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THESIS TITLE

Comprehending the standard of living in Algeria: Empirical analysis

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To our dear parents,

To our brothers and sisters,

To all those dear to us,

Thank you all

Acknowledgement

We would like to thank God Almighty for giving us strength, courage and patience to accomplish this modest work and to follow it to the end.

To our supervisor Pr. KHELIFA MAZOUZ for his methodological advice and encouragement.

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We also thank the jury members for devoting their time to the evaluation of our modest work.

All our recognitions are intended for all our teachers, throughout our course.

Abdenour and Djamal

List of abbreviations

ADF: Augmented Dickey Fuller

COL: Cost of Living

CPI: Consumer Price Index

DS: Differency Stationary

DW: Durbin Watson

FAO: Food and Agriculture Organization

GDP: Gross Domestic Product

HDI: Human Development Index

IMF: International Monetary Fund

LS: Least Squares

OECD: Organization for Economic Cooperation and Development

OLS: Ordinary Least Squares

PP: Purchasing Power

PPP: Purchasing Power Parity

QOL: Quality of Life

SOL: Standard of Living

TS: Trend Stationary

Summary

Introduction

Introduction

Development is the process of improving the quality of life and capabilities of all human beings by raising people's living standards, self-respect and freedom. For most of us, standard of living is a concept we know when we see it. We may not be able to express it in precise terms, but we think we know it when we see it. Ask us to define it, and we'll make a list of the things we associate with decent living: a nice car, a pleasant place to live, clothes, furniture, appliances, food, vacations, and maybe even education. Ask us to measure it, here the problem arises.

While standard of living (or living standard) is the ultimate aim of economic sciences, it has received relatively less attention in the economic literature. Many authors and researchers consider it a complex and elusive concept. Although it is hard to find someone who does not know its general meaning, its exact meaning and measurement remains unclear.

All economic policies and the action carried out by the public authorities are generally aimed at improving the standard of living and the well-being of citizens. As such, understanding the exact meaning of standard of living and its determinants is crucial for economic policy and decision makers.

The importance of this subject can also appear as a tool to solve many problems such as poverty, purchasing power issue, resource allocation problem, inequalities and the distribution of wealth, and especially it helps to optimize the efficiency of public spending and improve the quality of governance.

The objective of this research is therefore to enhance our understanding of standard of living in general, and in the context of Algeria in particular. We are especially interested in investigating the determinants of standard of living of Algerian citizens and assess the how such factors can be used to develop relevant policies that would

enhance the well-being of the Algerian people.

We are particularly interested in this topic because of lack of literature on the case of Algeria. Even at the international level, there is no well-defined theoretical framework that clearly deals with this phenomenon, apart from some related studies that focus on the measurement of standard of living. While these studies have brought a lot to this subject, their conclusions are largely mixed[1]. This is what motivated us to try to bring a contribution on this subject, in order to try to find a better scale of measurement of the standard of living of Algerians and to explain this phenomenon at the level of our country.[2]

The remote goal of any economist or economic policymaker is to improve the welfare and thus the standard of living of everyone in society. It is not an exaggeration to say that this is one of the main goals of the economy. Because if we define economics by its subject, we say that it is the science of wealth, the science of scarcity and allocation of resources, or the science of choices. So the goal and the challenge is always to find out how to manage limited resources to obtain maximum benefit and satisfaction, and how to cope with unlimited needs with limited resources.

The problematic is not far from this previously mentioned challenge, we wanted to understand what exactly is the standard of living as an economic phenomenon and to remove the confusion and the illusion of this concept? and after making a projection on Algerian society, we wanted to understand how this phenomenon behaves? we also want to try to model this phenomenon in the form of an econometric model that is most appropriate for our society after having presented the different modeling methods that exist, a model that tells us about the variables that best explain the

[1] See for example: Nicholson, J. L. (1976). Appraisal of different methods of estimating equivalence scales and their results. Review of Income and Wealth, 22(1), 1-11

[2] The methods of measuring the standard of living differ depending on the author's point of view on this phenomenon, since there is no single statistical variable which represents it. That is why each author has resorted to a specific solution to solve this problem.

standard of living in general and in Algeria in particular. This model must also have the capacity to show the type of relationships and causalities that exist between the standard of living and the variables that explain it.

Briefly, the aim of this research is to find out how to measure the standard of living since there is no variable that can fully represent it. Then highlight the factors that determine this phenomenon studied since the variables that influence it are multidimensional.

This is why we have chosen to start with a review of the theoretical literature on this phenomenon and to discuss its different visions, then to review the empirical methods to measure it, in order to finally be able to choose the appropriate empirical method to use to statistically represent the Algerian standard of living, then highlight the nature of the phenomenon which influences the most[3].

For this we have divided this work on three chapters, a first theoretical chapter which aims to clearly define the standard of living and the concepts that surround it to distinguish it from: cost of living, quality of life and purchasing power and do a literary review on the different economic visions to finally discuss them. The purpose of the second chapter is to present the different methods of measuring the standard of living existing in the literature, then to discuss the economic situation of the country in order to finally be able to put the hypotheses on the design of the third chapter, which in turn aims to model the phenomenon studied to finally conclude the nature of these different determinants for the case of Algeria.

[3] According to a study by Birciaková, N., Stávkova, J., & Antosová, V. (2015) where they evaluated the indicators of standard of living, they concluded that these indicators are economic, social, governmental, health, etc. .

CHAPTER ONE

Theoretical and Conceptual Framework

1. Concepts and definitions

In order to avoid any confusion and to help to distinguish concepts that overlap with each other, we have thought that it is necessary to define all the concepts which have a direct relationship with our research subject, especially the concepts (or the economic phenomena) which have a similarity between them. So, in this section we start with definitions in order to base all the study which follows on these definitions.

- Standard of Living (SOL): we start from this key concept, since it is the goal of our study and it is around this concept that we do all our study. The simple definition is that standard of living represents the degree of wealth and material comfort available to a person or community. We can say also, that standard of living refers to the quantity and quality of material goods and services available to a given population.

However, in addition to this general definition, prior studies defined standard of living in three ways; which *Maria Barreiro-Gen* has called "conflicting"[4] definitions. The first definition is according to (*Pigou* 1952) who defined it as the utility of life, the second one (*Deutsch and Silber* 1987) considered it to be the economic provision or "opulence" the last one (*Sen* 1984) considered it to be a type of freedom.

Maria Barreiro-Gen believes that the last of these is the most complete and complex definition. However, in fact, governments and institutions tend to use the second method because it is easier to obtain data. In the literature review section, we will present and discuss in depth these three approaches and others.

- Quality of Life (QOL): is a controversial multi-dimensional concept, which may

[4] Barreiro-Gen M. (2019) Discussing Approaches to Standard of Living. In: Leal Filho W., Azul A., Brandli L., Özuyar P., Wall T. (eds) Decent Work and Economic Growth. Encyclopedia of the UN Sustainable Development Goals. Springer, Cham. https://doi.org/10.1007/978-3-319-71058-7_22-1

encompass. for example, safety, time spent at work, the standard of health, comfort and happiness experienced by an individual or group. Quality of Life is more difficult to measure because as it includes factors that influence people's value in life above and beyond the material aspects.

- Cost of Living (COL): refers to the price level for a range of everyday items and services that an average person needs to maintain an average lifestyle. The indices used to measure inflation (such as the consumer price index) are not able to measure changes in the cost of living. To measure the evolution of the cost of living, we must include the variation in the quantities consumed. So, we can say that the cost of living is easily quantifiable. So, briefly, the cost of living is determined by the amount of money needed to buy the goods and services necessary to maintain a specific standard of living.

- Purchasing Power (PP): is the financial ability to buy products and services. In other words; is the amount of goods and services that can be purchased with a unit of currency. Disposable income and inflation are the two main factors that determine purchasing power.

From these definitions, we noticed that the major overlap that exist, it is between the these four concepts defined. It can be concluded that quality of life is the broadest and the most extensive concept, and the other three concepts are included within this concept, so it is the most qualitative concept and it is very difficult to quantify it. In the second level, it is the standard of living which encompasses the two others concepts “Cost of Living” and “Purchasing Power”, it is less qualitative and easier to quantify than “Quality of Life”. On the third order, it is the cost of living which includes the “Purchasing Power”, it is much more quantitative and more less qualitative, but it is the purchasing power which is the most direct and the most quantitative concept.

To explain all this empirically, we take the example of a person (or a region) who has a good quality of life, so automatically they have a good standard of living, and therefore a low cost of living, which means that necessarily this person (or in this region) has a high "PP". And any variation in its "QOL" necessarily is generated by a variation in one or all the three other criteria "SOL", "COL" and "PP".

On the other hand, if a person has a high purchasing power, it is not necessarily that his cost of living is low or his standard of living is high or even his quality of life is good, because despite if this person has a good salary and the price level is affordable, it may suddenly be that that same person will need a larger basket of goods (or service) without his income or prices changing (e.g. he had a new born so he will have new charges) so his cost of living will surely increase and therefore his standard of living decreases without his purchasing power changing.

We must also retain that the standard of living focuses on basic material factors such as income, gross domestic product (GDP), life expectancy, and economic opportunity. It generally refers to wealth, comfort, material goods, and necessities of certain classes in certain areas (it has more objective characteristics). It is closely related to quality of life, which can also explore factors such as economic and political stability, political and religious freedom, environmental quality, climate, and safety. Thus, the quality of life is more subjective and intangible, since the characteristics that make up a good quality of life for one person are not necessarily the same for someone else.

The key points to keep in mind[5]:

- Standard of living is a tangible and quantifiable term that refers to the factors available for a certain socioeconomic class or geographic area.
- Quality of life is the broadest term, difficult to quantify, it is subjective which can

[5] Cottam, H. R., & Mangus, A. R. (1942). A proposed definition of standard of living. Social Forces, 177-179.

even take happiness into consideration.

