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The impact of commercial openness on Life expectancy: Empirical evidence from Algeria

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Abstract:

This article studies the impact of Commercial openness on life expectancy at Birth (LEB) in Algeria during the period (1990-2022). The study utilized (ARDL) bound test.

The results obtained are education expenditures and health expenditures per capita (HE) and (EE), and degree of commercial openness (DCO) does not significantly influence life expectancy at birth (LEB). The labor force (LF) is a negative and significant effect on life expectancy at birth (LEB). The error correction coefficient was also negative and statistically significant.

The study recommends that the Algerian government open up trade to health sector goods and increase investment in the services sector to reduce occupational accidents and improve the quality of health life.

Keywords: *Commercial openness, life expectancy, Algeria, ARDL.*
Jel Classification Codes: *C32, F10, I1.*

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1. INTRODUCTION.

From ancient times to the Middle Ages, advanced civilizations traded with neighboring and distant lands, using land and maritime routes to transport goods and wealth. Throughout history, developed cities have focused on improving commercial resources and building intercontinental business networks.

In the 18th century. Technology and innovation increased productivity and expanded commerce. Large companies and giant factories need to increase sales of their raw materials and finished products. This drives countries to look for foreign markets to export their products.

The 1970s were a time for many changes as the international trading system began to emerge to facilitate the flow of goods, services, and capital between countries without borders. In addition to the efforts of international organizations aimed at assisting developing countries to be in touch with the word "outside" or "openness", like Algeria and the Middle East and North African countries, these countries are trying to evolve their situation to be close to the international standard.

Generally, it can be said that commercial openness can be a key factor in promoting economic growth and achieving sustainable development. Helping to increase investment and improve people's quality of life through better access to goods and services. In fact, commercial openness has a great impact on specific social indicators as public health, longevity and warrant closer examination, especially in developing nations like Algeria.

The life expectancy in Algeria has been steadily increasing over time. As of 2021, the estimated life expectancy at birth for the total population in Algeria was approximately 76 years, as reported by the World Bank **(The World Bank Group, 2023)**. This signifies an enhancement in the general health and well-being of the Algerian population.

It should be noted that life expectancy is influenced by various factors such as gender, socio-economic circumstances, the availability of health care, and lifestyle preferences. Access to healthcare amenities and infrastructure could have a positive effect on life expectancy, and generally, this is more available in urban areas.

The relationship between life expectancy and commercial openness is multifaceted. Commercial openness can extend life expectancy by promoting access to a broader variety of goods and services like healthcare technologies and pharmaceutical products. It may also have adverse impacts on the environment and climate as well as life expectancy. This can occur through the proliferation of factories, emissions, and pollution. This research aims to identify the effect of commercial openness on life expectancy in Algeria.

1.1 Research Problem.

Based on the previous information, another question has been raised which is as follows:

Is there a significant positive effects of commercial openness on life expectancy in Algeria from 1990 to 2022?

1.2 Research Hypotheses.

In the light of this problem, the research hypotheses of our research article are established as follows:

$H_0$1: Education expenditures have no statistically significant effect on life expectancy at birth in Algeria.

$H_1$1: Education expenditures have a positive statistically significant effect on life expectancy at birth in Algeria.

$H_0$2: Health expenditures have no statistically significant effect on life expectancy at birth in Algeria.

$H_1$2: Health expenditures have a positive statistically significant effect on life expectancy at birth in Algeria.

$H_0$3: The labor force has no statistically significant effect on life expectancy at birth in Algeria.

$H_1$3: The labor force has a positive statistically significant effect on life expectancy at birth in Algeria.

$H_0$4: Commercial openness has no statistically significant effect on life expectancy at birth in Algeria.

$H_1$4: Commercial openness has a positive statistically significant effect on life expectancy at birth in Algeria.

1.3 Research Objectives.

This research paper aims to achieve several goals.

-To examine the relationship between commercial openness and life expectancy, thus contributing to the broader economic literature;

-To investigate a significant relationship between variables in Algeria;

-To comprehend the significant role and impact of commercial openness on life expectancy;

1.4 Research Structure.

The study comprehensively investigates both theoretical and applied aspects of commercial openness and life expectancy in Algeria. Firstly, the concepts are succinctly discussed. Secondly, the empirical methodology employed the ARDL model, covering the period of 1990-2022, and is thoroughly explained with the support of the software EViews 13.

