

Article

The influence of unemployment and labor force participation rates on economic development in GCC countries: A cointegration approach

Md Shabbir Alam^{1,*}, Yasmeeen Ansari^{2,*}, Nadia Sha³, Khaliquzzaman Khan⁴¹ Department of Economics and Finance, College of Business Administration, University of Bahrain, Zallaq 32038, Bahrain² Department of Finance, College of Administrative and Financial Sciences, Saudi Electronic University, Riyadh 13323, Saudi Arabia³ Department of Finance and Economics, College of Commerce and Business Administration, Dhofar University, Salalah 2509, Oman⁴ School of Business, American University in Dubai, Dubai 28282, UAE* **Corresponding authors:** Md Shabbir Alam, shabbir.alam28@gmail.com; Yasmeeen Ansari, y.ansari@seu.edu.sa

CITATION

Alam MS, Ansari Y, Sha N, Khan K. (2024). The influence of unemployment and labor force participation rates on economic development in GCC countries: A cointegration approach. *Journal of Infrastructure, Policy and Development*. 8(2): 2962. <https://doi.org/10.24294/jipd.v8i2.2962>

ARTICLE INFO

Received: 30 September 2023

Accepted: 17 November 2023

Available online: 27 December 2023

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Abstract: This study explores the relationship between GDP growth, unemployment rate, and labor force participation rate in the Gulf Cooperation Council (GCC) countries from 1990 to 2018. Furthermore, the study incorporates control factors such as government spending, trade openness, and energy use into the regression equation. We used panel dynamic ordinary least squares (DOLS) and Fully Modified Ordinary Least Squares (FMOLS) estimators to investigate the relationships between variables in this investigation. The econometric technique accounts for nonstationary, endogeneity bias and cross-sectional dependencies between country-year observations. Cointegration was found among GDP growth, unemployment rate, and labor force participation. Long-term, the unemployment rate has a statistically significant negative effect on economic growth in the GCC nations. Meanwhile, the labor force participation rate significantly influences economic expansion in the long term. The expansion of government expenditures and international trade reduces economic growth. Alternatively, it is discovered that energy consumption has a substantial and positive effect on economic expansion. Okun's rule and the unidirectional causality from economic growth to unemployment indicate that the primary cause of unemployment in GCC nations is a failure to adequately expand their economies. When developing economic strategies to reduce unemployment, policymakers are particularly interested in determining whether or not economic development and the unemployment rate are cointegrated.

Keywords: economic growth; unemployment; labor force; Okun's law; GCC countries

1. Introduction

The Gulf Cooperation Council (GCC) countries have one of the largest percentages of youth (those under 25) in their populations, making up between one-fourth and half of the total to Abdulgadir (2020). Hence, according to Oxford Business Group (2016), youngsters make up 25% of the population in Qatar, 34% in the United Arab Emirates, 35% in Bahrain, 40% in Kuwait, 46% in Saudi Arabia, and 50% in Oman. In order to accommodate all young people in the labor market, such a demographic structure presents challenges for national economies. Youth employment is a prerequisite for both economic progress and stability. Farzanegan and Gholipour (2021) have noted that elevated youth unemployment rates in the Arab area have raised the possibility of political instability and other social issues. Unemployment is seen as an important economic problem experienced both across the developing and developed world. It has social, economic and distributional consequences. Both theory and data point to a lack of tightness in the short-term link between economic expansion

(GDP growth) and joblessness. While other broad measures of the macroeconomy tend to improve before the unemployment rate does, the reverse is true in the long run. In the long run, economic growth and the unemployment rate have an inverse connection. According to Okun (1962), there is a strong negative association between economic growth and unemployment rates. This means that when unemployment is low in any economy, economic growth rates rise.

Furthermore, how high unemployment impacts the sectors most impacted by economic growth will depend on the type, origin, and significance of the unemployment. Most of this research supports the negative association between the change in real GDP and the unemployment rate, but they also highlight the ongoing controversy around Okun's coefficient's magnitude. Furthermore, research has demonstrated that Okun's Law is neither constant nor linear nor symmetric over extended periods of time. Lastly, a few other studies brought up methodological concerns with measuring Okun's connection, specifically the GDP growth variable's endogeneity and the challenges with missing variables, and they recommended adjusting for these to provide more accurate estimates of the Okun coefficient. As a result, new research in this body of literature has sparked a discussion on the applicability of Okun's Law in industrialized and emerging nations, as well as the instability and nonlinearity of Okun's coefficient and the variables that could influence this kind of relationship. Okun's law has sparked a plethora of empirical studies that, using a wide variety of theoretical and methodological approaches (Lee, 2000; Farsio and Quade, 2003; Christopoulos, 2004; etc.), investigate the correlation between economic expansion and the unemployment rate. However, no clear conclusion can be drawn about the connection between economic expansion and joblessness (see Section 2 below). In addition, the rigidity of labor markets in various nations leads to large discrepancies in the estimated value of Okun's coefficient.

In general, the Middle East and North Africa (MENA) region and the Gulf countries¹. We are facing numerous socio-economic challenges ranging from unemployment, volatile growth performance, rapid population growth rate, low productivity to fiscal deficits and changing geopolitical scene in the region. In the meantime, there are differences in youth unemployment rates among the Gulf states, with Saudi Arabia having the highest rate at 29% and Qatar having the lowest rate at 1.5% (Abdelgadir, 2020). According to the World Bank estimates, the youth (those aged between 15–24 years) unemployment rate across the region is the highest globally. Workforce-related similarities amongst GCC nations include a high reliance on foreign workers, a lack of private sector jobs for natives, and a low rate of female labor force participation (Shayah and Sun, 2019). Oil and gas exports also play a significant role in the regional economy, which depends on foreign currency earnings for growth and development. A whopping 79% of all exports and 77% of all government income come from the hydrocarbon industry, which accounts for around 45% of real GDP. However, such an economic model transmits uncertainty in the macroeconomic environment because the endowments across the region are finite and technologically replaceable resources. The depletion of oil resources poses liquidity and currency risks. A drop in oil prices forces the countries to cut spending to balance their budget, which negatively impacts employment (Alsaman, 2016). Furthermore,

while the value addition of the hydrocarbon sector is significant, its labor absorption capacity is thin.

