Economic Growth and Unemployment: An Empirical Analysis of Okun's Law in the Case of Libya

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النمو الاقتصادي والبطالة: تحليل تجريبي لقانون أوكون حالة ليبيا

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Abstract:

In the past ten years, unemployment has increased in the majority of North African nations. Libya is experiencing a low employment rate and a high population increase. According to Okun's law, there is a negative correlation between economic growth and the unemployment rate. This study aims to evaluate Okun's law's applicability in Libya. We employed the Granger causality test framework of the vector autoregressive (VAR) model to assess the causal relationship between the variables and investigate the relationship between the unemployment rate and economic growth. Granger's causality test results show that GDP rate is Granger-caused, and the causation path is from GDP rate to the unemployment rate. the unemployment rate does not cause GDP Rate, because of the p-value ($0.106 > 0.05$).

Keywords: Unemployment, economic growth, Okun's law, cointegration, Granger Causality Test, Libya

الملخص

ارتفع معدل البطالة في العقد الماضي في معظم دول شمال إفريقيا. الوضع في ليبيا هو نمو سكاني سريع مع انخفاض مستوى معدل التوظيف. الاقتراح النظري لقانون أوكون هو أن هناك علاقة سلبية بين معدل البطالة والنمو الاقتصادي. تبحث هذه الدراسة العلاقة السببية معدل البطالة ومعدل النمو الاقتصادي في ليبيا باستخدام بيانات سنوية تغطي الفترة من 2000 حتى 2022 استخدمنا اختبار العلاقة السببية جرانجر لنموذج المُتجه ذاتي الانحدار لاختبار العلاقة السببية بين المتغيرات. من النتائج اتضح انه لا توجد علاقة مسببة بين معدل البطالة ومعدل النمو الاقتصادي ف ليبيا ومن الواضح أيضا من النتائج انها توجد علاقة سببية من معدل النمو الاقتصادي الى معدل البطالة.

الكلمات المفتاحية: البطالة، النمو الاقتصادي، قانون أوكن، التكامل المشترك، اختبار السببية لجرانجر، ليبيا.

1: Induction

Libya is a nation rich in historical legacy. It was ruled by foreign powers for centuries until 1951, when it became independent. Libya is a country in North Africa that has the Mediterranean Sea to its north. Its borders are shared by Egypt on the east, Algeria and Tunisia on the west, and Niger, Chad, and Sudan on the south. Libya has a surface area of 1,760,000 km2, making it the third largest country in Africa, although its population is only 6.8 million (WorldBank). The overall unemployment rate in Libya remained almost unchanged from 19.03 percent in 2003 to 19.71 percent in 2022. The unemployment rate for youth is particularly high, at over 48%, while the rate for women is 25%. By regional norms, the public sector employs about 85% of Libya's work force, which is a significant percentage (and for women, the number is 93%). There are little prospects for young people and

former combatants to reintegrate into the workforce, and 30% of businesses have reported having trouble finding qualified Libyan citizens because only 15% to 30% of them can be classified as "skilled."

Libya's economy has historically relied heavily on the public sector, leading to a lack of diversity in the labor market. The 2011 revolution caused political, security, and economic turmoil, negatively impacting state institutions and the economy. This has discouraged investment and job creation. Businesses have faced challenges such as reduced revenues, higher input costs, supply disruptions, and production delays. As of 2021, GDP per capita remains significantly below pre-crisis levels, with the COVID-19 pandemic exacerbating the situation by reducing oil revenues, disrupting international trade, and increasing production costs.

Productivity, income distribution, and unemployment are the three most important factors for the economy as a whole. Okun (1962) proposed a theoretical relationship between output and unemployment, which is one of the most well-known in macroeconomic theory. This relationship has been found to hold true for many countries, especially in developed countries (Christopoulos, 2004) & (Akeju & Olanipekun, 2014). Okun (1962) suggests a negative relationship between changes in the unemployment rate and real GDP, focusing on the empirical relationship between unemployment and GDP fluctuations. He emphasizes that changes in aggregate demand lead to changes in production patterns in industries, which in turn affect the demand for labor and ultimately the unemployment rate.

