

# Investigation of factors involved in Moroccan economic development

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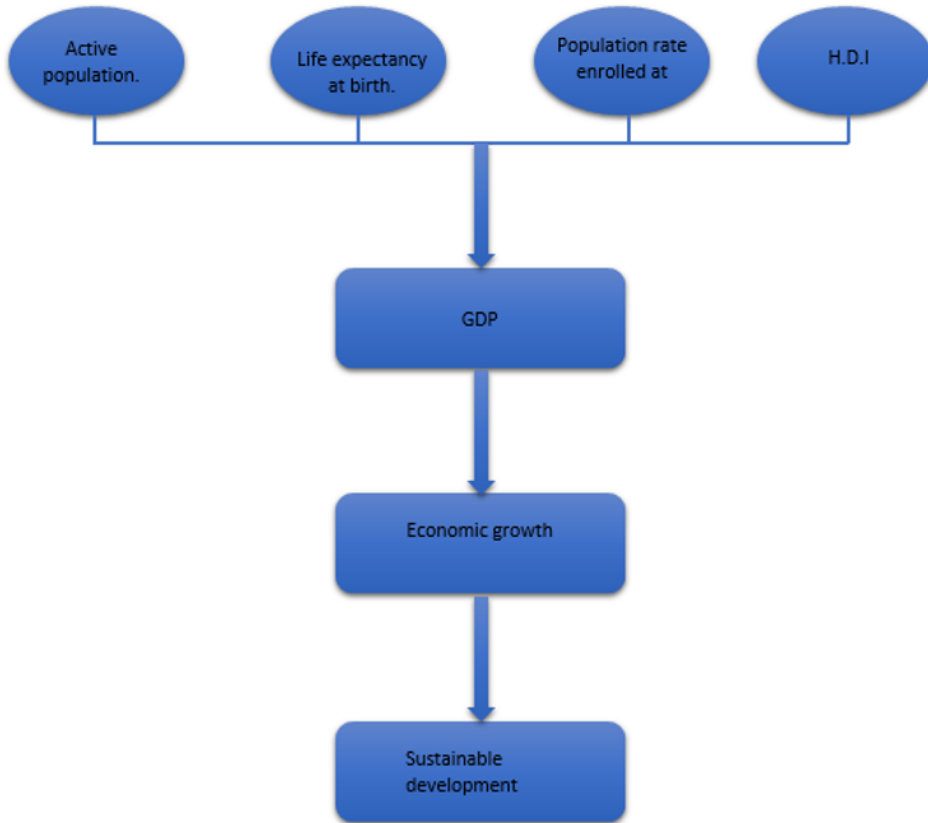
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**Abstract.** Recently, Morocco has initiated an extensive program of economic, financial, and social reforms aimed at achieving sustainable development. These reforms are mostly structural changes that take years to yield results. The green plan proposed by Morocco integrates an approach that addresses issues related to water scarcity and offers a chance to make the agriculture sector an engine of the economy, thereby rebalancing the trade balance. The strategy aims to give the sector a dynamic of balanced evolution, exploit the potential for progress, preserve the balance of social and economic issues, and support the profound change that the global agri-food system is undergoing. This investigation reveals that demographic development has a tangible impact on economic and sustainable development, and we must manage the risks associated with changes in today's world.

**Index Terms.** Demographic development, economic development, economic growth, human development index, GDP, Morocco, sustainable development.

## Introduction :

In the ongoing discussion about the most effective approach to sustainable development, the level of economic development plays a crucial role. The rapid increase in the rate of population growth is largely due to advances in modern medicine, which have resulted in lower mortality rates in societies without effective birth control. Children in low-income families often have to perform household tasks, and elderly people need support from their children to sustain themselves, while young parents require help to raise their children. This creates a vicious cycle: the desire for larger families has negative impacts on the environment, and more needs to be done to mitigate these consequences. Sustainable development requires a long-term plan that includes production, consumption, poverty reduction, income redistribution, employment, and environmental protection, all of which give rise to intertemporal exchanges. Economic growth should not be the goal but rather the result of a rational economic policy. It may be the case that sustainable development requires more growth, not less, but that growth must be composed differently.



**Fig1.** The determinants of economic development.

In this article, our objective is to examine and illustrate the influence of various factors that contribute to economic development and their impact on GDP and sustainable development. As depicted in the figure, we can observe that the Human Development Index, active population, life expectancy at birth, and population rate enrolled at primary level have a significant influence on the country's GDP. The GDP, in turn, plays a crucial role in driving economic development, which subsequently contributes to sustainable development.

