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# Employment trends and economic factors in MENA region: An ARDL approach

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# Abstract

This study investigates the relationship between macroeconomic variables and employment in the MENA region, focusing on the dynamics of economic growth, trade openness, investment, and services sector development. The aim is to provide insights into both the short- and long-term factors affecting labor force participation rates in the region. The research employs the Autoregressive Distributed Lag (ARDL) model to analyze time-series data, capturing the interplay between key macroeconomic variables. The model is chosen for its flexibility in handling variables of different integration orders. The results reveal significant relationships between the explanatory variables and employment in the MENA region. Economic growth, investment, and trade openness exhibit varying impacts in the short and long run, while the services sector emerges as a critical driver of employment. The bounds test confirms the existence of a long-run relationship, and the error correction model indicates strong adjustments towards equilibrium. This research contributes to the existing literature by employing the ARDL approach to explore employment dynamics in the MENA region, providing both theoretical and empirical insights. The findings offer valuable policy recommendations for enhancing employment outcomes in the region through targeted macroeconomic strategies.

Keywords: ARDL Model, Economic growth, Employment, Labor force participation, Macroeconomic variables, MENA region.

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**Transparency:** The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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# **1. Introduction**

Labor force participation is a critical indicator of economic performance and social development, reflecting the extent to which a population engages in productive activities. In the MENA region, labor market dynamics have been shaped by economic growth, globalization, and structural transformations in key industries. The region faces distinct labor market challenges, including high youth unemployment, low female labor force participation, a mismatch between skills and labor market needs, and a strong dependence on oil-driven economies. Additionally, economic diversification efforts, particularly in Gulf Cooperation Council (GCC) countries, have influenced labor force dynamics by fostering growth in non-oil sectors

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such as technology, finance, and tourism. However, the transition towards diversified economies requires significant policy interventions, investments in human capital, and the development of entrepreneurial ecosystems to enhance labor market resilience and create sustainable employment opportunities.

This research investigates the determinants of labor force participation in the MENA region from 1990 to 2023, focusing on economic, trade, and sectoral variables. The study examines the role of GDP growth, trade openness (exports and imports), foreign direct investment (FDI), and the service sector in shaping labor market trends. While economic expansion is generally associated with increased employment opportunities, the impact of globalization and sectoral shifts varies across countries and industries. The findings contribute to the ongoing debate on how policy measures can enhance labor force participation and address employment challenges in the region.

Using the Autoregressive Distributed Lag (ARDL) model and Error Correction Model (ECM), this research provides a comprehensive analysis of the short-term and long-term relationships between labor force participation and its determinants. The results offer valuable insights into the responsiveness of labor markets to economic changes and the effectiveness of trade and investment policies in fostering employment.

The structure of the paper is as follows: The next section presents a literature review, discussing previous studies on labor force participation and its determinants. The methodology section outlines the econometric approach and data sources. The results and discussion sections analyze the empirical findings, followed by policy implications and recommendations. Finally, the conclusion summarizes the key insights and suggests directions for future research.

# 2. Literature Review

The determinants of labor force participation have been extensively studied in economic literature, with researchers offering various theoretical and empirical perspectives on the factors influencing employment trends. This section explores key studies examining economic growth, trade openness, foreign direct investment (FDI), and the service sector's role in shaping labor force participation, particularly in the MENA region.

#### 2.1. Economic Growth and Labor Force Participation

Economic growth is widely regarded as a fundamental driver of employment. Solow [1] neoclassical growth model highlights the role of economic expansion in job creation, emphasizing that higher GDP levels lead to increased labor demand and participation. Barro and Sala-i-Martin [2] provide empirical evidence of a positive correlation between economic growth and employment rates, demonstrating that growth enhances job opportunities and reduces unemployment. In the MENA region, Makdisi, et al. [3] emphasize the importance of sustained economic growth in fostering labor market expansion. However, structural differences across countries, including variations in labor market policies and demographic factors, result in diverse outcomes. For instance, El-Hamidi and Wahba [4] note that economic growth has not always translated into higher labor force participation for women in the region due to cultural and institutional barriers. Recent research by Abid [5] and Abid, et al. [6] also suggests that economic and environmental dynamics, such as green growth strategies and carbon emissions, play a critical role in shaping employment trends in Gulf countries. Gafsi [7] further support this by examining how renewable energy and  $CO_2$  emissions interact with economic prosperity in G7 countries, which may offer comparative insights for policy adaptation in MENA economies. These findings underscore the need for inclusive economic policies that target underrepresented groups, such as women and youth, to maximize labor market engagement.