Okun's (1962) seminal work introduced the concept of Okun's law and presented several key postulates related to the relationship between output and unemployment. Here are the main postulates put forth by Okun:

1: Output-Unemployment Relationship: Okun observed a negative relationship between the percentage change in real GDP and the percentage change in the unemployment rate. He suggested that when output (GDP) grows faster than its potential rate, the unemployment rate tends to decline, and vice versa.

2: Output Gap and Unemployment Gap: Okun's law implies that there is a connection between the output gap (the difference between actual output and potential output) and the unemployment gap (the difference between the actual unemployment rate and the natural rate of unemployment). A negative output gap corresponds to an unemployment gap that is higher than the natural rate, while a positive output gap corresponds to an unemployment gap lower than the natural rate.

3: Output Gap and Cyclical Unemployment: Okun argued that the output gap is primarily driven by cyclical unemployment, which refers to the portion of unemployment that is caused by fluctuations in the business cycle. Cyclical unemployment increases during economic downturns and decreases during periods of economic expansion.

4: Okun's Coefficient: Okun quantified the relationship between the output gap and the unemployment gap by introducing the "Okun's coefficient" or "Okun's constant." He estimated that for every 1% increase in the unemployment rate above the natural rate, the output gap widens by approximately 2%.

Libya has been facing a serious issue with high unemployment, especially among its younger people. Since the 2011 revolution, the nation has seen political unrest, security issues, and economic setbacks, all of which have negatively impacted the labor market.

There are some major causes of Libya's unemployment issue, the persistent political, intermittent violent outbursts have impeded economic growth and employment generation. Due in large part to the unstable climate, which has discouraged foreign investment and interrupted economic activity, Libya's economy is highly dependent on oil production and exports, leaving it susceptible to changes in oil prices. Unpredictability in revenue and conflict-related disruptions to oil production have impeded economic growth and the creation of jobs in other sectors, there is often a mismatch between the skills possessed by job seekers and the demands of the labor market. The education and training system may not adequately align with the needs of the private sector, resulting in a gap between the skills available in the labor force and the skills required by employers, the economy's heavy dependence on the oil sector has hindered economic diversification and the development of other industries. This lack of diversification limits job opportunities outside of the oil sector, the informal sector plays a significant role in Libya's labor market, with many individuals engaged in informal and precarious work. However, such employment often lacks stability, social protection, and decent wages.

2: Unemployment in Libya

Given the current state of world oil markets and oil reserves in Libya, it is expected that the oil sector will not be creating significant numbers of new jobs in the foreseeable future. This is the case despite the fact that there is still an enormous potential contribution to the national economy that could be made by the oil sector. The OPEC quota and associated economic sanctions mean that there is a decrease in revenue and real income from oil, and a decline in the rate of growth of the economy at large. The bulk of new job creation must then come from the non-oil sectors. High unemployment rates among the youth and the educated, and the relatively limited prospects for job creation in the oil sector, imply a need to generate employment opportunities in areas where the skill and educational level of the prevailing and prospective labor force are relatively high. This includes Libya's public employment and the private sectors, particularly those industries producing non-oil tradable goods.

The late 1970s and early 1980s witnessed a massive influx of women into the education system in Libya. As a result, the number of highly educated women in Libya has grown to the extent that there is now a substantial oversupply of educated women in the labor market. The unemployment rate for women is now double that of men in Libya, as the public and private sectors are not creating a sufficient number of new jobs to absorb the increase in the supply of educated women in the labor market. This has meant a substantial loss of human capital for the economy and an increase in the opportunity cost of the resources expended on educating women. As these women are now more inclined to seek employment, and finding employment is proving more difficult, it is likely that the current rate of unemployment for women will continue to increase. Unemployment in urban areas in Libya is, in large part, a problem of immigrants from rural areas who are seeking work in the cities. Although urban unemployment rates are higher than rural rates, it is difficult to determine which urban residents are included in unemployment statistics and to what extent they are voluntarily seeking work. It is apparent that the urban immigrants, particularly the youth, face severe competition with little success in obtaining jobs.Unemployment is an economic condition where those who are willing and able to work at the going wage rate cannot find jobs.