### The theories of economic development :

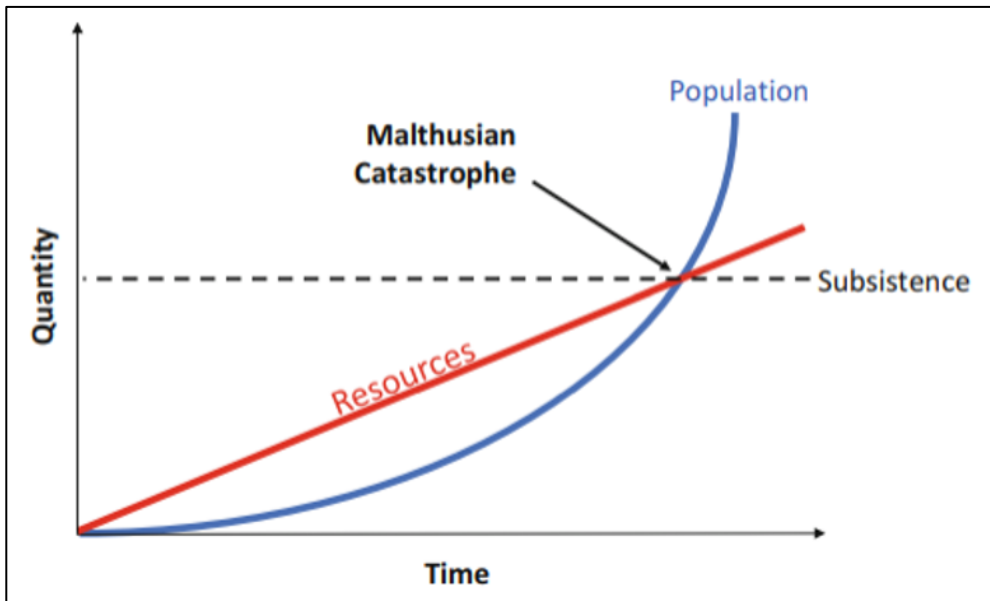
Economic development is a term used to describe the positive changes in the demographic, technical, industrial, sanitary, cultural, and social aspects of a region or population. This improvement in living conditions and enrichment of the population is associated with progress. Thomas Malthus, a British economist, made significant contributions to the biological and social sciences through his work on the relationship between population and production. His book, "An Essay on the Principle of Population" (1798), emphasized the biophysical, demographic, and economic factors that can contribute to population growth and, in some cases, collapse. Malthus believed that population growth would eventually surpass available resources due to its exponential growth rate, while food production would

only increase linearly. He argued that this would result in a surplus of labor, leading to lower wages and increased poverty levels. Additionally, the growing population and demand for raw materials would drive up food prices, while lower wages would contribute to poverty and misery among the working class. Therefore, according to Malthus, there would always be a long-term struggle for resources.

Malthus argued that the rates of food production and population growth were intrinsically linked. He observed that population growth followed an exponential pattern (such as 1, 2, 4, 8, 16, 32, 64, etc.), while food production increased at a linear rate (such as 1, 2, 3, 4, 5, 6, 7, etc.). As a result, Malthus predicted that at some point, the human population would surpass the availability of resources. He believed that a growing population would result in an excess of labor, leading to lower wages and increased poverty. Additionally, the increase in population and demand for raw materials would drive up the price of food, exacerbating the plight of the working class. Malthus concluded that this would lead to a perpetual struggle for resources in the long term.

In the 19th century, the mechanization of agriculture increased yields and provided enough food for the entire English population. Additionally, the improved living conditions of the poorer classes led them to limit the number of children they had. As a result, instead of experiencing starvation, agricultural resources improved. It is worth noting that these two phenomena were challenging to predict at the beginning of the 18th century. However, France had already started implementing measures to control fertility, while England was laying the foundation for its agrarian revolution.

Population growth stabilizes at an equilibrium level with low income and poor environmental quality. Furthermore, population growth induces an increased demand for goods, services, and livelihoods, which degrade the environment and put pressure on natural resources. According to Malthus, the laws on the poor were established to restore the demographic and economic equilibrium of the nation.



**Fig2.** The evolution of population and nourishment resources over time.

The figure illustrates Malthus' belief that any improvements in living standards would be temporary and ultimately result in a population collapse to subsistence levels. His theory was based on two unalterable assumptions. Firstly, human survival depends on food, with an optimal balance of fat, protein, and carbohydrates totaling approximately 2000 calories per day. Secondly, the natural inclination to reproduce would inevitably lead to population growth. Malthus also anticipated that population control would manifest in two forms: positive checks, which increase the mortality rate through factors such as famine, disease, and war, and preventive controls, which reduce the birth rate through measures like moral restraints, birth control, delayed marriage, and celibacy.

Malthus argued that an unlimited population growth was impossible due to the finite limits of the Earth. These two hypotheses have appeared as immutable laws of our existence since the beginning of humanity, and we cannot assume that they will ever change unless there is an immediate intervention from the entity that created the universe and set it in motion for the well-being of its creatures, following consistent laws governing all its diverse operations.

The growth of the economy is typically measured based on capital production and the savings rate of individuals. Economists often rely on the Harrod-Domar theory to estimate long-term rates of economic growth. By combining this calculation with other models and theories, valuable information about the state of the economy can be obtained, assisting policymakers in formulating new policies to stimulate growth. However, both Harrod and Domar expressed pessimism regarding the possibility of sustainable growth and achieving full employment. Additionally, this model assumes a proportional relationship between the rate of economic growth and the national savings rate. According to the economic model developed by Roy Harrod and Evsey Domar in the 1940s, national economies achieve macroeconomic equilibrium when movements in wages, consumption expenditure, savings, and investment ensure that resources are constantly transferred between businesses and households in equal amounts. Household income, therefore, flows back to businesses through expenditure on consumption and investments generated by savings. While consumption is immediately depleted once used, savings enable the accumulation of capital and facilitate future increases in the production capacity of companies.