### 2.2. Trade Openness and Employment

Trade openness significantly influences labor markets by altering production patterns and competitiveness. Krugman [8] argues that increased trade, particularly through exports, can boost employment by expanding production capacity and generating income. However, Rodrik [9] cautions that excessive reliance on imports may lead to job displacement in domestic industries, negatively impacting labor force participation. In the MENA region, empirical studies reveal mixed outcomes. [10] find that export-led growth has positively influenced employment, particularly in manufacturing and agriculture. Conversely, excessive import dependence often results in the displacement of local industries, highlighting the need for balanced trade policies that protect domestic production while promoting exports. Furthermore, trade liberalization's employment effects are often contingent on the skill levels of the workforce. For instance, Boughzala [11] observes that trade openness has benefitted skilled labor more than unskilled labor in MENA countries, exacerbating inequalities in the labor market. Abid, et al. [12] further emphasize that political instability can moderate the employment effects of trade and macroeconomic policies, suggesting that institutional factors must be incorporated into trade-related labor analyses. Gafsi and Bakari [13] contribute to this discourse by assessing agricultural exports and CO<sub>2</sub> emissions' influence on economic growth, which indirectly shapes labor market outcomes by affecting trade-based economic structures.

### 2.3. Foreign Direct Investment and Labor Market Dynamics

FDI's impact on labor force participation has been a subject of considerable debate in the literature. Borensztein, et al. [14] argue that FDI can promote job creation if directed toward labor-intensive industries. Conversely, Aitken and Harrison [15] demonstrate that FDI in capital-intensive sectors may have limited effects on employment levels, as such investments prioritize efficiency and technology over labor. Alfaro, et al. [16] emphasize that the employment effects of FDI in the MENA region depend on sectoral allocation and the availability of skilled labor. For example, FDI in the manufacturing and services sectors tends to have a more significant impact on labor force participation than FDI in extractive industries,

which are typically less labor-intensive. Additionally, Javorcik [17] highlights the potential of FDI to enhance technology transfer and skills development, provided that complementary policies are implemented to improve workforce capabilities and labor market flexibility. Abid [18] supports this view in the context of the MENA region, identifying economic, technological, and institutional factors, including FDI, as crucial determinants of international tourism and associated labor demand. Gafsi and Bakari [19] explore the role of agricultural raw material imports in agricultural growth across Sub-Saharan Africa, offering lessons on the labor intensity of FDI-driven supply chains, particularly relevant for food security and employment dynamics in MENA's agrarian economies. Zarrad and Gafsi [20] contribute a complementary perspective by examining the role of green finance in attracting sustainable investment flows that may indirectly enhance employment generation in emerging markets.

### 2.4. The Role of the Service Sector in Employment

The transition from agriculture and industry to a service-based economy, as described by Baumol [21] theory of structural transformation, has been a defining feature of economic development in recent decades. As economies grow, the demand for service-oriented jobs increases, leading to higher labor force participation. Herrendorf, et al. [22] observe that the service sector has become a major contributor to employment growth, particularly in advanced and transitioning economies. In the MENA region, the expansion of services such as finance, education, healthcare, and retail has played a pivotal role in job creation, particularly for women and younger workers [23]. However, the rapid growth of the service sector also raises concerns about job quality, wage disparities, and the informal nature of employment in some industries. For instance, Gatti, et al. [24] highlight that informal employment remains a significant challenge in the MENA region, particularly in service-oriented jobs, where regulations and labor protections are often weak. Chaabouni and Abid [25] add that energy consumption and sectoral demand structures in the GCC also significantly affect labor absorption in services and other industries. Moreover, Abid [5] explores how artificial intelligence innovations reshape economic performance, signaling profound changes for service-based employment and workforce skills. Ellouze and Gafsi [26] analyze how AIdriven transformations impact the banking sector through regulatory shifts, which holds implications for financial services employment trends. Hlali and Gfasi [27] also explore the intersections of digitalization and sustainable development, showing that digitized service sectors in Africa are expanding employment opportunities while also raising challenges related to labor informality. Similarly, Gafsi [7] examines customer and market orientation in Islamic insurance, highlighting service sector adaptability and its employment potential in niche markets. Policymakers must address these challenges by fostering skills development, promoting digital transformation, and ensuring decent work conditions to maximize the sector's contribution to labor force participation.