2. LITERATURE REVIEW.

Generally, various empirical studies have examined commercial openness or life expectancy separately. However, only a few of them have investigated the impact of both factors together.

(Aytemiz, Sart, Bayar, Danilina, & Sezgin, 2024) investigated the long-term effects of social, educational, and health expenditures on of life expectancy indicators in the OECD countries. using annual data collected from 2005 to 2021. The study found that the social, educational and health expenditures are significant drivers for life expectation. Besides, it arrives that GDP per capita has a positive significant effect on indicators of life expectancy in the OECD states.

(Mbabazi, 2017), This study aimed to analyze the impact of trade on income, education and life expectancy in sub-Saharan Africa. The generalized method of moments approach was used for 38 countries during the period (2004-2014). the empirical results suggest that an increase in trade is positively associated with enhancement in social welfare in Sub-Saharan Africa.

(Palamuleni, 2017) examined the long-run relationship between global trade and public health in 25 underdeveloped countries, using life expectancy as a measure. A panel data strategy was used to adjust for endogeneity and cross-sectional confounding, with annual

data collected from 1965 to 2013. The study finds two main conclusions: global trade and life expectancy are positively related in the long run, and the causal relationship is reciprocal. Suggesting that trade could be both a cause and a consequence of population health, it is advisable for LDCs to pursue policies that promote both trade and quality of life.

(Novignon & Atakorah, 2016) this study answered the question How does the health sector benefit from trade openness? Using panel data for 42 sub- Saharan African countries. The finding of the study showed a positive and significant relationship between commercial openness and both life expectancy, health financing. And negative significant relationship between commercial openness and both infant mortality rate and under five mortality rate. the empirical results support the international trade integration of sub- Saharan African countries.

(Herzer, 2015) explored the long-term impact of trade on life expectancy in the United States from 1960 to 2011, using annual time series data. The study finds a significant positive long-term correlation between TO and LE at birth through cointegration and causality analyses. The research paper indicates that the causality runs from TO to LE at birth. In other words, international trade increases life expectancy in a given country.

(Deshpande, Kumar, & Ramaswami, 2014) this study investigated the relationship between healthcare expenditure and life expectancy in both developed and developing countries, the results demonstrated insignificant correlation between health care expenditure and life expectancy in developing states, and a significant correlation between health expenditure and life expectancy in developed states. The researchers speculated that the quality of spent that effects healthcare in developing countries not the quantity of expenditure.

(Owen & Wu, 2007) examined the relationship between commercial openness and health outcomes, namely infant mortality rates and life expectancy, utilizing panel data from 219 countries. The analysis concluded that countries with higher levels of commercial openness have lower infant mortality rates and higher life expectancy, especially in developing countries. The study attributes this improvement to the transfer of knowledge resulting from international trade.

3. THE STUDY BACKGROUD.

Life expectancy and commercial openness are two significant factors that affect a country's socio-economic development. The aim of this paper is to examine these factors in details.

Commercial openness is the process of opening a country's economy to international trade and expanding trade with other countries. The history of commercial openness goes back to ancient times, when trade was an essential part in relations between people and different civilisations. The 17th and 18th centuries marked the emergence of international trade, which remained under Mercantilism principles. This idea states that countries possess varied natural resources, while their production facilities are inherently standard. Also, countries exhibit differences in climate and geological factors as well as access to labor and financial resources. In Wealth of Nations, Smith contends that if a foreign nation can provide a commodity at a lower cost than we can produce, it will be better to import that commodity through our own industries. **(Anozie & Nkoro, 2023, p. 115)**

Commercial openness is the degree to which a country is ready to participate in world trade, achieved by reducing trade barriers, such as tariffs and quotas, and promoting the

exchange of goods and services with other countries. In fact, it can promote innovation and economic development by facilitating the transfer of knowledge, technology, and ideas across borders. Thus, commercial openness is a key driver of development, skills' transfer, and productivity across the globe **(Shah, et al., 2021, p. 1690)**. There are multiple dimensions of international trade utilised by various academics like import, export, foreign direct investment, and exchange rate.

In other words, Commercial openness is the abandonment of trade borders and exchange rates. Openness is the procedure used to transfer international trade without the interference of the authority at the level of import and export.

