

Relationship between government spending on health and economic growth in Algeria (2000-2019)

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Abstract:

This paper examined the relationship between public spending on health (XPD) and economic growth (GDP) in Algeria for the period 2000-2019 using annual data based on the autoregressive model (VAR). This study concluded that there is no long-term relationship between the variables through the results of the Johansen co-integration test, and the causality test according to Granger showed that there is no two-way causal relationship between public spending on health (XPD) and economic growth (GDP), in contrast to public spending (DAB), which has a positive effect towards economic growth (GDP). Impulse-Responses analysis showed the reality of the complex relationship between public spending on health (XPD) and economic growth (GDP) through the alternating response between positive and negative economic growth (GDP), and in the end, some recommendations were presented.

Keywords: economic growth; public spending on health; public spending; autoregressive model

Jel Classification Codes : O4 ; I13 ; C1

1. Introduction:

The health sector has recently become one of the world's priorities because health is a prerequisite for sustainable development at the social, economic, and environmental levels. It is also a result and a goal of sustainable development, which is why so many countries of the world, in particular those seeking economic development, such as Algeria, seek to achieve health coverage for all community members in all regions. Through the allocation of the necessary financial and human resources, this was recorded during the period 2000-2019 through the adoption of health sector reform programs and future forward-looking plans. This demonstrates the importance of government spending on health and its important role in driving economic development. People's good health ensures efficiency and effectiveness in productivity. Among the above can be asked the following question:

What is the relationship between public government spending on health and economic growth?

To understand the topic of the study well, the public spending component was added to see the mutual impact between public spending and economic growth, and between public government spending on health and economic growth in particular. The following hypotheses were proposed for the initial answer to the study question:

- There is no correlation between public government spending on health and economic growth.
- There is a weak correlation between public spending and economic growth.

Objectives of the study:

This research aims at knowing the health sector and its relationship to economic growth by addressing the findings of previous studies through definitions of basic concepts and trying to understand the mutual impact of public spending, especially health spending, and Algerian economic growth during the period

2000-2019, marked by reforms in the health aspect and the adoption of a forward-looking view to improve the prevailing health situation.

The methodology used in this study:

Inrad's method of scientific research has been relied upon in the construction of this study's basic definitions and concepts about the subject matter of the study, Some previous studies on the topic of research were also addressed. On the applied side, a standard study was examined to determine the relationship and mutual impact between public government spending on the health sector and public spending on economic growth. The results of the study were discussed statistically, interpreted economically, and made some recommendations in latter.

2. The theoretical aspect of the research:

2.1. Health:

2.1.1. Health concept:

Health is a state of complete physical, mental and social integrity, not merely the absence of disease or disability. The enjoyment of the highest attainable standard of health is one of everyone's fundamental rights, without distinction as to race, religion, and political creed, economic or social status. And the health of all peoples is essential to achieving peace and security and depends on the fullest cooperation of individuals and States. (World Health Organization, 2023). The concept of health refers to the physical, mental, and psychological well-being of the individual, and the individual's level of health is linked to the housing situation, the level of education, the level and diversity of food, the level of hygiene of the surrounding environment, and the health services provided and their accessibility. (Demerdash, 2007, p. 9).

The above concept of health is the state of physical, psychological, mental, and social integrity of all diseases and illnesses that may cause an individual's disability and adversely affect his productivity and income. Access to health is a fundamental right of every member of society sought by various States.

2.1.2. Health services and their characteristics:

Health service is the most expensive type of service, with global annual spending on health services reaching US \$2 trillion, which is of great importance because it relates to the health of individuals and society, and is directly related to human life. It contributes to the well-being and stability of society, where everyone needs access to a range of health services in some way in their daily lives to keep their bodies and surroundings safe and free from contaminants of all kinds, infections, and diseases. On the other hand, this is done through preventive methods, treatments, etc. One indicator that best describes the role of health services in a country is that of spending on health services as a percentage of total expenditure, as a proportion of GDP. Health services have several salient features, including:

- Patient Service Inclusion Program
- Synchronization of production and consumption
- The poor capacity of hospital establishments
- Intangible Advantages of Health Service Outputs
- Heterogeneous and heterogeneous features. (Kafi, 2017, pp. 100-105)

Health services are essential for the performance of one's duties within the economic system with high efficiency and also to ensure a high degree of productivity. Health services have many characteristics that are considered sensitive and subject to customization according to the individual and society.

2.2. Economic growth:

2.2.1. Definition of economic growth:

Economic growth is defined as an increase in the production of economic goods and services over a given period compared to another, measured by GNP or GDP, and may sometimes use some alternative metrics, and may usually be associated with increased gross profit that increases income and increases consumers' purchasing power. (Rafaa & Djenidi, 2023, p. 104).

One of the simplest definitions of economic growth is the increase in real GDP, i.e. GDP after the effects of inflation have been eliminated, which some have defined as an increase in a country's productive capacity due to economic growth or an increase in productive capacity.

Improved use of resources in the economy or development of production technology, defined as a steady increase over a long period in the quantity of goods and services produced in the economy. (Messaoui & Ben hadj, 2021, p. 98)

2.2.2. Determinants of economic growth:

* **Work:** It is a set of physical and intellectual capabilities that human beings can use in the Production of goods and services necessary for their needs. It is considered an important factor in increasing production and thus economic growth rates.

* **Capital:** The total investments, equipment, and infrastructure owned by a particular Economy, these investments are financed through savings and contribute to the increase of the crude national output.

* **Technical Progress:** reflects the total of modern systems and advanced technologies used in production that involve speed in development resulting in increased productivity of production factors. This is reflected positively in economic development and thus growth rates.

