

The impact of Age Structural Transition on Economic Growth in Algeria Econometric Study for The Period :1990-2021

أثر التحول الهيكلي العمري على النمو الاقتصادي في الجزائر دراسة قياسية للفترة 1990 - 2021

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Abstract

This econometric study aims to highlight the impact of the demographic transition in Algeria represented by the demographic boost (the labor force for the age group 15-60 years), unemployment rates and capital accumulation on economic growth represented by GDP per capita during the period 1990-2021 in Algeria, by applying the model Proposed by Shimon & G. Steinmann using World Bank data, where the study concluded the positive impact of the demographic boost and capital accumulation rates, and the adverse effect of unemployment rates on economic growth.

Keywords

demographic boost ;
economic growth;
econometric study;
Algeria ;

JEL Classification Codes : B23

الكلمات المفتاحية

تهدف هذه الدراسة القياسية الى ابراز أثر التحول الديمغرافي في الجزائر ممثلا في الهبة الديمغرافية (القوة العاملة للفئة العمرية 15-60 سنة) و معدلات البطالة و تراكم رأس المال على النمو الاقتصادي ممثلا المحلي الإجمالي للفرد خلال الفترة 1990-2021 في الجزائر ، بتطبيق النموذج المقترح من طرف Shimon & G.Steinmann بإستخدام بيانات البنك العالمي ، حيث خلصت الدراسة إلى التأثير الإيجابي للهبة الديمغرافية و معدلات تراكم رأس المال، و التأثير العكسي لمعدلات البطالة على النمو الاقتصادي .

المخلص

تصنيف JEL : B23

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I. INTRODUCTION :

Age structural transition is a process and a consequence of shifting age structure from a young aged population to old aged population. It is well known that economic growth in Algeria was significantly contributed by demographic boost, that is decline in young aged population and increase in working aged population. However, little is known about the role of age structure changes on economic growth. In this paper, an attempt has been made to study the nature and process of age structural transition in Algeria. Further, this paper also attempts to study the influence of age structure changes on the economic growth. Time series analysis covering the period 1990-2021 has been used for studying the relationship between age structure and economic growth.

Population growth can be measured from civil status data, census results and possibly those of surveys, depending on the availability of information.

The demographic transition and the accompanying change of age groups have economic impacts. We are going to study the effects of this change (the demographic boost) on economic growth, which according to economic theory is affected in one way or another as a result of the change in demographic variables.

On this basis, we conducted a econometric study of the impact of the demographic boost, unemployment and capital as independent variables, showing their impact on economic growth as a dependent variable.

Therefore, we proceed from the following main question:

- Are there reciprocal effects of the demographic boost and economic growth?

From which, arise two sub-questions

- What is the impact of unemployment and capital on economic growth?
- Is there a co-integration relationship between the study variables?

In an attempt to answer the previous question, we proceeded from assuming some of the following hypotheses:

- The active category of the population contributes to raising the rates of economic growth.
- Unemployment has an adverse effect on the rate of economic growth.
- There is a short-term relationship between the variables of the study.
- Algeria has immensely benefited from its available workforce.

II. THEORETICAL FRAMEWORK AND PREVIOUS STUDIES:

1) PREVIOUS STUDIES

A. The study of tarkou mohamed and kourin hadj kouider

The two researchers studied the impact of Population growth on economic growth represented by Gross Domestic Product per capita for Algerian situation using time series analysis for the period 1962-2013. Trying to answer the main question wich is:

- What is the impact of population growth on economic growth?

By implicating the proposed model by Gideon Kiguru Thuku, Gachanja Paul and Obere Almadi, and through the theoretical and practical study that they carried out where the study concluded that the adverse impact of both of the rate total population growth and the population in urban areas, as well as the fertility rate and the number of births, and the share of the number of children per

population in the age of work on GDP per capita, with an estimated impact of this degree, ranging from 51.15% to 60.33%.

B. The study of Demim Fatima

Through her study entitled: The Economic and Social Effects of the New Demographic Context, Demim Fatima focused on this heated trend represented by population aging, declining mortality rates, fertility, and longevity, indicating that it is the product of great social and economic progress, wondering what are the implications for the new demographic changes on the economic and social fields?. Among the most prominent aspects of the new demographic transition, the researcher touched on the high rates of youth, aging, migration and urbanization, highlighting the role of advanced social protection in that, on one hand. On the other hand, the researcher dealt with the study and analysis of the expected economic effects of this transformation. The new demographic, especially in the areas of economic development, the emergence of the demographic boost has actual effects on the economy if it is exploited in the appropriate manner.

C. The study of Hocine Ahmed Saad Echedidi

The study conducted by Saad Echedidi dealt with: the optimal utilization of the opportunity for the demographic transition (the demographic boost) in Iraq, explaining the concept of the demographic boost. Which requires access to this phenomenon - according to the definition of the United Nations - that the proportion of the population under 15 years of age is less than 30% of the total population, and that the proportion of the elderly 65 years of age does not exceed 15% of the total population. Starting with the research problem, where the researcher believed that entering the demographic boost stage represents a significant development challenge that necessitates the adoption of development policies and mechanisms in order to best capitalize on the demographic boost opportunity, this study sought to demonstrate that increases in the working-age population represent a development opportunity that promotes growth and prosperity.

This study concluded that Iraq will be close to the scope of the demographic boost, and that this phenomenon is temporary and will not last long, and that it represents a development project that leads to accelerating economic growth rates, advancing the development process, increasing employment rates and tackling the problem of unemployment and poverty.

D. The study of E. Wesley & F. Peterson

In their important article on the role of population in economic growth. Wesley and Peterson started with a conviction in which the relationship between population growth and economic growth is controversial. So they showed up during their studies by using draws on historical data to chart the links between population growth, growth in per capita output, and overall economic growth over the past 200 years.