- Both can be faulty indicators because the factors can vary between people from the same geographic area or from the same socioeconomic class.

-The cost of living is the monetary cost of maintaining a particular standard of living.

In order to show the difference between these concepts and to illustrate the difference between them, we consider that it is necessary to build this figure:

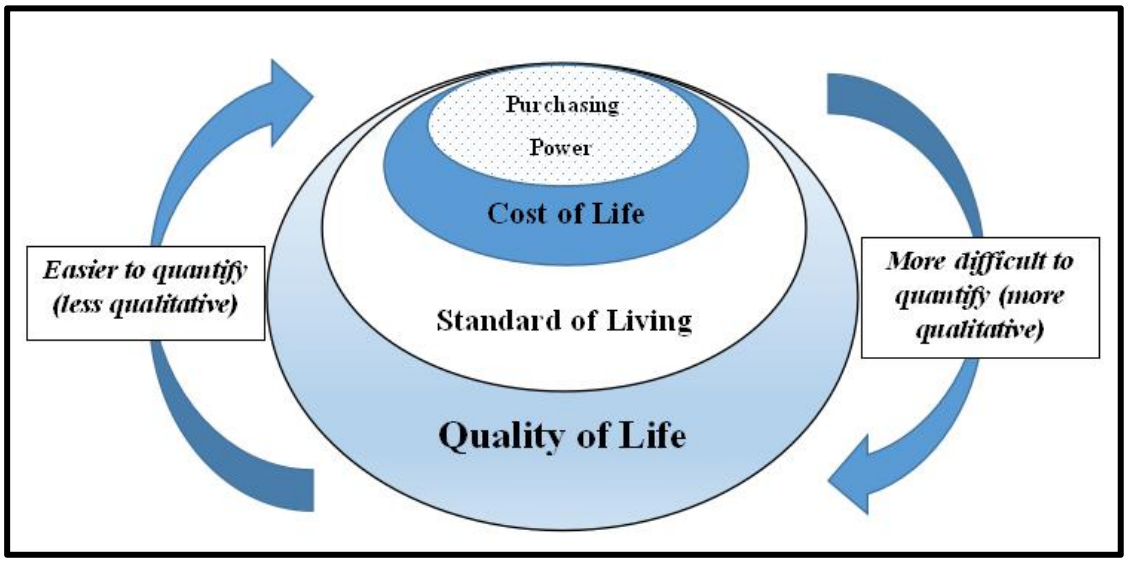


Figure 1: Difference between PP, COL, SOL and QOL(Source: *Author's own*)

2. Literature Review

Judging the prosperity of a country always begins by observing the standard of living of its inhabitants. According to many authors[6]; the per capita GDP is not an ideal measure of the level of development: it does not explicitly take into account the general level of education, the health status of the population...etc. Moreover, it does not take into account the problem of inequality. Rather, it is generally considered to be the real per capita income. As we all know, the country with a high standard of living is the most developed, and this standard of living as an economic phenomenon is closely related to many variables.

[6] See: Birciaková, N., Stávkova, J., & Antosová, V. (2015). Evaluating living standard indicators. DANUBE: Law, Economics and Social Issues Review, 6(3), 175-188.

Engel (1821-1896), after his investigation of the relationship between goods expenditure and income, expresses a link between the composition of consumption and the level of income by showing that the more income increases, the more the share devoted to food expenditure decreases. *Engel* enunciated three laws: the first is that "food expenses increase less quickly than income", the second is that "other expenses related to primary needs (housing, heating, clothing) increase at the same rate as income" and the third is that "expenses unrelated to the need to meet basic needs are increasing faster than income". These laws can help us get closer to a household's standard of living, because the composition of a household's consumption relative to its income level can tell us about its standard of living. For example, the more the share of income spent on food decreases, the more the standard of living tends to increase.

We have already mentioned that there are a number of definitions of Standard of Living, and that there is no scientific consensus on its precise extent. However, the three most commonly used definitions in the literature are:

- Standard of Living is the utility of life: It is the vision of *Pigou* who considers the Standard of living as; "economic welfare", "standard of real income," and "material prosperity". So according to this approach these terms are as more or less synonymous[7]. This is the oldest approach.

According to the modern version of this approach, utility is identified with fulfillment of wishes. More specific concepts have been defined recently, in order to go beyond just subsistence or poverty. According to *Rao* and *Min* (2018) it must (should) includes material conditions that are essential for humans to flourish, that is to say, a "*basic minimum*", and includes essential requirements for well-being, such as

[7] Pigou AC (1952) The economics of welfare, 4th ed, Macmillan, London

nutrition, clean air, education expenditure, and mobility. According to the same authors, the decent living standard can be defined as basic material requirements that are instrumental, but not sufficient, to achieve physical, and to an extent social, dimensions of human well-being, whether conceived as basic needs or basic capabilities, and independent of peoples values or relative stature in society[8].

- Standard of Living as the economic provision or "opulence": in other words the standard of living is considered a kind of economic supply or "richness and abundance", which measures the quantity and quality of goods that individuals can freely use. This approach is designed primarily by *Deutsch* and *Silber*[9] (1987). When assessing the living standards of individuals, families and even countries, this method relies on market purchase data.[10] However, it is not clear whether the economic supply concept of "standard of living" can accurately represent an individual's level of happiness. According to *Naidoo* (2019)[11], this method is not sufficient because it cannot provide "full control over resources".

- Standard of Living as a type of freedom. According to *Sen* (1984)[12] *Sen*, standard of living is to be free to do something, the capability to live well. *Sen*'s perspective is focused on what people are actually able to do or to be. *Sen* has proposed two conceptions of standard of living: the actual SOL of a person and the choice of lifestyles that are available to a person at a given point in time, because only one lifestyle can be chosen and the decision influences the actual situation. In line with this, *Nussbaum* (2000)[13] proposes how capabilities can

[8] Rao ND, Min J (2018) Decent living standards: material prerequisites for human wellbeing. Soc Indic Res 138 (1):225–244. https://doi.org/10.1007/s11205-017- 1650-0. Springer Netherlands.

[9] Deutsch J, Silber J (1999) Religion, standard of living and the quality of life. Contemporary Jewry 20(1): 119–137

[10] This means that this method depends more on what people are looking to buy and sell, ignoring some other data such as fresh air, absence of crime, etc., .According to *Sen*, this is due to compromises with harsh reality. The poor, the weak worker, and the defeated housewife all tend to deal with their hardships. So, the deprivation is suppressed or muted by the necessity of endurance in survival.

[11] Naidoo Y (2019) Comparing the Implications of Expanded Income-Based Measures of Living Standards with an Application to Older Australians. Jnl Soc Pol 48(1): 83–105

[12]Sen A (1984) The living standard. Oxf Econ Pap New Ser 36(Suppl):74–90

[13]Nussbaum MC (2000) Women and human development.The capabilities approach. Cambridge

provide a basis for principles that people have a right to demand from their governments.

Sen thinks beyond questions of wealth, utility and material comfort, because for him a good standard of living is above all "freedom". We agree with this proposal, because a prisoner cannot enjoy a good standard of living even if he is in a luxury prison.

In summary, the main difference between measures of standard of living and quality of life is the objectivity of these measures: the standard of living is more objective, it is possible to measure and define this concept with numbers. But factors related to quality of life are more difficult to measure because they are particularly qualitative:

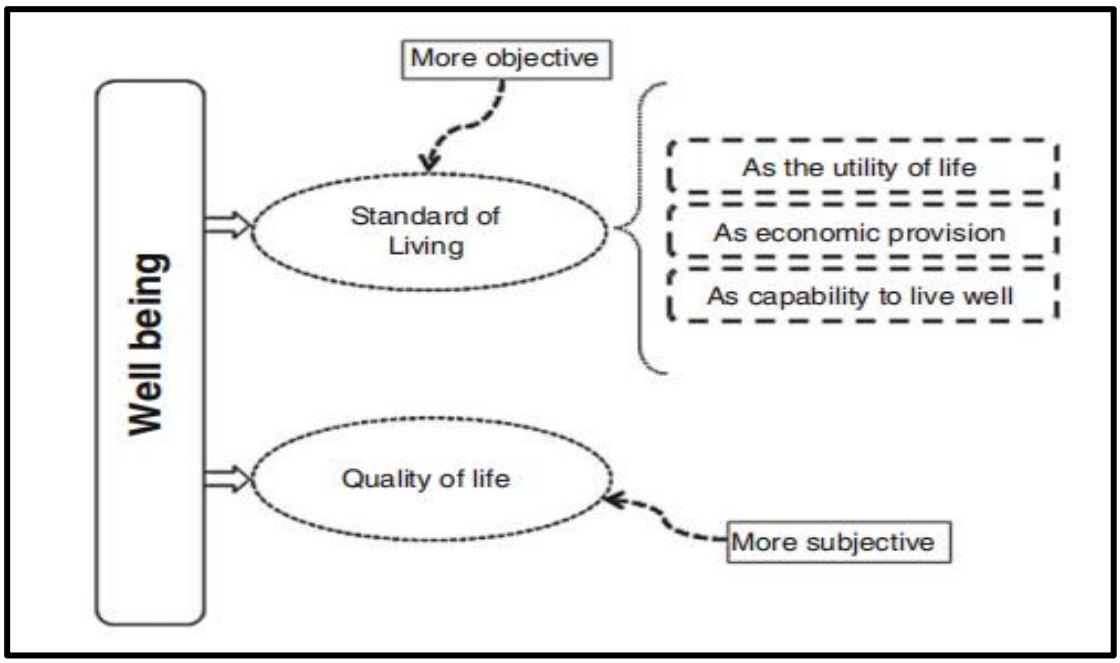


Figure 2: Some measures of well-being (Source: *Barreiro-Gen M.(2019) Discussing Approaches to Standard of Living. Page 10*).

