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Impact of Education, Life Expectancy, and Labour Force on Economic Growth: The Case of Morocco

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Abstract

Objective: This study aims to examine the relationship between life expectancy, labor force participation, and education with respect to Morocco's economic growth. Methodology: the effects of endogenous and exogenous theories on economic growth are investigated in this study. we exploit the ARDL approach. the dependent variable in our panel data regression methodology was GDP per capita. 23 observations overall from Morocco between 2000 and 2022 are included in our analysis. Secondary data from World Bank databases was used in the study. the main objective of the essay is to present and provide data analysis. Methodological contributions: indicate that life expectancy and economic growth are positively correlated, however there is a negative link between labor force participation and education. Findings: the study's findings imply that Morocco's economic growth initiatives need to be long-term. Therefore, raising the population's standard of living is necessary to assist the implementation of economic growth initiatives. This study's originality may reside in the way it examines how life expectancy, education, and labor force participation affect economic growth. Research/Practical Implications: Morocco's expertise with this subject might offer a distinctive viewpoint to the corpus of empirical study that has already been done.

Keywords: *Economic Growth, Life Expectancy, Education, Morocco, Labour force, Poverty*

INTRODUCTION

The relationship between economic growth and human resources has long piqued the curiosity of scholars and policymakers. The term "human capital," which is often used to refer to "human resources," describes the variety of skills, backgrounds, aptitudes, and knowledge that individuals contribute to the workplace. The role of human capital in promoting economic growth has grown as economies shift from traditional industries to knowledge-based sectors (Devassia & al (2024)). Many scholarly and empirical research have attempted to explain how disparities in human capital affect the differences in economic growth rates among nations (Devassia & al (2024)). The focus on human capital and how it affects a nation's economic growth is warranted by a number of relationships that, while not always clear-cut, are now found in new growth models connecting human capital to an economy's ability to innovate and increase productivity. Based on these data, the goal of this research is to determine how human capital affects GDP per capita growth, with a focus on how variables like life expectancy, education, and labor force participation can affect it. In order to accomplish this, we will look at Morocco, a nation that has traditionally seen education as an important component of economic development. These elements are closely connected. A sustained economic growth, for instance, may support educational investments and increase life expectancy. Additionally, a well-educated workforce can promote productivity and innovation, supporting economic growth. Enhancing life expectancy may also have a positive impact on the labor market by extending people's active lives. In 2022, Morocco, an upper-middle-income country, had a per capita income of $9,410 in purchasing power parity terms. Despite progress, challenges remain. The poverty rate increased from 3% in 2021 to 4.9% in 2022, while the unemployment rate rose from 11.8% in 2022 to 13% in 2023. This rise in unemployment disproportionately affects young people (35.8%), college graduates (19.7%), and women (18.3%). With anticipated increases in investment, GDP growth is projected to improve to 3.5% in 2024 and further accelerate to 3.8% in 2025. Morocco had several interrelated shocks in 2022, with a severe drought contributing to almost half of the country's economic decline. This was made worse by the downturn in the world economy and the increase in the price of commodities due to Russia's