Starting with question! How is the relationship between population growth and growth of Economic; The two researchers presented several studies that dealt with this topic, and they pointed out the differences between the studies. The study came to the conclusion that, if population growth and per capita GDP growth are fully independent, low population growth in high-income nations is likely to result in social and economic difficulties whereas large population growth in low-income countries may delay their progress. Although many people oppose it, international migration might assist to correct these inequities.

2) **THEORETICAL FRAMEWORK**

A. The Demographic transition

Demographic transition is a theoretical notion that describes the transition from a demographic regime where fertility and mortality are high to one where fertility, birth rate and mortality are low and are balanced. It is a phenomenon and theory which refers to the historical shift from high [birth rates](#) and high [infant death rates](#) in societies with minimal technology, education (especially of women) and economic development, to low birth rates and low death rates in societies with advanced technology, education and economic development, as well as the stages between these two scenarios.

the demographic transition ends with the end of the fertility transition; that is, the moment when couples take control of the number of their descendants through the use of contraception (Bennaoui, 2017)

The change in the age structure of the population is a result of demographic during the long period of time is relatively accumulated indexes in the earlier stages and formed the basis for the operations demographic significant that will happen in the coming years, this structure reflects the operations demographic long-term which may extend to more than a generation in his previous stage can also at the same time sensing of demographic processes that control the subsequent changes of the population in the next stage and its relationship with the complementary development, especially that the demographic changes can be predictable.

The population dynamics during the last thirty years have changed the Algerian age structure enormously. The birth of large cohorts of the fifties saw inflated generations entering the working ages and the parenting ages, and these will be the cohorts that will enter retirement. Even though fertility rates have been falling rapidly, the impact of the cohorts of “baby-boom” of the fifties on the population age structure has been noticeable since the late 1990s through to the new millennium, as indicated by the high proportion of the population at ages 0-15 years (2020، أسماء سلامي)

The population of Algeria, upon independence in 1962, was about nine million. Since independence, the average annual population growth rate has continued to be high (3%) until the mid-1980s, before declining to less than 2% since the mid-1990s. The combination of demographic aspects that preceded and followed independence led to the “youth bulge” of the 1980s. This, along with economic constraints, were factors that led to the social unrest that emerged at that time. (chronicle frank.com, 2022)

In recent decades, the birth rate has declined to less than 1.2% by 2010. This decline in population growth has been accompanied by the emergence of smaller families. The important factor behind this development was the improvement in the educational levels of Algerian women. During the second decade of the third millennium, population growth maintained its rate at an average of less than 2% annually. The National Bureau of Statistics estimated the country's population at the beginning of 2021 at 44.7 million, compared to 43.9 million at the beginning of 2020, with a growth rate of approximately 1.82%. The gender ratio for the births of 2020, remained at its previously recorded average of 104 males for every 100 females

1) Age transition

With the transformations of its age pyramid marked by a widening of its base and the increase in the proportion of the elderly, Algeria is starting to move towards the phase of Aging of the population. This demographic change will have multiple repercussions on public policies over the coming decades. This is how it should now be integrate care for the elderly as a priority in public policies and the action of social institutions

The demographic transition represents a real opportunity to drive growth and improve economic performance, which is With the decline in the birth rate and the increase in the proportion of middle-aged people, the proportion of the population of working age has increased rapidly, which helps to create conditions conducive to economic take-off. On the one hand, an increase in the supply of labor force leads to an increase in the amount of production, and on the other hand The decline in the dependency ratio contributes to alleviating pressure on household and government spending, and thus raising the level of internal savings necessary for capital accumulation.

Demographic boost is a term in used to describe the initially favorable effect of falling fertility rates on the age dependency ratio, the fraction of children and aged as compared to that of the working population.

The demographic boost can take two main forms: the simple boost and the double boost. The first is defined as the difference between the growth rate of the dependent population and the growth rate of the working-age population. The larger the difference, the theoretically higher the contribution of the demographic boost to GDP.

The double demographic boost is calculated on the basis of the difference between the population growth rate and the employment growth rate. It is called the doubling because it accommodates the growth of the working-age population in addition to the rate of halving the number of the unemployed population (الشديدي، 2014)

a. Trends of development:

The Algerian population has grown steadily from 12 million inhabitants in 1962 to 18 million in 1978 and 31.0 million in 2001, 43.4 in 2019 . The rate of natural increase that was more than 3% after independence is down to 1.93% in 2019. continuing to record the drop started since 2017, with a decline of 0.06 point per compared to the year 2018. This decrease is mainly due to the decline the volume of births registered in the during the year but also on the increase the volume of deaths.

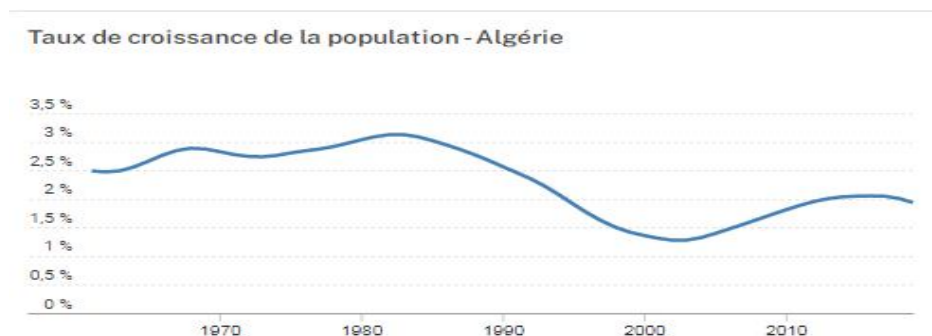
The population pyramid in Algeria is characterized by its wide base due to the increase in the proportion of young people in it as a result of its high birth rates and low Mortality rates for children, and the population pyramid is characterized by a gradual widening of its top, which constitutes the elderly, which is a small percentage compared to In the developed world, where the proportion of the elderly is high due to the attention and medical and preventive care that the elderly receive, which It led to an increase in the life expectancy of the individual and thus led to a high rate of population aging in the societies of the developed world