* **The availability of natural resources:** the resources that human beings enter into their Manufacture, consisting of the Earth and above and within it. The more available these resources are the higher the rate of economic growth and vice versa as other factors stand. Therefore, any national economy must develop the natural resources it has until economic growth increases.

* **Specialization and a large volume of production:** This factor will increase economic and productive efficiency and improve performance, generate new technology, and thus increase the economic growth rate. (Toaiba & Bensaha, 2022, p. 156)

2.2.3. Types of economic growth:

* **Expanded economic growth.** Croissance extension: This type of growth is the fact that Income growth is done at the same rate as population growth, i.e. individual income is static.

* **Intensive economic growth.** Croissance intensive: This type of growth is the fact that income growth outweighs population growth and thus increases per capita income. (Melouah & Makid, 2020, p. 128)

2.3. Health economics:

The steady increase in healthcare costs has become the focus of attention and attention of the majority of States, which have adopted the principles and foundations of economic analysis to control and optimize health costs and expenditures. s economy, which is a modern branch of economics that examines how the principles of economic analysis are applied to the health services market to increase the efficiency of health expenditure through equitable distribution of health services of a level between different segments of society.

2.3.1. Concept of health economics:

The health economy is defined as one of the branches of economics that are interested in applying economic analysis methods at both the micro and macro levels to try to manage the high costs of health services. The concept of health economics is linked to social, political, and environmental factors that allow it to apply the theoretical rules of the public economy to the health sector, by dropping market rules on the production and consumption of health services and alternative health opportunities. (Demerdash, 2007, p. 415). The concept of health economics refers to an attempt to use economic methods in interpreting the demand for health care and coming out with organizational solutions that contribute to maximizing the utilization of available resources and the public benefit of providing health care to everyone who requests it

2.3.2. The emergence of the health economy:

Health economics emerged as a separate science in 1960, when it was a branch of economics that combined economic and health methods, and sought to rationalize the use of existing material and financial resources in the field of health, drawing on different economic analysis methods to achieve individual and collective interests, thereby improving health conditions by reaching health care needs at the lowest cost. (Alouani, 2014, pp. 13-16)

2.3.3. Importance of the economics of health services:

Many countries of the world strive to provide advanced health services to their people, starting with primary health care, because it is the foundation of the health system and an integral part of the process of economic and social development. Health services require an effective management system to optimize their management to maximize the population's health by taking into account national economic resources. In recent years, interest in the health services sector has increased considerably for the following reasons:

- A healthy environment contributes to increasing the population's productivity
- Health is the most important issue for people.
- The problem of providing health services to the population is one of the main problems

Facing Governments, especially in developing countries, owing to the high cost and number of health workers. (Mohammed, 2018, p. 67)

The importance of the world's health has increased dramatically over the past two decades, and this topic has gained prominence as an indicator and tool for social and economic development, contributing to increased production and productivity. Economists believe that health is one of the forms of human capital that can be better utilized. Similar to human knowledge and skills, health is an essential factor and determinant of the value of work, increasing the importance of health from an economic perspective. Public health is a powerful driver of

social and economic growth, as it increases GDP by increasing people's productivity, job creation, and wealth creation. (Tiloult, 2020, p. 14).

2.4. Previous studies:

The impact of health government spending on economic growth in Algeria Standard study for the period (2000-2019), (dinaoui anfel aicha, zerouat fatma zohra, 2021): The objective of this study is to measure the impact of government health expenditure on Algeria's economic growth during the period 2000-2019. Adoption of the Distributed Time-Slowing Self-Decline Model (ARDL) It has been concluded that government health spending does not affect economic growth in the short term while affecting it positively in the long term. (Dinaoui & Zerouat, 2021)

Relationship between health care spending and economic growth In the Gulf Cooperation Council countries: Applied Study Using Joint Integration and Causal Relationship(dr. Mohammed bin Musa Osman Akili ,2021): This study examines the impact of healthcare spending on economic growth in the GCC countries during the period 2000 - 2020 by ascertaining the joint integration and the expected causal relationship between the variables, the study found that economic growth and spending on health care are jointly integrated. This means that there is a long-term correlation between the two variables of each country alone. (akili, 2021)

Health Status, Government Health Expenditure, and Economic Growth Nexus in India: A Toda–Yamamoto Causality Approach) Avinash Kaur, 2020): This article attempts to examine the causal relationship between government health spending, health status, and economic growth in India for the period from 1981-1982 to 2015-2016. The results of the Johansen co integration test indicate that the relationship between government spending on health, health status, and economic growth is long-term in India. The results of the Toda-Yamamoto causality test showed a one-way causal relationship starting from

government health spending to GDP (economic growth); gross domestic product to life expectancy; Government spending on health to infant mortality Infant mortality rate to life expectancy. On the other hand, there is no evidence showing a causal relationship in any direction between infant mortality rate, GDP (economic growth), and government spending on health to life expectancy. The study strongly confirmed that government spending on health has an impact on GDP (economic growth) and infant mortality rate (which depicts the state of health in India). Health outcomes, namely life expectancy and infant mortality are rare, revealing a one-way causal relationship between them. (Avinash, 2020)

Standard modeling of the causal relationship between public expenditure on the health sector and economic growth under the Vagner Act (Algeria Case Study 1995-2013). Medjdoub Bahoussi & slimani ilyes & Ammar Aries(2017): This study aims to analyze the causal link between spending on the health sector and economic growth in Algeria for the period 1995-2013 in the short and long term and to test the explanatory economic theories of this relationship approach, where this study focuses on joint integration, Granger methodology, as well as error correction model and the study, showed that there is a short-term and long-term causal relationship that extends from economic growth to public spending on health, While no causal relationship from public spending on health is observed in the direction of economic growth. (Bahoussi, Ilyes, & Aries, 2017)