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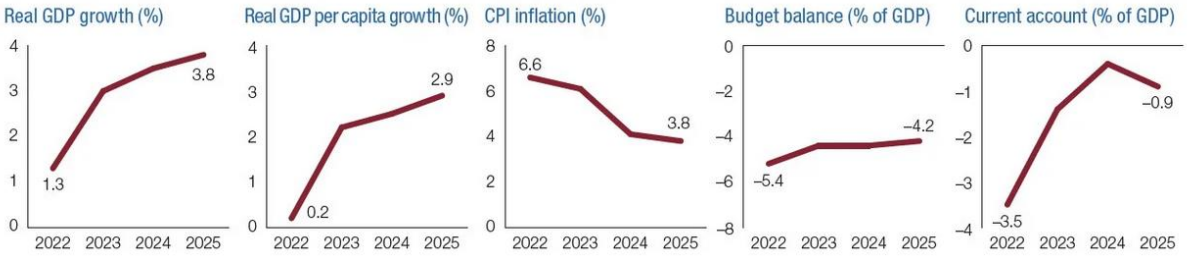
invasion of Ukraine. Real GDP growth decreased as a result, from 8% in 2021 to 1.3% in 2022. But as the effects of these shocks subsided, economic growth started to pick up steam in 2023, helped along by a modest uptick in agricultural output, a revival in the travel and tourism industry, and a healthy contribution from net exports. In 2023, real GDP growth reached 3% in the first half of the year. As global food prices decrease, inflation is expected to gradually decline to 4.1% in 2024 and 3.8% in 2025. As the economy recovers and subsidies for butane gas are reduced, Morocco's budget deficit is expected to progressively decrease to 4.4% of GDP in 2024 and 4.2% in 2025. However, due to increased imports, the current account is anticipated to show a slight deficit of 0.4% of GDP in 2024, which may deteriorate moderately to 0.9% of GDP in 2025. Growth prospects could be constrained by inadequate rainfall or slower economic growth in the EU, which might also impact terms of trade. Additionally, food prices could face further volatility due to escalating tensions related to Russia's invasion of Ukraine. On the positive side, efforts in royal social protection and the implementation of institutional measures to manage natural disasters and climatic shocks are expected to mitigate risks. To bolster structural reforms and enhance inclusivity, Morocco has developed a new development model.



Source: Data are as of April 2024 and are from domestic authorities; figures for 2023 are estimates and figures for 2024 and 2025 are projections by the African Economic Outlook team.

The paradigm encourages the growth of human capital, infrastructure connectivity, trade integration, and manufacturing. Morocco needs to continue having access to large amounts of longer-term, cheaper external funding in order to apply this approach and benefit from the global financial architecture.

This essay is structured as follows: This section gives an overview of Morocco's labor force, health, education, and economic growth. Section 2 contains the literature review. Section 3 outlines the investigation's objectives. Section 5 presents the investigation's conclusion, while Section 4 provides a detailed description of the methodology and findings.

THEORETICAL FRAMEWORK

There is no doubt in the economic literature that human capital has an impact on a nation's economic progress. Economists Schultz (1961), Becker (1964), and Mincer (1974) laid the foundation for modern human capital theory by arguing that investments in education and training are necessary for economic growth. These investments raise people's capacity for productivity, which raises GDP as a whole. Furthermore, Solow (1956) acknowledged in his growth models the significance of technological innovation and human capital for attaining sustainable economic growth. In his growth models, Solow (1956) highlighted the significance of technological innovation and human capital for long-term economic growth. Studies by Davenport and Prusak (1998) and Nonaka and Takeuchi (1995) highlight the vital role that human capital plays in the creation and sharing of knowledge within businesses. Further empirical research shows that long-term economic growth and educational achievement are positively correlated. Though theoretical models emphasize the role that education plays in economic growth; empirical models frequently downplay its significance. This disparity could be caused by the traditional approach to evaluating education, which frequently places more emphasis on the length of attendance than the real information and abilities gained. Moretti (2004) emphasizes the value of human capital in economic activity and draws the conclusion that investing in human capital benefits people individually as well as society at large based on his empirical research.

It also lowers the investment cost (Vithana & al., 2023). Psacharopoulos and Patrinos (2018) discovered a positive and consistent correlation between productivity and educational attainment in a variety of businesses and nations when conducting their study on the returns on education. The discussion turns to the relationship

between human capital and technical advancement after Lucas (1988). According to him, human capital improves people's capacity to create and accept new technology, both of which are essential for consistent, long-term economic growth. According to some research, human resources are what provide the economy value through the creative and inventive use of technology and the establishment of new companies.