Examination of the results of enumeration data and censuses tells us that the average annual growth rate of Algeria's population varies unevenly, it was 1.55% -1.93% between 2001 and 2019 (Prospects W. P.)

b. Population growth in Algeria:

The population of Algeria has witnessed a continuous growth, but the population growth rate witnessed fluctuation characterized by three phases, and this is what is illustrated by the following chart:

Figure (01): Population Growth Rate



Source: World Bank, link: <https://cutt.ly/KnGZRjD>

Based on the previous scheme, the population growth rate in Algeria knew three stages: ^(Factbook,)

- **The first stage:** since independence until 1985, when the population growth rate stabilized during this period at levels considered one of the highest levels of population growth in the world, which exceeded 3%, during which this period witnessed a decrease in death rates in line with the policy of free treatment that began with 1974.

- **The second phase:** started from 1985 to 2000, and this period witnessed a decrease in population growth rates to reach 50%, which is a clear reflection of national trends towards controlling population growth.

- **The third stage:** which started since 2001, which witnessed a return in the population growth rate to exceed 2% in 2019 for the first time since 1994, which refers to many demographic problems to the stability in death rates.

c. démographic boost indicators

The demographic indicators that enable us to calculate and estimate the demographic boost index are limited to the population growth rate, the proportion of the population under the age of 15 years, and the proportion of the elderly over the age of 60 years. Through these three indicators, the total dependency ratio can be calculated, and it is also possible to calculate and estimate what is known as the demographic boost, which is the category of the active population with religion providing an added value.

✓ **Age structure:**

0-14 years: 29.58% (male 6,509,490/female 6,201,450)

15-24 years: 13.93% (male 3,063,972/female 2,922,368)

25-54 years: 42.91% (male 9,345,997/female 9,091,558)

55-64 years: 7.41% (male 1,599,369/female 1,585,233)

65 years and over: 6.17% (male 1,252,084/female 1,401,357) (O'Neill, 2022)

This entry provides the distribution of the population according to age. Information is included by sex and age group as follows: 0-14 years (children), 15-24 years (early working age), 25-54 years

(prime working age), 55-64 years (mature working age), 65 years and over (elderly). The age structure of a population affects a nation's key socioeconomic issues. Countries with young populations (high percentage under age 15) need to invest more in schools, while countries with older populations (high percentage ages 65 and over) need to invest more in the health sector. The age structure can also be used to help predict potential political issues. For example, the rapid growth of a young adult population unable to find employment can lead to unrest.

Table (01):Population

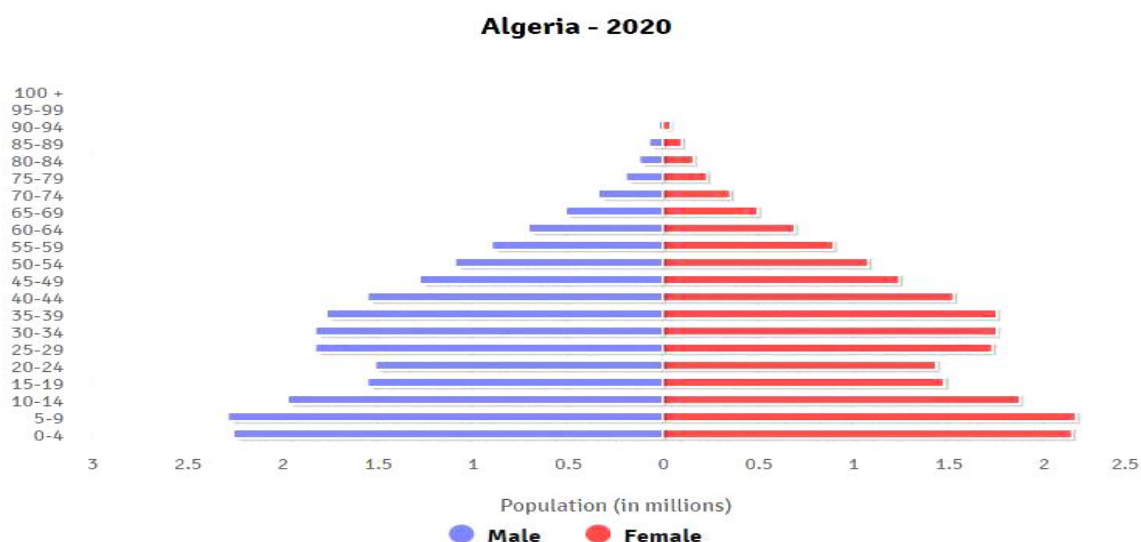
years	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019
Natural increase (in thousands)	78	79	03.5	28	56	95	34	63	90	31	48	08	95	40	58	86	70	45	37
Natural Growth Rate (in%)	,55	,53	,58	,63	,69	,78	,86	,92	,96	,03	,04	,16	,07	,15	,15	,17	,09	,99	,93
Total Demographic Dependency Rate (in%)	5,6	3,2	0,7	8,5	6,6	5,6	4,3	5	5,2	5	5,4	6,2	7,3	8,5	0,1	1,8	3,5	5,2	6,6
Demographic Dependency Rate under 15	4,3	1,8	9,4	7,2	5,3	4,1	2,8	3,5	3,7	3	3	3,5	4,2	5	6,1	7,4	8,6	9,8	0,7
Demographic Dependency Rate 60 years and over	1,3	1,3	1,4	1,3	1,4	1,4	1,4	1,5	1,5	2	2,4	2,7	3,1	3,5	4	4,4	4,9	5,4	5,9
Démographic boost rate	4,4	6,9	9,2	1,5	3,3	4,5	5,8	5	4,8	5	4,6	3,8	2,7	1,5	9,9	8,2	6,5	4,8	3,4

Source : Algerian Demography 2019 ,NSO of Algeria

✓ Population Pyramid

A population pyramid illustrates the age and sex structure of a country's population and may provide insights about political and social stability, as well as economic development. The population is distributed along the horizontal axis, with males shown on the left and females on the right. The male and female populations are broken down into 5-year age groups represented as horizontal bars along the vertical axis, with the youngest age groups at the bottom and the oldest at the top. The shape of the population pyramid gradually evolves over time based on fertility, mortality, and international migration trends. (algeria 2020, 2020).