The Harrod-Domar model suggests that an economy can achieve infinite growth if the savings rate is sufficiently high to compensate for capital depreciation and if the capital is invested in sectors with high returns. However, critics have identified flaws in the model, such as the assumption that the productivity of capital remains constant over time and is externally determined. The Solow model, on the other hand, argues that the long-term growth rate is determined by the combined effects of technological progress and population growth, while the behavior of economic agents influences the short-term growth rate. Technological progress plays a crucial role in sustainable growth, although it is not thoroughly explained in the Solow model. The "Solow residual" quantifies the rate of technological change that accounts for the difference between real income growth and the growth explained by labor and capital growth.

Solow has integrated a model which generates a displacement over time of economic equilibrium and that it has two factors of production which are Labor  $L_t$  and capital  $K_t$ . The marginal productivity of capital is decreasing, so each additional unit of capital decreases its marginal productivity. His production function is presented as:

$$Y_t = F[K_t, L_t, t] \quad (1)$$

With t effects of technical progress.

A quantity of labor and capital makes it possible to produce more in one year than another if production technology allows for it.  $Y_t$  represents the production on date t. The technology is assumed to be common, meaning that it is perceived as a homogeneous good which can be consumed as  $C_t$ .

According to Romer, technological change plays a crucial role in economic growth, and market incentives drive technological innovation. Unlike public goods, economic goods are both rival and exclusive, with research considered a public good, while human capital is an economic good. Technology is a non-rival and partially exclusive good with unlimited productivity, but its remuneration on the market is only partial. The production function that incorporates a non-rival input exhibits increasing returns to scale, implying that it cannot be concave. Romer's objective was to reconcile increasing returns resulting from externalities with competitive equilibrium to address the optimization problem faced by economic agents. To achieve this, a comprehensive model of global productivity endogeneity was necessary to integrate an additional factor of technical progress that carries the externality, exhibits increasing returns to scale, and accumulates without diminishing its marginal productivity.

In contrast to the concept of non-increasing returns that ensures competition, individual firms have the potential to experience increasing returns when they engage in shared activities. With the expansion of the market, each firm can benefit from externalities, meaning that their investments not only enhance their own production but also positively impact the productivity of other firms. Thus, the model is constructed based on the idea of externalities between firms, which allows for the emergence of increasing returns.

According to Romer, the role of the state is important in promoting economic growth, but he argues against relying solely on public spending as a means to accelerate technological progress. In his analysis, Romer identifies four key categories: physical capital, unskilled labor, human capital, and technology. The accumulation of physical capital can facilitate the accumulation of human capital, and the level of human capital in the labor force is influenced by the health of the population. Additionally, investment serves as a source of learning by doing, and the knowledge gained through this process can be captured and utilized by firms as a valuable product.

In summary, Romer's perspective is that an economy builds up knowledge and expertise as it produces, which in turn contributes to further growth. He posits that research and development can lead to the accumulation of technological capital, which in turn fuels both economic growth and innovation, creating a mutually reinforcing relationship.

And the production function is:

$$y = A \cdot K^n \cdot k^\alpha \quad (2)$$

y and k refer to the firm while A and K relate to the aggregate economy. While  $k^\alpha$  captures a positive externality for each firm, which represents the positive but inappropriate effect that the accumulation of knowledge represents each firm. This term positive externality implies that the investment decisions made by firms will be sub-optimal.

Lucas' approach stands out in that he aims to directly equalize the expected returns in any convergence process, rather than merely reducing the disparities between them. In his models, Lucas explains the endogenous origins of technical progress and highlights the role

of externalities in self-sustaining growth. He argues that individuals who possess higher levels of education and qualifications are more productive, innovative, and proficient in utilizing new technologies. As a result, he emphasizes the importance of investing in education to promote the accumulation of human capital by individuals. When individuals perceive a favorable return on their investment in the labor market, they are incentivized to acquire human capital through education. It can be inferred that the accumulation of human capital generates positive externalities, and this accumulation is endogenously determined. As growth becomes more significant, both individuals and states are likely to allocate more resources to education and training.

Lucas proposes a closed model in which he adds to the side of the postman labor  $L$ , and capital  $K$ , a third factor of production which is human capital  $h$ . Then the production is given by the combination of three factors capital, human capital and work according to a Cobb-Douglas type technology:

$$Y_t = A * K_t^\alpha (u_t h_t L_t)^{1-\alpha} h_t^\gamma \quad (3)$$

$u_t h_t L_t$  is the efficient labor and labor time. Lucas distinguished between the effect internal effect of human capital which directly raises the efficiency of work and the external effect or effect diffusion of human capital over the entire economy through the term  $h_t^\gamma$ .