The Relationship between public spending on health and economic growth in Algeria: Testing for Co-integration and Causality. (Fatima Boussalem & Zina Boussalem & Abdelaziz Taiba2014): This paper examined the causal and complementary relationships between public spending on health and economic growth in Algeria during the period 1974-2014 using annual data. This paper focused on time chains of integration and causation and the results revealed that there is a long-term reason for public spending on health to economic growth

while nothing has been observed in the short term from public spending on health to economic growth. (Boussalem, Boussalem, & Taiba, 2014)

In the case of Algeria: previous studies have examined the impact of government health spending on economic growth during different periods of economic growth", where 1974-2014 was characterized by a long-term relationship from public spending on health to economic growth while nothing was observed in the short term and for the period following 1995-2013, the study showed that there was a short-term and long-term relationship from economic growth to public spending on health, For 2000-2019, the Government showed that health does not affect economic growth in the short term while affecting it positively in the long term, The study examined the period 2000-2020 to determine the interrelationship between Algeria's government health expenditure and economic growth, as well as the developments resulting from health reforms during that period.

3. An econometric study of the relationship between public health spending and economic growth in Algeria for the period 2000-2019:

3.1. Description of study variables:

Through previous theoretical literature and published research on this topic, the data of the study variables from the World Bank's website for statistics, World Development Indicators Data, are identified and used in the range of 20 views per study variable. Appendice (1). This element is devoted to presenting the descriptive analysis of the data obtained.

3.1.1. Dependent variable:

The variable that refers to economic growth is **GDP growth expressed annually** and defined as the gross gross added value of all producers residing in the economy as well as product taxes and the lack of subsidies that are not covered by the value of products. Calculated without deducting the value of manufactured assets or making any liabilities due to depletion and degradation of natural resources. (The world bank, 2023): **GDP**.

3.1.2. Independent variables:

Public government spending on health Defined as the current level of health expenditure expressed as a percentage of GDP, estimates of current health expenditures include healthcare goods and services consumed during each year. This indicator does not include health capital expenditures such as buildings, machinery, information technology, and vaccine stocks for emergencies or outbreaks. (The world bank, 2023): **XPD**.

Public expenditure gross national expenditure (formerly domestic absorption) is total household final consumption expenditure (formerly private consumption), public government final consumption expenditure (formerly public government consumption), and total capital formation (formerly gross domestic investment). (The world bank, 2023): **DAB**.

3.2. Statistical characteristics of study variables:

Table (1): Descriptive Analysis of Study Variables Data

GDP XPD DAB

	GDP	XPD	DAB
Mean	3.290000	4.971164	92.90114
Median	3.300000	5.192325	90.87172
Maximum	7.200000	6.978492	114.1807
Minimum	1.000000	3.235161	73.10864
Std. Dev.	1.614050	1.315690	12.74740
Skewness	0.674296	0.030162	0.210099
Kurtosis	3.161938	1.371305	1.855864
Jarque-Bera	1.537436	2.213571	1.238011
Probability	0.463607	0.330620	0.538480
Sum	65.80000	99.42327	1858.023
Sum Sq. Dev.	49.49800	32.88976	3087.429
Observations	20	20	20

The source: Prepared by researchers based on the outputs of the Eviews13 program

The table shows that Algeria's GDP calculated average domestic production growth during the study period is 3.29% with the highest growth rate of 7.20% with the lowest growth rate of 1.00 %. Algeria's average public health expenditure was during the study period 4.97% with the highest rate of 6.97% and the lowest rate of 3.23%. For the public expenditure rate, the average arithmetic was in the range of 92.90% with the highest rate of 114.18% and the lowest rate recorded in the range of 73.10%, from the observation, no significant differences were recorded during the study period for both the domestic production rate, the health expenditure rate and the public expenditure rate. It is also noted that the value of the standard deviation is small for these study variables, indicating that the distance between the computational medium and individual data points is lower, which means that the data is less dispersed.

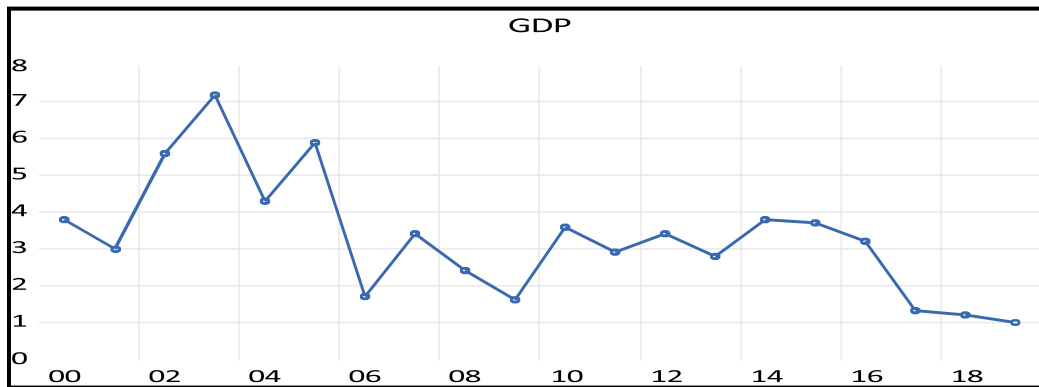
It was also noted that the study variable data followed the normal distribution where the probability value of Jarque-Bera's test value was greater than the critical value of 0.05 for all study variables.