Figure (02): population pyramid



source: [cia world factbook](https://www.cia.gov/library/publications/the-world-factbook) - this page was last updated on saturday, september 11, 2021

1. Dependency Ratio

The dependency ratio is a measure of the number of dependents aged zero to 14 and over the age of 65, compared with the total population aged 15 to 64. This demographic indicator gives insight into the number of people of non-working age, compared with the number of those of working age. It is also used to understand the relative economic burden of the workforce and has ramifications for taxation. The dependency ratio is also referred to as the total or youth dependency ratio. (HAYES, What Is the Dependency Ratio?, 2022)

➤ Minimum age support (children):

In 2019, the children dependency ratio in Algeria was 50.7 percent. Thus, there were nearly 51 children aged 14 years and younger for 100 working-age people aged 15 to 64 years. The young-age dependency ratio in the country increased compared to the previous years, burdening the people in the labor force (Ouadah-Bedidi, 2012)

It is used to calculate the dependency rate for children under 15 years old, and it is calculated in the following way: The minimum age dependency ratio = the number of the population in the age groups 15 and less / the number of the population in the age groups over 15 and less than 60. Minimum age dependency ratio percentage = (population in age groups 15 and less / population in age groups over 15 and less than 60) x 100. (AZRI, 2018)

➤ Senior age support (elders):

It is used to calculate the dependency rate for elders over 60 years old, and it is calculated in the following way: Senior age dependency ratio = population in age groups 60 and over / population in age groups over 15 and less than 60. Old age dependency ratio percentage = (population in age groups 60 and over/number of population in age groups over 15 and less than 60) x 100. (Ouadah-Bedidi, 2012)

2. An Analysis of Dependency Ratios

Dependency ratios are generally reviewed to compare the percentage of the total population, classified as working age, that will support the rest of the nonworking age population. This provides an overview for economists to track shifts in the population. As the percentage of non-working citizens rises, those who are working are likely subject to increased taxes to compensate for the larger dependent population.

At times, the dependency ratio is adjusted to reflect more accurate dependency. This is due to the fact those over 64 often require more government assistance than dependents under the age of 15. As the overall age of the population rises, the ratio can be shifted to reflect the increased needs associated with an aging population.

The dependency ratio only considers age when determining whether a person is economically active. Other factors may determine if a person is economically active aside from age including status as a student, illness or disability, stay-at-home parents, early retirement, and long-term unemployed. Additionally, some people choose to continue working beyond age 64.

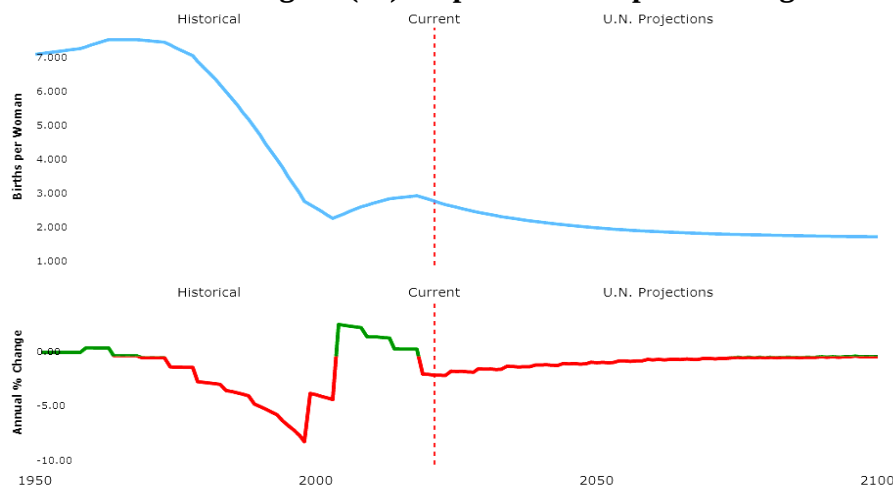
The decline in fertility is the main reason for this rise phenomenon, and consequently a decrease in the proportion of young people, which in turn reduces the possibility of Renewing the population, and as a result, the proportion of the elderly is increasing, as for The decrease in deaths is the result

of improved health conditions as well, which results in An increase in the proportion of the elderly population.

Fertility is also one of the most important demographic variables on which it is based Countries in measuring their growth and demographic transition, which is the number of children Those born alive during a woman's childbearing period, which is known as the synthetic index Fertility. Algeria is at the forefront of the Arab countries in the seventies The last century, which was known as fertility characterized by the absence of all forms of control, where Qualified to a high level in the world with a ratio of 8.3 children per woman, which It is considered one of the highest rates in Algeria after independence. (Ouadah-Bedidi, 2012)

Chart and table of the Algeria fertility rate from 1950 to 2021. United Nations projections are also included through the year 2100. (Nations, 2022).