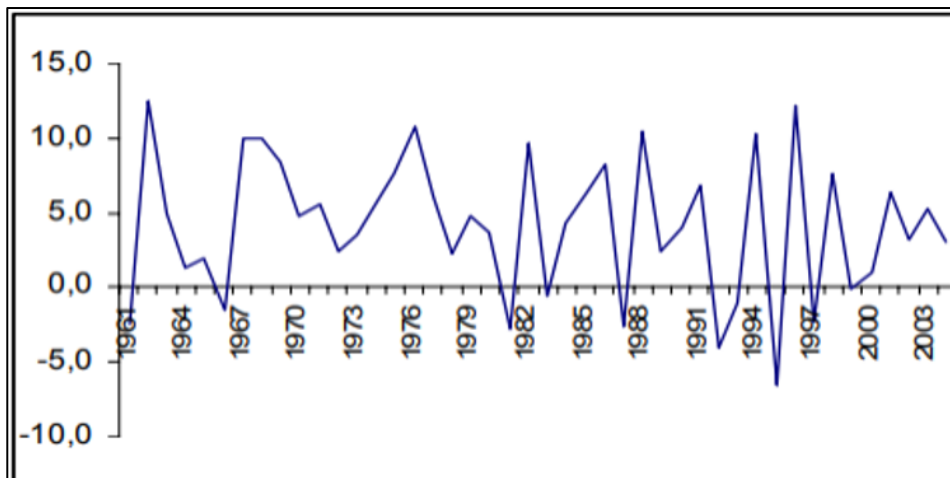
Lucas suggests that individuals have the flexibility to allocate their time between engaging in current production and investing in human capital accumulation. When individuals allocate less time to production, it can result in a decrease in the current output of the national product. However, increased investment in human resources can contribute to long-term growth in production. Both Romer and Lucas do not advocate for the state to play a primary role in economic growth, but they do emphasize the importance of state support for long-term growth initiatives.

### The economic development in Morocco :

Since gaining independence, Morocco has pursued economic and social policies aimed at integrating its society into the path of development. The country has adopted a liberal economic approach, which has allowed the state to foster economic growth. In the 1960s and 1970s, Morocco implemented Economic Development Plans to strengthen its economic structure and facilitate social transformations. These plans were designed to enhance the country's economic capabilities and support societal changes.

A country with high birth rates and low mortality rates faces challenges in allocating resources to social infrastructure, such as schools, hospitals, housing, and other essential services, for the growing population. While these investments are necessary, they are not immediately productive, making it challenging to accumulate capital for economic development. Savings are difficult to come by for families or the nation as a whole, leaving them with little choice but to turn to foreign investors or take on foreign loans. However, this can become a burden for future generations. Economic development is hindered in two ways: firstly, a disproportionate amount of available capital is directed towards social purposes rather than economic ones, and secondly, the formation of capital is hindered because the increase in production must be used to support the surplus population resulting from demographic growth and to improve the living conditions of the existing population, leaving little surplus to be reinvested to improve economic performance.

The natural potential of Morocco can support a potential increase in population and improve the living conditions of the existing population if the available resources are utilized and distributed effectively. The issue does not revolve around subsistence production or improving social organization, and the limit to population growth is not determined solely by subsistence or income but by the fair distribution of the benefits of economic growth.



**Fig3.** Annual GDP growth rate in Morocco (in %).

The growth of Morocco's GDP has shown instability over time, with its trajectory being influenced by the performance of the agricultural sector, which is susceptible to weather fluctuations. From 1960 to 2004, there were ten years of negative growth, and only sporadic periods where growth exceeded 5%. Strong performances often follow a significant decline in the previous year, but are frequently followed by sluggish growth, resulting in marked instability in the country's growth trajectory. This inherent instability presents a challenge to the accumulation of wealth needed to foster sustainable economic growth.

Furthermore, in Morocco, the civilian state is often the primary source of information, but it lacks accurate data on births, deaths, and marriages. This is due to the fact that the civil registration system was not mandatory until after independence. Several censuses were conducted in Morocco before and after independence, but the quality of the data varies across different operations. While there are a few demographic surveys available, caution must be exercised when utilizing the data as there is limited information on the methodologies employed, including the sampling frame, sample size, and response rate.

In the years following its independence, Morocco pursued economic and social policies aimed at promoting growth and development. However, the country has experienced moderate and unstable economic development since then, which has been insufficient in effectively addressing the issue of unemployment. Furthermore, demographic changes have exacerbated the employment situation, with investments in recent years remaining low and ineffective. The inability to fully utilize available financial resources reflects a weak capacity of the economy to convert these resources into productive capacities. To successfully manage the opening of the economy and demographic transition, Morocco must efficiently reallocate resources at both the micro and macro levels. This will be crucial in capitalizing on the

opportunities presented by these dynamics and effectively responding to the challenges they pose.

In today's economic landscape, technological advancements and innovations have emerged as significant factors influencing economic performance. Notably, the impact of information and communication technologies on both the economy and society is increasing. There is a growing synergy between science and industry, leading to accelerated development of new products and methods, as well as a shift towards knowledge-based sectors and services. Additionally, technology is diffusing at a faster pace, and there is a rising demand for skilled workers. The ability to generate and disseminate scientific and technical knowledge has become a crucial source of competitive advantage, wealth creation, and an improved quality of life. To fully harness the benefits of these trends, policymakers must develop appropriate strategies and policies.