In their studies on African countries like Nigeria, Anaduaka (2014) and Ogunleye (2017) shown how human resources drive economic growth in emerging nations by emphasizing a positive correlation between economic performance and human resource development. Studies conducted by Huselid and Becker (2000) and Barro and Sala-i-Martin (1995) have shown that investing in human capital can lead to higher levels of productivity and economic growth at the corporate and national levels. Research by Romer (1990) and Acemoglu and Zilibotti (2001) highlights the role that human capital plays in promoting growth spurred by innovation.

Additional research by O'Reilly and Tushman (2008) as well as Teece (2007) shows that human capital promotes organizational adaptability. It's also critical to match abilities to market demands (Heckman and Kautz, 2012). Human capital mobility can help achieve this alignment, which is advantageous to economic growth and development (Kerr and Kerr, 2020; Docquier and Rapoport, 2012). However, a number of research indicate that the growth of human capital is influenced by economic expansion (Mehrara and Musai, 2013).

According to Collin and Weil's (2020) research, investing in human capital yields a significantly higher return than investing in tangible assets. However, before investing in both human and physical capital, a nation must continue to grow and make money. The results of several studies show that employing green energy can sustainably promote and strengthen economic growth. One of the main indicators that national and international health systems use to evaluate a country's health is life expectancy (OECD, 2022).

METHODOLOGY

The information utilized in this study enables us to examine the variables impacting Morocco's economic growth. The analysis of the Moroccan nation spans the years 2000–2022, with a total of 23 observations. This study uses the databases from WORLD BANK (2024) to complete the dataset.

Table 1. Definitions of variables used in the study.

Variables	Abreviation	Definition	Sources
Economic Growth	LogGDP per capita	GDP per capita, PPP (current international $)	WDI 2024
Life expectancy (Health)	LogLE	Life expectancy at birth, total (years)	WDI 2024
Education	LogSET	School enrollment, tertiary (% gross)	WDI 2024
Labour force	LogLAB	Labor force participation rate, total (% of total population ages 15+) (modeled ILO estimate)	WDI 2024

Source: Own processing.

Our study framework's economic growth equation is based on an analysis framework created by Barro (2001), Solow (1956), and other authors. For estimation reasons, most authors define growth modeling elements. Conversely, our model looks like this:

Y = f (Life expectancy at birth, total (years), School enrollment, tertiary (% gross), Labour force participation rate, total (% of total population ages 15+) (modeled ILO estimate)).

We will utilize the logarithm for many reasons:

- The logarithm reduces the impact of time effects on the series;
- It decreases the number of steps required to reach a stationary series;
- It makes it possible to keep track of the series' initial values;
- We used logarithmic regression variables to make the model more stable because the variables are not the same units.

So, the following is the econometric model after the data have been made stationary by translating them into a natural logarithm function:

$$\textbf{LogGDP per capita}_t = \beta_0 + \beta_1 \textbf{logLE}_t + \beta_2 \textbf{logSET}_t + \beta_3 \textbf{logLAB}_t + u_t$$

With:

Y: Economic Growth proxed by GDP per capita, PPP (current international $);

LE: Life expectancy at birth;

SET: School enrollment, tertiary;

LAB: Labor force participation rate;

β_1 to β_3: Shows how sensitive GDP per capita is to the explanatory variables;

u_t: Error term;

t: Time.

and the Autoregressive Distributed Lag (ARDL) method is used to analyze it.

Table 2. Descriptive statistics.

	Loggdp Per Capita	Loglabor Force Participation Rate	Loglife Expectancy At Birth Years	Logschool Enrollment
Mean	8.780226	3.881324	4.263328	2.951107
Median	8.885581	3.895080	4.266461	2.770172
Maximum	9.127539	3.940785	4.317128	3.832537
Minimum	8.271952	3.790985	4.201508	2.306490
Std. Dev.	0.243134	0.049208	0.036444	0.547595
Skewness	-0.693823	-0.487977	-0.209054	0.296976
Kurtosis	2.291557	1.769772	1.708866	1.458572
Jarque-Bera	2.326309	2.363198	1.765097	2.615079
Probability	0.312499	0.306788	0.413727	0.270485
Sum	201.9452	89.27044	98.05654	67.87546
Sum Sq. Dev.	1.300507	0.053272	0.029219	6.596935
Observations	23	23	23	23

Source: Eviews 12, 2024

RESULTS AND DISCUSSIONS

Based on the data from the previous table, it can be seen that the variable with the highest volatility is the education variable, while the variable with the lowest volatility is the life expectancy at birth years. based on the Std. Dev. values. Additionally, this descriptive analysis shows that all variables follow a normal distribution (all Jarque-Bera probabilities are greater than 5%).