Life expectancy is a key health outcome indicator in studies of health. It refers to the average number of years that an individual is expected to live and is influenced by a number of factors, such as healthy lifestyle practices, educational attainment, body mass index (BMI), access to healthcare services, and habitual diet. **(Shah, et al., 2021, p. 1692)**

Life expectancy varies significantly worldwide due to disparities in public health, medical care, and nutrition. The health status and disease incidence in a population significantly impact how long individuals live. Moreover, economic conditions also affect life expectancy, as it is demonstrated in Fletcher's (2013) study on life expectancy in the UK. Life expectancy is several years higher in the richest and most affluent areas than in the poorest ones. Fletcher's (2013) research on life expectancy found a strong link between economic inequality and life expectancy. Maintaining a healthy lifestyle and having access to quality healthcare are crucial to achieve longer life expectancy. Additionally, other factors that affect an individual's life expectancy include genetic disorders, drug use, tobacco smoking, excessive alcohol consumption, obesity, access to healthcare, diet, and exercise habits. **(Anozie & Nkoro, 2023, pp. 118-119)**

Gender can affect life expectancy variations, as recent data demonstrates that women generally experience longer life expectancy than men. For example, in Algeria life expectancy differs (female= 78; male=75) in 2021 **(The World Bank Group, 2023)** , despite having higher morbidity rates. Moreover, males are more susceptible to fatal outcomes from both unintentional incidents like car accidents or workplace injuries and intentionally self-inflicted harm, such as suicide. **(Campbell, et al., 2014, pp. 1480-1481)**

4. RESULTS AND DISCUSSION.

4.1 Empirical Model.

For Measuring the impact of commercial openness on Life expectancy at birth in Algeria during the period (1990 -2022), we used a linear equation is based on the economic theory of the determinants of the human development indicators guide, as follows:

$$LEB_t = \beta_0 + \beta_1 EE_t + \beta_2 HE_t + \beta_3 LF_t + \beta_4 DCO_t + \varepsilon_t$$

This relationship can be converted into the following

$$\Delta LEB_t = \beta_0 + \beta_1 \sum_{t=1}^{n} \Delta EE_{t-1} + \beta_2 \sum_{t=1}^{n} \Delta HE_{t-1} + \beta_3 \sum_{t=1}^{n} \Delta LF_{t-1} + \beta_4 \sum_{t=1}^{n} \Delta DCO_{t-1} + \beta_5 ECM_{t-1} + \varepsilon_t$$

Where;

LEB: Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life;

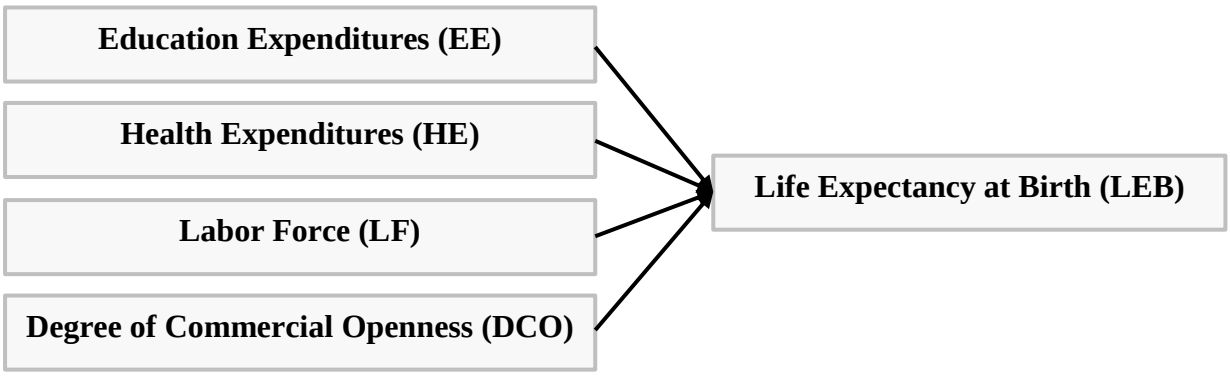
EE: The ratio of education expenditures per capita;

HE: The ratio of health expenditure per capita;
LF: Labor force;
DCO: Degree of commercial openness (The sum of exports and imports of the country for goods and services divided by gross domestic product, multiplying by 100).
Δ indicates the first differences of the variables;

Data from 1990 to 2022 for life expectancy at birth, the ratio of education expenditures and health expenditures per capita, the labor force and degree of commercial openness are obtained from the World Development Indicators database.