The literature highlights the complex interplay between economic growth, trade openness, FDI, and sectoral composition in shaping labor force participation. While GDP growth and export-oriented trade positively influence employment, excessive reliance on imports and capital-intensive FDI may hinder labor market expansion. The growing importance of the service sector further underscores the need for adaptive policies that prioritize skills development, digital integration, and inclusive growth. In the MENA region, addressing structural challenges and leveraging economic diversification efforts will be critical to enhancing labor force participation and achieving sustainable development goals.

## 3. Methodology

This study employs an econometric approach using the Autoregressive Distributed Lag (ARDL) model and the Error Correction Model (ECM) to examine the short-term and long-term relationships between labor force participation and its key determinants. The ARDL model, introduced by Pesaran and Shin [28] is particularly useful for analyzing time-series data with a mix of stationary and non-stationary variables. The ECM, developed by Engle and Granger [29] is employed to assess the speed of adjustment towards equilibrium in case of short-term shocks.

The basic ARDL model used in this study is formulated as follows:

$$Y_t = lpha + \sum_{i=1}^p eta_i Y_{t-i} + \sum_{j=0}^q \gamma_j X_{t-j} + \mu_t$$

where:

- Y<sub>t</sub> is the dependent variable at time ttt.
- X<sub>t-j</sub> are the independent variables at lag jjj.
- $\alpha$  is the constant term.
- $\beta_i$ ,  $\gamma_j$  are the coefficients of the lagged dependent and independent variables.
- p and q are the maximum lag lengths for Y and X, respectively.
- $\mu_t$  is the error term.

In the ARDL model, the short-run dynamics are captured by the coefficients of the first differences of the variables. While the long-run equilibrium relationship is determined by the coefficients of the lagged levels of the variables.

The ECM is derived from the ARDL framework. It is used when there is a long-run relationship between variables, but there are short-run fluctuations around this relationship. The ECM adjusts for deviations from the long-run equilibrium and captures the speed of adjustment back to equilibrium.

To capture the short-run dynamics, the ECM is formulated as:

$$\Delta Y_t = lpha + \sum_{i=1}^p eta_i \Delta Y_{t-i} + \sum_{j=0}^q \gamma_j \Delta X_{t-j} + \phi ext{ECM}_{t-1} + \mu_t$$

where:

- $\Delta Y_t$  and  $\Delta X_t$  are the first differences of the dependent and independent variables.
- ECM<sub>t-1</sub> is the lagged error correction term, which represents the deviation from long-term equilibrium.
- $\Phi$  is the coefficient of the error correction term, indicating the speed at which the system returns to equilibrium.
- $\mu_t$  is the error term.

In the ECM model, the coefficient of the error correction term should be negative and statistically significant if there is a long-run relationship. The ECM captures both the short-run dynamics and the correction to long-run equilibrium.

The ARDL approach is chosen for its flexibility in handling variables with different integration orders, its efficiency in small sample sizes, and its ability to provide both short-term and long-term estimates. The ECM allows for the analysis of how labor force participation responds to economic shocks and policy changes over time.

The estimation follows a three-step procedure. First, Augmented Dickey-Fuller (ADF) tests [30] are conducted to assess stationarity. Second, the Pesaran, et al. [31] bounds test is employed to determine the existence of a long-run relationship among variables. Then, the optimal lag structure is selected based on the Akaike Information Criterion (AIC).

To ensure the validity and reliability of the results, the study conducts several diagnostic tests.

The Breusch-Godfrey LM test is used to detect serial correlation in the residuals, ensuring that the errors are not correlated over time, which would violate the assumption of no autocorrelation [32].

The Breusch-Pagan test examines heteroskedasticity by testing whether the variance of the residuals is constant over time [33]. A significant result indicates the presence of heteroskedasticity, which could be addressed by employing robust standard errors or generalized least squares (GLS) to correct the issue.

The Jarque-Bera test assesses the normality of the residuals, a critical assumption for hypothesis testing and the validity of confidence intervals [34]. A significant result from this test suggests the residuals are not normally distributed, which could lead to inefficiency in the estimates and may require data transformations or the use of bootstrapping methods.

Finally, the CUSUM and CUSUMSQ tests, based on the work of Brown, et al. [35] evaluate the stability of the model's long-run relationships. If the plots of these tests lie within the critical bounds, the model parameters are considered stable; otherwise, instability may indicate a structural break, requiring model adjustments, such as including dummy variables to account for the break. Together, these diagnostic tests ensure the robustness and appropriateness of the ARDL and ECM models, helping to confirm that the results are both reliable and valid.

