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SEÇİLİ SEKTÖRLERDEKİ İSTİHDAMIN EKONOMİK BÜYÜME ÜZERİNDEKİ ETKİSİ: IRAK ÖRNEĞİ*

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Öz

Araştırmanın amacı, istihdamın ekonomik büyüme üzerindeki etkisini analiz etmek ve bu etkinin tarım, sanayi ve hizmet sektörleri üzerindeki etkisini değerlendirmektir. İlgili literatürden elde edilen bulgular doğrultusunda, bu çalışma Irak örneği üzerinden bir ARDL sınır testi ve Toda Yamamoto nedensellik analizi uygulanmıştır. Çalışmanın bulgularına göre, tarım, sanayi ve hizmet sektörlerindeki istihdam artışlarının ekonomik büyümeyi olumlu yönde etkilediği görülmüştür. Uzun dönem katsayı sonuçları, bu sektörlerde istihdamdaki artışların ekonomik büyüme ile pozitif bir ilişki içinde olduğunu ortaya koymaktadır. Özellikle, tarım sektöründeki istihdamda meydana gelen artışların ekonomik büyümeyi belirgin şekilde desteklediği tespit edilmiştir. Toda Yamamoto nedensellik analizi sonuçlarına göre, ekonomik büyüme ile tarım, sanayi ve hizmet sektörleri arasında tek yönlü bir nedensellik ilişkisi bulunmaktadır. Bu da ekonominin çeşitli sektörlerinin birbiriyle etkileşimi ve bu etkileşimin ekonomik büyümeyi teşvik etmesiyle açıklanabilir. Tarım, sanayi ve hizmet sektörlerinin ekonomik büyümeye olan katkılarının farklı olmasına rağmen, her birinin büyümeye olumlu yönde etkide bulunduğu görülmektedir.

Anahtar Kelimeler: Ekonomik Büyüme, Tarım Sektöründe İstihdam, Sanayi Sektöründe İstihdam, Hizmet Sektöründe İstihdam, ARDL Sınır Testi

Jel Kodları : *C40, C49, C50, C59.*

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THE IMPACT OF EMPLOYMENT IN SELECTED SECTORS ON ECONOMIC GROWTH: THE CASE OF IRAQ

Abstract

The aim of the research is to analyses the effect of employment on economic growth and to assess the impact of this effect on agriculture, industry and services. In line with the findings from the related literature, this study applied an ARDL bounds test and Toda Yamamoto causality analysis on the Iraqi case. The study found that, employment increases in agriculture, industry and services sectors have a positive impact on economic growth. Long-run coefficient results reveal that increases in employment in these sectors has a positive relationship with economic growth. In particular, increases in employment in the agricultural sector are found to significantly support economic growth. In accordance with the outcomes of the Toda-Yamamoto causality analysis, there is a unidirectional causality connection between economic expansion and agriculture, industry and services sectors. This can be explained by the interaction of various sectors of the economy with each other and this interaction encourages economic growth. Although agriculture, industry and services sectors have different contributions to economic growth, each of them has a positive effect on growth.

Keywords: Economic Growth, Employment in Agricultural Sector, Employment in Industrial Sector, Employment in Service Sector, ARDL Boundary Test

Jel Classification : *C40, C49, C50, C59.*

INTRODUCTION

The ability of a nation to attain economic growth on a sustainable basis is important for the favorable socio-economic development of that nation. This means that we need to, the factors that determine economic expansion, which can be described as the rise in the real value of total income over a given period, are among the most widely studied topics. Although it is influenced by many factors, how economic growth is influenced by which sectors has been the subject of research for many years.

Although economic growth is thought to be theoretically based on classical economics, according to the Physiocrats in the pre-classical period, agriculture is the only production activity that can give more output than the amount of input, and the agricultural sector is the locomotive of growth since it gives more than what is spent (Gudeman, 1980). Some of the academic studies provide evidence that the agricultural sector is the driver of growth (Poonyth et al., 2001; Safdar et al., 2012; Khan et al., 2012; Bakari and Mabrouki, 2018). In addition, innovations in consumption patterns and preferences have led to the development of the services sector worldwide. As in the case of India, the understanding of growth based on the service sector and the shift from industrial sectors to the services sector has become a subject of research. Researchers such as Tandrayen-Ragoobur (2010), Szirmai (2012), Alhowaish (2014), and Szirmai and Verspagen (2015) point to a trend from the industry to the services sector and conclude that the tertiary sector sector contributes significantly to economic expansion. On the other hand, Kaldor (1966) emphasized that the industrial sector is the most fundamental element of economic expansion and argued that the transition from agricultural production to industrial production is necessary for development and welfare increase. In addition to Lewis (1954), Myrdal (1957), Hirschman (1958), Chenery (1960), Prebisch (1962), Kuznets (1966) emphasized the inevitability of economic growth through industrialization. In general terms, there is a prediction that agricultural productivity has diminishing returns to scale and that the demand for agricultural products is limited. This assumption is supported by the fact that the share of the agricultural sector in GDP and the share of agricultural employment in total workforce engagement are quite low in today's industrialized nations. As of 2019, the share of agriculture in GDP in EU countries is around 1.6 per cent, while in Turkey it is around 6.4 per cent. While the share of agricultural workforce engagement in total workforce engagement is 4.2% on average in EU countries, it is 18.1% in Turkey. This ratio is 1.3 per cent for the USA and 1.04 per cent for the UK (World Bank, 2023).