The model used in the present study are given in figure:

Figure-1: Empirical Model



Source: Authors' computation

4.2 Estimation methodology.

In order to measure the impact of commercial openness on life expectancy in Algeria, an autoregressive distributed lag model (ARDL) was used. The model was developed by Pesaran & Shin (1999) and Pesaran & Smith (2001) **(Pesaran, Shin, & Smith, pp. 289-326)**.

4.3 Empirical Analysis.

4.3.1 Unit Root Test for Stationarity.

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests presented in Table 1 include the constant, Constant, Linear Trend and None. To do this, we run PP and ADF unit root tests in both level and first difference.

Table 1: Unit root tests for Stationarity

	Variable	Augmented Dickey-Fuller test statistic			Phillips-Perron test statistic		
		Constant	Constant, Linear Trend	None	Constant	Constant, Linear Trend	None
		Prob	Prob	Prob	Prob	Prob	Prob
level	LEB	0.7771	0.1017	0.9997	0.8809	0.1052	1.0000
	EE	0.0000*	0.0003*	0.0000*	0.0000*	0.0003*	0.0000*
	HE	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
	LF	0.7106	0.0274**	0.2026	0.7960	0.0300**	0.2195
	DCO	0.2403	0.8412	0.6686	0.4189	0.8796	0.6877
1st différence	LEB	0.0000*	0.0000*	0.1165	0.0000*	0.0000*	0.0000*
	DCO	0.0001*	0.0004*	0.0000*	0.0001*	0.0004*	0.0000*

Notes: * 1% significance level; ** 5% significance level; *** 10% significance level

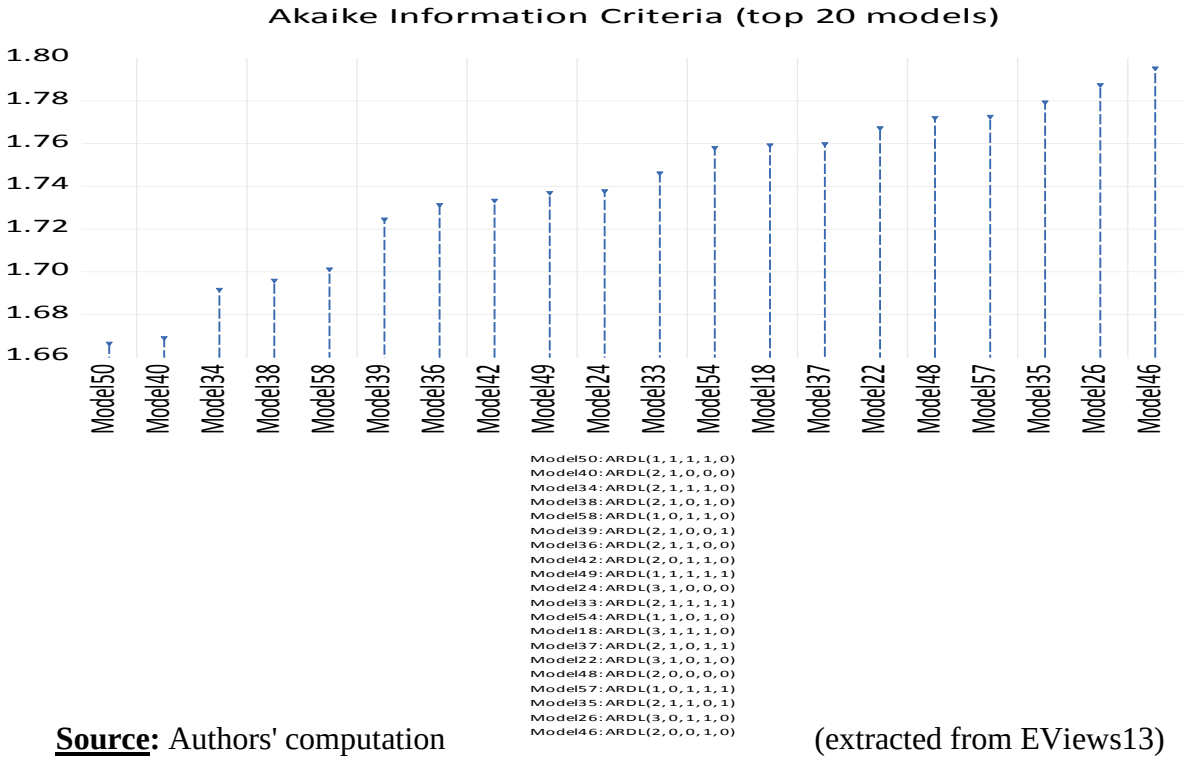
Source: Authors' computation (extracted from EViews13)