Some institutions around the world have developed surveys to measure the living standards in different country. For example, the National Institute of Statistics and Economic Studies of France (INSEE) defines a person's standard of living as

UniversityPress, Cambridge

"disposable household income divided by the number of consumption units[14]". Calculated in this way, it is the same for all the people in the same household and its developments are corrected for inflation.

Another example is that of Eurostat which defines the standard of living as the equalized median disposable income, that is to say the total income of a household (after taxes and other deductions) available for spending or saving, divided by the number of household members, converted to equalized adults.

The World Bank launched a campaign (program) in 1980 called: "Living Standard Measurement Study" and they has created a working team and a website[15] specially for this purpose. Its goal is to explore ways of improving the type and quality of household data collected by statistical offices in developing countries and to foster increased use of household data as a basis for policy decision making. Specifically, the LSMS strives to develop new ways to track progress in raising living standards, determine the consequences of past and proposed government policies on families, and improve communications between survey statisticians, analysts, and policy makers.

There is also the Center for the Study of Living Standards[16] which is an independent, national, non-profit organization of Canada that seeks to contribute to a better understanding of trends in determinants of productivity, living standards and economic well-being through research. These two launched programs may confirm the importance of this research topic.

The Organization for Economic Co-operation and Development (OECD) and OXFORD university have also developed equivalence scales to compare the living

[14] Consumption unit in the sense of an equivalence scale calculated according to different methods in order to give a weight for each individual within his household.
[15] https://www.worldbank.org/en/programs/lsms
[16] See: http://www.csls.ca

standards of households of various size and composition, aiming to take into account the economies of scale that result from pooling of resources and expenditure within households.

The World Inequality Database (WID.world)[17] aims to provide open and convenient access to the most extensive available database on the historical evolution of the world distribution of income and wealth, both within countries and between countries.

Lots of other examples; Nepal (Central Bureau of Statistics), Mexico (Ibero-American University), national statistical institutes for each of the following countries: Spain, Sweden, Finland, Norway and Sweden and many other countries that have developed methods to study the standard of living of their inhabitants.

All these methods of measuring and modeling living standards will be the subject of the following chapter.

3. Discussion, Critiques and Gaps

Although there is no scientific consensus on a very precise definition of the concept of standard of living, this difference has given a certain wealth of information for the benefit of the researcher in this field. This divergence arose mainly by the fact that this notion is vast and from the vision of which it is looked at this phenomenon. But there are gaps to be mentioned, for example there are few explanations in the literature that clearly define how the standard of living is related to other economic phenomena, in particular with: the quality of life, the cost of life and purchasing power. There are also some ambiguities in the question of the comparison between standards of living that we deem it necessary to clarify.

[17] See: https://wid.world

The standard of living can be used as a tool for comparison between countries[18], regions, households or between people. It is clear that it is not logical to compare between the standard of living of a country and that of a household, so there is a standard of living at several levels:

* At the individual level; to talk about (or measure) a person's standard of living.

* At the household level; to talk about (or measure) the standard of living of groups of individuals such as families.[19]

* Or at country or regional level; to talk about (or measure) the standard of living of the whole region or country.

Therefore, in general, we can look at this phenomenon in two ways[20];

- ✓ The human standard of living; which deals with standards of living either by individual or by structuring them in the form of households.
- ✓ The regional standard of living; which deals with the standard of living of an entire region or a country as a whole.

Another way of comparison between living standards can be done apart from the one mentioned above, this way consists in introducing the time factor in the comparison (or analysis). It can be carried out by two main ways:

- The first is to compare standards of living between two or more generations (or periods of time); for example between the generation of the 80s and a generation of the 90s, therefore not targeting a specific population.
- The second is to compare the standard of living of a specific generation (or individual) over time. So the goal is to target a specific generation (it's kind of a longitudinal study).

[18] See for example: Fleurbaey, M., & Gaulier, G. (2009). International comparisons of living standards by equivalent incomes. Scandinavian Journal of Economics, 111(3), 597-624.

[19] See as example: Eudeline, J. F., Garbinti, B., Lamarche, P., Roucher, D., & Tomasini, M. (2011). L'effet d'une naissance sur le niveau de vie du ménage. INSEE-Les Revenus et Le Patrimoine Des Ménages.

[20] It is a classification that we propose to emphasize these differences and to avoid any possible overlap to the reader in the chapters which follow.

The purpose of these two types of comparison is therefore to assess the age effect (life cycle), the generation effect, and the date effect on the standard of living[21]. It is therefore necessary to define the objective of the comparison or the analyse before starting a job which has for object the standard of living.

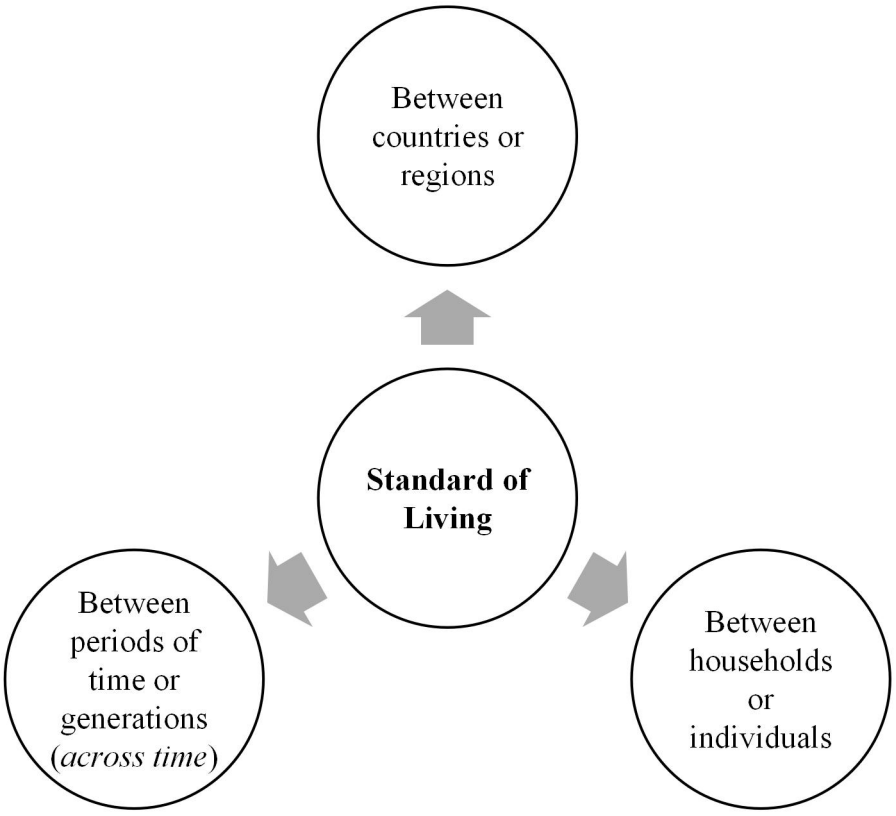


Figure 3: Possible ways to compare living standards (Source: *Author's own*)

We come back to the question of the existing ambiguities on the standard of living and its link with other phenomena such as purchasing power, cost of living, quality of life and others. First of all, we can say that there is a causal link between them (each phenomenon causes "or determines" the other) as shown in the figure below.

[21] As in the studies of: Lelièvre, M., Sautory, O., & Pujol, J. (2010). Niveau de vie par âge et génération entre 1996 et 2005. Les revenus et le patrimoine des ménages,.; and: Legris, B., & Lollivier, S. (1996). Le niveau de vie par génération.INSEE.

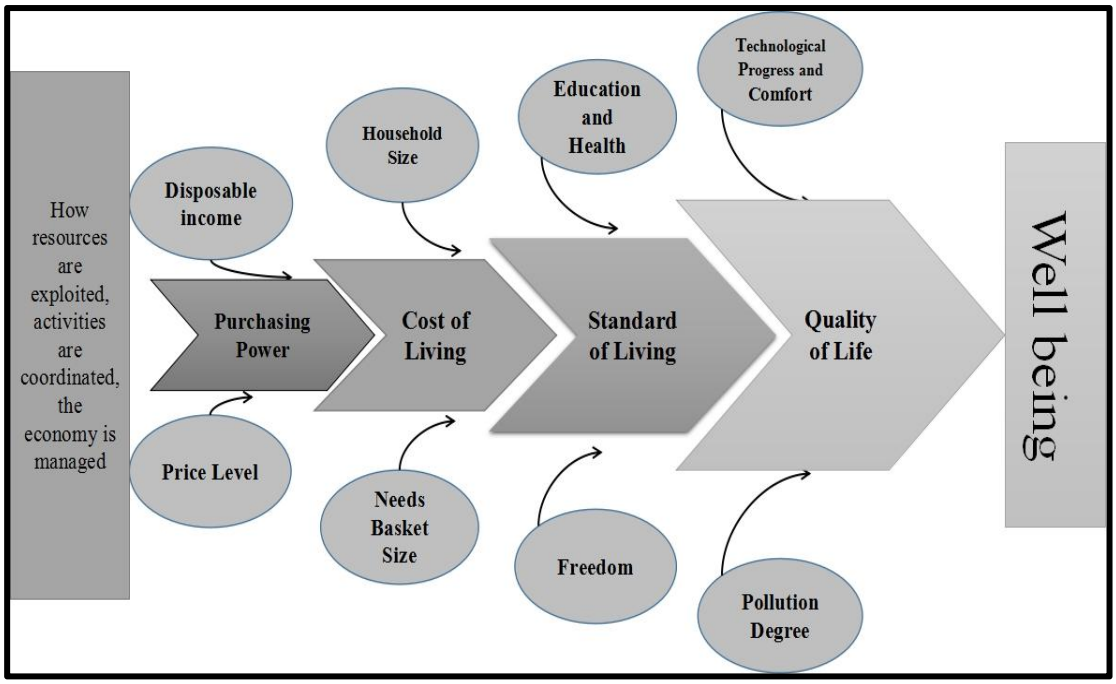


Figure 4: Interrelationship between PP, COL, SOL and QOL. (Source: Author's own).