In recent years, Libya has suffered from high unemployment rates and now faces an unemployment challenge. In Libya, unemployment is notably endemic among the youth, among women, and among those who reside in urban areas. The unemployment rate among the young population (15-24 years) is more than four times higher than that of the total unemployment rate in Libya. This represents an enormous waste of a critical and scarce resource, as it means a loss of human capital for the economy. There is a desperate need for skilled and unskilled labor in Libya, but for a number of reasons, the private and public sectors are not creating a sufficient number of new jobs to keep up with the growth in the labor force.

Libya's overall unemployment rate rose from 13.5 percent in 2010 to 19 percent in 2012, and it has stayed mostly stable ever then. Approximately 48% of young people are unemployed, whereas 25% of women are (Bank, 2015) . The socioeconomic effects of COVID-19 have also led to job losses for some people, which has worsened the nation's unemployment rate (Mahmoud, Mayouf, Ellafi, & Dhawi, 2021). Due to Libya's high unemployment rates and reliance on oil as its main source of income, tourism is being explored as a potential strategy for economic diversification. The oil industry in Libya, which contributes significantly to the GDP of the nation, has also encountered difficulties with training and development, which has affected job prospects (Elakouri, 2018).

Unemployment in Libya has been a significant issue for many years, especially following the civil war in 2011 and the subsequent political and economic instability. The official unemployment rate in Libya is estimated to be around 16%, but many experts believe the actual rate is much higher. The high unemployment rate has been attributed to various factors, including a lack of job opportunities, poor infrastructure, a mismatch between the skills of the workforce and the demands of the job market, and the overall economic instability. Additionally, the ongoing conflict and security concerns in the country have also contributed to the high unemployment rate, as businesses are hesitant to invest and create new jobs in such an uncertain environment. The Libyan government has made efforts to address the issue of unemployment, including implementing job creation programs and promoting entrepreneurship. In Libya, like in many other countries, there are various types of unemployment. These include:

Structural Unemployment: This type of unemployment occurs when there is a mismatch between the skills of the workforce and the demands of the job market. In Libya, this could be due to a lack of education and training programs that are aligned with the needs of the modern economy.

Cyclical Unemployment: This is the result of economic downturns or recessions, leading to a decrease in the demand for goods and services, and subsequently, a decrease in the demand for labor. The instability and conflict in Libya have contributed to cyclical unemployment as well.

Frictional Unemployment: This type of unemployment occurs when people are temporarily between jobs, either because they are transitioning from one job to another or entering the workforce for the first time.

Seasonal Unemployment: In certain industries, such as agriculture or tourism, there may be seasonal fluctuations in employment opportunities. This can lead to seasonal unemployment for workers in those sectors.

Long-term Unemployment: This occurs when individuals are unable to find employment for an extended period of time. This can have significant negative impacts on individuals and their families, as well as on the overall economy.Each type of unemployment presents its own unique challenges, and addressing these various forms of

unemployment in Libya will require a comprehensive approach that includes education and training programs, economic reforms, and stability in the political and security situation.The unemployment rate in Arab countries can vary widely depending on the specific country and its economic conditions. However, I can provide a general overview of unemployment rates in Arab countries based on historical trends and available information up until that time.

The Arab region has faced various economic and social challenges, including high unemployment rates. Factors such as population growth, limited job opportunities, political instability, and economic diversification play a role in shaping the employment landscape in different Arab countries.

It's important to remember that unemployment rates can fluctuate over time due to changes in economic conditions, government policies, and other factors. Here are some general observations regarding unemployment rates in Arab countries:

Gulf Cooperation Council (GCC) Countries: Countries like Saudi Arabia, United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman have historically had relatively lower unemployment rates due to their oil-rich economies and investments in infrastructure and job creation. However, these countries have been making efforts to increase employment opportunities for their growing populations and reduce reliance on the oil sector.