Both tests confirm that the the ratio of education expenditures and health expenditures per capita, the labor force are I(0), while the life expectancy at birth, and degree of commercial openness are I(1). None of variable is I(2).

4.3.2 Model Selection Criterion.

The criterion for variables lag order selection is presented in the following graph. On the basis of the Akaike Information Criterion (AIC). the optimal lag length has been selected. According to the AIC, among the top 20 model our best model for this study is ARDL (1,1,1,1,0) model.

figure-2: Model Selection Criterion



Source: Authors' computation (extracted from EViews13)

4.3.3 Results of the ARDL Bounds Tests:

In order to confirm the existence of a long run relationship between the variables Life expectancy at birth (LEB), The labor force (LF), The ratio of education expenditures and health expenditures per capita (HE) and (EE), and degree of commercial openness (DCO), the bounds test was used. The result of Bounds test is presented in Table 3. The computed F-statistic is 3.787488, as shown in Table 2, and is statistically significant at the 5% significance level, implying that these variables have a long-term relationship among themselves.

Table-2: ARDL bounds test result

F-statistic = 3.787488						
	10%		**5%**		**1%**	
Sample Size	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
30	2.525	3.560	3.058	4.223	4.280	5.840

Asymptotic	2.200	3.090	2.560	3.490	3.290	4.370

*** I(0) and I(1) are respectively the stationary and non-stationary bounds.**

Source: Authors' computation (extracted from EViews13)

Long-run and short run estimated coefficient of ARDL is presented in Table3 and Table4.

Table-3: Long Run Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EE(-1)	-0.102675	0.091753	-1.119036	0.2738
HE(-1)	-0.026624	0.046390	-0.573912	0.5712
LF(-1)	-1.764741	0.539214	-3.272800	0.0031
DCO	0.103611	0.106424	0.973575	0.3396
C	144.8256	25.42769	5.695587	0.0000

Source: Authors' computation (extracted from EViews13)

Table-4: Short Run Estimation and ECM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.136067	0.025652	-5.304303	0.0000
D(EE)	0.001501	0.004182	0.358804	0.7226
D(HE)	0.006104	0.002807	2.174802	0.0389
D(LF)	0.248563	0.114281	2.175006	0.0389

CE = LEB(-1) - (-0.102675*EE(-1) - 0.026624*HE(-1) - 1.764741*LF(-1) +0.103611*DCO + 144.8256)

Source: Authors' computation (extracted from EViews13)

Diagnostic checking

Table-5: Diagnostic checking

Diagnostic checking	
Breusch-Godfrey Serial Correlation LM Test	**F-statistic = 0.60539 (p-value = 0.5561)** **Chi-Square (2) = 1.79724 (p-value = 0.4071)**
Heteroskedasticity Test: ARCH	**F-statistic = 2.585813 (p-value = 0.1195)** **Chi-Square (1) = 2.534613 (p-value = 0.1114)**
Ramsey RESET Test	**F = 0.967044 (p-value = 0.3372)**
Jarque-Bera	**χ^2 = 0.916730 (pvalue = 0.632317)**