Economic growth is heavily influenced by labor productivity. In economic terms, output productivity refers to the correlation between the total output produced and the inputs required for its production. It can be calculated as the ratio of output to each production factor (Ai et al., 2020). Simply put, labor intensity is defined as the production volume per worker or the monetary value of that production. To accurately assess productivity, it is essential to consider not only the quantity of output but also its value, particularly value-added. This approach is crucial because generating high value-added products and effectively leveraging them domestically and in international markets gives nations a competitive edge in the global economy. Labor productivity, which is associated with the concept of effective labor in the Solow model (1956) through the inclusion of technological progress, is further elaborated in innovation-driven growth theories by Romer (1990), Grossman and Helpman (1991), and Aghion and Howitt (1992). These models define effective labor as a skilled workforce capable of creating value-added outputs or as labor engaged in the R&D sector, which is central to achieving competitive advantages.

This study primarily seeks to examine the connection between employment in the agriculture, industry, and services sectors and Iraq's economic growth, focusing on how this relationship evolves over the long term. The contributions of the agriculture, industry, and services sectors to economic development and the influence of employment within these sectors on economic growth hold strategic significance for developing nations. Consequently, this research aims to provide deeper insights into Iraq's structural economic transformation and the distribution of its sectoral dynamics.

The agricultural sector has traditionally been one of the determining sectors of the Iraqi economy. However, industrialization and growth in the service sector in recent years have led to a change in the economic structure and transformation of the employment structure. Therefore, analyzing the association between employment in cultivation production sector, production sector and services sectors and progress in the economy will contribute to a better understanding of Iraq's economic growth strategies and policies.

The importance of this study is necessary for making strategic decisions and allocating resources effectively in the economic development process of Iraq. An accurate understanding of the impact of employment in farming sector, manufacturing field and service sectors on economic growth can lead to more effective implementation of economic policies. Moreover, this study can serve as a model for other developing countries and encourage similar analyses in countries with similar economic structures.

In the first part of the study, the general introduction and purpose of the study are presented. In the second section, the concepts of workforce engagement and economic expansion, which constitute the focal point of the study, are explained in detail. Focusing on various aspects of employment, different types of employment such as full employment, underemployment, overemployment and informal employment are discussed. In addition, the importance of workforce engagement in farming sector, manufacturing field and services sectors and the factors affecting employment in these sectors have been emphasized. As for the concept of economic growth, its different types and models have been explained in detail along with its general importance. Classical, Marxist, Keynesian, Harrod-Domar, neo-classical and endogenous growth models are discussed and the basic elements of each of them are presented. In addition, the determinants of economic growth are also analyzed and it is explained how various factors from natural resources to technological development affect economic growth. In the third section, a literature review is conducted and the findings obtained from similar studies and the theoretical framework put forward are discussed. In the fourth section, the application and findings, which constitute the main part of the study, are presented. In this section, the connection between workforce engagement in agriculture, industry and tertiary sector sectors and economic expansion in Iraq is analyzed and the results obtained are evaluated in detail. In the fifth and final section, a general evaluation of the study is made, the importance of the findings is emphasized and suggestions for future studies are presented.

LITERATURE REVIEW

Previous research on the economic growth-employment relationship has drawn certain conclusions based on employment and economic growth data, despite differences in the methods of calculation.

Seyfried (2011) examined the connection between economic expansion, measured by both real GDP and the output gap, and workforce engagement in the top ten US states from 1990 to 2003. According to the study, economic growth has an immediate effect on employment and this effect lasts for months in most of the top ten states.

According to the empirical study conducted by Eser (2012), contrary to expectations, the relationship between unemployment and employment was mostly positive, while the connection between workforce engagement and economic expansion was negative in some years in Turkey. Looking at OECD countries, the Wald statistic was found to be significant at the 10% level in the estimation where unemployment change was the dependent variable and at the 1% level in the estimation where economic growth was the dependent variable. Therefore, a bidirectional causality relationship was found in OECD countries, with causality existing both from unemployment to growth and from economic growth to unemployment.

Timur and Doğan (2015) tested whether there is a causality connection between growth and employment rates for the years 1980-2014. Granger causality analysis was applied for this purpose. Causality relationship was rejected for both variables. Therefore, it cannot be concluded that the growth rate increases the employment rate or vice versa.

Dada (2018) analyzed the validity of jobless growth for the Nigerian economy. According to the results of the study, which analyzed the data between 2002 and 2014 with vector autoregressive models with structural breaks (SVAR), employment increases after economic growth in the Nigerian economy, especially in the agricultural sector. In general, it is concluded that non-employment generating growth is valid in the Nigerian economy except for the agricultural sector.

Çelik (2019) explains the connection between employment and economic expansion for G-8 countries and Turkey. Covering the years 2005 to 2017, the study examines the association between workforce inclusion and economic expansion for G-8 countries and Turkey using panel information and time series analysis. According to the outcomes of the Johansen cointegration test, there is a long-run connection between workforce engagement and economic expansion for the G-8 countries. Based on the Engle-Granger causality test data, the study concludes that there is a bidirectional causality connection between the variables (growth rate and employment rate) for both G-8 countries and Turkey. Thus, it is concluded that economic growth increases employment rates and employment increases economic growth.

Altun and İşleyen (2019) examined the association between economic expansion and workforce engagement in the industrial sector in Turkey. The study used the ARDL bounds testing approach, and data from the period 1991 to 2017 were used. The outcomes showed that there is a long-run association between economic expansion and employment in the industrial sector. The relationship is unidirectional, with industrial employment leading to economic growth.

Bölükbaş (2019) examined the association between workforce inclusion indicators and progress in the economy. Employment indicators such as employment rate, unemployment rate and youth unemployment rate were used. The analysis covered the period from 1996 to 2017 and included seven Balkan countries. The Granger causality test was used as the method of analysis. The results showed a one-way connection between employment and economic expansion in Greece and Croatia, with economic growth leading to employment. However, no causality could be established between workforce engagement and economic expansion in Albania, Bulgaria, Romania and Slovenia.