This methodological framework ensures a comprehensive understanding of labor force participation dynamics in the MENA region, providing empirical insights for policymakers to enhance employment opportunities and sustainable economic development.

# 4. Data

This study attempts to determine the impact of several economic factors on employment level in the MENA Region from 1990 to 2023. The data are obtained from the World Bank's World Development Indicators (WDI). All variables are log-transformed. The description of the variables is presented in Table 1. This table helps to clarify the scope of the study by defining the variables involved and their relevance to the model, allowing readers to understand their roles in the analysis.

# Table 1.

anables description.				
Category	Variable	Code	Description	
Labor Market Indicator Labor Force Participation Rate, Total		LABT	Percentage of the population aged 15+ actively engaged in the labor market (employed or seeking work).	
Economic Performance Indicator	GDP (constant 2015 US\$)	GDP	Measures the total economic output adjusted for inflation, reflecting overall economic performance.	
Economic Integration & Globalization Indicator	Foreign Direct Investment, Net Inflows (% of GDP)	INV	Represents the net inflow of foreign investment as a percentage of GDP, indicating economic globalization.	
Trada Opannass Indicator	Exports of Goods and Services (% of GDP)	EXPG	Share of exports in GDP, reflecting external demand's influence on the economy.	
Trade Openness indicator	Imports of Goods and Services (% of GDP)	IMPG	Share of imports in GDP, reflecting reliance on foreign goods and services.	
Economic Structure Indicator	Services, Value Added (% of GDP)	SRV	Contribution of the services sector to GDP, reflecting the economy's shift towards service-oriented industries.	

The dependent variable, Labor Force Participation Rate, Total (% of total population ages 15+), represents the percentage of the adult population actively engaged in the labor market, either through employment or job-seeking, and serves as a key indicator of labor market dynamics. Among the independent variables, GDP (constant 2015 US\$) reflects the overall economic performance by measuring total economic output adjusted for inflation, highlighting its impact on labor market activity. Foreign Direct Investment, Net Inflows (% of GDP) captures the level of economic integration and globalization, as higher FDI often leads to job creation and enhanced labor opportunities. Exports of Goods and Services (% of GDP) represent trade openness, showcasing how external demand and reliance on foreign goods influence economic and labor market conditions. Lastly, Services, Value Added (% of GDP) illustrates the economic structure by quantifying the contribution of the service sector to GDP, reflecting its influence on employment trends and sectoral labor demand. Together, these variables provide a comprehensive framework to analyze the factors driving labor force participation.

Table 2. Displays the correlation matrix of the variables included in the model. This matrix provides insights into the strength and direction of the linear relationships between each pair of variables.

Table 2.	
Correlation	matrix

Table 3.

Variable	LABT	GDP	INV	EXPG	IMPG	SRV
LABT	1.0000	-0.7290	-0.4692	-0.1982	-0.4662	-0.3864
GDP	-0.7290	1.0000	0.6431	0.5637	0.8066	0.2204
INV	-0.4692	0.6431	1.0000	0.5846	0.6394	-0.0961
EXPG	-0.1982	0.5637	0.5846	1.0000	0.6235	-0.6466
IMPG	-0.4662	0.8066	0.6394	0.6235	1.0000	0.0484
SRV	-0.3864	0.2204	-0.0961	-0.6466	0.0484	1.0000

The correlation matrix reveals complex relationships between labor force participation (LABT) and key economic variables. There is a strong negative correlation between LABT and GDP (-0.7290), suggesting that as the economy grows, labor force participation tends to decrease, possibly due to more capital-intensive growth. Similarly, labor force participation has a negative correlation with both investment (-0.4692) and imports (-0.4662), indicating that higher investment and imports might be associated with lower employment levels, potentially due to automation or foreign competition. The correlation with exports is weakly negative (-0.1982), suggesting minimal impact on labor force participation. On the other hand, services show a moderate negative correlation with LABT (-0.3864), which might indicate that growth in the service sector does not directly translate into higher employment in this dataset.

When examining the relationships between the other variables, GDP is positively correlated with investment (0.6431), exports (0.5637), and imports (0.8066), suggesting that economic growth is linked to greater investment and trade activity. Investment and exports are also positively correlated (0.5846), indicating that increased investment tends to drive export growth. The positive correlation between investment and imports (0.6394) points to the possibility that greater investment might lead to higher imports, possibly due to demand for foreign goods and services. The service sector shows weak correlations with most other variables, suggesting that its relationship with the broader economy is less straightforward. Overall, the matrix indicates that while the variables are interconnected, the nature and strength of their relationships vary, highlighting the complexity of the labor market and economic dynamics.