This illustration shows that disposable income and the price level[22] are the two main factors that determine purchasing power, and that the latter in turn determines the cost of living, in addition to this factor there are two other's whose impact on the cost of living cannot be overlooked; The household size and family structure (the number of people in the same family sharing an income) and the size of basket of goods and services necessary for the survival and well-being of family members. The quality of the environment can also affect the cost of living, because for example if the environment is polluted, it is sure that it will generate more costs for humanity. So, in general, the cost of living is determined by the amount of money needed to buy the goods and services necessary to maintain a specific standard of living. Adding to it all, basically; education, health expenditure, type and quality of governance, technological progress, accessibility to goods and services and freedom are all issues that also determine the standard of living. Away from safety, time spent at work, level of health, comfort and happiness and many others; the standard of living is important

[22] In turn, it is affected by the degree of economic development for that country or region and many other factors that are difficult to enumerate.

because it is considered to be the one that mainly contributes to an individual's quality of life.

Finally, we can see that we can classify the determinants that influence the standard of living and well-being in six types of factors:

- ✓ Economic: the price level, disposable income, purchasing power, cost of living, growth, unemployment, time spent at work, etc.
- ✓ Social and demographic: the structure and size of the family, the effect of newborns, the effect of immigration, the effect of crimes and theft, etc.
- ✓ Environmental: pollution, Infrastructure ... etc
- ✓ Educational and health; level of education, innovation, inventions, improvement of the health system, etc.
- ✓ Technological; as technical progress and comfort ... etc
- ✓ Governmental; quality of governance, corruption, justice, equality, respect for freedoms, etc.

This detailed classification is summarized by this figure below:

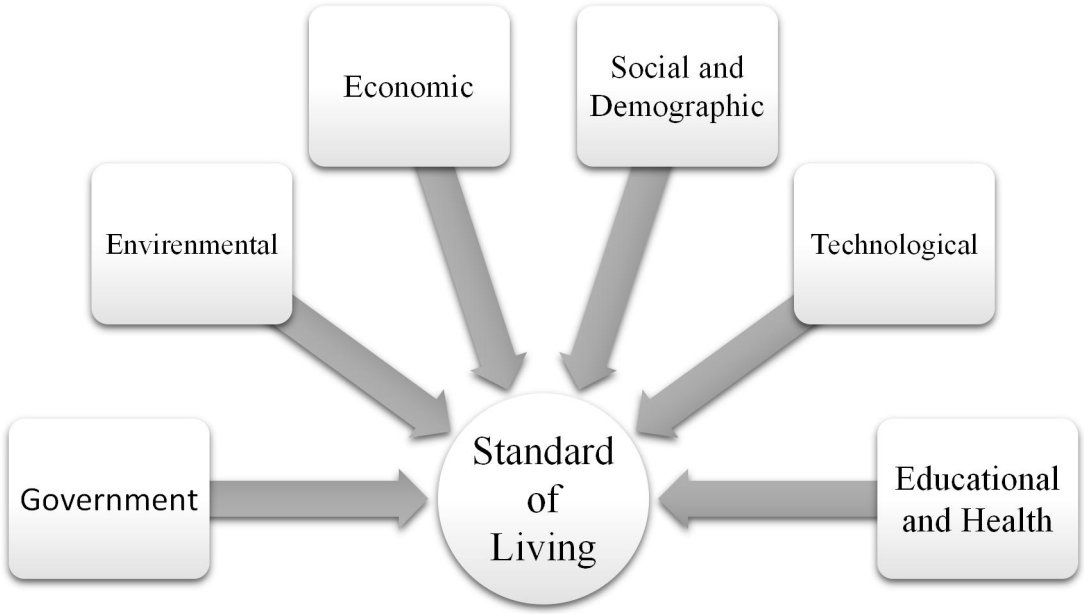


Figure 5: Types of factors that can influence the standard of living (Source:*Author's own*).

Before ending this chapter, we would like to draw attention to a special work entitled: «Non-democratic regimes and growth: theory and estimation»[23] by the author *Aristomène Varoudakis*, where he showed that even democracy plays a very important role in the well-being of citizens and generates economic growth. A work a little similar to that of *Aristomène Varoudakis* carried out by *Francesco Grigoli* and *Eduardo Ley* published by the IMF, entitled[24]: «Quality of Government and Living Standards» where the authors show how an efficient policy of public expenditure considerably improves the standard of living. All of this has been cited to show that the factors affecting people's standard of living go beyond some of the factors that some people think, and despite the multitude of determinants of standard of living, but

[23] Varoudakis, Aristomene. "Non-Democratic Regimes And Growth: Theory And Estimation." Economic Review, vol. 47, no. 3, 1996, pp. 831–840. JSTOR, www.jstor.org/stable/3502584. Accessed April 01, 2021.

[24] Grigoli, Francesco, and Eduardo Ley. IMF Working Paper: Quality of Government and Living Standards - Adjusting for the Efficiency of Public Spending. USA: INTERNATIONAL MONETARY FUND, 2012. https://doi.org/10.5089/9781475505306.001 Web.

one thing that is certain that good governance always generates a decent standard of living. Subsistence economy[25] which defined by *Todaro, M. P. & Smith* as an economy in which production is mainly for personal consumption and the standard of living yields little more than basic necessities of life as food, shelter, and clothing. It is usually the consequence of government decisions and her failed policy.

[25] Michael P. Todaro &Stephen C. Smith (2009). Economic development. Boston: Pearson Addison Wesley. Twelfth Edition. Page 6.

CHAPTER TWO
Review of methodologies and empirical findings

1. Measuring the standard of living

In economics, the standard of living is a statistical data commonly used to make international comparisons, to measure inequalities in order to better combat them or to assess the impact of technical progress. This concept thus responds to a precise definition: «*the standard of living is determined by what an individual actually has to live*», explains *Julie Labarre*, head of the Income and Household Wealth Division at INSEE[26].

We often hear remarks like: "Given his standard of living, he must have a large income!". However, the two are not necessarily related. This suggests that the standard of living may not be fully represented by a single variable. Because as indicated by the preceding sections, a set of components must be considered in the statistical modeling, measurement or comparison of standard of living. The objective of this section is, therefore, to search the literature for possible proposals or contributions concerning the measurement or comparison of living standards which can help us construct our model.

Many studies have suggested methods to model and measure the standard of living and well-being both at the individual and social levels, and due to their multiplicity, it is difficult to review all them, so we propose to review the most popular and those we think be able to contribute more for our case study.

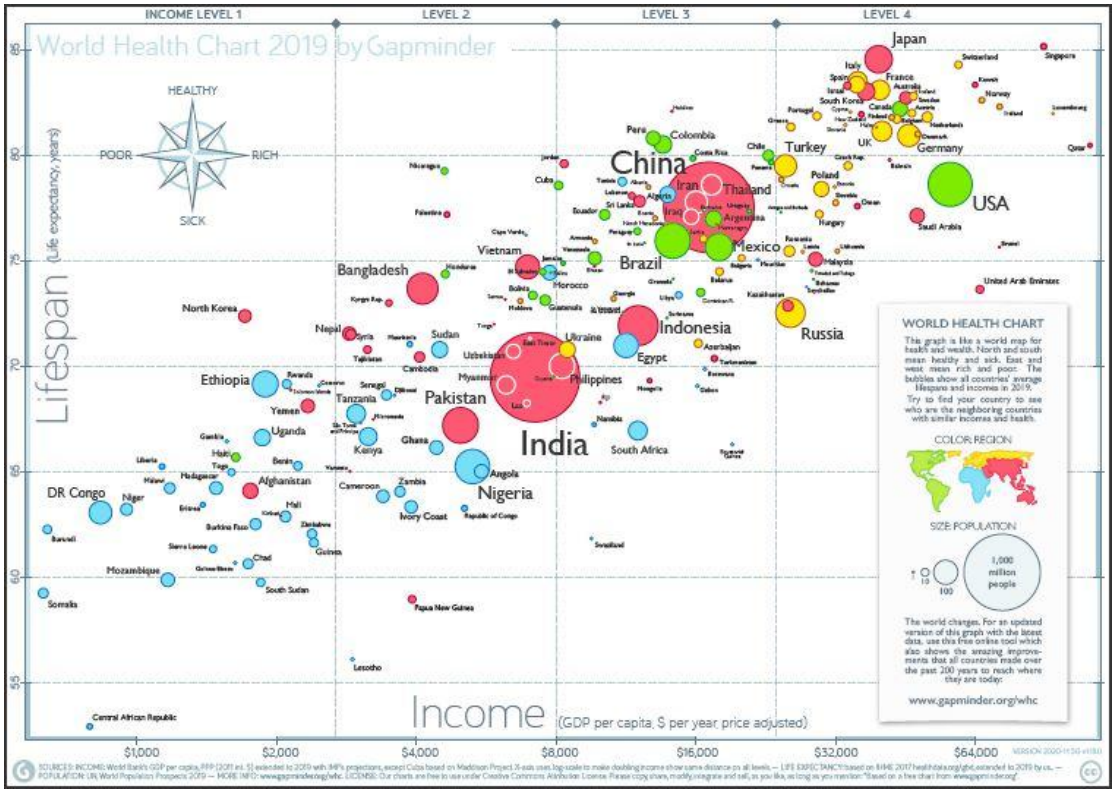
1.1. Real GDP per capita

It is the simplest and most used measure of standard of living because of the availability of data to use and it is easy to manage and use such metric. It measures

[26] Article edited by Béatrice Madeline, online magazine: "pour l'eco", December 26, 2019, modified August 28,2020. https://www.pourleco.com/les-bases/question-de-cours/comment-mesure-le-niveau-de-vieAccessed April, 2021.

the average individual standard of living in a country. It is true that it takes into account only material and merchant goods, but the advantage that it is correlated with a lot of other non-material component that determines the standard of living. In other words, increases in real GDP per capita also correlate with improvements in those things money cannot buy, such as health, happiness and education. This means that as real GDP per capita rises, a country also tends to get related benefits.