North African Countries: Countries like Egypt, Morocco, Algeria, Tunisia, and Libya have faced challenges in reducing unemployment rates. Factors such as population growth, youth unemployment, informal employment, and limited job creation have contributed to higher unemployment rates in these countries.Levant Countries: Countries like Jordan, Lebanon, and Syria have also experienced higher unemployment rates, particularly among youth. Political instability, conflicts, and limited economic opportunities have contributed to the challenges in these countries. However, these efforts have been hindered by the ongoing conflict and political instability. Overall, the high unemployment rate in Libya continues to be a major challenge for the country, and addressing this issue will be crucial for the long-term stability and prosperity of the nation.
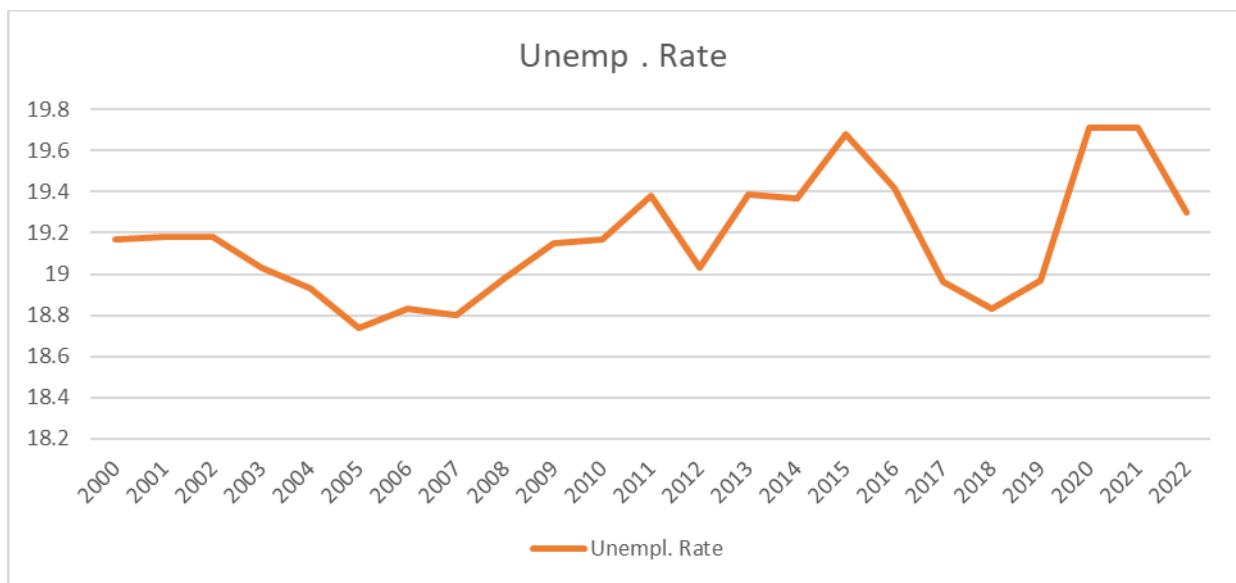

Figure 1: Unemployment rate in Libya (2000-20**22**).

3: Economic growth in Libya

The country of Libya is highly significant for its large resource wealth and product market potential in relation to the whole of Africa. Despite being one of the largest countries in Africa, Libya possesses a relatively small population. Much of the country's economic history and development has been dedicated to the processing and exporting of its rich endowment of natural resources. With increased production and revenues of oil through the OPEC oil shocks of the 1970s, Libya's sovereign wealth has increased substantially from the late 1970s to the present day. The economy is highly dominated by the public sector, with approximately 70% of the population employed by the government at the expense of private enterprise. Due to the lasting effects of the Arab Spring revolution and civil war, Libya's economy has suffered a major setback in both economic growth and absolute income. GDP growth was -50.3% in 2011, as many enterprises ceased functioning due to staff absenteeism and widespread capital and labour movement to bordering countries. This has been relatively unstable and hard to reverse given Libya's history of political and economic isolation from western nations. The economy is now faced with the heavy task of state building from the destruction of both infrastructure and institutions. This study is