The large increase in labor supply, especially youth, creates new challenges in the labor market across the region. The average youth unemployment rate in the MENA region was highest (around 30%) in comparison to East Asia (11%), Sub-Saharan Africa (13%), Latin America (19%), and the global average (12.6%) in 2017 (World Bank, 2019). Youth unemployment is most severe in Saudi Arabia and Kuwait. The unemployed youth as a share of the total labor force was estimated at 25% in Saudi Arabia and 16% in Kuwait in 2016–2017. Young unemployment in Qatar was less than 1% of the labor force. Youth unemployment among nationals is still a major economic and social concern, making unemployment a key policy problem. The unemployment rate among young people is higher among women than young men. For instance, whereas the unemployment rate for young males is 17.4% (World Bank, 2019), the rate for young women is 46.3%. High unemployment rates are an indication of a disconnect between production and employment.

The largest single cost of unemployment is the lost output (Dornbusch et al., 2013). The cost of lost output is very high: Okun's Law states that a 1% increase in unemployment costs 3% of GDP. The high unemployment rates underscore the importance of creating more job opportunities for the new entrants to the job markets. In this way, the Gulf countries have used a mix of economic reforms and development plans in recent years to make their economies less reliant on the oil sector, nationalize their workforces to deal with high unemployment rates among their people, encourage women to join the workforce and reform their labor markets; align their education and training systems with the needs of their national development plans to better prepare their people for the jobs of the future. Stable and sustained growth and job creation based on diversification of the national economies is a permanent theme in GCC's developmental plans.

Thus, this study examines the connection between economic growth, unemployment, and labor force participation rates in GCC nations during 1990–2018. This highlights the quality of the relationship between the unemployment rate and labor force participation rate on economic growth in the GCC economy. In addition, we used robust econometric methods, panel dynamic ordinary least squares (DOLS) and fully modified ordinary least squares (FMOLS) estimators to investigate the relationships between variables. It is also important to know how much changes in the unemployment rate produce changes in output. Moreover, the study employs public expenditure, trade openness, and energy consumption as control variables to derive robust economic growth and unemployment relationship estimates. It also assists in proposing some basic policies on the unemployment rate and labor force participation rate in growth for decision-makers within the GCC economy.

The remaining part of the paper is organized as follows. The literature review related to the economic growth and unemployment relationship in Section 2. The methodology is explained in Section 3, and the results and discussion are shown in Section 4. Finally, the conclusion and policy recommendation section conclude and provides policy recommendations from the present study.

2. Review of literature

2.1. Conceptual review

Okun's and Phillips curve postulates account for much of the discussions regarding the inflation-unemployment-growth nexus over the past four decades. Okun says unemployment will decrease if the economy expands more quickly and vice versa. The unemployment rate does not change when actual growth reaches potential Fouquau (2008); Guisinger and Sinclair (2015); Abdul-Khaliq et al. (2014). According to Okun's Law, the US economy grew negatively in the short term between 1947 and 1960, when the cyclical unemployment rate was highest. Numerous investigations have been conducted since Okun's coefficient was first proposed. When compared to other OECD nations, the US outcome was unusually steady.

Conversely, the Phillips curve maintains steady relationships for the dynamics of unemployment and inflation Phillips (1958) and Moore (1975). It asserts induced inflation growth from aggressive measures to uninterruptedly create more jobs. Unfortunately, this preliminary impression was fairly disproved, ensuing the well-known stagflation of the 1970s Sahnoun and Abdennadher (2019) and Wulandari et al. (2019).

2.2. Empirical literature

This part presents an overview of the empirical literature on the growth and unemployment link. In the 1960s, Okun's Law established a stable negative relationship between output (GDP) changes and unemployment. Okun (1962) reached this conclusion by measuring the link between economic growth and the unemployment rate in the United States from 1948 to 1960. He found that there was a negative association between the two variables. According to Okun's Law, an increase of one percentage point in the unemployment rate in the United States results in a reduction of three percentage points in GDP.

Furthermore, from 1992 to 2014, Soylu et al. (2018) investigated the relationship between unemployment and GDP growth in Eastern European countries using Okun's Law, which reflects the relationship between unemployment and economic growth. They discovered cointegration between unemployment and GDP growth, which is a negative relationship. Additionally, Noor et al. (2007) found a negative association between output and unemployment in a similar study using Okun's Law to examine the relationship between unemployment and the Malaysian economy.

There is a strong association between the rate of economic growth and the decline in unemployment rates, as evidenced by the relationship between the two variables. The employment rate rises, or the unemployment rate falls with an increase in the growth rate. In the economic literature, researchers have examined the relationship between economic growth and unemployment through experimental methods based on the Okun law. This law indicates that GDP and unemployment rate changes are inversely correlated. Okun (1962) successfully demonstrated that unemployment and economic growth are correlated reciprocally. According to his findings, a 1% decrease in unemployment would result in a 3% gain in real gross domestic product (RGDP) and vice versa. An increase in RGDP also leads to an increase in employment.

The theory of supply and demand has been seen to have an application in this particular situation. Similar to this, Eichengreen (2020) also presents the Keynesian Economics theory, which applies many macroeconomic considerations to comprehend economic concepts and employment practices. As mentioned in the study by Efrianti et al. (2018), the authors have offered a variety of claims and justifications for the many features of employment and economic growth, as well as the influence and interaction between the two. The evaluations of Soylyu et al. (2018) and Efrianti et al. (2018) have shown that growing economic growth in any nation results in a significant rise in GDP and labor productivity, which can be useful in generating job chances for the nation. Chand et al. (2017) have also provided evidence in favor of the idea that a growing economy might aid in the quick expansion of the labor force, ultimately resulting in a decline in the nation's unemployment rate. Conversely, Mihajlović (2020) has proposed that a low level of production in any nation might lead to the economy collapsing and potentially causing unemployment. The government and policymakers have devised various strategies to augment the employment rate and furnish individuals with an enhanced quality of life and level of living Al-Sawaiea et al. (2020).