We take the example of life expectancy, as one of the determinants of the standard of living. The figure below shows the relationship between GDP per capita (the horizontal axis) and life expectancy (the vertical axis). It is easy to notice that countries with higher GDP per capita also have higher life expectancy. In the same context, according to a study published by INSEE[27], the richest live up to 13 years longer than the poorest.



[27] Nathalie Blanpain, "L'espérance de vie par niveau de vie : chez les hommes, 13 ans d'écart entre les plus aisés et les plus modestes", Demographic Surveys and Studies Division, Insee. N 1687, Published on: 02/06/2018. Accessed May 2021:https://www.insee.fr/fr/statistiques/3319895#documentation

Figure 6: Relationship between GDP per capita and life expectancy (Source: https://www.gapminder.org/fw/world-health-chart/whc2019/ *based on data for the year 2019*)

In a multi-country study, *Stevenson and Wolfers (2008)* show that GDP per capita exhibit a positive association with other determinants of the standard of living, such as happiness and life satisfaction.

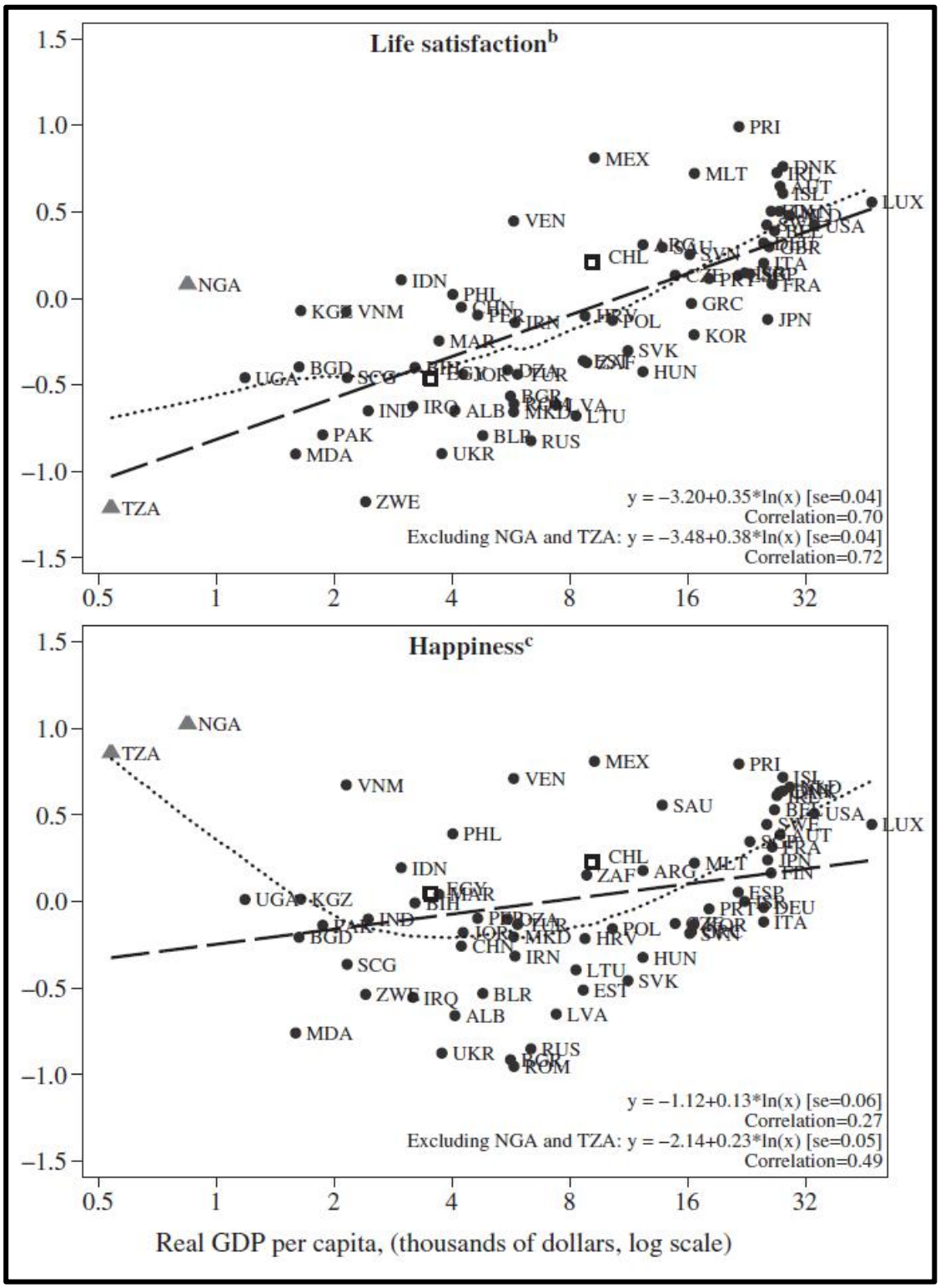


Figure 7: Subjective Well-Being and Real GDP per Capita: 1999–2004 World Values Survey (Source: Stevenson. B & Wolfers. J (2008). Economic growth and subjective well-being: Reassessing the Easterlin paradox (No. w14282). Page 17)

This above figure summarizes *Stevenson and Wolfers*'s (2008) results, with the GDP per capita on the horizontal axis, the level of happiness and the degree of life satisfaction on the vertical axes. The scatter plot shows some increasing trend and both regressions have a positive adjustment coefficient[28].

These results are confirmed by data from the United Nations, which shows that the Human Development Index (HDI)[29]"which combines measures of life expectancy, education and standard of living"from any country does increases only when GDP per capita also increases (see the figure below):

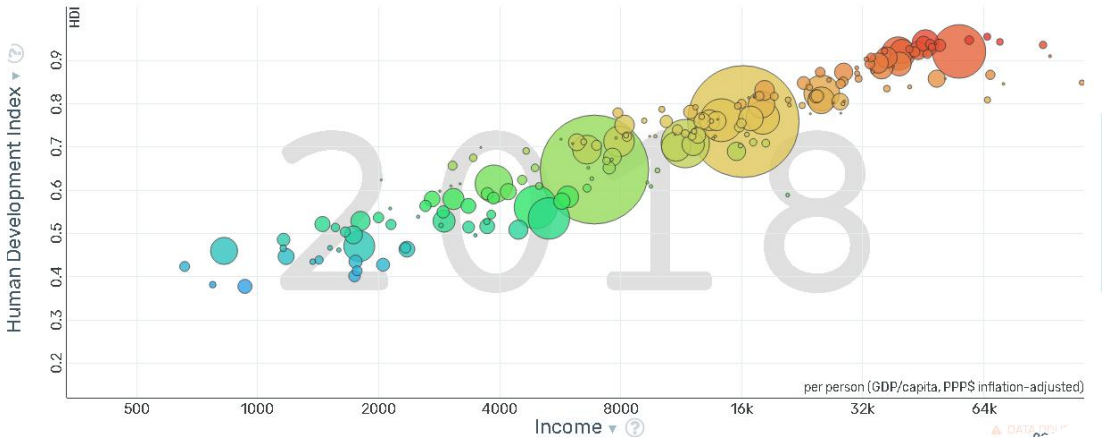


Figure 8: Chronological evolution of the HDI with the level of income constructed on the basis of the GDP per capita, PPP $ inflation adjusted. (Source: Gapminder World based on World Bank data; https://www.gapminder.org/tools).

[28] For more details on the data source used and the estimation method, please see the following article: Stevenson. B & Wolfers. J (2008). Economic growth and subjective well-being: Reassessing the Easterlin paradox (No. w14282). National Bureau of Economic Research. Brookings. Papers on Economic Activity. DOI 10.3386/w14282

[29] The Human Development Index (HDI) is a synthetic index which takes into account the main dimensions of human development; created by the United Nations Development Program (UNDP) in 1990, developed by UNCTAD (United Nations Conference on Trade and Development) under the leadership of Amartya SEN.

Both figures (8 and 9) are based on 2018 data. Each bubble is a country, and the size of the bubble represents the population, while the color of the bubble represents the continent to which that country belongs.