Moroccan industry has largely maintained its traditional export specializations and has not ventured into high-demand sectors on a global scale. The export of agro-food and textile products holds significant importance for Morocco, contributing to 72% of industrial exports and employing approximately 68% of the sector's workforce. However, the growth of international trade in these product categories has been relatively slow, and Morocco's policies in this regard face challenges such as protectionism in global markets and foreign competition. The manufacturing industry remains underdeveloped, employing only 14% of the workforce and contributing a mere 17% to the overall value added. These proportions have shown little change in the past decade. The limited size of this sector hinders its potential to play a leading role in economic growth, as its narrow scope largely accounts for Morocco's lower shares in international trade compared to emerging countries.

Developing countries that have experienced economic growth have typically witnessed a shift in factors of production, particularly a move away from agriculture. This shift occurs as national demand changes over time and productivity improvements allow for labor to be freed up for other sectors. The positive effect of this shift is due to the fact that labor productivity is generally higher in other sectors than in agriculture. Therefore, it is important for public authorities to establish sectoral policies that encourage the reallocation of factors of production to promising sectors where the country has a comparative advantage. Despite this, the Moroccan economy remains heavily reliant on agriculture, which is subject to climatic risks. Analysis of GDP by sector reveals that the primary sector (agriculture, fishing, mining, and energy) represented 30% of GDP in 1970 and 24% in 1993, while the secondary sector fell from 21% to 23% during the same period. However, the tertiary sector has experienced significant growth, increasing from 49% to 53%.

In addition, the agricultural and fishing sectors still account for 50% of jobs, 25% of exports, and 13% of GDP in Morocco. However, this situation has the disadvantage of leaving the economy dependent on climatic hazards, as evidenced by the seven droughts experienced by the country between 1980 and 1995, despite the implementation of dam policies in the 1970s. This resulted in irregular growth, with fluctuations of +6.8% in 1991, -4.4% in 1992, -1.1% in 1993, +11% in 1994, and -5% in 1995. As a result, Morocco must seek to reduce the weight of agriculture in its economy, as the succession of droughts not only affects the agriculture sector but also has indirect impacts on other sectors of the economy, such as rural exodus, farmer indebtedness, and the social climate.



Morocco has pursued export promotion strategies, but the share of exports in GDP has remained stagnant at 23.6% since the 1960s, resulting in a negative contribution to export growth. Morocco has implemented a stabilization policy to address this issue, which focuses on variables such as the inflation rate, budget deficit, balance of payments, exchange rate distortions, and external debt. These variables have a significant impact on economic performance in both the short and long term. Policies that contribute to macroeconomic stability and reduce uncertainty, such as fiscal, monetary, and financial policies, are crucial for encouraging investment and promoting long-term growth.

The Green Morocco Plan offers an opportunity to make the agriculture sector a key driver of the economy and address the issue of water resources. This integrated approach aims to create a balanced evolution in the sector, utilize its potential for progress, and support the changing global agri-food system while maintaining social and economic equilibrium. Achieving this goal will require substantial financial resources, with the public authorities needing to mobilize around 68.60 billion additional dirhams over the ten-year period of plan implementation. By rebalancing the trade balance, the plan has the potential to make a significant contribution to Morocco's economic development.

The "Emergence" Plan is a strategy aimed at repositioning Morocco's industrial sector towards profitable professions that will account for 70% of industrial growth and utilize the country's advantages, such as skilled labor, market access, and proximity. The plan mainly focuses on Morocco's Global Businesses (MMM) that have a competitive advantage in two categories: foreign direct investment-oriented businesses (IDE), including offshore, automotive, aeronautics, and electronics, and traditional trades such as the textile-leather sector and agrifood.

## Empirical analysis of the determinants of economic development in Morocco :

Our study is based on a sample of variables from Morocco covering the periods 1990-2020. The variables include GDP growth, life expectancy at birth, population, constant GDP, active population, GDP per capita, HDI, and the population rate enrolled in the primary sector. In this study, we will define each variable and analyze their relationships to better understand the economic and social factors that affect Morocco's development.

- ✓ The variable of life expectancy at birth is an important factor in explaining economic growth, as it has been found to have significant explanatory power in many empirical studies. This is not surprising since a higher life expectancy is associated with better health conditions and improved economic performance. Additionally, a longer life expectancy can be linked to higher levels of education and skills, and reflects the social and economic conditions in a country, serving as a measure of the effectiveness of government policies. Therefore, it is crucial for policymakers to focus on improving life expectancy as part of their efforts to promote economic development.
- ✓ Population refers to a biological system consisting of a collective group of individuals of the same species occupying a specific territory at a given time. Each individual has certain biological attributes, and the population as a whole goes through a life cycle of growth, maintenance, and decline. Additionally, the population has a definite organization and structure that can be described, and it