The primary objective of governments is to achieve economic growth, which is a measure of well-being, improved living standards, and decreased poverty rates. By applying Okun's Law, some research has empirically investigated the relationship between unemployment and economic growth. Al-Habees (2012) employed a basic Okun law model to investigate the relationship between unemployment and economic growth in a few Arab nations, with a primary example study being Jordan. The findings demonstrated the effectiveness of economic strategies aimed at lowering the unemployment rate while maintaining a balanced pace of economic growth and indicated a strong association between growth and fluctuating unemployment rates. In addition, Kreishan (2011) explained how unemployment and economic growth are related in Jordan and found that the absence of economic growth does not explain the unemployment phenomenon in Jordan. They also noted that Okun's Law and the Augmented Dickey-Fuller (ADF) for unit root for 1970–2008 are enforced.

Utilizing the Error Correction Model (ECM) and Autoregressive Distributed Lag (ARDL) Johansen cointegration test, Akeju and Olanipekun (2014) investigated Okun's Law in Nigeria to examine the relationship between unemployment and economic growth. Their findings revealed a significant relationship between the two. Abdul-Khaliq (2014) examined the relationship between unemployment and GDP growth in nine Arab nations between 1994 and 2010. He discovered a significant inverse association between growth and the unemployment rate and a positive correlation between the two.

Nagel (2015) examined the relationship between GDP growth and unemployment and discovered a negative relationship between the two. Furthermore, Ahmed (2013) used Ordinary Least Squares (OLS) to investigate the link between the growth rate and unemployment rate in a subset of SAARC countries from 1990 to 2010 and discovered regional differences in the association between the two variables.

Magnani (2013) sought to broaden the application of the Solow model, which can explain unemployment as a consequence of a lack of aggregate demand, which led to an increase in aggregate demand, which in turn helped to lower unemployment and enhance GDP. In South Africa, Xesibe (2020) examined the impact of unemployment

on GDP growth between 1994 and 2017. The findings indicated that South Africa's unemployment and economic growth rates are negatively correlated.

Turkey, Egypt, Israel, and Jordan were among the MENA nations studied by Haririan et al. (2010); a negative impact of economic growth on the unemployment rate is not always a likely outcome as demographic factors and institutional conditions in the labor market play moderating roles in the dynamics between the two macroeconomic variables. Louail and Riache (2019) examine Okun's rule in the Saudi economy by examining how the output gap affects unemployment rates and how economic growth contributes to decreased unemployment. The existence of Okun's Law in the Saudi economy between 1991 and 2017 is examined using the ARDL bounds testing approach. The empirical results confirm the existence of Okun's Law in the Saudi economy. The gross domestic product gap was revealed by coefficients computed with the Gap Version, and it had a significant negative impact on unemployment rates. Accordingly, there is a 0.29 percent decrease in the unemployment rate for every 1% increase in GDP. These findings contradict those of Haririan et al. (2010).

Lack of economic development is not the root cause of the unemployment problem, as suggested by the findings of the study by Kreishan (2011). Other macroeconomic situations may also explain unemployment in Jordan. Abugamea (2018) attempted to examine the impact of GDP, inflation, labor force, and trade restrictions on labor movements on unemployment in Palestine. The analysis uses the ordinary least squares (OLS) method and covers the 1994–2017. The findings highlight that GDP negatively and significantly impacts unemployment, implying that Okun's Law is valid in Palestine. While inflation, labor force and restrictions on labor movements have a positive and significant impact on unemployment. Elshamy (2013) employs long-term cointegration analysis to study the correlation between unemployment and output growth in Egypt. The study found the unemployment rate has a negative and statistically significant link with economic expansion. Okun's law's theoretical justification agrees with this negative association. A few studies, like Mossa (2008), have estimated Okun's coefficient in various nations. He calculates Okun's coefficient for four Arab nations between 1990 and 2005. According to his findings, Okun's values are -0.011 in Algeria, -0.001 in Egypt, -0.00009 in Morocco, and 0.001 in Tunisia.

Meidani and Zabihi (2001) used the autoregressive distributed lag (ARDL) model created by Pesaran and Shin (1999) to analyze the dynamic impacts of Iran's unemployment rate on GDP per capita. The analysis also included physical capital, consumer price index, and government expenditure as a share of GDP as control variables in the regression. The ARDL econometric approach provides efficient estimates in case of small sample size and nonstationary regressors. It was found in this study that unemployment has both a negative and a substantial effect on real GDP in the long run and the short run. Specifically, Okun's rule provides a very accurate description of the unemployment-output relationship in Iran. Bankole and Fatai (2013) want to put Okun's rule to the test with data from Nigeria. The cointegrating Equation was estimated using the FMOLS estimator, and the study relied on the results of an Engle-Granger cointegration test. Conclusions from the study showed a positive correlation between unemployment and economic expansion, indicating that Okun's

Law does not hold true in Nigeria. This research recommends implementing structural reforms and labor market policy adjustments as a matter of economic policy. Altunöz (2019) used panel integration techniques and panel error correction to look at the relationship between economic growth and unemployment in the eurozone between 2000 and 2012 in the context of Okun's Law. The analysis's findings point to the validity of the Okun statute. The cointegration coefficient is lower than Okun's coefficient, which is determined for the US and other developed-country tests. Soyulu et al. (2018) use a panel data approach to investigate the connection between economic development and unemployment in Eastern European nations from 1992 to 2014. Unit root tests, pooled OLS, and Johansen cointegration tests were among the standard statistical procedures used in this panel data study. Okun's coefficient is calculated to be -0.08%, which means that for every 1% rise in GDP, the unemployment rate drops by 0.08%. Kargi (2014) analyses the correlation between unemployment and GDP growth in 23 OECD countries using the Engle-Granger cointegration test and error-correction model. The findings support the applicability of Okun's Law in OECD nations, revealing a negative relationship between unemployment and economic development over the long term.