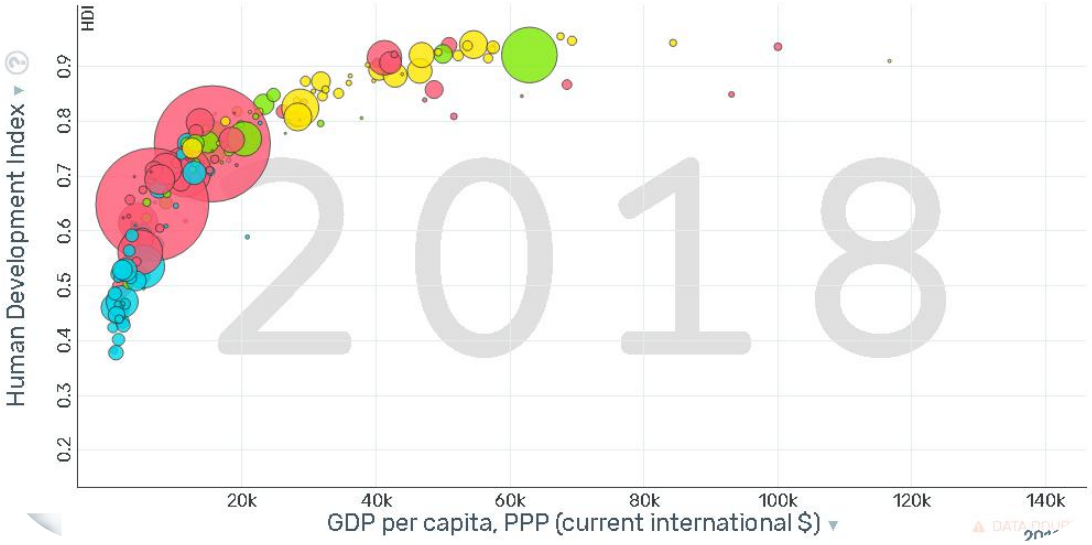


Figure 9: Chronological evolution of HDI with Gross Domestic Product per person adjusted for differences in purchasing power in international dollars, fixed 2009 prices, PPP based on 2011 ICP. (Source: Gapminder World based on World Bank data;https://www.gapminder.org/tools).

Despite the difference in the way of measuring GDP per capita in the two previous figures, but the strong correlation between it and the HDI still appears. An even more surprising observation is that the area where the GDP per capita is high (for example more than 40k) there are no countries with HDI below 0,8. The same also applies to the area where the GDP per capita is less than 2k, very few countries have an HDI that exceeds 0,6. In other words, this data shows us that income and health go hand in hand. People live longer in richer countries. Or the other way around. Countries are richer where people live longer. There are no high income countries with a short life expectancy, and no low income countries with a long life expectancy.

It is true that there is a huge difference in life expectancy between countries on the same income level, depending on how the money is distributed and how it is used.

But what must be kept in mind is that that despite the GDP per capita only takes into account the material side of a population, but it remains a good measure of standard of living. People's longevity tends to increase and citizens tend to be better educated and happier when the real GDP per capita of that population is greater. All these results prove that there is a positive link between the average levels of subjective well-being and the GDP per capita in the countries. Because by examining[30] the relationship between changes in subjective well-being and income over time in countries, we observe a clear picture of importance of real income level in determining happiness, standard of living and growth economy of the country.

Per capita GDP is the statistic that defines who is who in development rankings[31]. It may be a suitable indicator for tracking economic activity for a given country over time, but all this does not make it the perfect measure of standard of living.

Per capita GDP also has some flaws, and its shortcomings in measuring economic welfare are well known. First, since it measures the value of everything that is produced in a country during a year, divided by the number of people, so it is an average that does not take into account the extremities which is inequality in reality. By this we mean that the GDP per capita measurement assumes that production, and its income, are divided equally among everyone. That's because it is an average and ignores income inequality. It can report a high standard of living for a country where only a few people at the top enjoy the wealth. So it is not a question of income, but of income distribution, an issue that GDP per capita cannot fully address. Furthermore, since it is an average, GDP per capita cannot measure the standard of living at the individual or household level, therefore, only provides us with a glimpse of the

[30] See: Stevenson. B & Wolfers. J (2008). Economic growth and subjective well-being: Reassessing the Easterlin paradox. op cit.

[31] Grigoli, Francesco, and Eduardo Ley (2012). IMF Working Paper: Quality of Government and Living Standards - Adjusting for the Efficiency of Public Spending. USA: INTERNATIONAL MONETARY FUND. op cit

national standard of living. In other words, real GDP per capita can be viewed as a thermometer reading, which gives a quick overview of the temperature, but it doesn't tell us everything.

Second, the prices used to value the different goods that compose GDP reflect scarcity, not importance to welfare[32]. More specifically, prices do not give goods the right weight to measure well-being and standard of living. For example, water vital but cheap, while diamonds are non-essential but expensive.

Figure 10: Prices Used to Value Water and Diamonds in GDP Reflect Scarcity, not the Importance for Welfare. (Source: Reinsdorf, M. M. B. (2020). Measuring Economic Welfare: What and How?. International Monetary Fund. Page 15)

Finally, GDP per capita does not count unpaid work such as volunteer activities and housework although they are also essential for the well being of the people. Also the GDP per capita does not effectively measure pollution and safety, although they are all factors that can significantly influence the standard of living.

In short, while GDP per capita helps us measure a country's standard of living and provides a good indication of the progress of countries, it is far from the ultimate goal

[32] Reinsdorf, M. M. B. (2020). Measuring Economic Welfare: What and How?. International Monetary Fund.

of measuring the state of our well-being. However, it is worth understanding how GDP per capita correlates to many other things we care about such as our health, our happiness, and our education. For this reason, it is not a perfect measure of standard of living, but it is still a useful one.

1.2. Equivalence scales

Comparing the standard of living of households requires taking into account the demographic composition of these households, their disposable income as well as any economies of scale obtained by pooling their income and expenditure. To this end, we use the so-called equivalence scales.

According to the *New Palgrave Dictionary*[33], an equivalence scale is a measure of the cost of living of a household of a given size and demographic composition, relative to the cost of living of a reference household (usually a single adult), when both households attain the same level of utility or standard of living.

Balli and *Tiezzi*[34] view equivalence measures as indexes that convert the expenditure of a generic consumption unit into the expenditure of a specific reference unit, called equivalent expenditure, maintaining the same well-being of the former. A generic unit may be any household, but the reference unit is a household with specified demographic characteristics, as a childless couple or a single. However, *Nicholson*[35] argues that equivalence scales are intended to measure the relative income necessary to enable families of different sizes, or in different circumstances, to enjoy the same standard of living. He also considers equivalence scales to be useful in different

[33] Lewbel, A., & Pendakur, K. (2008). Equivalence scales. *New Palgrave Dictionary of Economics*,vol. 3, p. 26-29

[34] Balli, F., & Tiezzi, S. (2011). Equivalence scales declining with expenditure: Evidence and implications for income distribution. Università di Siena.

[35] Nicholson, J. L. (1976). Appraisal of different methods of estimating equivalence scales and their results. Review of Income and Wealthvol. 22, no 1

contexts, including assessing and comparing changes in real income, income distribution, taxes and social security benefits.

The equivalence scale has also been measured at the individual level as the household expenditure level scaled by the reference household equivalent-expenditures. For example, according to *Jackson* (1968), a typical adult living alone requires 36% of the income of a typical family of four to attain the same standard of living or welfare level as the family.[36]

Thus, equivalence scales are used to make interpersonal and inter-household comparisons of well-being and standard of living, to measure social welfare, economic inequality and poverty, and to index social benefits payments, taking into account the size and composition of the household and the economies of scale resulting from the pooling of income and expenditure within households. In other words, equivalence scales make the incomes of households of different sizes and compositions comparable, and measure the extent to which consumption units[37] share goods internally: higher values mean lower economies of scale.

Theoretically, the equivalence scales depend on the socioeconomic system in place. So, the fact that certain expenses are socialized or on the contrary left to be borne by households, or even the lifestyle of the community in which the household lives, affects these scales. For example, in countries where higher education is primarily the responsibility of households, the cost of a child is likely to be higher (especially after 18 years) than in a country where higher education is subsidized. So it makes sense that an equivalence scale is valid for a given socioeconomic and financial system and is therefore likely to be distorted when the latter changes.

[36] Jackson, Carolyn A., (1968), "Revised Equivalence Scale for Estimating Equivalent Incomes or Budget Cost by Family Type," U.S. Bureau of Labor Statistics Bulletin 1570- 2, November 1968.
[37] The meaning of the term: "consumption units" will be explained in the following.

In the literature[38], two approaches can be used to estimate these scales: an "objective" approach based on modeling household consumption expenditure, or a "subjective" approach based on how households perceive their standard of living:

The "objective" approach involves modeling household demand for various goods as a function of both income and household composition. In practice, this means that statisticians must define their own measure of a household's standard of living. Two major hypotheses have been proposed according to this approach:

- ✓ The first is the hypothesis of *Engel* already seen in the first chapter; according to which a household's standard of living depends on how much of its budget it spends on food expenses. The more a household spends a significant part of its budget on food, the lower its standard of living. It is therefore the budget coefficient associated with food that determines the standard of living of the household[39].
- ✓ The second is *Rothbarth*'s hypothesis, according to which expenditure on goods consumed exclusively by adults could be used as a measure of a household's standard of living. In other words, the more a household spends (in absolute value) on the purchase of goods intended for adults, the more it has a high standard of living. The problem for the statistician is then to isolate among the household expenses those which exclusively concern adults. In general, clothing for adults or spending on tobacco and alcohol are the most privileged[40].

The "subjective" approach, proposed for the first time in the literature by *Kapteyn* and *Van Praag*[41] (1976), Its main advantage is (unlike the objective approach) that

[38]See for example: Martin, H. (2017). Calculating the standard of living of a household: one or several equivalence scales?. *Économie et Statistique*, vol. 491, no 1, p. 93-108.

[39]Engel, E. (1857). Les conditions de la production et de la consommation en Saxe.

[40] Rothbarth, E. (1943). Note on a Method of Determining Equivalent Incomes for Families of Different Composition. In: Madge C. (Ed.). War Time Pattern of Saving and Spending. Occasional Papers IV, National Institute of Economic and Social Research.

[41] Kapteyn, A. & Van Praag, B. (1976). A new approach of the Construction of Family Equivalence

estimations do not need be based on a definition of the standard of living set arbitrarily by the statistician[42]. Indeed, the standard of living attributed to each household is based either on the household's opinion of its own standard of living or on the population's average opinion of its standard of living. The variables used are therefore not household expenditure but result from questions on the household's perception and feeling on their standard of living. In general, this approach is based on field surveys. this approach is based and using data from household budget surveys.