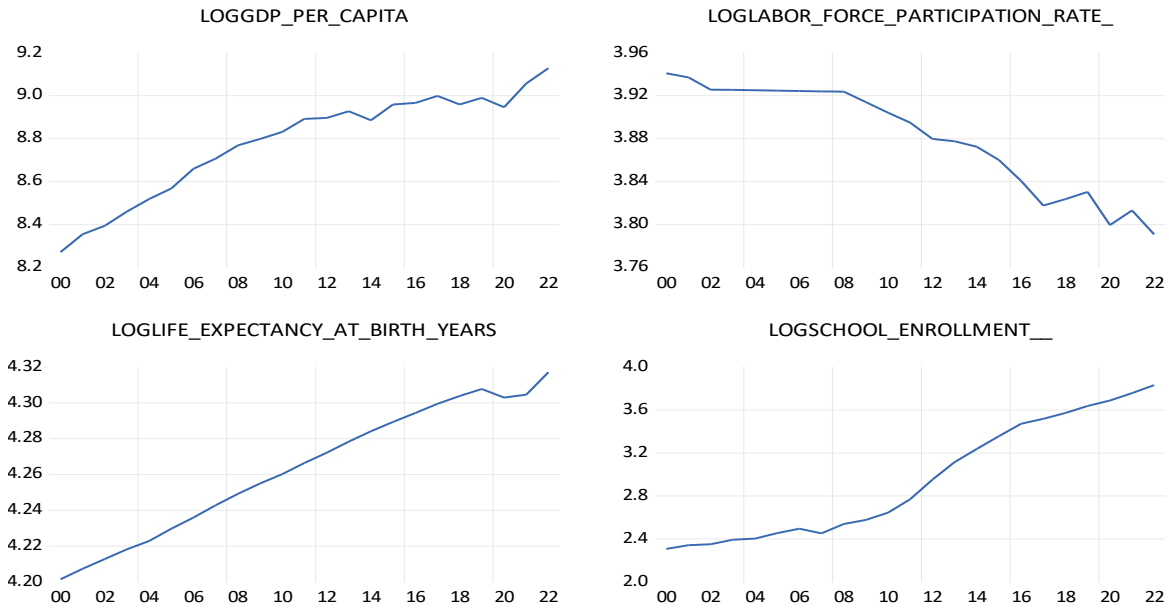


Figure 1. Variables' graphics.

Once the variables have been subjected to a descriptive and graphical analysis, their stationarity may now be verified. A temporal series is considered stationary if its average and/or variance do not vary over time. Several tests have been conducted to determine whether there is a single racine among them. The dickey-Fuller enhanced test (ADF) has been applied, and the results are shown in the table 3 below:

Table 3. Tests of stationarity.

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-5.55084	0.0000
Im, Pesaran and Shin W-stat	-5.99195	0.0000
ADF - Fisher Chi-square	46.5076	**0.0000**
PP - Fisher Chi-square	38.9154	0.0000

Source: Eviews 12, 2024

All variables are integrated in an order of one, which means that they must be differentiated once before they become stationary with the constant, according to the results of the ADF test. Since no variable in the model is I(2) and all variables are integrated to order 1, the ARDL approach to cointegration is the most suitable estimating technique. In order to estimate the model, we will choose the best ARDL model—that is, the model that produces statistically significant results—using the Akaike information criterion (AIC). The best possible model is depicted in the graph below.