- exhibits a level of irritability. Understanding population dynamics is crucial for studying various fields such as ecology, demography, and economics, among others.
- ✓ The active population is composed of individuals who are either currently employed or actively seeking employment. The employed labor force includes individuals who are currently working and receiving payment for their work, while the unemployed labor force consists of individuals who are not currently employed but are actively seeking employment. This classification is important for analyzing labor market dynamics and making policy decisions related to employment and job creation.
  - ✓ Constant GDP is a measure of the real variation in an economic quantity over time. This measure adjusts for the effects of inflation by keeping prices at a constant level, typically based on a reference year. This means that constant GDP measures changes in the volume of goods and services produced, rather than changes in their value due to inflation. By using a constant price level, the measure acts as if prices remain unchanged from the reference year, ignoring the effects of inflation. Constant GDP is, therefore, a useful tool for tracking changes in economic activity over time that are not driven by changes in prices.
  - ✓ GDP per capita is a commonly used indicator to compare the economic performance of countries and to track the standard of living of a country's citizens over time. It takes into account the size of the population and provides a better representation of the economic situation of individuals in a country compared to just looking at the total GDP of a country.
  - ✓ The growth rate is a percentage indicating the rate of change of a particular economic quantity, such as GDP, salary, or turnover, over a specific time period. It is typically calculated as the difference between the value of the economic quantity at the end of the period and its value at the beginning of the period, divided by its value at the beginning of the period, and then multiplied by 100. An increase in the quantity of goods and services produced or an increase in prices can contribute to an increase in GDP.
  - ✓ The Human Development Index (HDI) is an indicator of a country's development that is more comprehensive than just GDP per capita. It was created in 1990 by the United Nations Development Programme (UNDP) to classify countries based on their level of human development, which encompasses economic, social, and environmental factors. The HDI considers various indicators, such as life expectancy, education, and income, to provide a more comprehensive view of a country's development.
  - ✓ The population rate registered in the primary sector refers to the percentage of people who are employed in the primary sector of the economy, such as agriculture or mining. This is distinct from the percentage of the population who are educated, which is typically measured by the literacy rate or the proportion of the population with formal education or qualifications.

In order to study the determinants of economic development in Morocco between 1990 and 2020, we collected a sample of 31 observations. A chronological analysis of this data was conducted, which involved examining specific statistical indicators at regular intervals over time. The objective of this analysis was to identify the major trends and patterns in the data and to determine which indicators best represented the evolution of economic growth during the specified period.

This model aims to investigate how various factors affect the economic development of Morocco, with a focus on the impact of population. The variables included in the model are:

$$PIB_t = \alpha_0 + \alpha_1HDI_t + \alpha_2ESP_t + \alpha_3POP_t + \alpha_4POPAC_t + \alpha_5TPIOP_t + \varepsilon_t \quad (4)$$

$PIB_t$  : GDP per capita.

$HDI_t$  : Human development index.

$ESP_t$  : Life expectancy at birth.

$POP_t$  : Population.

$POPAC_t$  : Active population.

$TPIP_t$  : Population rate enrolled at primary level.

$\varepsilon_t$  : The error term.

We used annual data covering the period from 1990 to 2020. Data for our study are obtained from the World Bank. We have tried in this study to verify our hypotheses which are:

$H_0$  : Population growth has a significant impact on economic development.

$H_1$  : Population growth is not the only factor influencing economic development.

$H_2$  : The impact of population growth on economic development is positive.

The estimation of the ARDL model was used as part of our study. The empirical methodology is based on the approach of ARDL (Autoregressive Distributed Lag) cointegration.

Variable	Coefficient	Std-Error	t-statistic	Prob
D (Population (-1))	2.243325	0.133719	16.77641	0.0000
D (Population (-2))	-2.110043	0.208242	-10.13264	0.0000
D (Population (-3))	0.827871	0.093265	8.876511	0.0000
D (HDI)	279382.5	169920.8	1.644193	0.1284
D (HDI (-1))	-952667.7	254097.8	-3.749216	0.0032
D (HDI (-2))	-75039.4	207061.1	-3.626174	0.0040
D (HDI (-3))	-279749.6	210856.6	-1.326730	0.2115
D (population rate...)	46991.22	76744.39	0.612308	0.5528

D (population rate... (-1))	247623	94637.04	2.616554	0.0240
D (population rate... (-2))	161698.9	94149.26	1.717474	0.1139
D (population rate ... (-3))	164907.3	94227.10	1.750104	0.1079
CointEq (-1)*	-0.025631	0.004828	-5.309005	0.0002

**Table1.** Estimation of ST coefficients.

Variable	Coefficient	Std-Error	t-statistic	prob
HDI	58694759	4630233	12.67642	0.0000
Population rate ...	-6182060	3134931	-1.971992	0.0743
C	3230076	981255.1	3.291780	0.0072

**Table2.** Estimation of LT coefficients.

The results in tables 1 and 2 indicate that the coefficient of population has a statistically significant negative impact on short-term GDP. However, this impact is positive in the long term. Furthermore, the impact of HDI and the percentage of population enrolled in the primary level is positive for both short-term and long-term GDP.