Ben-Salha and Zmami (2021) seek to examine the employment intensity of economic growth; that is, the study analyses the employment-growth relation instead of the unemployment-growth relation as suggested by Okun's Law. The sample includes GCC countries and covers the 1970–2017 period. Furthermore, using a pooled mean group (PMG) estimator, the study examines the long-term effects of trade liberalization, the percentage of services in GDP, the expansion of the working-age population, urbanization, natural resource rents, and macroeconomic volatility on the employment intensity of economic growth. The results indicate that employment intensity is positively affected by trade openness, the proportion of services to real GDP, the expansion of the working-age population, and urbanization. The elasticity of job growth is adversely affected by the broader economic uncertainty caused by oil and gas price swings. The analysis recommends trade policy, labor market reforms, and diversification through developing the financial sector, real estate, and technology to increase employment response to economic growth.

Shayah and Sun (2018) discuss the current and future employment and human resources trends in GCC countries. The study highlights demographic issues prevalent across the Gulf region. The nations have high rates of population growth, reliance on foreign workers, few jobs for locals in the private sector, low female labor force participation, and high unemployment rates. Reforms to the labor market are recommended to increase private sector employment among nationals and female labor force participation. Salama and Oláh (2019) discuss key factors affecting unemployment across the selected Arab countries, including Algeria, Egypt, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, and Tunisia. The study uses panel regression methods and covers the 2000–2016 period. The analysis reveals a negative but insignificant relationship between economic growth and unemployment. On the other hand, government revenues as a share of GDP and economic freedom have a significant negative relation with unemployment.

This unique study examines a long-term time series concerning how unemployment and labor force participation affect GCC economic growth. To

conclude, the above-cited studies produce mixed results regarding the relationship between economic growth and unemployment due to differences in econometric methods, countries under investigation, data and sample period of the analysis. Furthermore, the literature on growth and unemployment relations in GCC countries is scanty. About this research gap, the present paper aims to investigate the empirical relationship between economic growth and unemployment in GCC countries. Moreover, not all of the previous studies agree with their findings.

3. Data and methodology

3.1. Data description

Six Gulf Cooperation Council (GCC) nations were included in the study's longitudinal dataset: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. The panel data set is collected for real GDP in constant 2011 US dollars, the unemployment rate (the percentage of the labor force that is unemployed but actively looking for work), and the labor force participation rate (the percentage of the population that is economically active between the ages of 15 and 64). The research also uses energy consumption (kilograms of oil equivalent per capita), trade openness (the ratio of exports plus imports to GDP), and public expenditure as a percentage of GDP. The necessary data set was obtained from the World Bank's World Development Indicators. A summary of the primary factors is provided in **Table 1**.

Table 1. Description of the variables.

Variables	Description	Source
GDP	Real GDP measured in constant 2010 US dollars	World bank national accounts online database
Unemployment rate	unemployment, total (percent of the total labor force)	World bank national accounts online database
Labor force participation rate	labor force participation rate, total (percent of total population ages 15–64)	World bank national accounts online database
Public expenditure	ratio of public expenditure to GDP	World bank national accounts online database
Trade openness	the ratio of the sum of imports and exports to GDP	World bank national accounts online database
Energy consumption	kilogrammes of oil equivalent per capita	World bank national accounts online database

Source: Author's compilation.

3.2. Model specification

We use a different version of Okun's Law to check its validity for GCC countries. Okun (1962) estimates the empirical model in the gap and difference versions. Since unemployment and the output gap are unobservable in the long run and must be estimated, this creates uncertainty in estimating Okun's Law in the gap version (Andonova and Petrovska, 2019); the change/first difference version of Okun's Law can be presented in Equation (1):

$$Y_{it} - Y_{it-1} = \alpha + \beta(U_{it} - U_{it-1}) + e_{it} \quad (1)$$

the dependent variable (Y_{it}) real GDP and Y_{it-1} lagged GDP of country i in period t is a cross-section and time dimension of the data series of independent variables such as (U_{it}) current unemployment rate and U_{it-1} is the lagged unemployment rate. Okun Law is estimated in the first difference, assuming no change in the natural unemployment rate and constant growth in potential GDP. The different versions of Okun's Law given in Equation (1) can also be written in the following form:

$$\Delta Y_{it} = \alpha + \beta \Delta U_{it} + e_{it} \quad (2)$$

where Δ is the first difference operator. β represents the response of changes in the GDP to changes in the unemployment rate. We are mainly interested in this coefficient because it allows us to determine whether Okun's Law is applicable and valid in a given economy or area. A negatively signed coefficient predicts an inverse relationship between changes in the unemployment rate and changes in economic growth. Nevertheless, as they illustrate the overall impact of variations in GDP on variations in the unemployment rate, Equations (1) and (2) are aggregate in nature. In order to examine the distinct impacts of various unemployment rate components on the GDP, we adhere to Anderton et al. (2014) and enhance the Okun relationship by breaking down changes in the overall unemployment rate into its expenditure components, which are as follows: labor force participation (L), government expenditure(G), international trade (TO) and energy consumption (EC):

$$\Delta Y_{it} = \sum_g \lambda_{git} \Delta U_{git} \quad (3)$$

λ_{git} is a weight attached to each component of government expenditure, international trade and energy consumption as a share in the unemployment rate. Equation 2 is obtained by substituting Equation (3):

$$\Delta Y_{it} = \alpha + \sum_g \beta_g \lambda_{git} \Delta U_{git} + e_{it} \quad (4)$$

We estimate a different Okun coefficient β_g for each component rather than a single one β . Equation (4) is thus increased by adding the unemployment rate expenditure components to it, and it is as follows:

$$\Delta Y_{it} = \alpha + \beta_1 \lambda_{g1it} \Delta L_{it} + \beta_2 \lambda_{g2it} \Delta G_{it} + \beta_3 \lambda_{g3it} \Delta TO_{it} + \beta_4 \lambda_{g4it} \Delta EC_{it} + e_{it} \quad (5)$$

The coefficients β 's from 1 to 4 show individual Okun's Coefficients for labor force participation rate, public expenditure, trade openness and energy consumption, which measure the differential response of GDP to each component of aggregate demand, respectively.

3.3. Methodology

The inverse relationship between the unemployment rate and potential output was established by Arthur Okun (1962) through his study of the US economy. A larger workforce necessitates the production of additional goods and services, which forms the theoretical foundation of the relationships Okun studied. According to Okun's research, the unemployment rate rose in years with low or even negative real growth rates, while it decreased in years with high real growth rates.