Tütüncü and Zengin (2020) analyzed the connection between employment and economic growth, emphasizing the role of female employment. Their study focused on E7 countries during the 1991–2016 period, utilizing multiple break panel cointegration and panel causality tests to determine the relationship. The findings showed a unidirectional relationship in Turkey, Indonesia, and Brazil, while a bidirectional relationship was observed in China, India, and Russia. In Turkey and Indonesia, female employment drove economic growth, whereas in Brazil, economic growth led to higher female employment. No causal link was found between economic expansion and female employment in Mexico.

Aigheyisi and Edore (2021) investigate how economic expansion affects workforce engagement in the service sector in Nigeria. Employing the ARDL approach, the study utilizes data from the years 1991 to 2020. In addition to economic growth, variables reflecting trade openness, inflation, and financial sector development are included in the model. The findings reveal that economic growth positively influences employment in the service sector in both the short and long term in Nigeria. An increase in trade openness and the development of the financial sector contribute to the growth of employment in the service sector, while an increase in inflation has a negative impact.

Tecirli (2022) explored the connection between innovation, employment, and economic expansion in OECD countries using panel data regression analysis. The study, covering the 2013–2020 period, revealed that both capital and employment indices positively and similarly influenced the growth rate.

Özgün (2023) analysed the connection between economic expansion and workforce engagement from a sectoral perspective and the case of Turkey. Engle-Granger cointegration analysis and Granger causality test was used in the analysis based on the share of service sector employment in total employment and GDP values based on the chained volume index. The analysis, which covers the period 1998-2021, reflects the existence of a long-term relation among the factors and a one-way causal relation from economic development to services employment.

MATERIAL AND METHOD

This study seeks to examine the impact of employment in selected sectors on economic growth, utilizing annual data spanning the period from 1991 to 2022. The analysis utilizes a comprehensive set of variables, each of which plays a critical role in examining the research objectives. These variables are carefully selected to capture the intricate dynamics of the relationship under investigation, ensuring that the analysis is both robust and reliable. The data for these variables is sourced from the World Bank database, a globally recognized repository known for its credibility and extensive coverage of economic indicators. By relying on this reputable source, the study benefits from a high degree of accuracy and comparability across datasets. Each variable reflects a unique aspect of the economic environment, and their collective integration allows for a multidimensional exploration of the topics at hand. This methodological rigor not only strengthens the empirical findings but also enhances the overall validity of the research conclusions. The detailed description of these variables and their respective sources is provided in the accompanying table to ensure clarity and transparency for readers.. For all variables except economic growth, natural logarithms were applied. The purpose of taking the natural logarithm is to mitigate large fluctuations in the dataset and enhance both the comparability and consistency of the analysis (Yeh and Liao, 2017; Wong and Li, 2020). Table 1 provides detailed information about the variables used in the study. Analyses were conducted using Eviews 14 statistical program.

Table 1. Definition of Series

Symbol	Variables	Source
gdp	Economic Growth	World Bank
$lneag$	Employment in the Agriculture Sector	World Bank
$lneind$	Employment in the Industrial Sector	World Bank
$lnes$	Employment in the Service Sector	World Bank

In the investigation of the long-term connection between variables, the model presented in equation (1) was considered:

$$gdp_i = \beta_0 + \beta_1 lneag_i + \beta_2 lneind_i + \beta_3 lnes_i + e_i \quad (1)$$

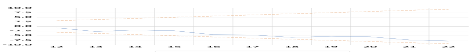
here, gdp represents economic growth, $lneag$ denotes workforce engagement in the agricultural sector, lneind represents workforce engagement in the industrial sector, and $lnes$ represents workforce engagement in the service sector. β_0 denotes the constant term, and e_i represents the error term.

Time series studies have increasingly focused on stationary stochastic processes. A stochastic process is deemed "stationary" when its statistical properties, such as the mean, variance, and covariance, remain consistent over time. This implies that the process behaves in a predictable manner, as its characteristics do not change regardless of the specific time period being analyzed. One of the key attributes of stationarity is that the covariance between values at any two points in time is determined exclusively by the time difference or lag between those points, rather than their absolute positions on the timeline. In simpler terms, the relationship between data points in the process depends only on how far apart they are in time, not on when the measurement is taken. This invariance ensures that the process exhibits a level of temporal uniformity, making it easier to model and analyze. For instance, if a time series exhibits constant mean and variance and a covariance structure that depends only on the lag, it can be considered stationary. This property is crucial in time series analysis, as many statistical methods assume stationarity to provide valid and reliable results. Understanding and verifying stationarity allows researchers to avoid misleading conclusions that might arise from non-stationary data, where trends, seasonality, or structural shifts can distort interpretations. (Gujarati, 2003; Demir and Görür, 2020). Put simply, stochastic processes are termed stationary if their conditional probability distributions remain unchanged over time (İşleyen et al., 2017). Non-stationarity is a common challenge in time series analysis, making stationarity a critical property. This is because, in models where non-stationary data is used, relationships between variables may appear statistically significant despite no true connection, resulting in spurious or misleading regression outcomes (Sevüktekin and Nargeleçekenler, 2005; Eygü, 2018). Stationarity tests play a key role in identifying and addressing such issues. When stationarity tests reveal non-stationary series, these series are transformed into stationary ones by taking their differences (Demir and Görür, 2020).

Augmented Dickey-Fuller (1981) Unit Root Test

The Dickey-Fuller (DF) (1979) unit root test initially specified all-time series as first-order autoregressive processes. However, DF tests can also be used to test for higher-order autoregressive processes.