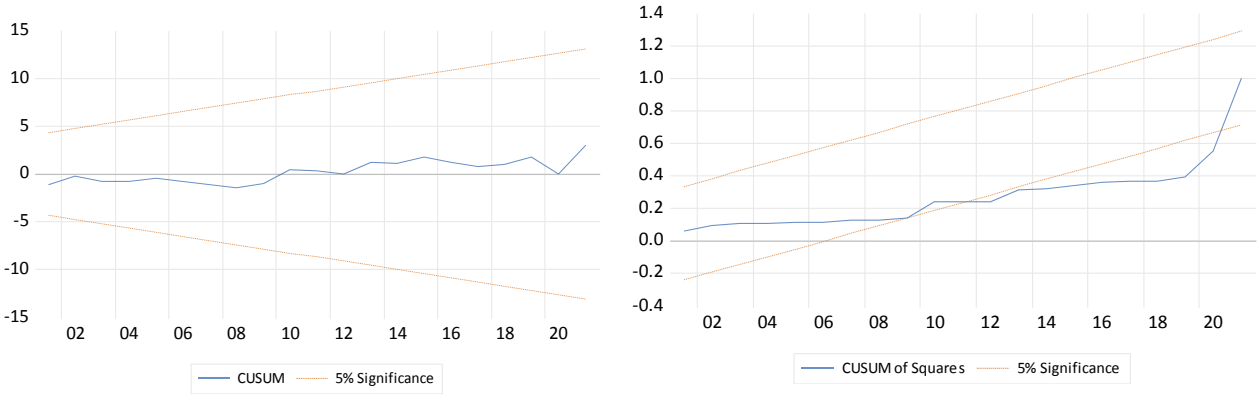
Source: Authors' computation (extracted from EViews13)

Stability Test

Cumulative sum (CUSUM) test and Cumulative sum of squares (CUSUM of squares) test has been examined to test the stability of long run coefficient.

The result obtained is given in the following figure-3:

Figure-3: Stability test of coefficient



Source: Authors' computation (extracted from EViews13)

It appears that the two graphs of the cumulative sum of residuals and the cumulative sum of squares of residuals fall within the framework of the critical limits at a significant level of 5%, which indicates the stability of the short and long-term parameters of the estimated model, meaning that the long-term results are fully consistent with the short-term results.

4.4. DISCUSSION.

This paper studied the impact of commercial openness on life expectancy in Algeria during the period 1990 to 2022, using Autoregressive Distributed Lag Model (ARDL).

The results indicate that the health expenditures per capita (HE) has a negative and statistically insignificant (economically unimportant) effect on life expectancy at birth, which means that health spending in Algeria is not an important variable. This result clearly indicates that the funds directed by the state to the health sector are not allocated in a better and more efficient manner. Increasing public spending on health does not necessarily guarantee an improvement in health care because the increase in spending is only quantitative and not qualitative. Unfortunately, when more money is pumped into the health sector, the focus is usually on raising employee wages rather than improving the health care system. This causes a loss in the positive effect of the government spending on health. This result is consistent with the study **(Deshpande, Kumar, & Ramaswami, 2014)**

The applied results showed that the education expenditures per capita (EE) has a negative and statistically insignificant (economically insignificant) effect on life expectancy (hope for life). This means that spending on education in Algeria does not constitute a significant variable in the life expectancy of the Algerian citizen. Unfortunately, this result clearly indicates that education in Algeria does not make a positive contribution to life expectancy. It does not contribute at all to increasing health awareness, people's quality of life, and access to better medical care services. This result is not consistent with the study **(Aytemiz, Sart, Bayar, Danilina, & Sezgin, 2024)**

The results showed that the labor force (LF) in Algeria has a negative and statistically significant (economically significant) effect on life expectancy (hope for life).it means that the increase on labor force decrease the life expectancy, and this may be explained by the fact that the majority of the labor force in Algeria works in sectors that negatively affect the health of the individual. Most of them work in the construction sector (physically difficult work) and in petroleum companies (negative impact of chemical products), this result is consistent with the study **(Mbabazi, 2017).**

The main finding of this study showed that the degree of commercial openness (DCO) in Algeria has a positive and statistically insignificant (economically insignificant) effect on life expectancy (hope for life). This means that the commercial openness in Algeria does not an important variable in the life expectancy of the Algerian citizen. This indicates that Algeria's exports and imports are directed to sectors other than the health sector, or that the goods exchanged for the health sector are not of sufficient quality. This result does not match with that reached in the study **(Novignon & Atakorah, 2016)**

5. COCLUSION.

Health is one of the most important development issues facing various countries of the world today. Hence, this study attempted to analyze and measure the long-term impact of the degree of trade liberalization, government spending on education, health, and labor force on life expectancy as measured by life expectancy at birth in Algeria during the period between 1990 and 2022. The experimental investigation was conducted using the Autoregressive Distributed Lag (ARDL) model. The applied results of this study concluded that there are no significant economic effects of public spending on education, health, and trade openness in improving the health of Algerian citizens, while the results showed that the labor force has a negative and economically significant effect in improving the quality of healthy life in Algeria. Also, these results proved that the estimated model includes a mechanism for returning to the equilibrium state again, as the error correction coefficient was negative and statistically significant. Through the results reached in this experimental study, we recommend the following to policy and decision makers in Algeria:

- Intensifying investment and work in the service sector where workers are less exposed to accidents and occupational diseases, which increases the life expectancy rate.
- Trade openness to health sector goods, which contributes to the state benefiting from medicines, modern medical equipment, and the expertise of doctors, which inevitably reflects on reducing diseases and increasing life expectancy.
- In the future, it may be useful to study the impact of other variables that may have a direct impact on the quality of health care apart from government spending, such as the population density variable.

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7. APPENDICES:

t	LEB	EEX	HEX	LF	DCO
1990	67,416	NA	NA	43,659	48,381
1991	67,688	150,980	34,424	43,960	52,718
1992	67,757	26,823	17,292	44,110	49,189
1993	67,719	27,515	14,666	44,474	44,923
1994	67,361	10,145	24,243	44,783	48,584
1995	67,454	10,234	10,250	44,860	55,191
1996	68,749	34,483	3,035	44,920	53,705
1997	69,171	5,523	3,381	44,650	52,244
1998	69,451	4,673	1,007	44,380	45,094
1999	70,032	2,941	1,041	44,110	50,929
2000	70,478	9,524	10,794	43,841	62,858
2001	70,823	28,696	0,663	43,572	58,706
2002	71,230	5,405	1,293	43,303	61,134
2003	71,287	11,538	18,256	43,035	62,125
2004	71,762	13,218	23,325	42,767	65,701
2005	72,061	4,061	18,299	42,499	71,279
2006	72,334	11,111	12,916	42,233	70,730
2007	72,602	30,476	16,427	41,966	71,938
2008	72,941	36,131	25,484	41,700	76,685
2009	73,620	35,389	21,376	41,430	71,324
2010	73,808	7,327	16,160	41,710	69,867
2011	74,123	39,483	20,746	41,855	67,474
2012	74,202	42,725	1,685	42,000	65,405
2013	74,615	25,023	1,928	43,200	63,611
2014	75,110	16,811	0,152	40,740	62,414
2015	75,622	2,328	24,226	41,710	59,695
2016	75,732	2,896	3,864	41,870	55,926
2017	75,743	0,319	1,983	41,817	55,321
2018	76,066	0,425	0,830	41,766	58,065
2019	76,474	0,841	35,969	41,750	51,810
2020	74,453	6,730	5,100	39,349	45,331
2021	76,377	1,700	3,400	40,055	53,195
2022	NA	1,435	3,100	40,582	54,116

Appendix. 1: variables used in this study

Appendix. 2: Cointegrating Specification

Deterministics: Rest. constant (Case 2)

CE = LEB(-1) - (-0.102675*EE(-1) - 0.026624*HE(-1) - 1.764741*LF(-1) +0.103611*DCO + 144.825620)

Appendix. 3: Cointegrating Coefficients

Variable *	Coefficient	Std. Error	t-Statistic	Prob.
EE(-1)	-0.102675	0.091753	-1.119036	0.2738
HE(-1)	-0.026624	0.046390	-0.573912	0.5712
LF(-1)	-1.764741	0.539214	-3.272800	0.0031
DCO	0.103611	0.106424	0.973575	0.3396
C	144.8256	25.42769	5.695587	0.0000

Note: * Coefficients derived from the CEC regression.

Appendix. 4: Short Run Estimation and ECM

Dependent Variable: D(LEB)
Method: ARDL
Date: 02/15/26 Time: 22:17
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): EE HE LF DCO
Fixed regressors: C
Number of models evalulated: 64
Selected Model: ARDL(1, 1, 1, 1, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.136067	0.025652	-5.304303	0.0000
D(EE)	0.001501	0.004182	0.358804	0.7226
D(HE)	0.006104	0.002807	2.174802	0.0389
D(LF)	0.248563	0.114281	2.175006	0.0389

R-squared	0.532980	Mean dependent var	0.289633
Adjusted R-squared	0.479093	S.D. dependent var	0.596236
S.E. of regression	0.430327	Akaike info criterion	1.275023
Sum squared resid	4.814712	Schwarz criterion	1.461849
Log likelihood	-15.12534	Hannan-Quinn criter.	1.334790
F-statistic	9.890692	Durbin-Watson stat	2.020605
Prob(F-statistic)	0.000158		

* p-values are incompatible with t-Bounds distribution.