Table 3 presents the descriptive statistics for the variables used in the analysis.

Descriptive statistics.					
Variable	Obs.	Mean	Std. Dev.	Min.	Max.
LABT	33	3.8406	0.0160	3.7921	3.8658
GDP	34	28.4560	0.3688	27.8330	28.9788
INV	34	0.3111	0.7998	-1.3592	1.6111
EXPG	30	3.6982	0.1619	3.3438	3.9450
IMPG	34	3.5253	0.0859	3.3337	3.6676
SRV	34	3.8892	0.0790	3.7299	4.0452

The dataset provides an overview of the key economic variables used in the analysis. The labor force participation rate (LABT) has a mean value of 3.84, with a very low standard deviation of 0.0160, indicating little fluctuation in participation rates over the observed period, ranging from 3.7921 to 3.8658. The GDP, with a mean of 28.456 and a standard deviation of 0.3688, shows moderate stability in the economy, fluctuating between 27.833 and 28.9788. Investment (INV) displays a higher level of variability, with a mean of 0.3111 and a relatively large standard deviation of 0.7998, indicating significant fluctuations in investment levels, ranging from -1.3592 to 1.6111. The exports of goods and services (EXPG) and imports of goods and services (IMPG) are relatively stable, with means around 3.7 and low standard deviations, suggesting that trade flows have remained consistent. Lastly, services value added (SRV) has a mean of 3.8892 and a standard deviation of

0.0790, indicating that the service sector's contribution to GDP has remained relatively stable, with values ranging from 3.7299 to 4.0452. These statistics offer a snapshot of economic trends and variability within the dataset.

Table 4 displays the results of the Augmented Dickey-Fuller (ADF) unit root test for the variables included in the analysis. This test is used to assess the stationarity of each variable by testing the null hypothesis that the series has a unit root, indicating it is non-stationary.

Table 4.	
Unit root to	est

Variable	Test Statistic	<b>P-value</b>	Variable	Test Statistic	P-value
labt	-2.7360**	0.0681	dlabt	-4.4050***	0.0003
gdp	-1.5980	0.4845	dgdp	-5.0080***	0.0000
inv	-1.9290	0.3185	dinv	-5.6640***	0.0000
expg	-1.8970	0.3334	dexpg	-5.0100***	0.0000
impg	-2.5500	0.1038	dimpg	-3.1080***	0.0260
srv	-2.4790	0.1207	dsrv	-6.2800***	0.0000

The Dickey-Fuller test results show that several variables, including **gdp**, **inv**, **expg**, impg and **srv**, are non-stationary. However, after differencing them, the variables become stationary, indicating that they have no unit roots after differencing and are suitable for further analysis.

# 5. Results

This section outlines the findings from the empirical analysis, beginning with the selection of the most appropriate model to explain the relationship between economic indicators and employment in the MENA region.

Table 5 presents the model selection criteria used to choose the best-fitting model for the analysis. It includes the results of various model specifications, with key statistical measures such as the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC).

Table 5.
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Model	choice.	

Model	Lag	AIC	BIC
Model 1	1	-202.2200	-186.2300
Model 2	2	-202.2800	-178.9500
Model 3	3	-260.8300	-230.6300

Model 3 is the best ARDL model for explaining labor force participation. It has the lowest AIC and BIC, suggesting it fits the data better than the other models.

Table 6 presents the results of the ARDL (Autoregressive Distributed Lag) model estimation. The ARDL model's estimation results offers insights into the relationships between the dependent and independent variables over different time lags.