The ADF (1981) unit root test was developed as an extension of the traditional DF (1979) test to address the issue of autocorrelation in error terms, which was ignored in the original DF (1979) test. In the DF (1979) unit root test, autocorrelation in the error terms poses a problem. One way to deal with this problem is to add to the right-hand side of the equation in the DF (1979) model lagged values of the dependent variable, enough to overcome the autocorrelation problem (Dickey and Fuller, 1979; Demir, 2021a; Özen et al., 2023; Dickey and Fuller, 1981):



(2)

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \sum_{j=2}^{k} \delta_j \, \Delta Y_{t-j+1} + \varepsilon_t \tag{3}$$

$$\Delta Y_t = \alpha + \beta t + \delta Y_{t-1} + \sum_{j=2}^{k} \delta_j \, \Delta Y_{t-j+1} + \varepsilon_t \tag{4}$$

The critical values to be used for the ADF (1981) test are the critical values of the Dickey and Fuller (1979) test. The calculated Tau test statistic is compared with these critical values to examine the presence of a unit root (Dickey and Fuller, 1979).

Phillips-Perron (1988) Unit Root Test

The Dickey-Fuller (1979) test is applied under the assumption of constant variance and independence of error terms. However, it has been observed that error terms in many time series exhibit heteroskedasticity and weak dependence properties. Phillips and Perron (PP), in their study in 1988, relaxed the assumptions about the error terms and generalized the DF (1979) test, developing a non-parametric test for detecting unit roots. The following two regression equations are used for the PP (1988) unit root test (Phillips and Perron, 1988):

$$y_t = \hat{\mu} + \hat{\alpha} y_{t-1} + \hat{u}_t \tag{5}$$

$$y_t = \tilde{\mu} + \tilde{\beta}\left(t - \frac{1}{2}T\right) + \tilde{\alpha} y_{t-1} + \tilde{u}_t \tag{6}$$

In equations (5) and (6), ($\hat{\mu}$, $\hat{\alpha}$) and ($\tilde{\mu}, \tilde{\beta}, \tilde{\alpha}$) are the parameters of the OLS regression and T is the number of observations. The t-statistics for these coefficients are as follows (Phillips and Perron, 1988):

$$t_{\hat{\alpha}} = (\hat{\alpha} - \alpha)\{\sum(y_{t-1} - \bar{y}_{-1})^2\}^{\frac{1}{2}}/\hat{s}$$

$$t_{\hat{\mu}} = (\hat{\mu} - \mu)\{\sum(y_{t-1} - \bar{y}_{-1})^2\}^{\frac{1}{2}}/\hat{s}$$

$$t_{\tilde{\mu}} = (\tilde{\mu} - \mu)/(\tilde{S}^2 C_1)^{\frac{1}{2}}$$

$$t_{\tilde{\beta}} = (\tilde{\beta} - \beta)/(\tilde{S}^2 C_2)^{\frac{1}{2}}$$

$$t_{\tilde{\alpha}} = (\tilde{\alpha} - \alpha)/(\tilde{S}^2 C_3)^{\frac{1}{2}} \quad (7)$$

Hypotheses for Phillips and Perron (1988) unit root test are as follows (Phillips and Perron, 1988):

$H_0 : \alpha = 0$

$H_A : \alpha < 0$

The calculated test statistics are compared with the critical value produced by PP (1988) (Phillips and Perron, 1988; Özen et al., 2023).

ARDL Boundary Test

To assess the cointegration relationship between variables, the Engle-Granger Cointegration Test (Engle and Granger, 1987) or the Johansen Cointegration Test (Johansen, 1988) is commonly used. A key requirement for these tests is that all variables must have the same order of integration. If the variables are integrated at different levels, these tests are not applicable. In such instances, the ARDL (Autoregressive Distributed Lag) Bounds Test, introduced by Pesaran et al. in 2001, serves as an alternative method.

With the ARDL Bounds Test, even if the variables are integrated at various levels, it is possible to determine the short-run and long-run cointegration relationship between the variables. Compared to other cointegration tests, the ARDL Bounds Test has a significant advantage. This advantage lies in the absence of any constraints in the error correction model considered in the test. Therefore, more reliable and accurate findings are obtained with the ARDL Bounds Test (Demir, 2021b; Özen et al., 2023). Three different equations are primarily considered in the implementation of this test. The first equation is specified as the bounds test equation, examining the cointegration relationship. The other two equations are sequentially the equations examining the long-run and short-run connections. The ARDL Bounds Test equation is specified as follows (Pesaran et al., 2001):

$$y_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} \Delta y_{t-i} + \sum_{i=0}^{k} \alpha_{2i} \Delta x_{t-i} + \delta_1 y_{t-1} + \delta_1 x_{t-1} + e_t \quad (8)$$

here, Δ represents the differencing operator, y_t is the dependent variable, x_t is the independent variable, β_i is the short-run coefficient, δ_i is the long-run coefficient, e_t is the error term, and k is the optimal lag length.

In the cointegration test conducted by Pesaran et al. (2001), the following hypotheses are tested for both F and t tests (Pesaran et al., 2001):

$H_0 : \delta_1 = \delta_2 = 0$ (There is no long-run relationship.)

$H_1 : \delta_1 \neq \delta_2 \neq 0$ (There is a long-run relationship.)

Toda-Yamamoto Causality Test

Vector Autoregressive Models (VAR) are one of the most commonly used methods in applied econometrics. However, if the variables contain unit roots, hypothesis tests in the VAR method cannot be applied. After conducting VAR analysis with variables that do not contain unit roots, the F-statistic from the Granger causality test is used. Standard Granger causality test results lose validity when the linear combinations of non-stationary series are stationary, meaning there is cointegration relationship between them. In the Toda-Yamamoto test, whether the series are stationary or have cointegration relationship is not considered. In this test, the validity of the test is not affected by the equality of the series and the series are not differenced and made stationary as in the Granger causality test, thus preventing data loss. This is because even if there are unit roots and cointegration connection between the series, the level values of the series are used when conducting the Toda-Yamamoto test (Toda and Yamamoto, 1995; Demir et al., 2023).