3.2.1. Analysis of variable curves:

3.2.1.1. Development of GDP growth:

Figure (1): Gross domestic product (GDP) growth

The source: Prepared by researchers based on the outputs of the Eviews13 program

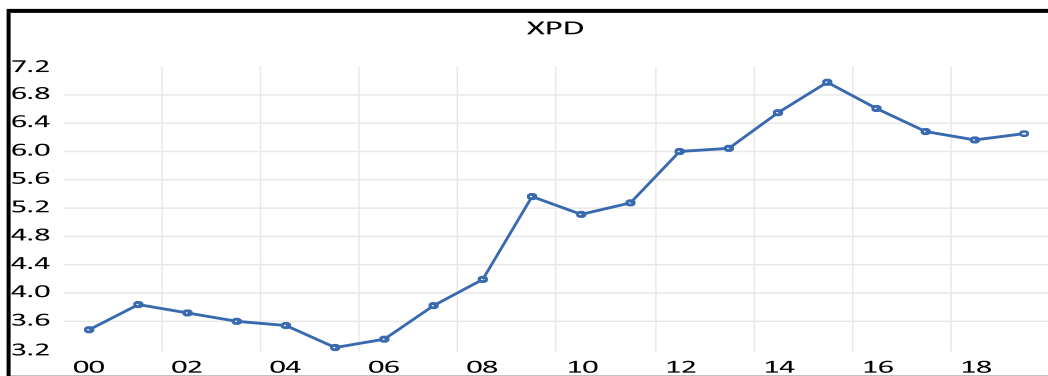


The source: Prepared by researchers based on the outputs of the Eviews13 program

From 2000 to 2003, the graph showed an increase in GDP growth rate of 7.20% in 2003, followed by the period 2004-2016, where the growth rate stabilized at 3% and continued to decline, registering 1% in 2017-2019.

3.2.1.2. Development of public spending on health:

Figure (2): Public expenditure on health

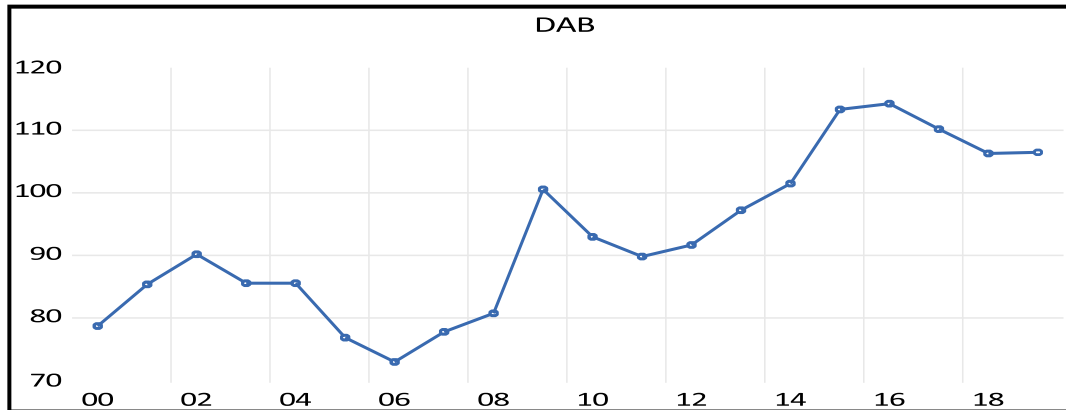


The source: Prepared by researchers based on the outputs of the Eviews13 program

Figure 2 shows that the health expenditure rate during 2000-2007 was around 3% and increased to 5% during 2008-2011, and continued to rise during 2012-2019 and reached 6%.

3.2.1.3. Evolution of public expenditure:

Figure (3): public expenditure



The source: Prepared by researchers based on the outputs of the Eviews13 program

We note from the graphic representation that the rate of public expenditure was around 80% for the period 2000-2008 and increased to 100.58% in 2009 and decreased during the period 2010-2013 to about 90%, then returned to 110% for the period 2014-2019.

3.3. Time series stability test for study variables:

Through the graphic representation of the various study variables, it is clear that time series are not consistent, which requires the use of unit root tests to test the stability of the time series of study variables, the Dickey-Fuller (ADF) and Philips-Perron (PP) tests have been relied on and the results are shown in the following table

Table (2): Dickey-Fuller (ADF) and Philips-Perron (PP) tests results

UNIT ROOT TEST TABLE (ADF)					UNIT ROOT TEST TABLE (PP)				
At Level					At Level				
		GDP	XPD	DAB		GDP	XPD	DAB	
With Constat	t-Statistic	-1.1540	-0.7688	-1.1925	With Constat	t-Statistic	-	-0.8050	-1.2565
	Prob.	0.6699	0.8051	0.6551		Prob.	2.3675	0.7947	0.6270
With Constat & Trend	t-Statistic	-3.9407	-1.4581	-3.3178	With Constat & Trend	t-Statistic	-	-1.6102	-2.0412
	Prob.	0.0352	0.8079	0.0968		Prob.	0.1632	n0	n0
Without Constant & Trend	t-Statistic	-0.8550	1.3060	0.7516	Without Constant & Trend	t-Statistic	3.3945	n0	n0
	Prob.	0.3316	0.9455	0.8681		Prob.	0.0819	*	n0
At First Difference					At First Difference				
		d(GDP)	d(XPD)	d(DAB)					

		d(GDP)	d(XPD)	d(DAB)
With Constat	Prob.	0.0000	0.0169	0.0095
		***	**	***
With Constat & Trend	t-Statistic	-6.8332	-3.4794	-3.7676
	Prob.	0.0002	0.0723	0.0436
Without Constant & Trend	t-Statistic	-6.9428	-3.3997	-3.9032
	Prob.	0.0000	0.0019	0.0006
		***	***	***

		d(GDP)	d(XPD)	d(DAB)
With Constat	t-Statistic	-6.7528	-3.5967	-3.8802
	Prob.	0.0000	0.0169	0.0095
With Constat & Trend	t-Statistic	-6.7864	-3.4794	-3.7624
	Prob.	0.0002	0.0723	0.0440
Without Constant & Trend	t-Statistic	-6.8707	-3.3997	-3.9032
	Prob.	0.0000	0.0019	0.0006
		***	***	***

Notes: (*) Significant at 10%; (**) Significant at 5%; (***) Significant at 1%. and (no) Not Significant
*MacKinnon (1996) one-sided p-values.