Appendix. 5: Bounds Test

Null hypothesis: No levels relationship

Number of cointegrating variables: 4

Trend type: Rest. constant (Case 2)

Sample size: 30

Test Statistic	Value
F-statistic	3.787488

Bounds Critical Values

	10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
30	2.525	3.560	3.058	4.223	4.280	5.840
Asymptotic	2.200	3.090	2.560	3.490	3.290	4.370

* I(0) and I(1) are respectively the stationary and non-stationary bounds.

Appendix. 7: Breusch-Godfrey Serial Correlation LM Test
Null hypothesis: No serial correlation at up to 2 lags

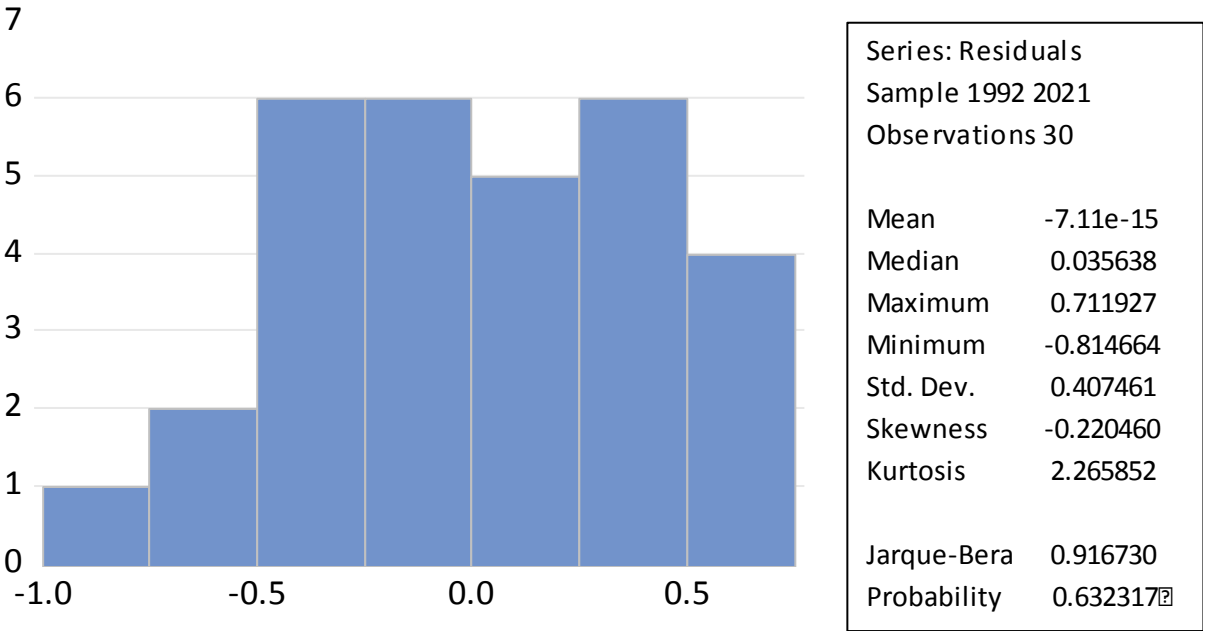
F-statistic	**0.605397**	**Prob. F(2,19)**	**0.5561**
Obs*R-squared	**1.797247**	**Prob. Chi-Square(2)**	**0.4071**

Appendix. 8: Heteroskedasticity Test: ARCH

Heteroskedasticity Test: ARCH

F-statistic	**2.585813**	**Prob. F(1,27)**	**0.1195**
Obs*R-squared	**2.534613**	**Prob. Chi-Square(1)**	**0.1114**

Appendix. 9: Histogram - Normality test



Appendix. 10: Ramsey RESET Test

Ramsey RESET Test
Equation: EQ
Omitted Variables: Squares of fitted values
Specification: LEB LEB(-1) EE EE(-1) HE HE(-1) LF LF(-1) DCO C

	Value	df	Probability
t-statistic	0.983384	20	0.3372
F-statistic	0.967044	(1, 20)	0.3372
Likelihood ratio	1.416588	1	0.2340