Test statistic	Value	Signif	l(0)	l(1)
F-statistic	5.536445	10%	2.63	3.35
k	2	5%	3.1	3.87
		1%	4.13	5
Asymptotic : n=1000				

**Table3.** Results of F-Bound test.

The "Bound Test" is a method used to estimate the long-term relationship between variables. The F-statistic calculated in Table 3 has a value of 5.53, which is greater than the lower bounds and above the significance level of 10%, 5%, and 1%. This indicates that there is a long-term relationship between the variables being studied.

Variable	Coefficient	Std-Error	t-statistic	prob
C	-1419378	375454.7	-3.780425	0.0026
Population (-1)*	-0.021594	0.005546	-3.893553	0.0021
Active population (-1)	-0.044386	0.015169	-2.926139	0.0127
Life expect...	36543.36	99990.538	3.657798	0.0033
D (population (-1))	1.833739	0.158522	11.56770	0.0000
D (population (-2))	-1.261695	0.275487	-4.579871	0.0006
D (population (-3))	0.294987	0.168970	1.745792	0.1064
D (active population)	-0.002897	0.005898	-0.491177	0.6322
D (active population (-1))	0.037636	0.010780	3.491196	0.0045
D (active population (-2))	0.022336	0.007795	2.865367	0.0142
D (life expenc..)	1711335.4	70356.47	2.435247	0.0314
D (life expenc..)	-311508.5	140164.1	-2.222456	0.0462
D (life expenc..)	257732.8	145550.7	1.770743	0.1020
D (life expenc..)	-171190.7	88577.51	-1.932666	0.0772

**Table4.** Estimation of ST coefficients.

Variable	Coefficient	Std-Error	t-statistic	prob
Active population	-2.055457	0.343188	-5.989308	0.0001

Life expectancy...	1692263	123431.1	13.71019	0.0000
C	-65729089	4918596	-13.36338	0.0000

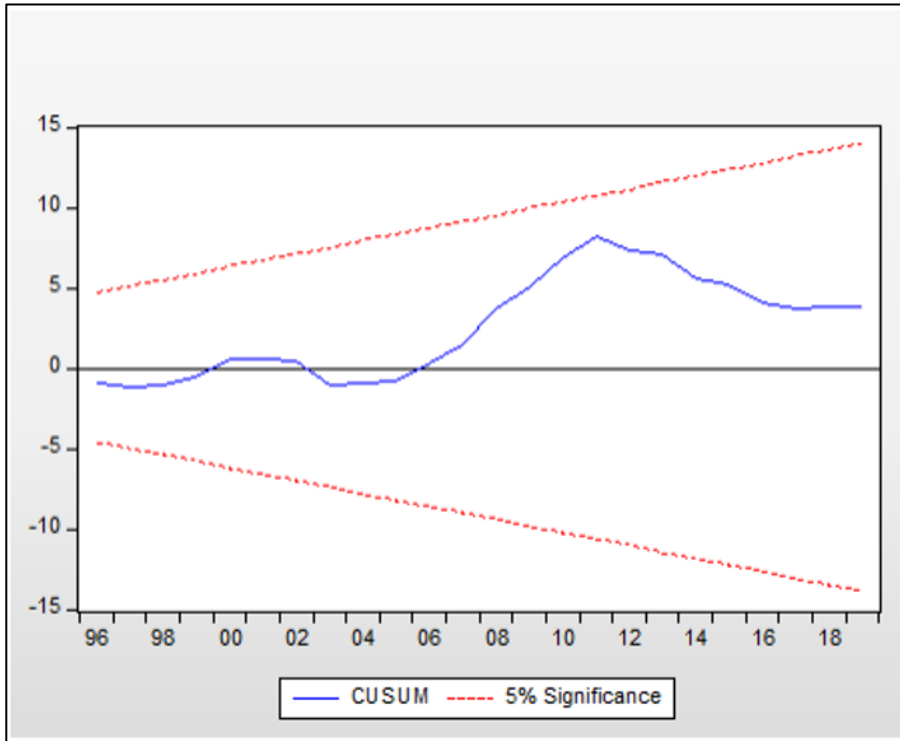
**Table5.** Estimation of LT coefficients.

The results in tables 4 and 5 demonstrate that the coefficient for population has a negative and statistically significant impact on short-term GDP. However, in the long run, the impact of population on GDP becomes positive. Life expectancy at birth has a negative impact on GDP in the short term, but a positive impact in the long term. The working population has a negative impact in the short term, but a positive impact in the long term.