This study examines the relationship between the GCC's unemployment rate, labor force participation, and GDP growth from 1990 to 2018. We added some control variables to Okun's model, such as public expenditure, trade openness, and energy

consumption, which are the main sources of unemployment and labor force participation in the GCC economy. The study uses the following methodological framework:

To begin the formal analysis of the panel country-year observations, we must first determine the cross-section dependency present in the data. Oil prices and global financial shocks are two examples of common global shocks with varying impacts on different nations, which might lead to this association. This association may also arise from regional or global impacts that have local origins. In order to do this, the Pesaran (2004) cross-sectional dependence (CD) test is utilized.

The integration properties of the variables under study (GDP, unemployment rate, labor force participation rate, public expenditure, trade openness, and energy consumption) are tested using first and second-generation unit root tests, depending on whether or not cross-sectional dependence is present. When doing Dicky-Fuller regressions, the second-generation unit root tests (Pesaran, 2007) allow cross-section heterogeneity and cross-section dependency in the country-year observations, but the first-generation unit root tests (e.g., Maddala and Wu, 1999) do not.

The current research applies the first and second-generation cointegration tests employed by Malik and Masood (2021) to determine if economic growth, unemployment rate, and labor force participation rate are cointegrated over the long run. Second-generation cointegration tests, like the Westerlund test, have the immediate benefit of allowing cross-section dependency in the country-year observations. The first-generation cointegration tests, such as Pedroni and Koa, do not detect cross-sectional dependency.

So, for estimating long-run coefficients in Equation (2), the present analysis utilizes DOLS and FMOLS, as suggested by Kao and Chiang (2001). DOLS and FMOLS perform more efficiently than OLS in eliminating autocorrelation in the cross-country residual terms. These estimators are further robust to the endogeneity bias in the explanatory variables.

4. Results and discussion

The findings of the CD test for cross-section dependency in panel time-series data are presented in this section, written by Pesaran (2004). Following that, the results of the first-generation panel unit root test, as well as the second-generation panel unit root test for the primary variables, are reported. Both the first generation and the second generation of cointegration tests are utilized in order to evaluate whether or not the variables do, in fact, have a long-term connection with one another, also known as cointegration. Finally, DOLS and FMOLS estimators are used to estimate long-run coefficient estimates of unemployment, labor force participation rate, public expenditure, energy consumption, and trade openness.

4.1. Cross-section dependence and other tests

Table 2 displays the results of the CD test conducted by Pesaran (2004) to investigate the cross-section dependency among the country-year observations. The assumption that there is no cross-section dependency in the variable series is referred to as the test's null hypothesis. At the 1% significance level, the findings provided in

Table 2 demonstrate that the null hypothesis should be rejected. It provides evidence that the variable series contains a cross-section dependency that is present.

Table 2. Various pre-estimation tests.

Test	Statistic	Conclusion
Pesaran CD	$F = 14.18; p\text{-value} = 0.000$	Presence of cross-section dependence
Woolridge test for autocorrelation	$F(1,5) = 479.76; p\text{-value} = 0.000$	Presence of autocorrelation
Wald test: Panel group wise heteroscedasticity test	$Chi = 143.90; p\text{-value} = 0.000$	Group wise heteroscedasticity

Note: For the Pesaran CD test, H_0 is “cross-section independence”. For the Woolridge test, the null hypothesis is “no first order autocorrelation”. For the Wald test, the null hypothesis is “homoscedasticity”. Source: Authors own calculations.

In order to test for the presence or absence of autocorrelation, Woolridge’s (2010) autocorrelation test is utilized. The test maintains the null hypothesis of “no first-order autocorrelation”. The data shown in **Table 2** indicate that the null hypothesis of no first-order autocorrelation should be rejected at the 1% significance level. In addition, the Wald test is applied in order to analyze group-wise heteroscedasticity. The model rejects the null hypothesis of the residuals having homoscedasticity at the 1% significance level in favor of heteroscedasticity. All of these tests provide evidence that the conventional estimators of fixed and random effects can easily lead to biased results because of issues like cross-sectional dependence, autocorrelation, and heteroscedasticity. These results justify the application of FMOLS and DOLS estimators in the present analysis.

4.2. Unit root testing

The results of the unit root tests based on p -values at various lag lengths are presented in **Table 3**, which may be found here. As the non-stationary variables can produce misleading regression problems, The goal is to test the stationarity of all studies would be required before model estimation. In order to accomplish this goal, we use the unit root tests of the first generation (Maddala and Wu, 1999) and the second generation (Pesaran, 2007). Although the test was successful, it is essential to highlight that the null hypothesis is still supported by the Maddala et al. tests since “the series has unit root”. Both of these tests are considered heterogeneous panel tests, which means that they use a unit root test for each nation, and then they combine the findings by running them through an F -test to determine whether or not a joint unit root exists in the series for all of the countries. In addition, the Maddala and Wu test assumes that cross-section dependence takes the form of many unobserved common factors, whereas the Pesaran test assumes that cross-section dependence takes the form of a single unobserved common factor. According to the results presented in **Table 3**, the Maddala and Wu and Cross sectional Im Pesaran Shin (CIPS) panel unit root tests imply that we are unable to reject the null hypothesis that the variables are nonstationary for up to four lags. However, the results of both tests show that all variables reach a stationary state after the first differentiation. At the 5% significance level for one lag, our findings conclude that the alternative hypothesis that the variable

series is I(0) is more likely to be true than the null hypothesis that the variable series is I(1).