In the Toda-Yamamoto causality test, after determining the optimal lag length (k) of the VAR model and the maximum order of stationarity (d_{max}) of the included series, a VAR model of size $(k + d_{max})$ is estimated. Thus, the Toda-Yamamoto causality test can be conducted (Şentürk and Akbaş, 2014).

The equation of the VAR model considered in the Toda-Yamamoto (1995) causality test is as follows:

$$Y_t = \overline{w} + \sum_{i=1}^{k} \alpha_{1i} X_{t-i} + \sum_{i=1}^{k} \beta_{1i} Y_{t-i} + \sum_{j=m+1}^{d_{max}} \delta_{1i} X_{t-i} + \sum_{j=m+1}^{d_{max}} \theta_{1i} Y_{t-i} + \varepsilon_{1t}$$

$$X_t = \partial + \sum_{i=1}^{k} \alpha_{2i} X_{t-i} + \sum_{i=1}^{k} \beta_{2i} Y_{t-i} + \sum_{j=m+1}^{d_{max}} \delta_{2i} X_{t-i} + \sum_{j=m+1}^{d_{max}} \theta_{2i} Y_{t-i} + \varepsilon_{2t} \quad (9)$$

The k specified in the equations refers to the appropriate lag length, and d_{max} refers to the maximum degree of integration. It is assumed that the mean of the error terms ε_{1t} and ε_{2t} is zero and the covariance matrix is constant.

ANALYSIS AND FINDINGS

Table 2 shows the descriptive statistics for the variables and the correlation matrix:

Table 2. Descriptive Statistics and Correlations

	gdp	$lneag$	$lneind$	$lnes$
Mean	6.082	3.236	3.023	3.980
Median	5.580	3.264	3.018	3.986
Maximum	53.381	3.469	3.109	4.079
Minimum	-64.047	2.986	2.985	3.863
Std. Dev.	20.065	0.164	0.028	0.075
Skewness	-1.068	-0.044	1.005	-0.168
Kurtosis	7.045	1.692	3.781	1.622
Jarque-Bera	27.905	2.290	6.208	2.680
Probability	0.001*	0.318	0.044*	0.261
Correlation Matrix				
gdp	1			
$lneag$	0.075	1		
$lneind$	0.002	-0.463	1	
$lnes$	-0.068	-0.99	0.373	1

*p<0.05 (Probability values are from the Jarque-Bera test)

When examining Table 2, an assessment based on the mean values reveals differences between economic growth and the sectors. Economic growth exhibits significantly higher performance compared to the other sectors, as indicated by having the highest average value. This suggests that the overall health of the economy is good and continues to grow. Conversely, the lowest average value for workforce engagement in the industrial sector indicates lower workforce engagement in this sector compared to others. This may suggest that employment in the industrial sector is growing at a slower pace or showing less development compared to other sectors, possibly influenced by economic growth.

Analyzing the data based on median values, employment in the industrial sector stands out with the lowest median value. This indicates that the distribution of employment in the industrial sector is generally lower than the mean. This suggests that employment in the industrial sector may be less stable or at a lower level compared to other sectors. On the other hand, the highest median value for economic growth indicates a more stable distribution overall and a higher average compared to other sectors.

In the analysis based on standard deviation values, the most notable feature is observed in employment in the industrial sector. Having the lowest standard deviation suggests that this data is less variable and more stable. This implies that employment data in the industrial sector is more consistent and predictable. Conversely, the highest standard deviation observed in Economic Growth indicates that this data exhibits much more variability and has a broader distribution compared to other variables. This suggests that economic growth data is more variable and uncertain, potentially experiencing wider fluctuations at different times.

In the analysis based on skewness values, workforce engagement in the agricultural sector has the lowest skewness value, while workforce engagement in the industrial sector has the highest skewness value. The negative skewness value for employment in the agricultural sector indicates that its distribution is symmetric, with outliers being more evenly distributed. Conversely, the positive skewness value for employment in the industrial sector suggests that its distribution is right-skewed, with the right tail being longer than the left tail. This implies that employment in the industrial sector generally tends towards higher values, with more outliers spreading towards the right.

In the analysis based on kurtosis values, employment in the service sector has the lowest kurtosis value, while economic growth has the highest kurtosis value. The low kurtosis value for employment in the service sector indicates a flatter distribution with a more central tendency. In other words, the dataset is generally clustered around average values and has fewer outliers. On the other hand, the high kurtosis value for economic growth indicates a sharper peak in the distribution with more prominent extreme values. This suggests that economic growth data has a wider distribution and may experience larger fluctuations at times.

The outcomes of the Jarque-Bera test reveal that the economic growth variable does not follow a normal distribution, as indicated by a high Jarque-Bera statistic and a very low probability value. Conversely, the employment variable in the agricultural sector exhibits an acceptable Jarque-Bera statistic and probability value, suggesting a normal distribution. For the industrial sector, the Jarque-Bera test results raise some uncertainty regarding normality, while for the service sector, the results indicate a distribution that is closer to normal. Overall, it is observed that workforce engagement data in the agricultural and service sectors align more closely with a normal distribution, whereas economic expansion and workforce engagement data in the industrial sector deviate from this pattern.