The source: Prepared by researchers based on the outputs of the Eviews13 program

From the table, it is clear that all study variables (GDP growth, public expenditure on health, and public expenditure) according to the two tests are not entirely stable at the I0 level, and at the first difference it was observed that the probability value of the ADF PP tests for study variables is below critical values which confirms the stability of time series at the first difference I1.

From this point, the application of the autoregressive model (VAR) was selected.

3.4. Cointegration test :(Johansen Method)

With That the time series to be studied are stationary of the same order, there is likely a cointegration relationship between the variables, and to confirm this hypothesis, we test the presence of co- integration between these series by adopting the Johansen test, after obtaining the optimal degree of delay for the VAR model and then estimating it using the original series.

After the aforementioned steps obtained the results of the Johansen test, which we summarize through outputs Eviews13.

Table (3): Johanssen test results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	Prob.**
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None	0.596307	20.69305	29.79707	0.3771

At most 1	0.212600	4.365251	15.49471	0.8719
At most 2	0.003489	0.062920	3.841465	0.8019
The trace test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Max-eigenvalue)				
Hypothesized		Max-Eigen	0.05	Prob.**
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None	0.596307	16.32779	21.13162	0.2063
At most 1	0.212600	4.302331	14.26460	0.8261
At most 2	0.003489	0.062920	3.841465	0.8019
The max-eigenvalue test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

The source: Prepared by researchers based on the outputs of the Eviews13 program

Through the results of Table 3, it is clear that the probability values of the impact tests and the maximum eigenvalue are all greater than 0.05, which makes us reject all hypotheses that state the existence of a co-integration relationship between the variables of the study, as a result, we support the hypothesis that there is no relationship in the long term and we will suffice with studying the relationship between variables in the short run only.

3.5. Determining the amount of lags :

Table (4): Results of Determining the amount of lags

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-88.91593	NA*	9.978325	10.81364	10.96068*	10.82825
1	-79.20662	14.84952	9.426402*	10.73019*	11.31834	10.78865*
2	-75.96081	3.818601	21.10144	11.40715	12.43642	11.50947
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

The source: Prepared by researchers based on the outputs of the Eviews13 program

Table 4 shows that the minimum value of all criteria including AIC is recorded at the first degree of lags $p=1$ excluding SC and LR, which recorded a minimum value at $p=0$, taking the $p=1$ lag score and approving AIC for its high accuracy.

3.6. Causality test (Granger):

Examining the causal relationship between the study variables at the first difference of both the GDP growth rate, the health expenditure rate, and the public expenditure rate taking the optimal degree of lag $p = 1$. The results are shown in the following table:

Table (5): Results of causality test (Granger)

Pairwise Granger Causality Tests			
Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
DXPD does not Granger Cause DGDB	18	2.96553	0.1056
DGDB does not Granger Cause DXPD		0.05868	0.8119
DDAB does not Granger Cause DGDB	18	6.39626	0.0231
DGDB does not Granger Cause DDAB		0.01998	0.8895
DDAB does not Granger Cause DXPD	18	4.32434	0.0551
DXPD does not Granger Cause DDAB		3.88643	0.0674

The source: Prepared by researchers based on the outputs of the Eviews13 program

Through the results of the table for the causation test the relationship between the variables can be summarized as follows:

- In terms of the relationship between the public spending rate on health and the GDP growth rate, there is no causal link between the two variables because of the probability value corresponding to Fisher's two-way statistic (0.1056, 0.8119) which is greater than 0.05.
- The relationship between the rate of public expenditure and the rate of GDP growth contains a causal link between the two variables as the rate of public expenditure causes the rate of GDP growth due to the probability value corresponding to Fisher's statistic (0.0231) which is less than 0.05 while in the other direction, there is no causal relationship between the two variables because

the probability value corresponding to Fisher's statistic (0.8895) is greater than 0.05.

- For the relationship between the rate of public expenditure on health and the rate of public expenditure, there is no causal link between the two variables because of the probability value corresponding to Fisher's two-way statistic (0.0551, 0.0674), which is greater than 0.05.

3.7. Estimation of the Autoregressive Model (VAR):

After confirming that there is no common integration between the study variables, we will estimate the VAR model taking into account the optimal lag score $p = 1$ and the results of the estimate shown in the following table.

From Table 6, the model can be formulated as the following equations:

$$\text{DGDB} = -0.460946 \cdot \text{DGDB}(-1) - 0.154458 \cdot \text{DXPD}(-1) + 0.125681 \cdot \text{DDAB}(-1) - 0.347626$$

$$\text{DXPD} = -0.014867 \cdot \text{DGDB}(-1) + 0.680314 \cdot \text{DXPD}(-1) - 0.043016 \cdot \text{DDAB}(-1) + 0.096907$$

$$\text{DDAB} = -0.086850 \cdot \text{DGDB}(-1) + 12.06473 \cdot \text{DXPD}(-1) - 0.499790 \cdot \text{DDAB}(-1) + 0.131825$$