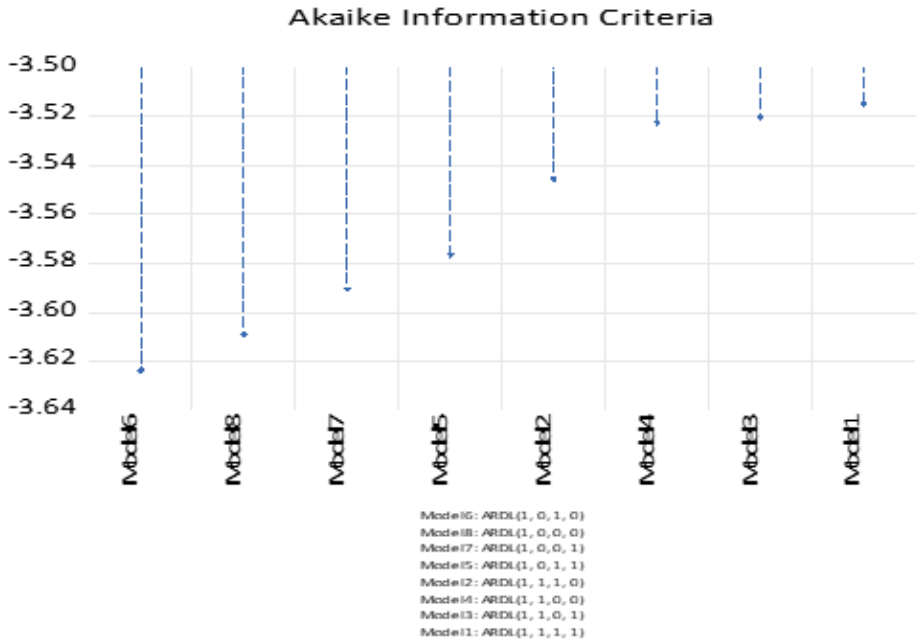


Figure 2. Values of the AIC graph.

Source: Eviews 12, 2024

Based on the aforementioned graph analysis and the AIC criteria, the ARDL (1, 0, 1, 0) model is determined to be the most optimal of the eight models examined because it displays the lowest AIC value. Therefore, this model is the one that yields statistically significant results. Once the ARDL (1,0,1,0) model has been determined to be the most optimal, its estimation is displayed in the following table 4:

Table 4. Results of the coefficient estimation.