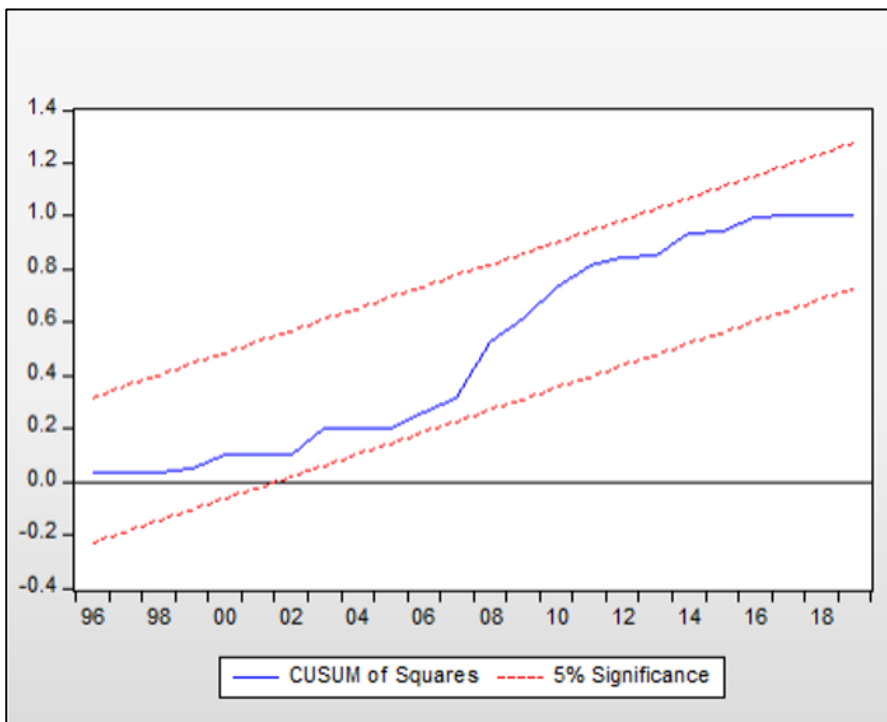
Test statistic	Value	Signif	l(0)	l(1)
F-statistic	14.44229	10%	2.63	3.35
k	2	5%	3.1	3.87
		1%	4.13	5
Asymptotic : n=1000				

**Table6.** Estimation on F-Bound test.

The F-statistic calculated in table 6 with a value of 14.44 exceeds the lower bounds and is significant at the 10%, 5%, and 1% levels, indicating a strong relationship between the variables.



**Fig4.** CUSUM.



**Fig5.** CUSUM OF SQUARES.

The results in Figures 4 and 5 show that the CUSUM and CUSUM OF SQUARES statistics graphs remain within the range of critical values at a 5% threshold. As a result, the model coefficients are stable.

The Bounds test shows a strong long-term relationship between GDP per capita, HDI, life expectancy at birth, the population enrolled in primary education, and the labor force. The short-term and long-term coefficients indicate that while the impact of population, working population, and life expectancy at birth is negative in the short term, it becomes positive in the long term. Conversely, for HDI and the population rate enrolled at the primary level, the impact is positive in both the short and long term. Based on this empirical study, we can accept the proposed hypotheses, as there is a relationship between population growth and economic development. However, demographic growth is not the only factor, as HDI, life expectancy at birth, and the population rate enrolled at the primary level also play a significant role. The stable situation of a healthy, educated, and skilled population can influence long-term economic development.

The impact of population, labor force and life expectancy at birth influences GDP per capita negatively in the long run, but the influence will change positively in the long run which means an economic growth that pushes an economic development towards increase. On the other hand, HDI, the rate of population enrolled at primary level influences GDP per capita positively in the short and long term, so the influence is positive on economic growth which allows to improve economic development.

In conclusion, this study allowed us to know the relationship between GDP per capita, HDI, life expectancy at birth, population, labor force and population rate registered at primary level and we noticed that these variables have impacted positively the GDP per capita positively in the long run, which allows for a positive change in the level of economic development. Thus, our hypotheses are that population growth influences economic development through life expectancy at birth, HDI, and primary school enrollment. population enrolled in primary education.

## Conclusion :

The impact of population, labor force, and life expectancy at birth negatively influences GDP per capita in the short term, but this influence changes to the positive in the long term, leading to economic growth and development. In contrast, HDI and the rate of population enrolled in primary education have a positive influence on GDP per capita in both the short and long term, contributing to economic growth and development. The debate on sustainable development emphasizes the importance of creating fair institutions for global regulation that address the economic, social, and environmental aspects of development. Policymakers view sustainable development, green growth, energy efficiency, and clean energy technologies as interdependent goals. To tackle the challenge of sustainability, it is important to analyze the economic and scientific factors affecting ecological scarcity, measure the loss in benefits, and implement policies to address these issues. Currently, sustainable development involves maintaining physical capital and increasing it relative to population growth, technological advancements, and intertemporal choices. Sustainability also involves maintaining, renewing, and growing capital while considering depreciation, amortization, and physical and technical obsolescence. Environmental concerns raise questions about the sustainability of the development model adopted by industrialized countries on a global scale and the failure to prioritize environmental issues in poor developing countries.



If investments in natural resources cannot be evaluated, it is desirable to focus on evaluating the results rather than the means used. This means that we must avoid polluting the water, air, and land on which our lives and work depend and prevent the depletion of renewable resources that are essential to production, unless adequate alternatives can be found. These alternatives may involve increasing environmental resources through population growth, technological innovations, intertemporal choices, and other means. All of these issues and challenges keep economists on alert as they search for solutions for the present and future generations to lead a better life. Population growth is a primary reason for these challenges related to scarce resources, but the environment must also be protected and conserved for the future. Economists and scientists are still working on green investments and evaluating the financial risks associated with them.

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