Figure (03): Population Prospects Of Algeria



Data Source: [United Nations - World Population Prospects](#)

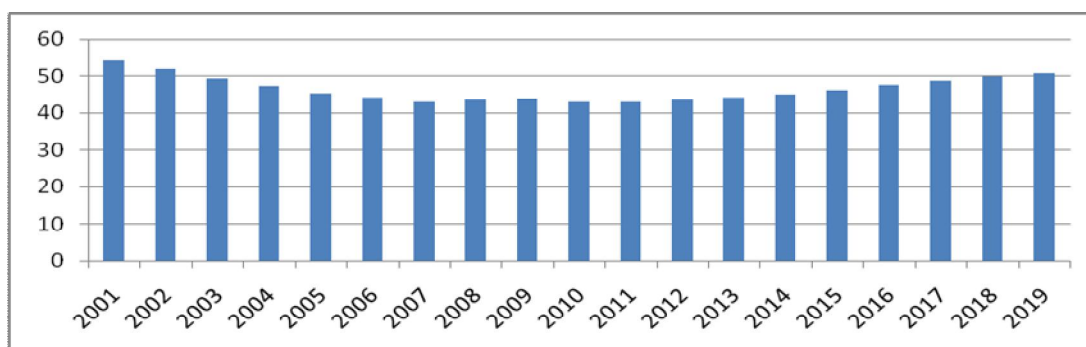
The current fertility rate for Algeria in 2021 is **2.893** births per woman, a **1.8% decline** from 2020.

The fertility rate for Algeria in 2020 was **2.946** births per woman, a **1.73% decline** from 2019.

The fertility rate for Algeria in 2019 was **2.998** births per woman, a **1.7% decline** from 2018.

The fertility rate for Algeria in 2018 was **3.050** births per woman, a **0.59% increase** from 2017

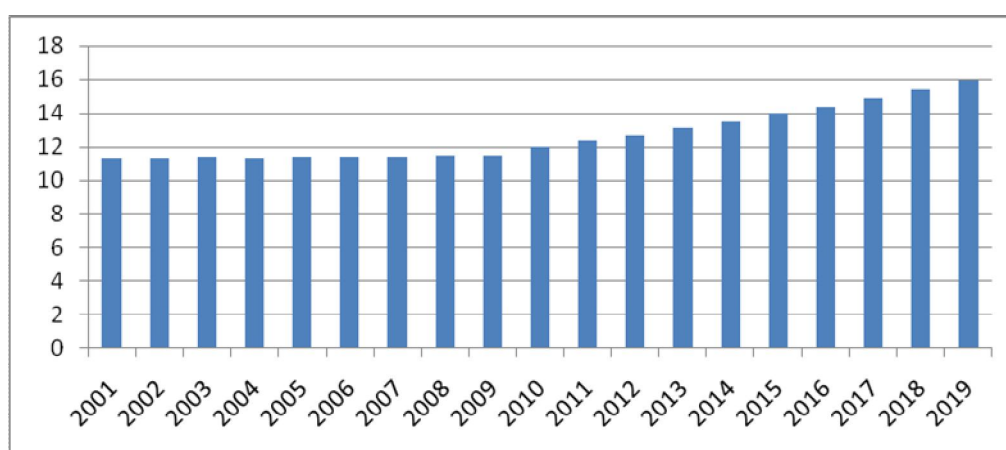
Figure (04): Demographic Dependency Rate under 15



Source :Presented By The Researcher Based On Excel 2007, And Data From The National Statistics Office.2019.

It is clear from the graph representing the development of the dependency ratio for the age group less than 15 years, during the period 2001-2019, that it decreases from the year 2001 at a rate of 54% to 43% in the year 2007 and then shows gradual increases starting from the year 2008 to the year 2019 Where did the percentage of minor highs reach 51%? The decline is explained by the decline in fertility rates, as the decline in fertility rates contributes to reducing the rate of the burden of support. (unicef, 2022)

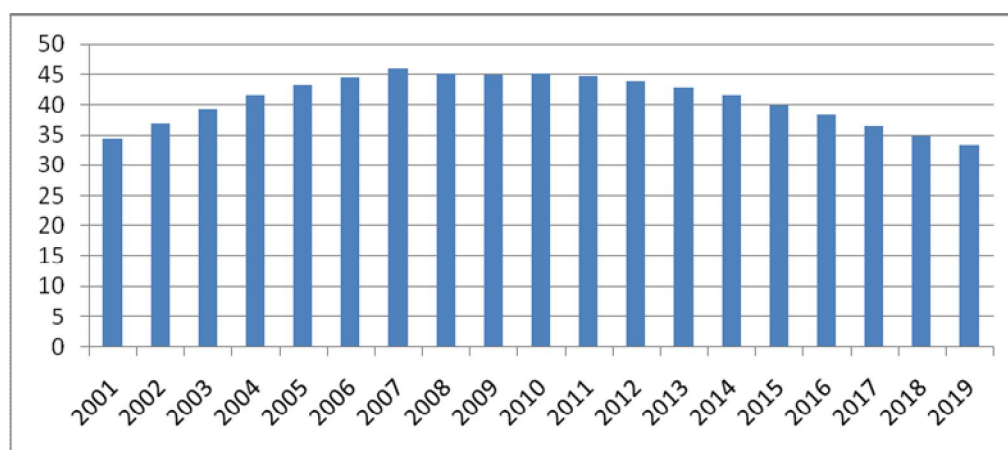
Figure (05): Demographic Dependency Rate 60 years and over



Source :Presented By The Researcher Based On Excel 2007, And Data From The National Statistics Office.2019.

Through the graph representing the development of the dependency ratio for the older age group over a year, during the period 2001-2019, it is gradually increasing to exceed 16% in 2019 because the number of individuals aged 60 years and over in Algeria is constantly increasing, and this category will be the The interest of decision makers in the near future because of its significant impact on the economic and social aspects.

Figure (06): démographic boost rate



Source :Presented By The Researcher Based On Excel 2007, And Data From National Statistics Office.2019.

Through the graph that represents the development of the percentage of the active group, which is relied upon to bring about positive economic and social effects, we see that there is an increase during the period 2001-2007, which also reflects the decrease in the rates of the youngest dependents. The increase in the percentage of the older age groups leads to a decline in the rate of working groups, which constitutes what is known as the demographic boost. Where this category approached 48%, at its highest level in 2007.