Vector Autoregression Estimates			
Included observations: 18 after adjustments			
Standard errors in () & t-statistics in []			
	DGDB	DXPD	DDAB
DGDB(-1)	-0.460946 (0.19522) [-2.36119]	-0.014867 (0.05438) [-0.27341]	-0.086850 (0.94241) [-0.09216]
DXPD(-1)	-0.154458 (1.31453) [-0.11750]	0.680314 (0.36614) [1.85805]	12.06473 (6.34585) [1.90120]
DDAB(-1)	0.125681 (0.07663) [1.64010]	-0.043016 (0.02134) [-2.01536]	-0.499790 (0.36993) [-1.35104]
C	-0.347626 (0.35791) [-0.97127]	0.096907 (0.09969) [0.97208]	0.131825 (1.72778) [0.07630]
R-squared	0.463547	0.237882	0.207983
Adj. R-squared	0.348593	0.074570	0.038265
Sum sq. residues	28.03384	2.174932	653.3112
S.E. equation	1.415068	0.394148	6.831185

F-statistic	4.032451	1.456616	1.225464
Log-likelihood	-29.52826	-6.520524	-57.86603
Akaike AIC	3.725362	1.168947	6.874003
Schwarz SC	3.923222	1.366807	7.071864
Mean dependent	-0.111111	0.134102	1.169631
S.D. dependent	1.753279	0.409720	6.965758
Determinant resid covariance (dof adj.)			6.120384
Determinant resid covariance			2.879687
Log-likelihood			-86.14181
Akaike information criterion			10.90465
Schwarz criterion			11.49823
Number of coefficients			12

The source: Prepared by researchers based on the outputs of the Eviews13 program

3.7.1. Statistical analysis of the model:

-From the above table, R-squared in the range of 0.463547 means that the GDP growth rate is explained by 46.35%, while the remaining 53.65% is explained by other factors not included in the model.

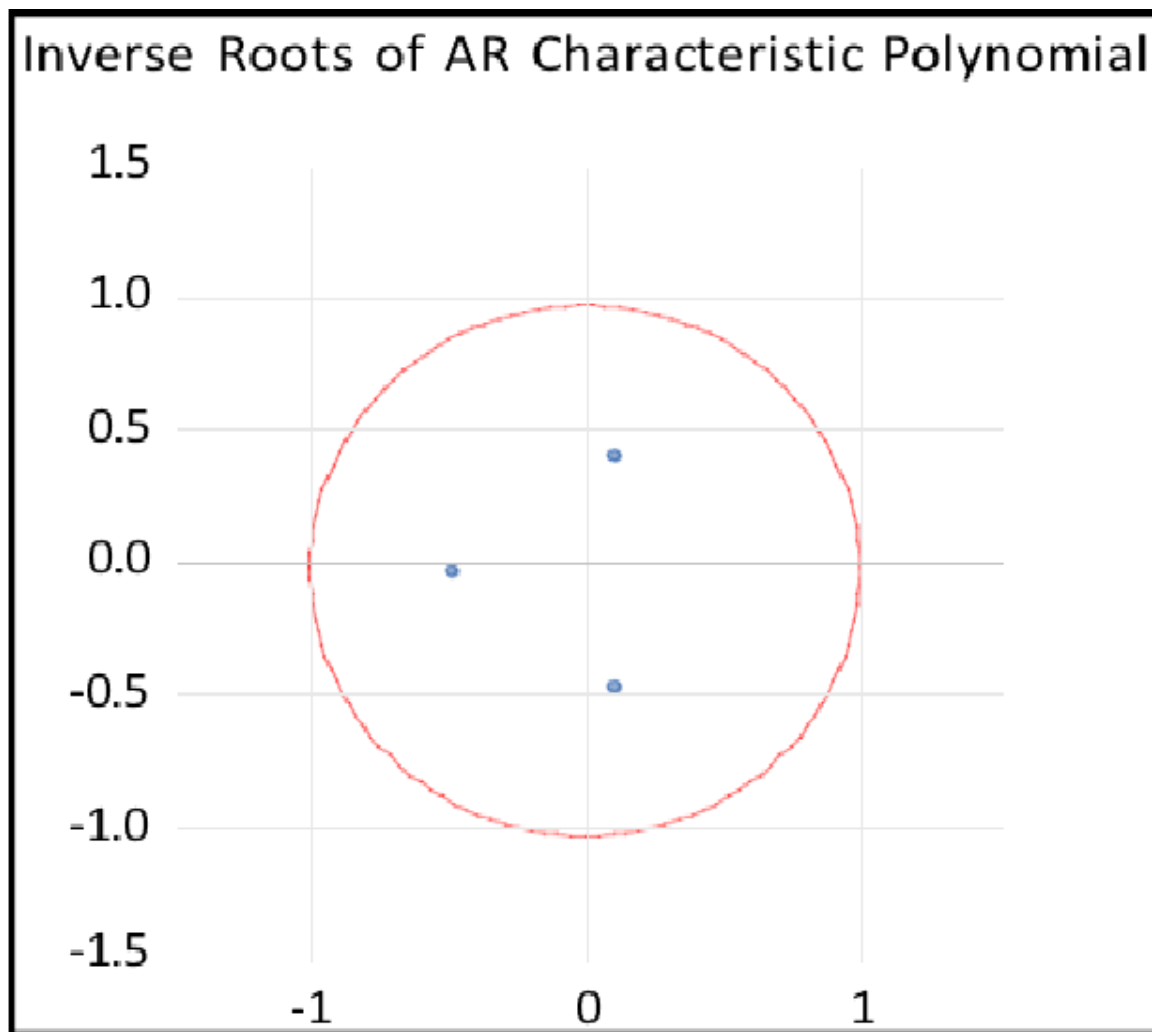
-The independent variable XPD affects negatively but minus, meaning each increased rate of public spending on health in one unit decreases the GDP growth rate by 15.44%.

-The independent variable DAB also affects positively minus, meaning the higher the rate of public spending in one unit the higher the GDP growth rate by 12.56%.