The correlation matrix analysis shows that the correlation coefficient between progress in the economy and workforce inclusion in the agricultural sector is 0.075, indicating a very weak and practically insignificant positive relationship. Similarly, the correlation coefficient between economic growth and industrial sector employment is 0.002, suggesting an extremely limited or negligible relationship. In contrast, the correlation coefficient between economic growth and service sector employment is -0.068, pointing to a very weak and practically insignificant negative relationship. These findings imply that economic growth has minimal or no direct influence on employment in the agricultural, industrial, and service sectors. The outcomes of the unit root tests for the variables are presented in Table 3:

Table 3. Unit Root Test

	Stable	Stable and Trendy

	ADF	PP	ADF	PP
gdp	-1.189 (0.413)	-1.127 (0.576)	-1.79 (0.681)	-1.135 (0.532)
Δgdp	-8.189 (0.001)*	-8.135 (0.001)*	-8.79 (0.001)*	-8.135 (0.001)*
$lneag$	-0.351 (0.905)	-0.387 (0.899)	-2.953 (0.162)	-0.387 (0.899)
$\Delta lneag$	-3.991 (0.004)*	-3.96 (0.004)*	-3.843 (0.027)*	-3.96 (0.004)*
$lneind$	-1.619 (0.406)	-1.139 (0.687)	-2.077 (0.536)	-1.139 (0.687)
$\Delta lneind$	-3.533 (0.012)*	-3.185 (0.021)*	-3.675 (0.025)*	-3.185 (0.021)*
$lnes$	-2.073 (0.256)	-1.036 (0.727)	0.931 (0.999)	-1.036 (0.737)
$\Delta lnes$	-2.685 (0.049)*	-3.427 (0.017)*	-3.144 (0.034)*	-3.427 (0.017)*

*p<0.05 (Values in parentheses indicate probability values)

Table 3 shows that unit root tests, namely ADF and PP, were used to assess the stationarity properties of the variables. Unit root tests are used to determine whether a time series has a unit root, which indicates non-stationarity. The overall conclusion from the table is that the variables become stationary when differenced. This is important in time series analysis, as the results of unit root tests serve as a basic tool for determining the stationarity of the series used in the analysis. The transformation of variables into stationarity through differencing allows for more reliable and meaningful statistical analyses of the series. To ascertain the presence of cointegration among long-term variables, Table 4 below presents the results of the ARDL bounds test:

Table 4. ARDL Boundary Test Results

	Test Statistics		Conclusion
$f(gdp\backslash lneag, lneind, lnes)$	$F_{OVERALL}$	20.616*	Cointegrated
ARDL (1, 4, 4, 4) k: 3 m: 2 n: 28	T_{DV}	-8.983*	

Table CV	1%		5%		10%	
Tests	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
$F_{OVERALL}$	5.198	6.845	3.615	4.913	2.958	4.1
T_{DV}	-3.43	-4.37	-2.86	-3.78	-2.57	-3.46

Note: * indicates 5% significance level; k is the number of independent variables; m is the maximum delay length; n indicates the number of observations.

The F-Bounds Test (FOVERALL) and t-Bounds Test (tDV) results indicate the presence of symmetric or linear cointegration at the 1% significance level. This conclusion is drawn because the test statistic values exceed the upper bounds for I(1) in absolute terms. Therefore, it can be concluded that the variables exhibit long-term co-movement and converge to an equilibrium point in their linear combinations (Göksu, 2022).

In developing countries like Iraq, farming sector, manufacturing field, and tertiary sector sectors typically constitute the fundamental components of the economy. However, the connection between workforce engagement and economic expansion across these sectors is complex and influenced by various factors. Understanding this relationship necessitates considering numerous factors. Countries like Iraq often undergo economic transformation processes wherein employment in the agriculture sector may decline while increasing in the manufacturing field and tertiary sector sectors. This scenario can indicate cointegration among sectors due to structural changes in the economy. Particularly, the decreasing significance of agriculture as a sector alongside modernization and industrialization processes can lead to a shift in employment towards other sectors. Considering that economic growth often occurs more prominently in the industry and services sectors rather than agriculture, establishing a direct connection between agricultural workforce engagement and economic expansion might be challenging. Instead, the focus lies on how changes in agricultural employment affect growth in other sectors. For instance, improvements in agricultural productivity may stimulate resource transfer to non-agricultural sectors, thereby fostering economic growth. Additionally, it's essential to recognize the influence of government policies and investments on sectoral balances in countries like Iraq. Government incentives or agricultural policies, for instance, can affect employment distribution and, consequently, economic growth. Investments in the industrial sector, for example, can enhance productivity and support economic expansion. In conclusion, the theoretical coherence of cointegration between employment in farming sector, manufacturing field, and tertiary sector sectors and economic expansion in Iraq is plausible because the economic structure, policies, and transformation processes in such countries converge to form a complex network of relationships among sectors. The results of estimating the short- and long-run coefficients of the ARDL are presented below:

Table 5. ARDL Short- and Long-Term Coefficient Estimation Results

a) Long term (Dependent Variable: gdp)	Coefficient	Std. Error	t-Statistic	Prob.
$lneag$	1.77	1.417	3.254	0.023*
$lneind$	3.989	1.704	2.340	0.039*
$lnes$	2.559	2.774	2.423	0.037*
b) Short term	Coefficient	Std. Error	t-Statistic	Prob.
$D(LNEAG)$	-2. 518	1.726	-1.459	0.173
$D(LNEAG(-1))$	1.062	6.835	1.554	0.148
$D(LNEAG(-2))$	-1.438	9.276	-1.551	0.149
$D(LNEAG(-3))$	-3.227	9.482	-3.404	0.006*
$D(LNEIND)$	3.664	2.093	1.751	0.108
$D(LNEIND(-1))$	1.347	6.546	2.059	0.064*
$D(LNEIND(-2))$	-1.434	8.528	-1.677	0.122
$D(LNEIND(-3))$	-3.027.	8.429	-3.592	0.004*
$D(LNES)$	-2.366	6.642	-0.036	0.972
$D(LNES(-1))$	4.649	1.707	2.722	0.020*
$D(LNES(-2))$	-2.809	1.946	-1.443	0.177
$D(LNES(-3))$	-7.296	2.022	-3.608	0.004*
C	-5.160	5.036	-10.247	0.000*
$CointEq(-1)*$	-1.841	0.180	-10.245	0.000*

*p<0.05

According to the long-run coefficient outcomes, the coefficients of employment in agriculture, industry and services are positive. A 1% increase in agricultural employment would increase the economic expansion variable by approximately 177%. Given the linear connection between these variables, the converse is also true in table 5. That is, a 1% decrease in agricultural employment would result in an approximate 1.77% decrease in the economic growth variable. Similarly, a 1% increase in industrial employment would result in an approximate 3.98% increase in the economic growth variable, while a 1% decrease in services employment would result in an approximate 3.98% decrease in the economic growth variable. These results are statistically significant at the 1% level. In addition, a 1% increase in service sector employment would increase the economic growth variable by about 2.55%, and a 1% decrease in service sector employment would decrease the economic growth variable by about 2.55%. These results are also statistically significant at the 1% level. These results are also significant at the 5% level.