B. Economic Development

Economic development is the process by which emerging economies become advanced economies. In other words, the process by which countries with low living econometrics become nations with high living econometrics. Economic development also refers to the process by which the overall health, well-being, and academic level the general population improves.(What is economic development? Definition and examples - Market Business News)

Economic development is a critical component that drives economic growth in our economy, creating high wage jobs and facilitating an improved quality of life.

a. Source of Economic Development:

1. Labor force
2. Technology
3. Capital
4. Natural resource
5. Land
6. Education and knowledgeable skill

These are the top six reasons why economic development plays a critical role in any region's econom :

➤ Job creation

Economic developers provide critical assistance and information to companies that create jobs in our economy. We help to connect new-to-market and existing companies with the resources and partners they need to expand, such as CareerSource Central Florida, utilities, and county and city partners.

➤ Industry diversification

A core part of economic development works to diversify the economy, reducing a region's vulnerability to a single industry. While tourism plays an important role in creating jobs in the Orlando region, economic development efforts help to grow industries outside of tourism, including Innovative Technologies and Digital Media, Life Sciences & Healthcare, Aviation, Aerospace & Defense, Advanced Manufacturing, and Business Services.

➤ Business retention and expansion

A large percentage of jobs in the Orlando economy are created by existing companies that are expanding their operations. Our economic development team executed 73 business retention and expansion visits to local companies just last year to assist with their operational needs.

➤ Economy fortification

Economic development helps to protect the local economy from economic downturns by attracting and expanding the region's major employers.

➤ **5. Increased tax revenue**

The increased presence of companies in the region translates to increased tax revenue for community projects and local infrastructure.

➤ **Improved quality of life**

Better infrastructure and more jobs improves the economy of the region and raises the econometric of living for its residents.

b. Different Measures of Economic Development(infobloom.com)

Measures of economic development can take social factors, hallmarks of economic growth, and market characteristics into consideration. These allow analysts to determine not just whether an economy is growing, but whether it is becoming more stable and improving quality of life for area residents. Many of these measures can be objectively assessed, which allows for comparisons between nations and economies. Detailed analysis of this nature can help nations identify areas where their economies need work, as well as achievements.

Social factors are linked with quality of life, which is one of the important measures of economic development. Analysts can look at life expectancy, literacy rates, and infant mortality, for example. The first two examples should rise over time, while the third should drop. Other factors can include urbanization, the distribution of wealth, and responses on surveys that measure happiness and satisfaction. Overall physical and mental health can be another social factor under consideration.

i) Economic development indicators (bitsize, 2022)

To assess the economic development of a country, geographers use economic indicators including:

Gross Domestic Product (GDP) is the total value of goods and services produced by a country in a year.

Gross National Product (GNP) measures the total economic output of a country, including earnings from foreign investments.

GNP per capita is a country's GNP divided by its population. (*Per capita* means *per person*.)

Economic growth measures the annual increase in GDP, GNP, GDP per capita, or GNP per capita.

Inequality of wealth is the gap in income between a country's richest and poorest people. It can be measured in many ways, (eg the proportion of a country's wealth owned by the richest 10 per cent of the population, compared with the proportion owned by the remaining 90 per cent).

Inflation measures how much the prices of goods, services and wages increase each year. High inflation (above a few percent) can be a bad thing, and suggests a government lacks control over the economy.

Unemployment is the number of people who cannot find work.

Economic structure shows the division of a country's economy between primary, secondary and tertiary industries .

Demographics study population growth and structure. It compares birth rates to death rates, life expectancy and urban and rural ratios. Many LEDCs have a younger, faster-growing population

than MEDCs, with more people living in the countryside than in towns. The birth rate in the UK is 11 per 1,000, whereas in Kenya it is 29.

GDP per capita growth (annual %) - Algeria

The per capita gross income indicator is of great importance in evaluating the development policies in the country. It shows the developmental effects on the social life of the population.

it is another of the measures of economic development. This provides an overview of the value of the goods and services a nation produces in a given year. Along with other indicators of growth like increasing consumption, greater rates of financial activity, and capital investments in infrastructure, this can indicate a nation's economy is growing . (BROCK, 2022)

Annual percentage growth rate of GDP per capita based on constant local currency.

Aggregates are based on constant 2010 U.S. dollars. GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

III. METHOD AND PROCEDURES:

THE PRACTICAL STUDY

In the practical side of the study, we are trying to measure the impact of the demographic boost on economic growth represented in the growth of gdp.

Depending on the model of shimon & g. Steinmann, economic growth is written in terms of the demographic boost, unemployment and fixed capital, in a mathematical form, and assuming that the relationship is linear, it can be written as follows:

$$Pib = \alpha + \beta_1 cht_t + \beta_2 k_t + \beta_3 pop_{2t} + \varepsilon_t$$

PIB_t: represents ross domestic product .

CHT_t: the general unemployment rate.

K_t : capital.

TFT_t: demographic boost (proportion of active class population)