3.8. Testing the stability of the autoregressive model:

To ensure the stability of the model party, an AR test was used

Figure (4): partie, AR test results



Outputs of the Eviews13 program

During figure 4, all the reverse roots of many boundaries associated with the autoregression part are values below one. We note that they are all within the unit circle, so the estimated model achieves stability conditions.

3.9. The normality of residuals (jarque-bera):

Table (6): results of jarque-bera test (residuals)

Component	Jarque-Bera	df	Prob.
1	0.353902	2	0.8378
2	4.562937	2	0.1021
3	0.356758	2	0.8366
Joint	5.273598	6	0.5092

*Approximate p-values do not account for coefficient estimation

The source: Prepared by researchers based on the outputs of the Eviews13 program

Jarque-Bera's probability value for the three equations (0.8378, 0.1021, and 0.8366) is greater than the critical value of 0.05, so we cannot reject the null hypothesis, meaning the residuals are naturally distributed at the critical value of 0.05%.

3.10. Autocorrelation test for the residuals:

Table (7): results of autocorrelation test for the residuals

Lags	Q-Stat	Prob.*	Adj Q-Stat	Prob.*	df
1	2.832952	---	3.010011	---	---
2	11.20804	0.2617	12.50177	0.1865	9
3	18.84303	0.4015	21.77283	0.2422	18
4	32.95867	0.1984	40.23175	0.0487	27

*Test is valid only for lags larger than the VAR lag order.
 df is the degrees of freedom for the (approximate) chi-square distribution

The source: Prepared by researchers based on the outputs of the Eviews13 program

The autocorrelation test indicates that the null hypothesis is not rejected, which means that there is no autocorrelation at the 5% level of significance, because all Q-Stat values (0.2617, 0.4015, 0.1984) were greater than the critical value of 0.05, as can be seen in Table 7 above.

3.11. Impulse-Responses analysis of the VAR model

Estimates of the response function over 10 years are shown in the following table:

Table (7): results of Impulse-Responses analysis of the VAR model

Period	DGDP	DXPD
1	1.415068	0.000000
2	-0.732273	0.586921
3	0.389839	-0.004608
4	-0.170207	-0.059968
5	0.078100	-0.039658
6	-0.041966	0.017827
7	0.020133	0.004959
8	-0.008844	0.000597
9	0.004451	-0.002415
10	-0.002279	0.000134

Cholesky One S.D. (d.f. adjusted) Innovations
 Cholesky ordering: DGDP DXPD DDAB

The source: Prepared by researchers based on the outputs of the Eviews13 program

Inducing a positive shock in the variable XPD estimated at one unit in the first year results in a positive response in the variable GDP in the same year with (1.415068) units. This positive response continues in each of the third, fifth, seventh, and ninth years. As for the rest of the years, the response was negative, which means that the response varied between Positive and negative in the ten years.

3.12. Economic analysis of the results obtained

Through the above, the results of the statistical study were interpreted economically as follows: After the joint integration test (Johansen) the result was a lack of integration between the study variables in the short term. The results indicated a causal link between DAB-GDP as the public expenditure rate causes a GDP growth rate while there is no reverse causal link. This is the case of economic theory in previous studies, which stipulated that public spending is the most important financial instrument referred to by JOHN MAYNARD KEYNES, which achieves economic equilibrium as well as public spending policy with the important objectives of achieving economic growth, reducing unemployment and inflation and balancing the balance of payments. And has also focused modern theory on the importance of public spending in its various forms, such as spending on infrastructure, technology, and spending on human capital (El Ayati & Benazza, 2018, p. 125). The relationship between the rate of public spending on health and public spending was not statistically sufficiently significant, but it should be noted that health spending is an integral part of public spending and is considered one of its basic determinants, and the relationship between public spending on health and economic growth also did not exist, but according to theory. The aforementioned economic condition, good health gives individuals the best performance and thus achieve productivity that increases the rate of economic growth. After estimating the model, the R-squared ratio was 46%, which means that the remaining 53.65% is explained by other factors not included in the model,

and this is due to choosing only two variables are explained in this model: the rate of government spending on health and the rate of public spending in general. Its purpose is to find out the mutual effect between spending on health and economic growth during the study period. The result of the model's estimation of the relationship between public spending and economic growth was logical, as it appears that public spending affects positively. Whenever the rate of public spending increases by one unit, the GDP growth rate increases by 12.56%. Regarding spending on health, the effect was negative, meaning that whenever the rate of public spending on health increased by one unit, the GDP growth rate decreased by 15.44%. This is what previous studies on this subject have gone to, which indicated the quality of spending on health, as it is considered non-investment spending, and its added value does not appear directly on economic growth, since the Algerian economy depends primarily on hydrocarbons (Boussalem, 2010, p. 155) and this The results of the XPD response function on GDP show the unstable and fluctuating relationship between the health spending rate on the GDP growth rate, where a positive shock to the independent variables showed a positive immediate response followed by a negative response alternately over ten years.

4. Conclusion and some recommendations:

The health sector is considered one of the sensitive sectors in which the world has become very interested due to its direct and important relationship with economic activity. The good health of individuals largely guarantees optimal performance and productivity for them. However, the increase in health services expenditures due to demographic growth and global health crises such as the Covid 19 crisis has begun to affect health. Countries with a weak economy follow the method of free health care. From this standpoint, it has become necessary to introduce a new concept of health financing that is in line with the prevailing economic situation in the country. Algeria is one of the countries on the path of growth, working to

raise the level of quality of health services by adopting future programs with A forward-looking view of the reality of health, and this is what we have seen from the development of health spending during the period 2000-2019 through the adoption of comprehensive reform plans aimed at rationalizing expenditures and establishing new health poles that would bring health services closer to the citizen. This challenge to achieve health development must take into account the country's economic aspect and its specificities, the most important of which is that It is still considered an oil economy therefore some recommendations have been indicated:

- Activating the role of preventive health to avoid health crises and mitigate their severity by intensifying and sensitizing media sessions
- Work to improve health laws and legislations and make them more flexible
- Work to achieve the objectives of the programs and the forward-looking plans previously outlined by activating the oversight role
- Encouraging the private health sector by providing all conditions to increase investment in the health sector
- Consider ways of financing the public health sector to avoid future crises
- Paying attention to the medical and administrative staff of the health system through continuous training, because they are considered the basic unit in achieving sustainable health development.
- Making the health sector participate in economic growth by creating health investment programs
- Encouraging the local pharmaceutical industry and accompanying producing laboratories to reduce the import bill
- Involving the various components of society to maintain healthy structures.