Table 3. Panel unit root tests.

lags	Ln _y	Lnuemp	lnlab	At levels without a trend			At first, difference without a trend						
				lnexp	lntrade	lnenergy	ΔLn _y	ΔLnuemp	Δlnlab	Δlnexp	Δlntrade	Δlnenergy	
First generation unit root test: Maddala and Wu (1999) Panel unit root test (MW)											-	-	-
0	2.13 (0.99)	9.51 (0.65)	1.14 (1.00)	2.33 (0.94)	5.60 (0.38)	4.60 (0.83)	132.06 (0.00)	83.93 (0.00)	29.02 (0.00)	30.09 (0.01)	34.90 (0.00)	45.98 (0.00)	
1	5.33 (0.94)	14.07 (0.29)	4.17 (0.98)	5.57 (0.99)	9.80 (0.71)	12.07 (0.92)	62.36 (0.00)	66.31 (0.00)	23.87 (0.02)	67.98 (0.00)	54.82 (0.00)	76.88 (0.00)	
2	2.75 (0.99)	14.30 (0.28)	2.87 (0.99)	2.98 (0.83)	2.56 (0.31)	8.70 (0.32)	27.02 (0.00)	42.18 (0.00)	18.04 (0.11)	19.98 (0.00)	76.00 (0.00)	65.47 (0.00)	
3	3.87 (0.98)	17.28 (0.13)	2.14 (0.99)	4.70 (0.70)	2.57 (0.94)	7.40 (0.54)	18.17 (0.11)	33.72 (0.00)	10.70 (0.55)	15.54 (0.11)	54.98 (0.00)	11.10 (0.43)	
4	4.047 (0.98)	15.65 (0.20)	2.45 (0.99)	2.657 (0.19)	6.50 (0.23)	5.60 (0.14)	11.34 (0.50)	26.34 (0.01)	7.99 (0.78)	12.21 (0.54)	(11.98) (0.54)	10.12 (0.50)	
Second generation unit root test: Pesaran (2007) Panel unit root test (CIPS)											-	-	-
0	-2.07 (0.01)	2.18 (0.98)	0.16 (0.56)	-4.07 (0.17)	1.82 (0.87)	1.06 (0.66)	-7.74 (0.00)	-7.13 (0.00)	29.02 (0.00)	-8.84 (0.00)	-9.31 (0.00)	30.00 (0.00)	
1	-0.50 (0.84)	1.71 (0.95)	-2.11 (0.01)	-0.75 (0.57)	1.17 (0.59)	-1.21 (0.03)	-4.57 (0.00)	-4.78 (0.00)	32.75 (0.00)	-5.47 (0.00)	-8.87 (0.00)	32.78 (0.02)	
2	1.00 (0.84)	2.70 (0.99)	-1.11 (0.13)	1.34 (0.48)	7.02 (0.39)	-1.21 (0.14)	-2.30 (0.01)	-2.66 (0.00)	15.40 (0.21)	-2.50 (0.01)	-2.76 (0.00)	17.40 (0.10)	
3	0.07 (0.52)	2.18 (0.98)	-1.49 (0.06)	0.70 (0.20)	8.12 (0.89)	-4.59 (0.16)	-1.15 (0.12)	-0.17 (0.43)	10.70 (0.55)	-1.14 (0.11)	-0.13 (0.34)	8.70 (0.65)	
4	0.96 (0.83)	1.25 (0.89)	-3.62 (0.00)	0.67 (0.54)	2.51 (0.98)	-6.23 (0.00)	-1.62 (0.05)	0.99 (0.83)	7.99 (0.78)	-1.26 (0.04)	0.709 (0.73)	7.89 (0.78)	

Notes: Null for MW and CIPS tests: Series is I(1). MW test assumes cross-section independence. CIPS test assumes cross-section dependence is in the form of a single unobserved common factor. Ln_y is the natural log of GDP, Lnuemp is the natural log of the unemployment rate, and lnlab is the natural log of the labor force participation rate. Source: Authors own calculations.

4.3. Cointegration test results

To determine if there is a long-run relationship between GDP growth, unemployment rate, labor force participation rate, public expenditure, trade openness, and energy consumption, we first tested for cointegration after establishing the presence of cross-sectional dependence and the order of integration of the variables. For this purpose, we describe cointegration tests from the first (Pedroni, 2004; Kao, 1999) and second (Westerlund, 2007) generations. The absence of cointegration is the null hypothesis for Pedroni and Koa tests. At the same time, the absence of a panel error correction model between the variables is the null hypothesis for the Westerlund test. If there is cointegration between the variables, there must be a panel error correction model. The outcomes of the cointegration tests are shown in **Tables 4** and **5**. The Akaike Information Criterion (AIC) determines the optimal lag time. The findings show that cointegration is widely acknowledged, indicating a genuine structural link between the variables.

Table 4. Pedroni and Kao cointegration test.

A. Pedroni residual cointegration test				
Alternative hypothesis: Common AR coefs. (within-dimension)			Weighted	
-	Statistic	Prob.	Statistic	p-value
Panel v-Statistic	5.562549	0.0000	6.523057	0.0000
Panel rho-Statistic	-6.509603	0.0000	-5.791204	0.0000
Panel PP-Statistic	-5.380149	0.0000	-5.456375	0.0000
Panel ADF-Statistic	-5.553816	0.0000	-5.338465	0.0000
Alternative hypothesis: Individual AR coefs. (between-dimension)				
Group rho-Statistic	-4.766836	0.0000	-	-
Group PP-Statistic	-6.998407	0.0000	-	-
Group ADF-Statistic	-6.339328	0.0000	-	-
B. Kao test			t-statistic	p-value
Alternative hypothesis:				
ADF	-	-	-5.965504	0.0000

Note: Null hypothesis: no cointegration. Average AIC selected lag length: 1. Source: Authors own calculations.

Table 5. Westerlund ECM panel cointegration tests.

Statistics	Value	z-value	p-value
Gt	-3.328	-3.203	0.000
Ga	-15.08	-2.553	0.007
Pt	-6.690	-2.679	0.002
Pa	-13.25	-3.946	0.000

Note: Null hypothesis: no panel error correction model. Average AIC selected lead length: 0.17. Source: Authors own calculations.

4.4. FMOLS and DOLS estimates

Results of estimating Equation (2) with panel FMOLS and DOLS estimators in the presence of cointegration are shown in **Table 6**. The Akaike Information Criterion (AIC) determines the optimal gap and lead sizes. The calculated findings show that the unemployment coefficient is negative and statistically significant at the 5% confidence level. An increase in the growth rate by 1% will decrease the unemployment rate by about 0.34%. This result is compatible with economic theory (Okun's coefficient) that claims an inverse linkage between economic growth and unemployment rate in GCC states. These results are consistent with the findings reported by (Hjazeen, 2021). Additionally, at the 1% level of statistical significance, the effect of the labor force participation rate is positive and significant. Okun (1962), Christopoulos (2004), Meidani and Zabihi (2001), etc. all found similar things in their empirical research. However, our analysis contrasts with the findings of Kreishan (2011), Bankole and Fatai (2013), and Salama and Olah (2019).