The short-term forecast results show that the error correction term has a coefficient of -1.841 with a probability value of 0.000. Since the probability value is less than 0.05, this coefficient is statistically significant. The negative sign of the coefficient indicates that any disequilibrium in the model will be corrected over time (Özçelik and Göksu, 2020). Additionally, the constant term, labeled as "C," has a positive and statistically significant coefficient.

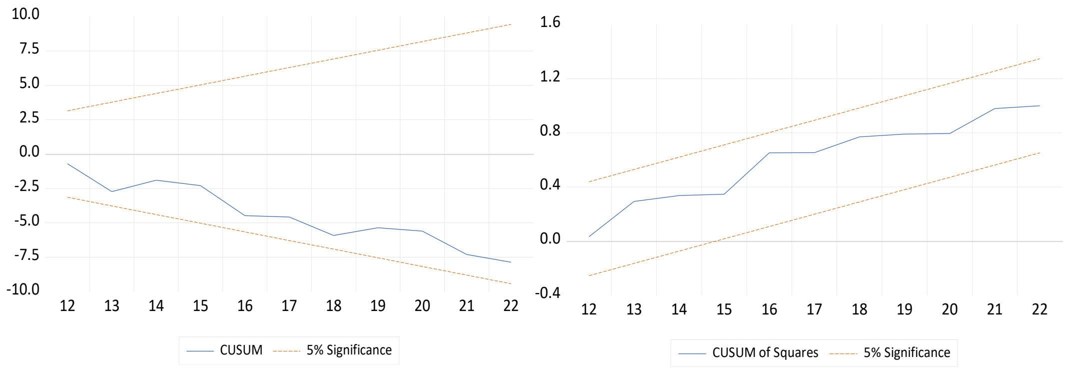
The robustness of the findings obtained from the estimated model is ensured through diagnostic tests. The results of the applied ARDL diagnostic tests are presented in Table 6:

Table 6. ARDL Diagnostic Test Results

Diagnostic Tests	Test value	Possibility
Breusch-Godfrey Serial Corr. LM test χ^2_{SC}	2.341	0.151
Breusch-Pagan-Godfrey Heteroskedasticity test $\chi^2_{HET(BPG)}$	1.802	0.162
ARCH Heteroskedasticity test $\chi^2_{HET(ARCH)}$	0.059	0.810
Jarque-Bera Normality test χ^2_{NORM}	0.624	0.731
Ramsey RESET test χ^2_{FF}	0.013	0.907
CUSUM = Stable	CUSUM^2 = Stable	

The diagnostic test outcomes, as presented in Table 6, show that the "Breusch-Godfrey Serial Correlation LM test" value is 2.341, with a probability value of 0.151. Since the probability is greater than 0.10, this indicates that there is no issue of autocorrelation in the model. For the test of heteroscedasticity, the first "Breusch-Pagan-Godfrey" test yielded a coefficient of 1.802 with a probability value of 0.162. With the probability value exceeding 0.10, there is no evidence of changing variance in the model. The second test, the "ARCH" test, produced a coefficient of 0.059 and a probability value of 0.81, which also suggests no issue with changing variance, as the probability is above 0.10. The "Jarque-Bera" test value was 0.624, with a probability of 0.731. Since the probability is greater than 0.10, it can be concluded that the model follows a normal distribution. The "Ramsey RESET" test coefficient was 0.013, with a probability value of 0.907, indicating no specification error in the model, as the probability is above 0.10. Furthermore, the CUSUM and CUSUM^2 graphs remain within the 95% confidence interval and the desired bounds, confirming the stability of the model. Figure 1 shows the CUSUM and CUSUM^2 graphs separately.

Figure 1. CUSUM Graph and CUSUM^2 Graph



Toda-Yamamoto causality analysis relies on vector autoregressive models, hence appropriate lag lengths need to be determined for each model to be constructed. Therefore, information criteria are utilized for this purpose. The relevant information criterion values are provided in Table 7.

Table 7. Information Criteria for Delay Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	61.164	NA	2.60e-07	-3.810	-3.624	-3.751
1	193.606	220.735	1.12e-10	-11.573	-10.639*	-11.274
2	214.064	28.641*	8.87e-11*	-11.870*	-10.189	-11.333*

Note: AIC is the Akaike Information Criterion; SC is the Schwarz-Bayesian Information Criterion and HQ is the Hannan-Quinn Information Criterion.