ARDL model estimation.					
Variable	Coefficient	Std. Error	t-Statistic	<b>P-Value</b>	Significance
LABT (L1)	-0.4371	0.2276	-1.9200	0.1950	Insignificant
LABT (L2)	-0.3620	0.2282	-1.5900	0.2530	Insignificant
LABT (L3)	0.3682	0.2046	1.8000	0.2140	Insignificant
DGDP (Current)	0.4613	0.0577	7.9900	0.0150	Significant
DGDP (L1)	0.3273	0.0918	3.5700	0.0700	Significant
DGDP (L2)	0.3598	0.1175	3.0600	0.0920	Significant
DGDP (L3)	0.2782	0.0685	4.0600	0.0560	Significant
DINV (Current)	-0.0074	0.0029	-2.5300	0.1270	Insignificant
DINV (L1)	0.0026	0.0039	0.6700	0.5710	Insignificant
DINV (L2)	0.0126	0.0031	4.1200	0.0540	Significant
DINV (L3)	0.0022	0.0033	0.6600	0.5800	Insignificant
DEXPG (Current)	0.2397	0.0351	6.8300	0.0210	Significant
DEXPG (L1)	0.2480	0.0695	3.5700	0.0700	Significant
DEXPG (L2)	0.1566	0.0514	3.0500	0.0930	Significant
DEXPG (L3)	0.0151	0.0345	0.4400	0.7030	Insignificant
DIMPG (Current)	-0.1887	0.0325	-5.8100	0.0280	Significant
DIMPG (L1)	-0.0720	0.0473	-1.5200	0.2680	Insignificant
DIMPG (L2)	-0.1711	0.0411	-4.1700	0.0530	Significant
DIMPG (L3)	-0.0171	0.0267	-0.6400	0.5880	Insignificant
DSRV (Current)	0.5052	0.0636	7.9500	0.0150	Significant
DSRV (L1)	0.4336	0.1318	3.2900	0.0810	Significant
DSRV (L2)	0.3408	0.1029	3.3100	0.0800	Significant
DSRV (L3)	0.0005	0.0597	0.0100	0.9940	Insignificant
Constant	5.4320	0.8400	6.4700	0.0230	Significant

Table 6.

The ARDL regression highlights the dynamic relationship between labor force participation rate (LABT) and the independent variables: GDP, foreign direct investment (FDI), exports, imports, and the services sector. The model exhibits an excellent fit, with an R-squared of 0.9979, indicating that 99.79% of the variation in LABT is explained by the independent variables and their lags. GDP shows a significant positive relationship with LABT, both in the current period and with lagged effects, emphasizing its critical role in driving labor market participation. Exports also positively and significantly impact LABT in the short term, though the effects of lagged exports are less consistent. In contrast, imports exhibit a significant negative effect on LABT, suggesting that reliance on foreign goods may reduce domestic labor market opportunities. The services sector significantly contributes to LABT, both in the current period and through lagged effects, reflecting the sector's role in labor market expansion. FDI, while showing some delayed positive effects, has an overall weak and inconsistent influence on LABT. Additionally, the constant term indicates a base level of labor force participation when all variables are zero. Overall, the results underscore the importance of GDP growth, trade composition, and the services sector in shaping labor force participation trends, while imports and FDI present mixed implications.

Table 7 presents the results of the Bound Test for cointegration, which is used to assess the presence of long-run relationships among the variables in the ARDL model.

 
 Table 7. Bound test.
 P-value
 Critical Value Bounds (5%)

 Test Statistic
 Value
 P-value
 Critical Value Bounds (5%)

 F-statistic
 5.7800
 0.0023
 3.41 (I0) - 4.68 (I1)

In this case, the F-statistic of 5.7800 is greater than the upper bound at the 5% significance levels, suggesting strong evidence to reject the null hypothesis of no long-run relationship. Therefore, there is a statistically significant long-run relationship between the variables in the model.

Table 8 presents the results of the Error Correction Model (ECM) estimation. The ECM is used to analyze the shortrun dynamics of the model and examine how the variables adjust to long-run equilibrium after a shock. This analysis is essential for understanding the short-term dynamics and long-term adjustment process of the variables in the model.

ECM estimation					
Variable	Coefficient	Std. Error	t-Statistic	P-Value	Significance
LABT (L1)	-0.4258	0.1112	-3.8300	0.0020	Significant
DGDP (L1)	0.3893	0.1171	3.3200	0.0050	Significant
DINV (L1)	-0.0008	0.0036	-0.2300	0.8250	Insignificant
DEXPG (L1)	0.2175	0.0760	2.8600	0.0130	Significant
DIMPG (L1)	-0.0606	0.0402	-1.5100	0.1540	Insignificant
DSRV (L1)	0.3991	0.1283	3.1100	0.0080	Significant
DGDP (D1)	0.2959	0.0713	4.1500	0.0010	Significant
DINV (D1)	-0.0084	0.0034	-2.4700	0.0270	Significant
DEXPG (D1)	0.1742	0.0445	3.9100	0.0020	Significant
DIMPG (D1)	-0.0894	0.0347	-2.5800	0.0220	Significant
DSRV (D1)	0.3103	0.0720	4.3100	0.0010	Significant
ECM Lag	-0.6413	0.3388	-1.8900	0.0790	Significant
Constant	1.6166	0.4242	3.8100	0.0020	Significant