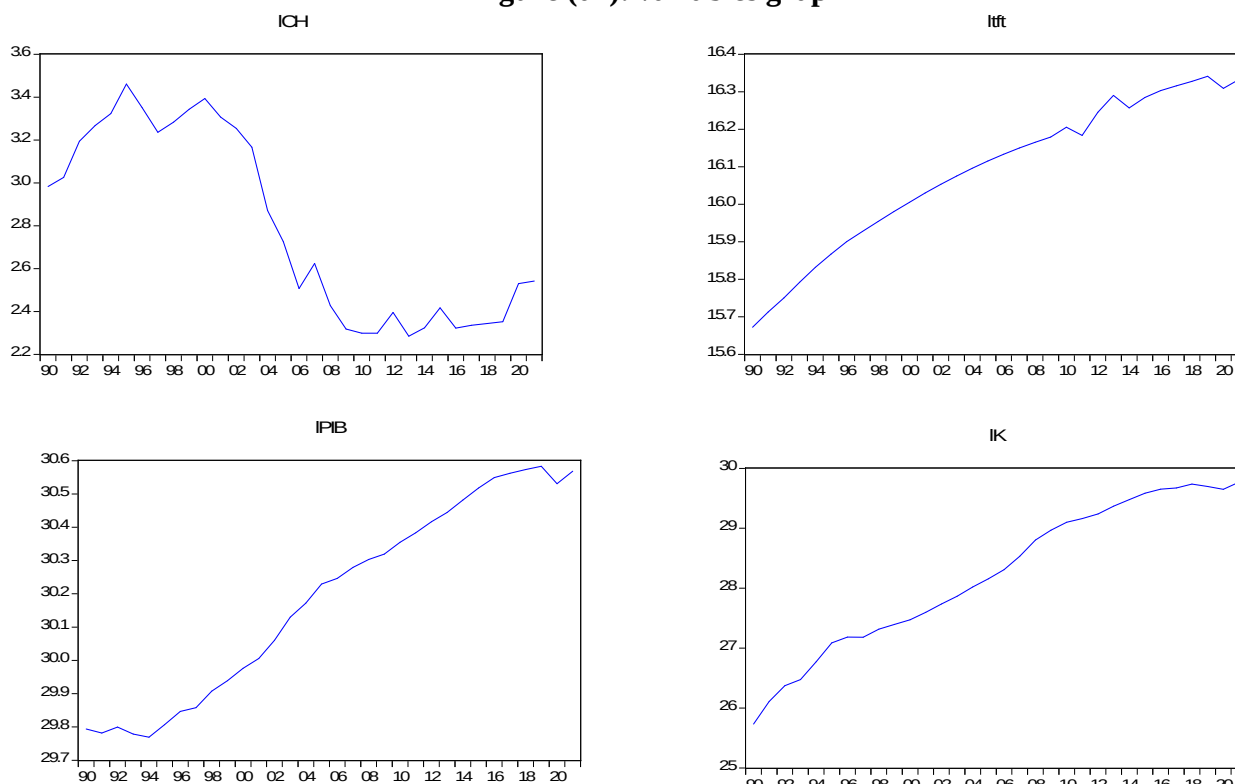
We insert the logarithm on both sides of the equation in order to make the variables homogeneous and to express the transactions flexibility.

We included in our study the variables: the demographic boost, the unemployment rate, the capital as independent variables, while the economic growth was expressed by the variable GDP as a dependent variable.

Graphical representation of the study variables

The data available to us was downloaded from the open data sources of the World Bank, covering the period 1990-2021, with a total of 32 views.

Figure (07): variables graph



Source: Presented By The researcher Based On Eviews 10

IV. STUDY RESULTS (ANALYSIS AND DISCUSSION)

❖ Study results :

First, we will discuss the root of the unit to check if the data is stable or not?
And if there is a co-integration between the variables? Until we end up by finding the results.
We summarize the results of the estimation by least squares in the following equation:

$$LPIB = 0.032 * LK - 0.206 * LCH + 0.869 * LTFT + 15.87$$

We note that all parameters of the model have statistical significance except for the capital coefficient,

We used the Dickey-Fuller test to determine the stability of the data;

▪ Variables Stationary test :

Table (02): Variables Stationary test

variables	level			1st difference			décision
	none	Trend and intercept	intercept	none	Trend and intercept	intercept	
Tst critical value	-	-3.562882	-	-	-3.568379	-	
	1.952066		2.960411	1.952910		2.963972	
Pib	5.709001	-1.290916	-	-	-4.130556	-	Stati- in L(1)

			0.333700	1.176588		4.153270	
Cht	-	-1.570032	-	-	-4.188466	-	Stati- in L(1)
	0.783574		0.649027	4.276047		4.271678	
Tft	0.111439	-1.479654	-	-	-6.965690	-	Stati- in L(1)
			1.723858	6.919932		6.800221	
K	2.453868	-1.109571	-	-	-3.868419	-	Stati- in L(1)
			1.623689	2.476712		3.670999	

Source: Presented By The researcher Based On Eviews 10

When comparing the results of the Dickey Fuller statistic calculated at the level, it became clear that all variables are unstable at the level. And when taking the first differences, we found that the calculated Dickey Fuller statistic is greater than the tabular sum of variables, since all the variables are stable at the same level (the first difference). There is an indication of the possibility of a joint integration between them.

Applying the Engel and Granger methodology to detect cointegration, which requires that there are two steps.

The first step: estimating the co-integration regression through a long-term relationship between the two variables. There are conditions for this stage, the first of which implies that the variables are integrated of the same degree, and the variables that we have made are integrated of the same degree, that is, they are stable of the same degree.

The second condition implies that the series of residuals must be stable at the level.

We note through the outputs of Eviews that the Dickey Fuller statistic for the series of residuals at 5% and in a model without secant and vector is less than the tabulated, and therefore the series of residuals is stable at the level.

▪ **Second stage: error correction model – ECM:**

When we estimate the regression model using ECM we get :

$$DLPIB = C(1) + C(2)*DLCH + C(3)*DLK + C(4)*DLTFT + C(5)*U(-1)$$

$$DLPIB = 0.01697 + 0.004307*DLK - 0.07337*DLCH + 0.27337*DLTFT - 0.278677*U(-1)$$

We note that the error correction coefficient has a big significance, i.e. less than 0.5% 0.0085, and its sign is negative -0.278675. Accordingly, there is a long-term relationship between the independent variables and the dependent variable. This coefficient measures the rate of imbalance in economic growth that is adjusted every year.