As for the controlled variables, we found that public expenditure negatively impacts the growth rate of GDP in the GCC countries. The coefficient estimate of public expenditure is negative and significant at a 10% significance level. An increase in the growth rate by 1% will decrease the public expenditure by about 0.15%. Over the decades, GCC countries opted for a state-led economic development model

controlled by the public sector. The significant interference of the public sector in economic activities resulted in inefficiency and corruption, which negatively impacted GDP growth. The coefficient estimate of trade openness is also negative but insignificant. The negative relationship between trade openness and GDP growth can be attributed to numerous factors, such as a large share of primary product exports (fuel exports) as a percentage of merchandise trade across the GCC countries. Finally, the impact of energy consumption on GDP growth is positive and significant at a 1% significance level. The coefficient shows that a 1% increase in energy consumption produces about a 0.21% increase in GDP growth rate. This result indicates that an increase in energy consumption promotes economic growth. These results are consistent with the findings reported by Hakura (2004), Pamuk (2006), Loko and Diouf (2009), Sabra (2016), and Damette and Seghir (2018). The regression results of FMOLS are consistent with the DOLS model, though the coefficient estimates of unemployment and labor force participation rates differ.

Figure 1 reinforces the results presented in **Table 6**. Here, the Y-axis measures the unemployment rate, and the X-axis measures GDP. A clear negative relationship between unemployment and output is observed in Bahrain, Oman, and Qatar. The absence of a negative relationship in Kuwait, UAE and Saudi Arabia indicates that reducing unemployment will not accompany a cyclical recovery. Further, it might reflect the structural component of the unemployment rate and specific differences in the labor market in these countries.

Table 6. Long-run coefficient estimates using DOLS and FMOLS.

Variables	Model FMOLS	Model DOLS
Dependent variable: lnY	Coefficients	Coefficients
Lnuemp	-0.3485** (0.1444)	-0.2554** (0.1414)
Lnlab	9.6617* (1.3647)	11.2448* (1.4201)
Lnexp	-0.153*** (0.0509)	-0.131*** (0.060)
Lntrade	-0.734 (0.0584)	-0.374 (0.340)
Lnenergy	0.432* (0.216)	0.321* (0.160)
Adj R^2	0.84	0.88
S.E. of regression	0.45	0.40

Notes: Parenthesis shows standard errors. *, **, *** denotes 1%, 5%, and 10% significance levels, respectively. We estimated the grouped version of the FMOLS and DOLS, which estimates the cross-section average of the individual cross-section estimates. Source: Authors own calculations.

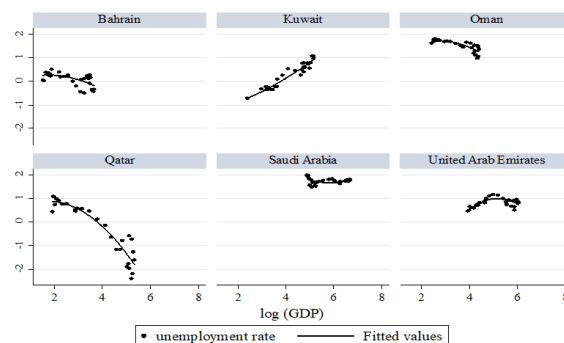


Figure 1. Okun’s Law—GDP growth and unemployment. Source: Authors own calculations.

4.5. Granger causality results

To analyze the Granger causality relationships among unemployment, labor force participation, and GDP growth, we used the Dumitrescu-Hurlin (2012) test. Since this article focuses on examining the relationship between unemployment, labor force participation, and economic growth without introducing any intervening factors, please note. The long-term causality findings are shown in **Table 7**. At the 1% threshold of importance, it is agreed that the unemployment rate does not hinder economic growth. In contrast, the inverse causal relationship between economic growth and unemployment is rejected at a 1% significance level, meaning the null hypothesis is false. These findings point to a one-way causal relationship between economic expansion and joblessness. The non-Hodges-Granger causal relationship between the labor force participation rate and GDP growth is also rejected at the 1% significance level. However, the data also indicate that economic development is causally linked to higher labor force participation rates. Further, a long-run causal relationship runs from labor force participation rate variations to unemployment. These results suggest that the lack of economic growth and increasing labor force participation rate explains the unemployment problem in GCC countries.

Table 7. Pairwise Granger causality test.

Null hypothesis	W-statistic	Z bar-statistic	p-value
$\ln uemp \neq \ln y$	2.82936	0.63384	0.5262
$\ln y \neq \ln uemp$	4.98131	2.80109	0.0051
$\ln lab \neq \ln y$	2.99059	0.81320	0.4161
$\ln y \neq \ln lab$	8.84445	6.76287	0.000
$\ln uemp \neq \ln lab$	1.82621	-0.37645	0.7066
$\ln lab \neq \ln uemp$	4.99254	2.81240	0.0049

Note: \neq indicates “does not cause.” $\ln y$ denotes the natural log of real GDP, $\ln uemp$ denotes the natural log of the unemployment rate, and $\ln lab$ denotes the log of the labor force participation rate. Source: Authors own calculations.

4.6. Diagnostic tests

In **Figure 2**, we see the actual values, fitted values, and residuals (e_{it}), as well as the plus and minus one standard error estimates in the dotted lines, to evaluate the “goodness of fit” of Equation (2). The residuals are shown on the left vertical axis, the actual values and the fitted values on the right, and the slope of the line connecting the two is the fitted value. The figure shows that the actual and fitted values are moving closely with each other in all the panel units, implying a reasonably better fit of the model (Equation (2)). But the residuals graph shows a very small number of data points for which the fit could be better. Further, following Alejo et al. (2015), we check for skewness and kurtosis in both country-specific effects (μ_i) and innovation term (e_{it}). Here, skewness and kurtosis provide information about the effects of unemployment, labor force participation patterns, public expenditure, trade openness and energy consumption on economic growth across the GCC countries. **Table 8** reports four statistics used for skewness and kurtosis for each error component (i.e., μ_i and e_{it}). The lower part of the table shows a joint test for normality on μ_i and e_{it} and the respective p-values. The results reveal that both the components of the error

term are (separately and jointly) normal. Overall, Figure 1 and Table 8 reveal that Equation (2) has desirable statistical and theoretical properties and, therefore, can be used for policy analysis.