highly oriented to a context of micro and macroeconomic theory and is dedicated to an investigative analysis of primary/secondary data relating to the empirical time series component of Libya's economy from 2000 to 2022. A guided comparison will be made between the years prior and post the 2011 revolution, and potential recommendations given as to policy initiatives and initiatives pertaining to reconstruction and cultivating economic growth. This should be done with a view of first returning to a stable state of economic growth and then addressing the issue of economic diversification to lessen dependence on the natural resource sector.
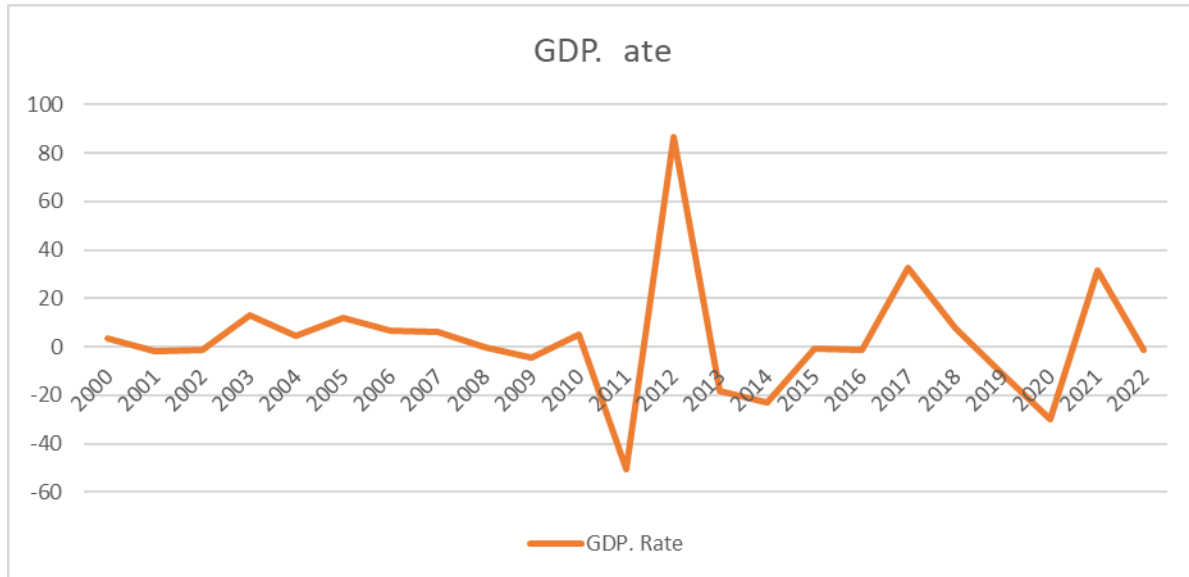

Figure 2: GDP Rate in Libya (2000-2022).

4: Literature Review

There is a definite correlation between GDP and unemployment, according to numerous research. According to a study by (Ball & Mankiw, 2002), there is a 0.5% drop in the unemployment rate for every 1% increase in GDP. This implies that an expanding economy creates more jobs, which in turn lowers unemployment rates.

Furthermore, studies conducted by (Blanchard & Wolfers, 2000) showed that variations in GDP significantly affect the rate of unemployment. They discovered that the jobless rate drops by 0.33% for every 1% increase in GDP growth. This suggests that declining unemployment rates are linked to economic growth.

Furthermore, studies have looked at how unemployment affects GDP. According to a study by (Okun, 1963), the GDP falls by 2% for every 1% increase in the unemployment rate. This shows that there may be a negative relationship between high unemployment and economic growth.

Furthermore, research on the connection between GDP and unemployment has been done in a variety of national contexts. In a study, (Hamdan and Zurbruegg, 2013) examined the correlation between 23 OECD nations' GDP and unemployment rates. The findings demonstrated that GDP growth in these nations has a statistically significant negative effect on the unemployment rate.

The connection between GDP and unemployment in different nations has been the subject of numerous studies. Using data from 1987 to 2017, (Lee et al. 2019) carried out an empirical analysis in Indonesia in accordance with Okun's law, which postulates that higher labor inputs result in higher GDP.

When (Kocisova et al. 2020) examined the factors that contribute to non-performing loans in nations that are members of the European Union, they discovered that the GDP and unemployment rates had an impact on the NPL ratio.

(Al-Afeef, 2020) looked into how Jordan's GDP and unemployment rate were affected by support for small and medium-sized enterprises (SMEs).The study's key finding, which was that 95% of changes in economic development could be shown by the study model, was the statistically significant influence of financing SMEs on GDP and unemployment.