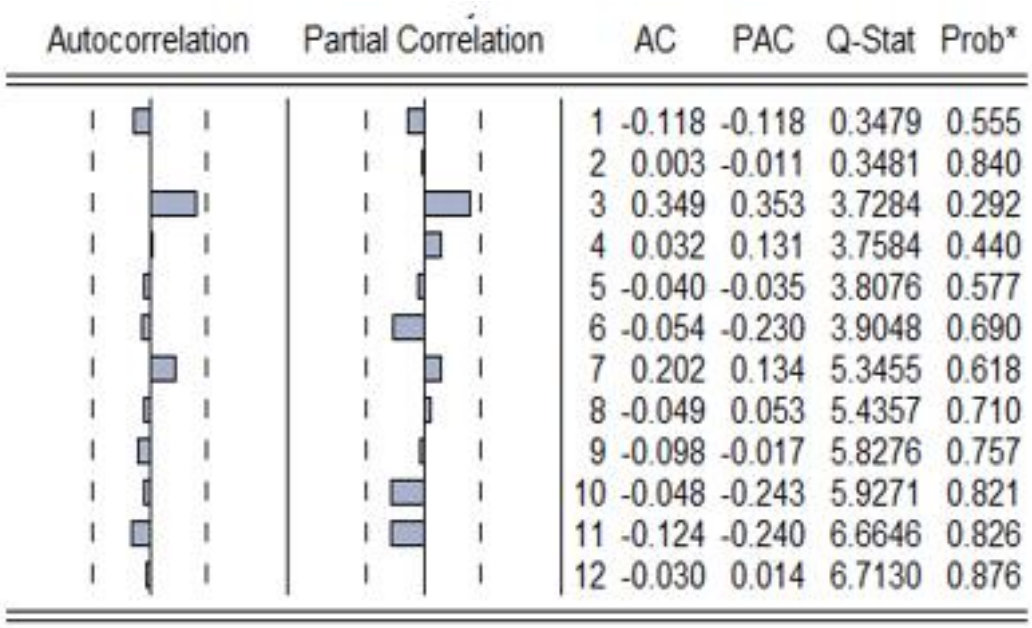
Variable	Coefficient	Std. Error	T-Statistic	Prob.*
LOGGDP_PER_CAPITA (-1)	0.305524	0.307460	0.993704	0.3352
LOGLABOR_FORCE_PARTICIPATION_RATE_	0.263681	0.917384	0.287427	0.7775
LOGLIFE_EXPECTANCY_AT_BIRTH_YEARS	10.84694	4.128185	2.627532	0.0183
LOGLIFE_EXPECTANCY_AT_BIRTH_YEARS (-1)	-3.866400	2.892974	-1.336479	0.2001
LOGSCHOOL_ENROLLMENT__	-0.160278	0.153859	-1.041721	0.3130
C	-24.21970	13.47103	-1.797910	0.0911
R-squared	0.980676	Mean dependent var		8.803330
Adjusted R-squared	0.974637	S.D. dependent var		0.221512
S.E. of regression	0.035277	Akaike info criterion		-3.624148
Sum squared resid	0.019912	Schwarz criterion		-3.326591
Log likelihood	45.86562	Hannan-Quinn criter.		-3.554052
F-statistic	162.3966	Durbin-Watson stat		1.954111
Prob(F-statistic)	0.000000			

Source: Eviews 12, 2024

The validity of the calculated model can be evaluated using the diagnostic tests listed below: heteroscedasticity, autocorrelation, white noise, normality, and model stability.

- **White Noise Test**

The purpose of this test is to confirm that the residuals representing the variation between the estimated and theoretical models are noise. The Ljung_Box Q-statistic is the foundation of this test. The residuals' correlogram yielded the following outcomes:



	AC	PAC	Q-Stat	Prob*
1	-0.118	-0.118	0.3479	0.555
2	0.003	-0.011	0.3481	0.840
3	0.349	0.353	3.7284	0.292
4	0.032	0.131	3.7584	0.440
5	-0.040	-0.035	3.8076	0.577
6	-0.054	-0.230	3.9048	0.690
7	0.202	0.134	5.3455	0.618
8	-0.049	0.053	5.4357	0.710
9	-0.098	-0.017	5.8276	0.757
10	-0.048	-0.243	5.9271	0.821
11	-0.124	-0.240	6.6646	0.826
12	-0.030	0.014	6.7130	0.876

Figure 3. The correlogram of the residuals.

Source: Eviews 12, 2024

Given that all correlogram terms remain inside the stylized dotted band and that all probability values are greater than 0.05, it is indicated that the residuals of this model consist of white noise.

- Error Autocorrelation Test

According to the model estimated at that time for the coherence of these estimates, the errors must be independent. The results of applying Breush and Godfrey's test are as follows:

Table 4. Error autocorrelation test.

F-statistic	0.132692	Prob. F(2,14)	0.8768
Obs*R-squared	0.409272	Prob. Chi-Square(2)	0.8149

Source: Eviews 12, 2024

This table makes it simple to conclude that the residuals are not autocorrelations, that is, independent, because the test's probability is more than 5%.

- Heteroscedasticity Test

One of the main theories behind linear models is heteroscedasticity. If a residual's variance is constant, it is regarded as homoscédastic. You can use the Breusch-Pagan-Godfrey test to determine if the residues are homoscédastic or heteroscédastic. With this test, the presence of heteroscedasticity can be statistically evaluated.

Table 5. Heteroscedasticity test.