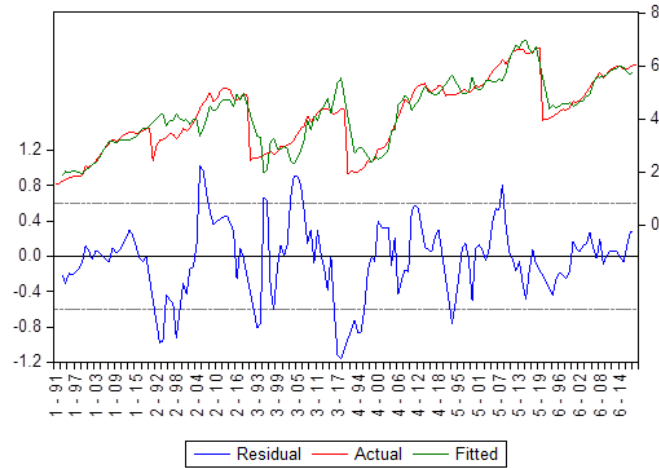


Figure 2. Residual plot (Source: Authors own calculations).

Table 8. Tests of normality.

-	Observed coef.	Bootstrap Std. Err.	<i>z</i>	<i>P</i> > <i>z</i>	Norma-based 95% Conf. Interval	
Skewness_ <i>e_{it}</i>	-0.436	0.199	-0.22	0.827	-0.433	0.346
Kurtosis_ <i>e_{it}</i>	-0.385	0.839	-0.46	0.646	-2.031	1.260
Skewness_ <i>μ_i</i>	0.138	0.820	0.17	0.866	-1.469	1.745
Kurtosis_ <i>μ_i</i>	-1.348	6.385	-0.21	0.833	-13.862	-11.166
Joint test for normality on <i>e_{it}</i> :			$\chi^2(2) = 0.26$		$P > \chi^2 = 0.878$	
Joint test for normality on <i>μ_i</i> :			$\chi^2(2) = 0.07$		$P > \chi^2 = 0.964$	

Note: Standardized coefficients. The null hypothesis assumes normality in *μ_i* and *e_{it}*, respectively. Source: Authors own calculations.

5. Conclusion and policy recommendations

The present research carried out a panel cointegration analysis to examine the impact of the unemployment rate and labor force participation rate on economic growth in GCC countries over the 1990–2018 period. Moreover, the study utilized the regression’s control variables of public expenditure, trade openness, and energy consumption. Specifically, the study evaluates evidence of Okun’s Law in GCC countries. The present analysis settled for panel FMOLS and DOLS estimators based on various pre-estimation test results (such as cross-section dependence, autocorrelation and heteroscedasticity). Further, Dumitrescu-Hurlin’s (2012) panel causality test examines causality amongst the variables.

The paper’s findings revealed the long-run relationship between economic growth, unemployment, labor force participation, public expenditure, trade openness and energy consumption. The unemployment rate is found to have a long-run negative and significant impact on GDP, with a coefficient estimate of -0.36. Therefore, Okun’s Law is valid for GCC countries. At the same time, the labor force participation rate is found to have a long-run positive and significant impact on GDP. Public

expenditure has a negative impact on the GDP growth rate, with a coefficient estimate of -0.15 in the GCC countries. The coefficient estimate of trade openness is also found to be negative but insignificant. Finally, the impact of energy consumption on GDP growth is found to be positive and significant, with a coefficient estimate of 0.432 in the GCC countries. Furthermore, the results reveal the existence of unidirectional causality running from economic growth to unemployment.

6. Policy suggestions

Nowadays, many countries are trying to develop strategies and plans to expand job opportunities and decrease the existing unemployment rate. Lack of economic development is the primary cause of unemployment in the GCC nations, as shown by Okun's rule and the unidirectional causation between the two. In enacting economic policy to reduce unemployment, the GCC states must take into account the presence of a long-run link between unemployment and economic growth. These results suggest that GCC nations benefit from an increase in economic activity since this would encourage private sector development and employment, therefore absorbing the region's expanding workforce and lowering the unemployment rate. The government of the GCC economy has to focus on creating a proper environment for the private sector to create more jobs and increase job opportunities. Hence, lowering unemployment and transforming the youth bulge into the youth dividends in the GCC nations may be achieved by economic policies focused on structural improvements and reforms in the labor market. These findings have significant policy implications for the group of developing and emerging nations and significantly add to the current discussion surrounding Okun's Law. Specifically, in the strategy to lower unemployment in these countries, enhancing the institutional environment through enhancing government effectiveness (GE), control of corruption (CC), regulatory quality (RQ), the rule of law (RL), voice and accountability (VA), and so on is just as crucial as promoting economic growth.

The limitation of this study is that the time horizon was limited to 28 years due to the lack of reliable and consistent data on the unemployment and labor force participation rate in GCC countries. Moreover, accounting for factors like public expenditure, trade openness, and energy consumption would add more value to the quantification of the relationships and make it more informative. However, notwithstanding the present study some limitations, the quantitative analysis conducted in the present study provides some useful information for policymakers on the role of sustainable growth in improving the material well-being and standard of people's lives in developing countries.

Author contributions: Conceptualization, SA and YA; methodology, SA; software, SA; validation, NS and YA; formal analysis, SA; investigation, YA; resources, NS and KK; data curation, NS; writing—original draft preparation, SA and YA; writing—review and editing, KK and YA; visualization, NS; supervision, KK; project administration, KK; funding acquisition, YA. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

Note

- ^{1.} We follow Christopoulos (2004), Harris and Silverstone (2001), Viren (2001), and Freeman (2001), who specified output expansion as a function of the unemployment rate only while assuming that other variables (e.g., capital stock) change *pari passu* with the unemployment rate (or other variables are on their equilibrium path). Still, the regression model retains a few important variables (specific to GCC economies).

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