamics of economic growth are first reflected in labor force participation rather than directly in a reduction of open unemployment.

The elasticity analysis reinforces this conclusion. The sensitivity of unemployment to changes in both economic growth and the labor force is fluctuating and inconsistent across years, with a tendency toward an opposite-direction relationship as implied by Okun's Law, namely that an improving economy and increasing labor absorption are followed by declining unemployment. However, the presence of several years with an opposite-direction relationship affirms that the relationship among employment variables in Sigi Regency is strongly influenced by the regional economic structure, which still relies on the agricultural sector, so that aggregate economic growth has not become a direct driver of reduced unemployment.

Based on these findings, the Government of Sigi Regency is advised to pursue economic diversification by developing an agriculture-based manufacturing industry sector and increasing labor-intensive-oriented investment, so as to create quality jobs capable of absorbing the labor force optimally. In addition, skills training programs aligned with the needs of the local labor market should be developed, together with the encouragement of entrepreneurship through mentoring and access to capital, particularly in the creative and digital economy, in order to reduce the mismatch between the qualifications of job seekers and the needs of the business world. This study is limited to three variables using the Granger causality and elasticity approaches, so that future research may expand the variables to include education level, minimum wage, and regional investment, and conduct comparative studies with other regencies in Central Sulawesi Province to identify best practices in addressing unemployment in the region.

ACKNOWLEDGEMENTS

The authors express their gratitude to the Statistics Indonesia offices of Central Sulawesi Province and Sigi Regency for the availability of the data that form the basis of this research, as well as to the Department of Economics and Development Studies, Faculty of Economics and

Business, Tadulako University, for the guidance and support throughout the research process. The authors also thank all parties who provided constructive input in refining this article.

REFERENCES

- Ahyar, H., Andriani, H., Sukmana, D. J., Ustiawaty, J., Utami, E. F., Istiqomah, R. R., Fardani, R. A., & Auliya, N. H. (2020). *Buku metode penelitian kualitatif & kuantitatif* (H. Abadi, Ed.). CV Pustaka Ilmu.
- Ariefianto, M. D. (2012). *Ekonometrika: Esensi dan aplikasi dengan menggunakan EViews*. Erlangga.
- Arsyad, L. (1999). *Ekonomi pembangunan*. Penerbitan Sekolah Tinggi Ilmu Ekonomi YKPN.
- Azizah, F. I. N. (2016). Analisis pengaruh jumlah penduduk, pertumbuhan ekonomi, dan inflasi terhadap pengangguran terbuka. *Jurnal Pendidikan Ekonomi (JUPE)*, 3(3), 1–13. <https://doi.org/10.26740/jupe.v3n3.p>
- Boediono, B. (1999). *Teori pertumbuhan ekonomi*. BPFE.
- Cendana, H. (2019). Hubungan kausalitas antara pertumbuhan ekonomi dan pengangguran di Kabupaten Nagan Raya. *EKOMBIS: Jurnal Fakultas Ekonomi*, 4(2), 133–142. <https://doi.org/10.35308/ekombis.v4i2.5243>.
- Gujarati, D. N. (2015). *Dasar-dasar ekonometrika*. Salemba Empat.
- Kartika, R., & Muslim, I. (2021). Analisis pengaruh pertumbuhan ekonomi dan angkatan kerja terhadap pengangguran di Kota Langsa. *Jurnal Orientasi Bisnis dan Entrepreneurship (JOBS)*, 3(2), 131–139. <https://doi.org/10.33476/jobs.v3i2.2936>.
- Moosa, I. A. (2008). Economic growth and unemployment in Arab countries: Is Okun's Law valid? *Journal of Development and Economic Policies*, 10(2), 5–24.
- Nisa, H. (2023). *Analisis kausalitas pertumbuhan ekonomi dengan pengangguran di Provinsi Sumatera Utara* [Skripsi, Universitas Islam Negeri Sumatera Utara].
- Nurinnisa, A. A. (2024). Pengaruh tingkat angkatan kerja dan indeks pembangunan manusia terhadap pengangguran. *Trending: Jurnal Ekonomi, Akuntansi dan Manajemen*, 2(1), 158–167. <https://doi.org/10.30640/trending.v2i1.1924>.
- Okun, A. M. (1962). Potential GNP: Its measurement and significance. In *Proceedings of the Business and Economic Statistics Section* (pp. 98–104). American Statistical Association.
- Simanjuntak, P. J. (2001). *Pengantar ekonomi sumber daya manusia*. Lembaga Penerbit Fakultas Ekonomi Universitas Indonesia.
- Sugiyono, S. (2017). *Metode penelitian kuantitatif, kualitatif, dan R&D*. CV Alfabeta.
- Sukirno, S. (2002). *Pengantar teori makroekonomi* (Ed. ke-2). PT Raja Grafindo Persada.
- Sukirno, S. (2013). *Makroekonomi: Teori pengantar*. Raja Grafindo Persada.
- Todaro, M. P., & Smith, S. C. (2006). *Pembangunan ekonomi di dunia ketiga*. Erlangga.
- Widarjono, A. (2018). *Ekonometrika: Pengantar dan aplikasinya disertai panduan EViews* (Ed. ke-5). UPP STIM YKPN.
- Zed, M. (2004). *Metode penelitian kepustakaan*. Yayasan Obor Indonesia.
- Badan Pusat Statistik Kabupaten Sigi. (2024). *Kabupaten Sigi dalam angka 2024*. BPS Kabupaten Sigi.
- Badan Pusat Statistik Provinsi Sulawesi Tengah. (2024). *Laju pertumbuhan PDRB menurut kabupaten/kota Provinsi Sulawesi Tengah*. BPS Provinsi Sulawesi Tengah.