F-statistic	1.599082	Prob. F(5,16)	0.2168
Obs*R-squared	7.330528	Prob. Chi-Square(5)	0.1972
Scaled explained SS	7.170603	Prob. Chi-Square(5)	0.2083

Source: Eviews 12, 2024

This table shows that the residuals are homoscedastic since the F-statistical probability is more than 5%.

- **Test For the Normality of Residuals**

The normality of errors is a fundamental hypothesis in linear models, much like homoscedasticity. The Jarque-Bera test is utilized to verify this hypothesis:

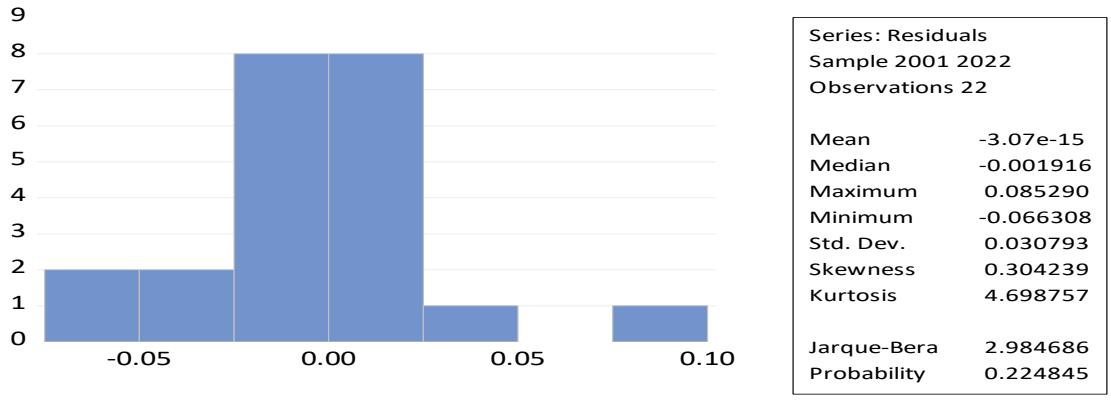


Figure 4. Distribution of residuals histogram.

Source: Eviews 12, 2024

Given that the Jarque-Bera probability exceeds 5%, the residual distribution follows a normal distribution.

- **Stability test of the model**

In order to determine if the model is stable or not, the CUSUM test-which is based on the sum of the squares of the recursive residuals-was used to Eviews 12. The following graph illustrates the test's results:

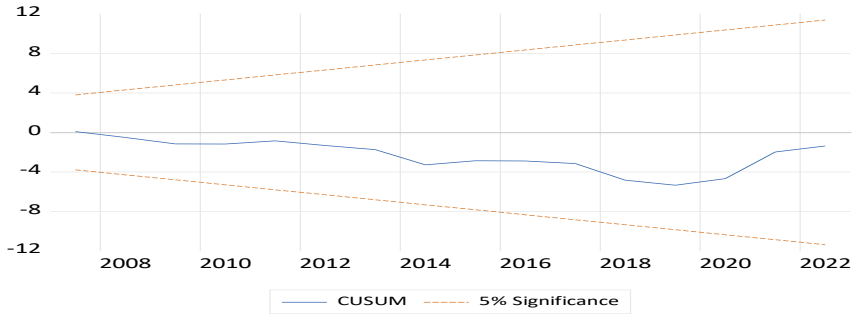


Figure 5. Stability test of the model.

Source: Eviews 12, 2024

According to the above graph, the curve does not exit the pointed corridor at the 5% level, and the model's coefficients remain constant throughout time. In summary, all applied diagnostic tests have led to the validation of our estimated model, ARDL (1,0,1,0). This model is characterized by the absence of autocorrelation, homoscedasticity, normality, and stability of the coefficients, as well as the reliability of the observed estimates.