5. Referrals and references:

1. Books:

Demerdash, T. (2007). Health Service Economics (éd. Second edition 2007) p9 and p415. Faculty of Commerce, Egypt: Al-Quds Library - Al-Zagaziq Egypt.

Alouani, A. (2014). Health Economy Foundations (éd. first part) pp13-16. Algeria: Houma House for Printing, Publishing, and Distribution - Algeria.

2. Journal article:

Akili, m. b. (2021). relationship between health care spending and economic growth in the gulf cooperation Council countries applied study using joint integration and causal relationship. Arab Journal of Management, 41 (2), 323-335.

Avinash, K. (2020). Health Status, Government HealthExpenditure, and Economic Growth Nexus in India: AToda– Yamamoto Causality Approach. Journal of Economic Theory and Practice, 1-13.

Bahoussi, M., ilyes, s., & Aries, A. (2017). Standard modeling of the causal relationship between public expenditure on the health sector and economic growth under the Vagner Act (Algeria Case Study 1995-2013). Economic Insights Magazine, 7 (2), 13-27.

Boussalem, f. (2010). Analysis of the causal relationship between public spending on health and economic growth in Algeria. Journal of Law and Humanities - Economic Studies -, 23 (02), 137-157.

Boussalem, F., Boussalem, Z., & Taiba, A. (2014). The Relationship between public spending on health. International Journal of Business and Management, 2 (3), 25-39.

Dinaoui, a. a., & Zeuoata, f. z. (2021). The impact of health government spending on economic growth in Algeria standard study for the period (2000-2019). Economics and Environment Magazine, 04 (02), 58-85.

El Ayati, d., & Benazza, m. (2018). Public expenditure and economic growth: the correlation or separation in Algeria's economy is a standard and analytical approach to the causal relationship between public spending and economic growth in Algeria. Journal of Research and Business Studies (03), 124-147.

Kafi, m. y. (2017). management of health services (éd. first edition). oman, University of Applied Sciences, Jordan: dar- elhamid Publishing and Distribution.

Melouah, f., & Makid, a. (2020). the determinants of economic growth in Algeria. *Revue d'Economie et de Statistique Appliquée* , 17, 126-141.

Messaoui, E. K., & Ben hadj, m. (2021). the main sources of economic growth in Algeria. *Journal of Economic and Administrative Research*, 15 (03), 95-114.

Mohammed, K. A. (2018). The economics of health services and their impact on Sudan's economic growth. *Arab Journal of Science and Research Publishing-Journal of Economic, Administrative and Legal Sciences*, 02 (15), 63-80.

Rafaa, M., & Djenidi, M. (2023). The impact of the government support on economic growth in Algeria. *Journal of Economic Growth and Entrepreneurship JEGE*, 6 (1), 96-117.

Tiloult, S. (2020). The economy of health in Algeria: financing and prospects. *Al-Qastas Journal of Administrative, Economic and Financial Sciences*, 2 (1), 10-29.

Toaiba, L., & Bensaha, A. (2022). Forecasting the economic growth of Algeria using the Box-Jenkis methodology for the period. *Journal of Business Administration and Economic Studies*, 08 (02), 151-168.

3. Internet websites:

The world bank. (2023, 07 25). GDP growth (annual %) - Algeria. Consulté le 08 04, 2023, sur the world bank data: <https://data.albankaldawli.org/indicator/NY.GDP.MKTP.KD.ZG>

The world bank. (2023, 07 25). Current health expenditure (% of GDP) - Algeria. Consulté le 08 04, 2023, sur the world bank data: <https://data.albankaldawli.org/indicator/SH.XPD.CHEX.GD.ZS?locations=DZ>

The world bank. (2023, 07 25). Gross national expenditure (% of GDP) - Algeria. Consulté le 08 04, 2023, sur the world bank data: <https://data.worldbank.org/indicator/NE.DAB.TOTL.ZS?locations=DZ>

World Health Organization. (2023). Constitution of the World Health Organization. Consulté le 07 16, 2023, sur <https://www.who.int/ar/about/governance/constitution>

6. Appendices:

Algerian Data (World Bank Statistics)

Years	GDP growth (annual %)	Current health expenditure (% of GDP)	Gross national expenditure (% of GDP)
2000	3,80	3,49	78,72
2001	3,00	3,84	85,33
2002	5,60	3,73	90,13
2003	7,20	3,60	85,63
2004	4,30	3,54	85,59
2005	5,90	3,24	76,87
2006	1,70	3,36	73,11
2007	3,40	3,82	77,80
2008	2,40	4,20	80,74
2009	1,60	5,36	100,58
2010	3,60	5,12	92,98
2011	2,90	5,27	89,90
2012	3,40	6,00	91,62
2013	2,80	6,04	97,20
2014	3,80	6,55	101,52
2015	3,70	6,98	113,35
2016	3,20	6,61	114,18
2017	1,30	6,28	110,06
2018	1,20	6,16	106,34
2019	1,00	6,25	106,38

Appendices (1)