We note that the computed Fisher statistic f has significant significance given the probability that is less than 5%

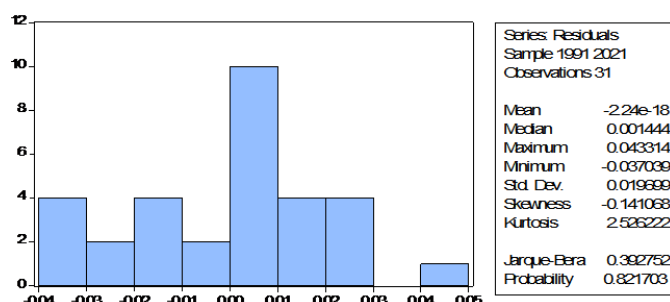
The model as a whole has statistical significance

▪ **Test model econometric problems - model quality:**

1- The normal distribution of the residuals

We note from the statement that the residuals are distributed normally

Figure (08): Résidual Normal Distribution



Source: Presented By The Researcher Based On Eviews 10

The variance difference issue: by looking directly at the probability, we note that there is no difference in the variance because the probability is bigger than 5%, and therefore we accept the null hypothesis, which is the absence of econometric problems

Figure (09): The Variance Difference Issue

Heteroskedasticity Test: ARCH				
F-statistic	0.204550	Prob. F(1,28)	0.6546	
Obs*R-squared	0.217571	Prob. Chi-Square(1)	0.6409	
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 09/27/22 Time: 09:29				
Sample (adjusted): 1992 2021				
Included observations: 30 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000350	0.000112	3.117167	0.0042
RESID^2(-1)	0.086330	0.190881	0.452272	0.6546
R-squared	0.007252	Mean dependent var	0.000381	
Adjusted R-squared	-0.028203	S.D. dependent var	0.000479	
S.E. of regression	0.000485	Akaike info criterion	-12.35891	
Sum squared resid	6.60E-06	Schwarz criterion	-12.26549	
Log likelihood	187.3836	Hannan-Quinn criter.	-12.32902	
F-statistic	0.204550	Durbin-Watson stat	1.943011	
Prob(F-statistic)	0.654558			

Source: Prepared By The Researcher Based On Eviews 10

Autocorrelation test: By looking directly at the probability, we note that there is no autocorrelation problem because the probability is greater than 5%, and therefore we accept the null hypothesis, which is the absence of econometric problems.

Figure (08): Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	0.505980	Prob. F(2,24)	0.6092	
Obs*R-squared	1.254230	Prob. Chi-Square(2)	0.5341	
Test Equation:				
Dependent Variable: RESID				
Method: Least Squares				
Date: 09/27/22 Time: 09:37				
Sample: 1991 2021				
Included observations: 31				
Presample missing value lagged residuals set to zero.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001802	0.007255	-0.248404	0.8059
DLCH	0.028372	0.046564	0.609302	0.5480
DLK	0.014712	0.048440	0.303721	0.7640
DLTFT	0.013789	0.218272	0.063173	0.9502
U(-1)	-0.071472	0.125080	-0.571412	0.5730
RESID(-1)	0.226802	0.319800	0.709198	0.4850
RESID(-2)	0.200040	0.246839	0.810408	0.4257
R-squared	0.040459	Mean dependent var	-2.24E-18	
Adjusted R-squared	-0.199426	S.D. dependent var	0.019699	
S.E. of regression	0.021574	Akaike info criterion	-4.638984	
Sum squared resid	0.011170	Schwarz criterion	-4.315180	
Log likelihood	78.90425	Hannan-Quinn criter.	-4.534322	
F-statistic	0.168660	Durbin-Watson stat	1.904230	
Prob(F-statistic)	0.982760			

Source: Prepared By The Researcher Based On Eviews 10

❖ **Discussion:**➤ **statistical interpretations**

Statistically, we note the good explanatory power of the model, and this is indicated by the coefficient of determination, which amounted to 0.98. Therefore, the explanatory changes of unemployment, fixed capital, and demographic boost justify 98% of the dependent variable (economic growth) and the remaining 2% are justified by other variables.

Through the Astudent test, we note that all parameters of the model have statistical significance, except for capital, whose parameter is Statistically not significant, and through Fisher's test, we note that the model is statistically acceptable, as:

(Prob F-stat = 0 < 0,05)

➤ **Economic interpretations**

The estimated function is economically compatible with the empirical and theoretical considerations that were formulated previously, where we find that:

1. From the equation, if the capital k changes by one unit, the crude internal product pib changes by 0.04307 units
2. If the unemployment rate ch increases by one unit, the gross domestic product decreases by 0.073 units, and this explains the negative sign of the unemployment variable, that is, there is an inverse relationship between unemployment rates and economic growth.
3. While the labor force, which represents in our model this demographic boost, has a positive sign, and it has a direct relationship with economic growth, as if it changes by one unit, the economic growth changes by 0.27 units.

V. CONCLUSION:

Through our study, we tried to shed light on the impact of the demographic boost on economic growth in Algeria during the period 1990-2021, and we proved the existence of a simultaneous integration relationship between the variables of the study, and we found a relationship in the long term between the model variables and their absence in the short term, and that there is a positive effect of the demographic boost on economic growth. This result is in line with economic theory and is consistent with the conclusion reached by researcher K.Navaneetham in 2002 on Southeast Asian countries.

Many empirical studies have proven the weak relationship between economic growth and demographic indicators, as studies justified this by the weak diversification of output, which led to its weak response to changes in economic growth, while other studies justified this by the rapid growth of the population in a way that is not commensurate with the balanced development of economic growth. We tried to highlight the impact of the age change or what weakens the demographic boost on economic growth in Algeria for the period 1990-2021, where we proved the existence of a co-integration relationship between the model variables and that there is a positive effect of the demographic boost, which is consistent with the economic theory.

Findings and Recommendations:

Through the theoretical and practical study, the following most important results can be drawn in the following:

It is possible to benefit from the high proportions of the population in the age group 15-60 (the active population), which represents two thirds of the population of Algeria in bringing about economic development.

Development policies and programs must be developed according to the current demographic elements, with continuous work to be done.

There are periods when demographic rates are greater than others.

Young energies capable of working provide greater opportunities to achieve development goals if they are framed and provided with job opportunities in various fields.

Intensifying research in the areas of development especially related to the demographic factor - health, poverty, employment...etc

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