The results of the Error Correction Model (ECM) reveal key insights into the dynamics of labor force participation (LABT) in relation to economic variables. The error correction term (ECM lag) of -0.6413 suggests that approximately 64.13% of the previous period's disequilibrium in labor force participation is corrected each period, although the effect is only marginally significant ( $p \approx 0.079$ ). In terms of short-term dynamics, GDP growth (0.3893) and exports (0.2175) have a positive and statistically significant effect on labor force participation, indicating that economic growth and trade openness both drive employment. The service sector (0.3991) also positively impacts labor force participation, underscoring the importance of services in generating jobs. However, the effects of investment and imports show negative signs, with investment having a small negative short-term effect (-0.0084) and imports (-0.0894) slightly reducing labor force participation. The model's overall fit is strong, with an R-squared value of 85.17%, indicating that the independent variables explain a significant portion of the variation in labor force participation. The model is statistically significant, confirming that the variables in the model collectively play a crucial role in shaping employment outcomes.

Table 9 presents the results of several diagnostic tests used to validate the assumptions of the estimated ARDL model. The Breusch-Godfrey LM Test checks for autocorrelation in the residuals, with the null hypothesis being the absence of autocorrelation. The Breusch-Pagan / Cook-Weisberg **Test** examines heteroskedasticity, testing whether the variance of the residuals is constant. Finally, the Shapiro-Wilk Test is used to assess the normality of the residuals. These tests help ensure that the model meets the standard assumptions necessary for reliable and valid inferences.

#### Table 9.

Table 8.

Model validation.			
Test	Statistic	P-value	Conclusion
Breusch-Godfrey LM Test	2.0000	0.1573	No autocorrelation (fail to reject null)
Breusch-Pagan / Cook-Weisberg Test	2.0500	0.1525	No heteroskedasticity
Shapiro-Wilk Test	0.9709	0.6473	Residuals are normally distributed

The diagnostic tests for the residuals of the Error Correction Model (ECM) suggest that the model is well-specified. The Breusch-Godfrey LM test indicate no significant autocorrelation in the residuals, as the p-values (0.1573) are greater than the 0.05 threshold. The Breusch-Pagan/Cook-Weisberg test for heteroskedasticity shows no evidence of heteroskedasticity, with a p-value of 0.1525, suggesting constant variance in the residuals. Finally, the Shapiro-Wilk test confirms that the residuals are normally distributed, as indicated by a p-value of 0.64729, which is well above the 0.05 significance level. Therefore, the residuals meet the standard diagnostic assumptions for regression analysis.

The CUSUM chart is used to assess the stability of a regression model over time. In this test, the solid line represents the cumulative sum of residuals, while the dashed lines indicate the confidence bounds, typically set at a 5% significance level. The horizontal line at zero serves as the baseline (Figure 1).



CUSUM (Cumulative Sum) stability test chart.

As observed, the CUSUM line stays within the confidence bounds throughout the analyzed period. This indicates that the regression model is stable, with no significant structural breaks or instability in the coefficients during this timeframe.

## 6. Discussion

The ARDL results provide critical insights into the determinants of labor force participation, highlighting the interplay of economic growth, trade activity, sectoral transitions, and foreign direct investment (FDI). The finding that GDP growth significantly drives labor force participation aligns with classical economic theory, particularly the Solow [1] model, which underscores the role of economic expansion in enhancing labor demand. Higher GDP levels signify improved economic conditions, leading to greater job opportunities and encouraging more individuals to enter the labor market. This relationship is especially relevant in regions like MENA, where economic growth often translates into increased investments and infrastructural development that stimulate labor absorption.

The positive influence of exports on labor force participation resonates with trade-led growth theories. Krugman [8] emphasizes that increased trade activity, particularly through exports, fosters employment by expanding production and enhancing competitiveness. In the MENA context, export-driven industries often create jobs across manufacturing and agriculture, where labor-intensive activities dominate. Conversely, the negative impact of imports on labor force participation reflects the challenges of import-driven competition. Rodrik [9] argues that heavy reliance on imports can displace local industries and redirect resources from labor-intensive sectors to more capital-intensive or automated ones, thereby reducing overall employment opportunities in domestic markets.

The results further emphasize the significant role of the service sector in driving labor force participation. As economies transition from agriculture and manufacturing to services, job creation in sectors such as finance, education, healthcare, and retail accelerates. This trend aligns with Baumol [21] theory of structural transformation, which identifies services as a key driver of modern employment growth. In the MENA region, the expansion of the service sector has not only created more diverse employment opportunities but also encouraged female participation and youth engagement in the workforce, particularly in urban areas.