- **Bounds Test**

We proceed to a critical step after confirming our estimated model: figuring out whether the variables have a cointegration connection. We use the cointegration test created by Pesaran et al. (2001) to do this. In this test, the null hypothesis predicts no cointegration, whereas the alternative hypothesis points to the existence of a long-term equilibrium relationship. The Fischer test statistic is compared to two predetermined critical values using the Pesaran test. There are three conceivable outcomes from this comparison:

- If the Fischer test value is less than the lower bound, it means that there is no cointegration relationship between the variables.
- No conclusion can be drawn if the Fischer test value lies between the two bounds.

- If the Fischer test value is greater than the upper bound, cointegration between the variables is present.

The following results were obtained from using Pesran's cointegration test on Eviews 12:

Table 6. Outcomes of Pesaran et al.'s cointegration test (2001).

F-Bounds test		**Null Hypothesis: No levels relationship**		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	1.944227	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: Eviews 12, 2024

Upon examining the above table, the Eviews software confirms that there is no cointegration relationship.

- **Long-Term Coefficients and the Adjustment Coefficient**

The following table shows the long-term estimated coefficients of the chosen model. This long-term relationship looks at how explanatory factors like life expectancy, education, and labor force participation affect the variable that determines economic growth over the long run.

Table 7. The long-term estimated coefficients.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGLABOR_FORCE_...	0.379684	1.336677	0.284051	0.7800
LOGLIFE_EXPECTAN...	10.05152	1.516354	6.628744	0.0000
LOGSCHOOL_ENRO...	-0.230790	0.162320	-1.421820	0.1743
C	-34.87481	7.379881	-4.725661	0.0002

EC = LOGGDP_PER_CAPITA - (0.3797*LOGLABOR_FORCE_PARTICIPATION_RATE_ + 10.0515*LOGLIFE_EXPECTANCY_AT_BIRTH_YEARS -0.2308*LOGSCHOOL_ENROLLMENT__ - 34.8748)

Source: Eviews 12, 2024

The statistical result demonstrates that life expectancy is the only factor that is statistically significant and has an effect on the long-term fluctuations in economic growth in Morocco. However, our variable is not affected over the long run by the other independent variables, which is economic growth. Ultimately, in order to assess the quality of the adjustment speed, the adjustment coefficient—also known as the coefficient of force of recall—was estimated. After the software exited, the following table was created:

Table 8.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGLIFE_EXPECT...	10.84694	1.590262	6.820848	0.0000
CointEq(-1)*	-0.694476	0.199225	-3.485888	0.0031

Note: * p-value incompatible with t-Bounds distribution.

Source: Eviews 12, 2024.

According to the above table, the coefficient of force of return is negative and ranges from 0 to 1. It differs significantly from 0 at the 5% significance level, and since it is statistically significant, there is an error correction mechanism in place. That is to say, following a collapse last year, 69% of the imbalance between the actual and wish levels of economic growth in Morocco has been adjusted very quickly. The life expectancy has a substantial long-term impact on economic growth. Consequently, a considerable lot of academic and empirical study has

tried to explain why different countries' rates of economic development differ in ways that are influenced by human capital. Huselid and Becker (2000) as well as Devassia & al (2024).

CONCLUSION

In the initial stage, the order of integration for the variables was determined using the ADF unit root test. After verifying that the variables are stationary at different orders, the ARDL bounds testing approach was employed to examine whether the variables are co-integrated. From a scientific perspective, this research advances our understanding of economic growth by using an economic approach. The study strengthens the scientific rigor in this field by providing empirical results based on quantitative data through the use of advanced statistical analysis tools. In many contexts, the applied economic methods may also serve as a foundation for further research on poverty and socioeconomic determinants. The findings of this study may offer invaluable information to managers and policymakers for the creation and implementation of programs and policies aimed at combating poverty. These results, which identify the factors that significantly contribute to poverty, can focus efforts in the areas that are most important for reducing poverty and raising the standard of living of vulnerable groups. Regarding boundaries, it is important to note that despite the scientific contributions of our work, this dataset has a number of limitations related to data availability and quality, temporal dynamism, and specific context.

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