The significance of Foreign Direct Investments (FDI) on economic growth in Serbia was highlighted by (Vukmirović et al., 2021), who predicted a rise in GDP and FDI together with a decline in the unemployment rate for the following 5 years.

5 Methodology
The pioneering economist who initially explored the empirical relationship between unemployment and economic growth was Arthur (Okun, 1963).. He determined that the unemployment rate would decrease by merely 0.3% for every 1% augmentation in the growth rate exceeding the trend rate. In circumstances where the causality is inverted, a 1% rise in unemployment is likely to precipitate a decline of over 3% in GDP growth. This equation indicates that GDP must expand at a rate commensurate with its potential growth to sustain a stable unemployment rate. Consequently, GDP growth must surpass potential output growth to effectuate a reduction in unemployment (Tatom, 1978).

In a general sense, Okun's law represents an economic paradigm that elucidates the correlation between unemployment rates and economic growth. An empirical observation regarding the association between the unemployment rate and economic expansion is referred to as Okun's law. Additional variables, including labor unions and regulations governing the labor market, may exert influence on the coefficient. For instance, due to the comprehensive social employment protections in Japan, unemployment rates exhibit diminished variability relative to a given GDP. Given that the nexus between unemployment and output growth is contingent upon legal frameworks, technological advancements, consumer preferences, social norms, and demographic factors, Okun coefficients are prone to temporal fluctuations. There exist two proposed methodologies for the calculation of Okun's coefficient; this delineates the manner in which Okun's Law is articulated..

To apply the knowledge gathered from the reviewed literature, Okun's law was modified to create a standard version, which is as follows:

$$U_t - U_{t-1} = \sum_{i=1}^{k} b_{t-i}\, U_t^c + \sum_{i=0}^{k} C_{t-i}\, Y_{i=0}^{C} + \in_t$$

Where: U_t^c = the level of unemployment, Y_t^c = The general trend of GDP

Discussion of Findings
Unit Root Test: Using the data from the Phillip Perron test, the variables were checked for stationarity at levels and at first difference. While the unemployment rate variable has unit root issues at I(0) and becomes stationary at the first difference, the GDP Rate is stationary at level, according to the unit root estimation. Since the integration variables have a zero and one order, we may test for short- and long-term dynamism on the two variables securely using the Johansen cointegration test and the Error Correction Model.

Table 1: Results of PP test.

Variables	At levels	Critical value at 5 %	At 1st Diff	Critical value at 5 %	Order of Integration
unemployment rate	-7.918	-12.500	-13.252	-12.500	I(0)
GDP Rate	-24.348	-12.500	-28.733	-12.500	I(1)

Co-integration Analysis
Econometric techniques advise using cointegration analysis to ascertain the long-term relationship between the model's variables. Given that every variable is stationary at first difference, the Johansen and Juselius (1990) technique is the best option for co-integration. The long-term association between the growth of the economy and the use of energy has been determined using this method.

The study selects the proper lag duration using the Hannan-Quinn Criterion (HQ), the Schwartz Bayesian Criterion (SBC), the Akaike information criterion (AIC), and the final prediction error (FPE). The outcomes are displayed in Table 2. As can be seen, HQ, SBC, AIC, and FPE suggest lag lengths of 4 and 1, respectively. The study follows Johansen and Juselius (1990) and determines that a lag length of one is a suitable lag length.

Table 2: Lag Length Selection Criteria for Order of VAR Model.

Lag	LL	LR	FPE	AIC	HQ	SBC
0	-93.4481	NA	79.1712	10.0472	10.064	10.1466
1	-83.5419	19.813	42.7356	9.42546	9.47593	9.7237
2	-77.6581	11.767	35.7582	9.22717	9.3113	9.72425
3	-69.8172	15.682	25.0233	8.82287	8.94064	9.51877
4	-61.9277	15.779*	18.214*	8.41344*	8.56487*	9.30817*

To ascertain the number of co-integrating vectors, the Trace Statistic and Maximum Eigenvalue tests are employed. Out of the five co-integration models, the model with "unrestricted intercept and no trend" has been found to be the most appropriate using the Pantula principle. These models consider different parameters for the intercept and trend terms. The "unrestricted intercept and no trend" model (ASTERIOU & Hall, 2007) asserts that the intercept in the Vector Autoregressive (VAR) model cancels out the intercept in the co-integrating equation. Consequently, the constant term (or intercept) is not reported in the computed model.