The weak and inconsistent effects of FDI on labor force participation could be attributed to the nature and allocation of foreign investments in the MENA region. Borensztein, et al. [14] suggest that FDI's impact on employment largely depends on whether investments target labor-intensive or capital-intensive industries. In MENA, a significant proportion of FDI flows into extractive and capital-intensive sectors such as oil and gas, which have limited capacity to generate widespread employment. Additionally, the lack of alignment between foreign investment inflows and the skillsets of the domestic labor force may further dampen the positive effects of FDI on labor participation.

Overall, the ARDL results underscore the need for balanced economic policies to enhance labor market outcomes. Policymakers in the MENA region must prioritize economic diversification, promote skill development, and ensure that trade and investment strategies are aligned with labor market needs. Addressing structural challenges, such as the dominance of capital-intensive sectors and the underutilization of the service sector's potential, will be essential for fostering sustainable labor force participation and inclusive economic growth.

The ECM results provide additional evidence of the dynamic relationship between economic factors and labor force participation. The statistically significant error correction term confirms that deviations from the long-run equilibrium are corrected relatively quickly, indicating a responsive and adaptable labor market in the studied context [29]. This responsiveness highlights the ability of the labor market to adjust to economic shocks, ensuring stability and equilibrium over time.

In the short run, GDP growth and exports exhibit significant positive effects on labor force participation, emphasizing the critical role of economic expansion and trade in job creation. These findings align with established economic theories, such as those of Solow [1] and Krugman [8] which associate GDP growth and export activity with increased labor demand. In particular, the positive contribution of exports suggests that production expansion to meet external demand generates employment opportunities, especially in labor-intensive sectors such as manufacturing and agriculture, which are prominent in MENA economies.

The service sector's positive impact further supports structural transformation theories, which emphasize the sector's growing importance in modern economies. Herrendorf, et al. [22] identify the service sector as a key driver of employment growth in advanced and transitioning economies. The shift toward service-based activities in the MENA region—such as finance, education, retail, and hospitality—provides diverse and sustainable job opportunities, particularly for women and younger workers. This structural transformation not only boosts overall labor force participation but also contributes to more inclusive labor market dynamics.

However, the slight negative effects of FDI and imports on labor force participation highlight potential structural inefficiencies within the economy. Aitken and Harrison [15] argue that FDI inflows often benefit capital-intensive industries, which have limited capacity to generate significant employment growth. In the MENA region, FDI tends to concentrate in sectors like oil and gas, which, despite their economic importance, do not create substantial labor opportunities. Similarly, the negative impact of imports may reflect a dependency on foreign goods, potentially displacing domestic industries and limiting local job creation, as noted by Rodrik [9].

The robustness of the results highlights the importance of adopting balanced and targeted economic policies to maximize labor market benefits. Policymakers should focus on fostering sustainable economic growth, promoting exportoriented industries, and diversifying FDI toward labor-intensive sectors. Addressing structural inefficiencies, such as reliance on imports and limited integration of foreign investment with local labor markets, will be crucial in enhancing labor force participation and achieving inclusive economic development.

## 7. Conclusion

This study has provided an in-depth analysis of the determinants of labor force participation in the MENA region from 1990 to 2023, using an ARDL approach to examine both short-term and long-term dynamics. The findings highlight the pivotal role of GDP growth, trade openness, and the service sector in influencing labor force participation, while the effects of imports and FDI remain mixed. The results suggest that a well-balanced trade strategy, along with policies supporting domestic industries and labor-intensive investments, can enhance employment outcomes. Furthermore, the responsiveness of labor force participation to economic changes underscores the need for adaptive labor market policies.

Based on these findings, policymakers should focus on strategies that enhance GDP growth, expand export capacity, and support the service sector to boost labor force participation. Reducing dependency on imports through domestic industry support and ensuring that FDI is directed toward labor-intensive sectors can also help optimize employment outcomes. Trade policies should encourage value-added exports while safeguarding against excessive import competition that could displace local jobs. Additionally, fostering a service-driven economy through digital transformation and skills development can sustain employment growth in the long run.

Future research should explore the impact of technological advancements, digital transformation, and automation on labor force participation in the MENA region. Additionally, analyzing the role of education, skill development, and gender disparities in employment trends can provide further insights into labor market dynamics. Expanding the dataset to include post-2023 data and incorporating machine learning techniques for forecasting labor force trends could also enhance predictive accuracy and policy effectiveness.

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