These scales which measure the equivalent needs of households of different composition are useful in a wide variety of contexts such as income distribution and redistribution, studies on poverty, standards of living. Below are some examples of equivalence scales:

1.2.1. Engel scales

Engel, the founding-father of this whole subject, considered that the proportion of the total expenditure of a household which is spent on food is a good indicator of the material standard of living of the household. This was based on the observed decline which took place in the proportionate expenditure on food as income increased, and provides a numerical method of comparing the standards of living of households of the same composition.

The vision of *Engel* in 1857 allowed the emergence of many ideas, including the proportional approach, which built equivalence scales on the basis of expenditure for a given product or group of products as a proportion of income. The main bases for

Scales. European Economic Review, 7(4), 313–335.

[42] Hourriez, J.-M. & Olier, L. (1997). Niveau de vie et taille du ménage : estimations d'uneéchelle d'équivalence. Économie et Statistique, 308-309-310, 65–94. doi: 10.3406/estat.1998.259

constructing equivalence scales according to *Engel*'s approach can be summarized as follows[43]:

- **Expenditure on Food**

This type of equivalence scales are based on food expenditure, and derive from the work of *Engel* who, in 1857, had observed that the proportion of the total of expenditure used for food, (other things being equal), is the best measure of the material standard of living of a population. It is now a well-known fact that expenditure on food as a proportion of total expenditure (or income) decreases as a household's income increases.

- **Expenditure on "Necessities" other than Food**

Scales have also been constructed based on the proportion of a household's expenditure on other "necessities" such as housing, heating and lighting, and clothing, separately or in combination with food. Expenditure on these "necessities" as a proportion of total expenditure (or income) also decreases as a household's income increases.

- **Expenditure on "Luxuries"**

Corresponding scales can be constructed, based on the proportion of total expenditure going on "luxuries" with varying coverage.

- **Total Consumers' Expenditure/Savings**

It has also been observed that the proportion of total consumer spending to income decreases as income increases; or, to put it the other way around, that the ratio of savings to income increases as income increases. Other scales can also be estimated from the proportion of income going to consumer goods and services (or savings).

[43] Nicholson, J. L. (1976). Appraisal of different methods of estimating equivalence scales and their results. Op cit.

1.2.2. The OECD equivalence scales

Since households differ in size and composition, it is necessary to adjust income to account for differences in needs in order to be able to measure the standard of living of the entire household, as the needs of a household increase with each additional member but in a non-proportional way due to economies of scale in consumption. For example, the needs for housing, electricity, etc. will not be three times more important for a household with three members than for a single person. Per capita income (or real GDP per capita) ignores these economies of scale in the production and consumption of household goods and services. This is why equivalence scales have been designed to assign a value proportional to household needs while taking into account the size of the household and the age of its members (because the needs of adults and children are not the same).

In addition to family characteristics such as age and household structure, the region also affects the standard of living of the household as it is the region which determines the social and economic system and the lifestyle as we have already explained above.

In general, the total disposable income of the household divided by the equivalent number of its members measures the well-being of the household. In other words, it is necessary to adjust the total disposable income according to the total weight of the people who make up the household and not their number. It is these weights attributed to each member of the household (according to their age or sex or other) that make the difference between the different equivalence scales currently used in policies or discussed in the scientific literature.

So this diversity of equivalence scales is evident in comparative studies of the distribution of income and well-being. But in general they are presented in the form of

a ratio which represents the elasticity of needs which maintains a given standard of living by varying the size of the household. And as we have already said; the factors commonly taken into account to construct these equivalence scales are the size of the household and the age of its members, and using these equivalence scales, each type of household in the population is assigned a value proportional to its needs. A wide range of equivalence scales exist, many of which are reviewed in *Atkinson*[44] *et al.*(1995). Some of the most commonly used scales include:

- **Old OECD scale**

This scale, also called the "Oxford scale", assigns a value of 1 to the first member of the household, 0.7 to each additional adult and 0.5 to each child under 14 years of age. An OECD report recommended its use in 1982, and according to *Förster & d'Ercole*[45]this scale was mentioned by OECD (1982) for possible use in "*countries which have not established their own equivalence scale*". For this reason, the literature also refers to it as the "(old) OECD scale"[46]. This scale dominated the literature from the 1950s[47].

- **OECD-modified scale**

After having used the "old OECD scale" in the 1980s and the earlier 1990s, the Statistical Office of the European Union (EUROSTAT) adopted in the late 1990s the so-called "OECD-modified equivalence scale". This scale, first proposed by *Haagenars et al.*(1994)[48], assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child aged under 14.

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[44] Atkinson, A.B., L. Rainwater and T. M. Smeeding (1995), Income Distribution in OECD Countries, OECD Social Policy Studies, No. 18, Paris.

[45] Förster, M. F., & d'Ercole, M. M. (2012). The OECD approach to measuring income distribution and poverty. Counting the poor: new thinking about European poverty measures and lessons for the United States, 27-58.

[46] Martin, H. (2017). Calculating the standard of living of a household: one or several equivalence scales?. *Économie et Statistique.* Op cit.

[47] See:Hourriez & Olier, (1997).

[48] Hagenaars, A., K. de Vos and M.A. Zaidi (1994), Poverty Statistics in the Late 1980s: Research Based on Micro-data, Office for Official Publications of the European Communities. Luxembourg.

- **Square root scale**

However, in the early 1990s, after a review of empirical research on the topic, the OECD opted for a new scale of reference, assigning each household a number of adult equivalents equal to the square root of the number (N) of individuals living in the household. Knowing the age of individuals is not necessary for calculations based on the "square root of N" scale, making it easier to use. This implies that, for instance, a household of four persons has needs twice as large as one composed of a single person. This has been adopted by more recent OECD publications (e.g. OECD 2011[49], OECD 2008[50]) comparing income inequality and poverty across countries use a scale which divides household income by the square root of household size.

In conclusion, what these three scales have in common is that the construction of these scales is based on a principle called "Equivalisation" which is a technique in economics in which members of a household receive different weightings. Single adult households are taken as a reference group and given a weight of 1. Total household income is then divided by the sum of the weightings to yield a representative income. It is these "weightings" that INSEE calls "consumption units". In its "Family Budget" survey, like the majority of European countries, INSEE adopts a subjective approach using the modified OECD scale and assumes that the poverty line is equal to 60% of the median standard of living in the year 1990[51].

On the other hand, in the first and second scales, the age of 14 separates adults from children. Children under 14 are given a lower weight than an adult to reflect their assumed lower cost of living, while children 14 and over are given the same weight as an adult because their cost of living is assumed to be the same as that of an adults.

[49] OECD (2011), Divided We Stand – Why Inequality Keeps Rising, Paris.
[50] OECD (2008), Growing Unequal ? Income Distribution and Poverty in OECD Countries, Paris.
[51] See for example: Lelièvre, M., Sautory, O., & Pujol, J. (2010). Niveau de vie par âge et génération entre 1996 et 2005. Les revenus et le patrimoine des ménages,. And: Martin, H. (2017). Op cit.

So, in summary, equivalence scales are used to adjust household income, taking into account household size and composition, mainly for comparative purposes. The equivalence values for each member of the household are added together to give a total equivalence number for the household. For example, a household with a total equivalence value of 2 shows that this same household needs twice the income of a single adult household (which is the reference household) to achieve a comparable standard of living.

The table below illustrates how needs are assumed to change as household size increases, for the three equivalence scales described above and for the two "extreme" cases of no sharing of resources within household (per capita income) and full sharing (household income):

Household size	**Equivalence scale**				
	per-capita income	"Oxford" scale ("Old OECD scale")	"OECD-modified" scale	Square root scale	Household income
1 adult	1	1	1	1	1
2 adults	2	1.7	1.5	1.4	1
2 adults, 1 child	3	2.2	1.8	1.7	1
2 adults, 2 children	4	2.7	2.1	2.0	1
2 adults, 3 children	5	3.2	2.4	2.2	1
Elasticity[1]	1	0.73	0.53	0.50	0

Table 1: OECD equivalence scales and per capita income by household size. (Source:OECD. 2015. WHAT ARE EQUIVALENCE SCALES?Retrieved from: http://www.oecd.org/eco/growth/OECD-Note EquivalenceScales.pdf)

Using household size as the determinant, equivalence scales can be expressed through an "equivalence elasticity", that is, the power by which economic needs change with household size. The equivalence elasticity can range from 0 (when unadjusted household disposable income is taken as the income measure) to 1 (when per capita household income is used). The smaller the value for this elasticity, the higher the economies of scale in consumption.

It is true that the OECD scales and others can easily be applied, and are widely used in applied research. But, despite their popularity, several drawbacks of using equivalence scales have been pointed out in the literature (e.g., *Lewbel*[52], 1989; *Blundell* and *Lewbel*[53], 1991) because they involves many difficulties, both conceptual and practical, first of all they are difficult to construct because household utility cannot be directly measured, which results in economic identification problems.

Secondly, if the equivalence scale is defined as the relative cost of maintaining the same level of utility under different demographic regimes[54], and although if it being an inevitable element of comparison of well-being between households. But, there are several theoretical and structural problems in their calculation and interpretation, and it is well known that these equivalence scales are only identifiable under explicit assumptions.