Table 7 displays the information criteria used to determine appropriate lag values for VAR models and the lag values obtained based on these criteria. Information criteria are measures that assess the goodness of fit of the model and balance it with its complexity. Lower information criterion values indicate better model fit. Therefore, it is observed that the appropriate lag value is 2. The outcomes of the Toda-Yamamoto causality analysis carried out to identify the causal relation among the factors are as follows:

Table 8. Toda Yamamoto Causality Analysis Results

Hypotheses	Test Statistics	Probability
Economic growth is not the cause of employment in the agricultural sector.	6.304	0.047*
Employment in the agricultural sector is not the cause of economic growth.	2.086	0.554
Economic growth is not the cause of employment in the industrial sector.	11.278	0.010**
Employment in the industrial sector is not the cause of economic growth.	2.012	0.569
Economic growth is not the cause of employment in the service sector.	11.604	0.008*
Employment in the service sector is not the cause of economic growth.	3.288	0.349

*p<0.05

Looking at Table 8, it is clear that in Iraq there is a unidirectional causal connection from economic expansion to both the agricultural, industrial and services sectors. In other words, economic expansion in Iraq is the cause of the development of the agricultural, industrial and service sectors. This relationship can be explained by the diversity of the country's economic structure and sectoral interactions. Agriculture, industry and services are the cornerstones of the economy, and economic growth is typically associated with increased activity in these sectors. For instance, improvements in agricultural productivity can boost food supply, leading to an increase in the number of employees in restaurants and markets within the service sector. Similarly, increased production in the industrial sector can drive up demand for logistics and transportation services. Additionally, government policies and investments influence sectoral growth. Infrastructure investments in the industrial sector, for example, promote industrial growth, while support for agriculture can strengthen the agricultural sector. Therefore, there exists a unidirectional causal connection from economic expansion to the agricultural, industrial, and service sectors in Iraq, indicating a strong connection among these sectors.

CONCLUSION

Economic growth stands as one of the fundamental objectives of nations. It not only concerns the trajectory and functioning of the economy but also correlates with the quality-of-life standards, social and cultural dynamics of the individuals residing in the country, and their impact on other nations. To achieve the goal of growth, there exist fundamental macroeconomic objectives such as price stability, employment, monetary policies, and inflation. Additionally, there are numerous sub-sectors and variables that influence economic growth. Population, migration, life expectancy at birth, infant mortality rates, per capita income are among the primary variables. Utilizing both macro and microlevel effects as well as the impacts of sub-sectors efficiently and effectively enhances total production and income growth. The increase in total production and income directly affects economic growth.

Employment, among the macroeconomic objectives of economic growth, signifies the reduction of unemployment. Unemployment affects the physical and mental health, income status, service, agriculture, and industrial sectors, education status, internal and external migration of individuals residing in the country, and consequently influences economic growth. Preventing unemployment relies on expanding employment opportunities. Particularly, employment, which entails the inclusion of all production factors, especially labor, in the production process, complements unemployment as two interrelated components. To ensure employment, the problem of unemployment needs to be reduced or eliminated. The utilization of production factors becomes crucial in increasing total production. The efficient utilization of production factors directly influences the labor market, thereby increasing employment and overcoming unemployment, which hinders economic growth. The efficiency of the labor market leads to more effective and efficient utilization of production factors, enhancing the country's prosperity and achieving significant technological progress. The support of production factors with technological advancements results in an increase in the national incomes of countries.

For a country to achieve good economic levels and growth, emphasis must be placed on the factor of employment. This factor is crucial for the progress of both national and global levels. The elements that determine the structure of employment, which plays a significant role in economic growth, should be prioritized. These elements include the country's population, labor productivity, demand for labor, the quality of labor, and sectoral analysis. Each country differs from each other in terms of sectors. The geopolitical position of the country leads to its positioning as an agricultural, industrial, or service country. The presence of these sectors creates separate employment opportunities in these sectors.

In this study, where workforce engagement is evaluated for the farming sector, service, and industrial sectors, which are important concepts for economic expansion, the results obtained provide an opportunity to evaluate the impact of workforce engagement on economic expansion by sector. The outcomes of the ARDL cointegration test conducted in Iraq indicate a long-run connection between workforce engagement in farming sector, manufacturing field and tertiary sector and economic expansion. According to the long-run coefficient outcomes, the coefficients of workforce engagement in farming sector, manufacturing field and tertiary sector are positive. This indicates that economic expansion is proportional to the increase in workforce engagement in these sectors. Specifically, it was observed that a 1% increase in workforce engagement in the agricultural sector led to a 1.77% increase in economic expansion. Similarly, increases in workforce engagement in the industrial and service sectors also positively affect economic expansion.

According to the outcomes of the Toda-Yamamoto causality analysis, there exists a unidirectional causal relationship from economic expansion to both the agricultural, industrial, and service sectors in Iraq. This relationship can be explained by the interaction among various sectors of the economy and how this interaction supports economic growth. While the contributions of the farming sector, manufacturing field, and service sectors to economic growth may vary, it is observed that each sector positively contributes to growth. These results indicate that various sectors of the Iraqi economy are strongly interconnected and that economic growth is directly related to the increase in employment in these sectors.

Suggestions for future studies can be outlined as follows:

• Deepening sectoral analyses is crucial. The connection between workforce engagement in the farming sector, industry, and service sectors and economic growth can be examined in more detail. The contribution of each sector to economic expansion and the interactions between these sectors can be addressed more comprehensively.

• Focus can be placed on sectoral policy analyses. Policy recommendations aimed at increasing employment in the agriculture, industry, and service sectors can be developed. Special policy recommendations can be made for each sector, and the impact of these policies on economic expansion can be evaluated.

• A more detailed examination of socio-economic factors is important. Research can be conducted on the impact of factors such as education level, income distribution, and technological development on employment in the agriculture, industry, and service sectors, and their relationship with economic growth.

• Regional analyses can be conducted. It is important to examine the economic differences and sectoral structures between different regions of Iraq. Thus, the differences in the connection between employment and economic growth at the regional level can be identified, and regional policy recommendations can be developed accordingly.

• Applied policy assessments can be conducted. Applied studies can be carried out to evaluate the effectiveness of the proposed policy measures. Modeling studies supported by real-world data can clarify the feasibility and impact of the proposed policy recommendations. The implementation of these recommendations can help us better understand the relationship between employment in the agriculture, industry, and service sectors and economic growth and develop more effective policy recommendations in these areas.

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