The results of the Maximum Eigenvalue test and the Trace Statistic test are displayed in Tables 3 and 4, respectively. The Trace Statistic reports a single co-integrating vector and maximum.

Table 3: Unrestricted Cointegration Rank Test (Trace).

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.757781	74.38540	47.85613	0.0000
At most 1 *	0.434484	30.43016	29.79707	0.0422
At most 2	0.270565	12.75966	12.75966	0.1239
At most 3	0.091642	2.979608	2.979608	0.0843

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue).

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.757781	43.95524	27.58434	0.0002
At most 1 *	0.434484	17.67050	21.13162	0.1427
At most 2	0.270565	9.780048	14.26460	0.2268
At most 3	0.091642	2.979608	3.841466	0.0843

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

According to the statement you gave, the Trace statistic is recommended when the Maximum Eigenvalue test and the Trace value test in cointegration analysis clash. Because it considers all of the smallest eigenvalues, the Trace statistic is more potent, according to Johansen and (Soren Johansen & Juselius, 1990) and (ASTERIOU & Hall, 2007). It is hence capable of identifying more cointegrating correlations between variables in a model.

According to this interpretation, the study you cited only took into account one cointegrating link among the model's components. This suggests that the researcher believed the variables under study had a single, long-term relationship.

It is noteworthy that cointegration analysis is frequently employed to investigate the long-term correlations between variables and whether they move in tandem over time. The particular research issue, the properties of the data, and the model's underlying assumptions all influence which of the Trace and Maximum Eigenvalue statistics is used. The appropriateness of each statistic for their specific analysis should be carefully considered by researchers.

Granger Causality Test

In the first row, p-value for GDP Rate is very small ($0.001 < 0.05$). Therefore, the null hypothesis stating that "lagged values of GDP Rate do not cause Unemployment rate" can be rejected at a 5% level of significance. This implies that does Granger-cause GDP Rate and the direction of causality is from GDP Rate to Unemployment rate

The second row of the above figure shows that lagged values of Unemployment rate do not cause GDP Rate, because of the p-value ($0.106 > 0.05$), lagged values of GDP Rate do not cause Unemployment rate. Therefore, the null cannot be rejected.

Table 5: Granger causality Wald tests.

Equation Excluded	chi2	df	Prob > chi2	Decision
unemployment rate GDP Rate	17.673	4	0.001	cause
GDP Rate unemployment rate	7.624	4	0.106	Do not cause

Conclusion

Some significant findings emerge from the examination of the correlation between unemployment and economic growth in Libya between 2000 and 2022. Libya's labor market performance and economic growth were very volatile throughout this time, primarily due to political unrest and changes in the world oil price. The empirical findings demonstrate that in this more recent period, Okun's law was still valid in Libya. The country is known for its high unemployment rate and rapid economic expansion. The flagrant mishandling of the country's resources results in financial theft and unnecessary expenditures. Therefore, Libya is not covered by Okun's law. The research does, however, also draw attention to the difficulties Libya has had in converting economic expansion into widespread employment creation. Libya has failed to significantly and permanently reduce its consistently high unemployment rate, which has averaged about 18% since 2000, even during times of comparatively robust GDP development. This indicates that the labor market in Libya has institutional shortcomings and structural rigidities that have prevented the economy from taking full advantage of growth prospects. The poor employment response to economic expansion has been caused by several factors, including dependence on public-sector employment, limited private sector development, and skills mismatches. Going forward, attempts to diversify the economy and lessen Libya's reliance on the unpredictable oil industry must be combined with the implementation of a comprehensive reform plan by officials that tackle these labor market issues. To improve the relationship between growth and job creation, investments in institutional capacity building, private sector promotion, and human capital development will be essential. To create successful policies and guarantee long-term increases in job creation and economic development, it will be crucial to keep an eye on and analyze the dynamic relationship between Libya's labor market outcomes and economic performance.

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