By this we mean that the choice of a particular equivalence scale depends on technical assumptions about economies of scale in consumption as well as on value judgments about the priority assigned to the needs of different individuals such as children or the elderly. These judgments will affect results. For example, the poverty rate of the elderly will be lower (and that of children higher) when using scales that give greater weight to each additional household member[55]. In selecting a particular equivalence scale, it is therefore important to be aware of its potential effect on the level of inequality and poverty, on the size of the poor population and its composition, and on

[52] Lewbel, A. (1989). Nesting the AIDS and translog demand systems. International Economic Review, 349-356.
[53] Blundell, R., & Lewbel, A. (1991). The information content of equivalence scales. Journal of econometrics, 50(1-2), 49-68.
[54] Majumder, A., & Chakrabarty, M. (2010). Estimating equivalence scales through Engel curve analysis. In Econophysics and economics of games, social choices and quantitative techniques (pp. 241-251). Springer, Milano.
[55] Förster, M.F. (1994), "Measurement of Low Incomes and Poverty in a Perspective of InternationalComparisons", OECD Labour Market and Social Policy Occasional Paper, No. 14, Paris.

the ranking of countries. Sensitivity analyses suggest that while the level and, in particular, the composition of income poverty are affected by the use of different equivalence scales, trends over time and rankings across countries are much less affected[56].

In general, there is no accepted method for determining equivalence scales, and no equivalence scale is recommended by the OECD for general use.

1.3. Konüs index

A *Konüs* index is a type of cost-of-living index that uses an expenditure function or a utility function to assess the expected compensatory variation (in prices and quantities). It is also called "the true cost of living index". This theory was originally developed by the Russian economist, *A.A. Konüs* and he was also behind the theoretical basis for the cost of living index.[57]

According to the U.S. Bureau of Labor Statistics, a cost-of-living index is a theoretical price index that measures relative cost of living over time or regions. It is an index that measures differences in the price of goods and services, and allows for substitutions with other items as prices vary[58].

On the other hand, the cost of living index for a single person is defined according to

[56] Burniaux, J-M, T-T Dang, D. Fore, M.F. Förster, M. Mira d'Ercole and H. Oxley (1998), "Income Distribution and Poverty in Selected OECD Countries", OECD Economics Department Working Paper, No. 189,. Paris.

[57] Konüs, A. A. (1924). The problem of the true index of the cost of living (in Russian). Econ. Bull. State of Affairs Inst, 7, 64-72. This paper was first published by A. A. Konuis in The Economic Bulletin of the Institute of Economic Conjuncture, Moscow, No. 9-10 (36-37), September- October, 1924, pp. 64-71. It was translated from the Russian for Professor Henry Schultz by Dr. Jacques Bronfenbrenner of Washington University, St. Louis, Mo. Professor Schultz suggested that it be published in ECONOMETRICA.

[58] "BLS Information". Glossary. U.S. Bureau of Labor Statistics Division of Information Services. February 28, 2008. Website: https://www.bls.gov/bls/glossary.htm Accessed May 31, 2021.

Diewert[59] as the minimum cost of achieving a certain standard of living during a given period divided by the minimum cost of achieving the same standard of living during a base period. In order to numerically construct an individual's cost-of-living index, it is necessary to know his or her preferences over economic goods. Since these preferences are essentially un-observable, it is necessary to construct approximations to the cost-of-living index.

There are many different methodologies that have been developed to approximate cost-of-living indexes[60]. But generally in practice, the usual method of computing indexes of the cost of living is the so-called method of aggregates. This method consists of calculating the cost of a given aggregate of consumers goods taken in amounts corresponding to the average or normal consumption and at the prices prevailing at a given time, and dividing it by the cost of the same aggregate of consumers goods calculated on the basis of the prices of another period. Thus for instance in calculating the budgetary index of the Central Bureau of Labor and of the Gosplan[61], we use as a basis a collection of 24 kinds of goods which make up the normal consumption of a worker, according to the budgetary investigations of the end of 1923[62].

[59] Diewert, W. E. (1990). The theory of the cost-of-living index and the measurement of welfare change. Contributions to Economic Analysis, 196, 79-147.

[60] The commonly used cost of living index is the consumer price index, although this index is not, strictly speaking, a cost of living index. Other examples: Laspeyres price index, Paasche price index and Fisher price index. According to the The Boskin Commission Report (1996), Toward A More Accurate Measure Of The Cost Of Living, Washington. The Laspeyres index overestimates the cost of living because it does not take into account the possibilities of substitution. The Paasche index underestimates the cost of living. We could then believe that the "true" index lies between the Laspeyres index and the Paasche index and use the Fisher index which is the geometric mean of the two. But, this is not necessarily always the case, as it is even possible that the Paasche index is higher than the Laspeyres index.

[61] Commonly known as Gosplan, was a state body of the Soviet Union responsible for defining and planning the economic objectives to be achieved. It was created in February 1921 by decision of the Labor and Defense Council. The role of this institution increased in 1929, when the first five-year plan was implemented, providing for rapid industrialization and a significant reduction in the private sector of the economy. The Gosplan was dissolved in April 199 shortly before the disappearance of the Soviet Union.

[62] We have chosen this example it is just because we are dealing with an index of Russian origin.

The basis of Konüs index theory is that it assumes that consumers are "optimizers" and get as much utility as possible from the money that they have to spend. These assumptions can be shown to lead to a "consumer cost function"; *C(u,p)*, the cost of achieving utility level *u* given a set of prices *p*. Assuming that the cost function holds across time (i.e., people get the same amount of utility from one set of purchases in year as they would have buying the same set in a different year) leads to a "true cost of living index".[63] The general form for Konüs true cost-of-living index compares the consumer cost function given the prices in one year with the consumer cost function given the prices in a different year (reference year, also called base year). This is why this theory can therefore address the cost of living for a single consumer (or household) because it relies on the assumption of optimizing behaviour on the part of economic agents (consumers or producers)[64].

Practically, we assume that the household or individual has recurring preferences over combinations of N goods that may be represented by a utility function *F* where $u=F(x)$ is the utility level or standard of living that can be attained if the individual consumes the consumption vector $Xj= (X1, X2,...,Xj)$, in way that it aims to maximize its utility according to consumer theory.

The problem of maximizing consumer utility can be decomposed into two stages. In the first stage, the consumer attempts to minimize the cost of achieving a given utility level, and in the second stage, he chooses the maximal utility level that is just consistent with his budget constraint. It is therefore necessary to assume that the consumer maximizes his utility function *F(x)* under a budget constraint.

So, this index can show the relative change that occurs in the monetary cost of

[63] Konüs, A. A. (1939). The problem of the true index of the cost of living. Econometrica: Journal of the Econometric Society, 10-29.http://www.jstor.org/stable/1906997Accessed May, 2021.
[64] Diewert, E. (2004). The economic approach to index number theory: the single-household case. Consumer Price Index Manual–Theory and Practice, Genève, 313-335.

consumer goods that are necessary to maintain a certain standard of living. Thus, by calculating the true cost of living index, we compare the monetary cost of two different combinations of goods which are linked only by the condition that when consuming these two combinations, the general state of satisfaction of needs (the standard of living) is the same.

In simpler terms, the true cost-of-living index is the cost of achieving a certain level of utility (or standard of living) in one year relative to the cost of achieving the same level the next year (or base year relative to any year).

It is true that Konüs index only serves as a theoretical idea and is not a practical price index compared to the Laspeyres price index. But his theory allowed to show that the Laspeyres index is in common use to measure the cost of living. Therefore, we can use the utility function of this cost of living theory to estimate the standard of living that can be achieved if an individual (or household) consumes a certain amount of a set of goods at a given cost. Which means, that the minimum cost of a basket of goods and services can be used to achieve a standard of living associated with the same minimum cost to measure the standard of living to be achieved during the base period.

Which made us think about that; are the work results of *Latimaha, R., Ismal, N. A., & Bahari, Z*[65] which states that the cost of living and standard of living are two elements that have strong causal relationship and that there is a long-run relationship between the cost of living and standard of living[66]. In identifying the factors that influence the cost of living, the Granger causality test results indicate that there is evidence of unidirectional Granger causality from the cost of living to the standard of

[65] For more information please see: Latimaha, R., Ismal, N. A., & Bahari, Z. (2020). Cost of Living and Standard of Living Nexus: The Determinants of Cost of Living. Jurnal Ekonomi Malaysia, 54, 3. Available on the website: http://dx.doi.org/10.17576/JEM-2020-5403-01

[66] According to these three authors; even also with other factors as gross domestic product per capita, population growth, unemployment rate and degree of openness.

living but not vice-versa in Malaysia. So we can conclude that the cost of living is an essential factor that determines the standard of living, and for that, we can use the theory of true cost of living index in the analysis of standard of living.[67]

It is worth noting that the assessment of the effects on welfare must be unambiguous. This is why criticisms have been leveled at the Konüs index by *Guerra, A. I., Manresa, A., & Sancho, F*.[68] These authors have shown that the Konüs true index of cost of living is numéraire dependent in general equilibrium, which can lead to ambiguity or even contradiction in the interpretation of welfare results. In a partial equilibrium framework, they express quantities of value in fixed nominal terms and they therefore consider that there is no ambiguity linked to their interpretation. Under general equilibrium and due to Walras' law, the representation of any equilibrium price vector is unique but only until the selection of a reference unit, i.e. the numéraire. This selection will determine the expression of all the magnitudes of value; in particular, it will affect the minimum spending levels and therefore the Konüs index itself.

To correct this problematic interpretive situation, these same authors in their publication suggest normalizing the standard Konüs index using an endogenously determined price index. They also provide a simplified expression of the index for the special case of homothetic utilities, which is especially relevant given their widespread use in numerical general equilibrium.

1.4. Cluster analysis

This is a method of analyzing of standard of living Indicators that we discovered through the article edited by Czech authors: *Naďa Birčiaková, Jana Stávková and*

[67] We have already discussed this idea in the first chapter, but we wanted to detail more on the occasion of this title which is strongly linked to the topic of cost of living.
[68] Guerra, A. I., Manresa, A., & Sancho, F. (2018). The true index of cost of living under general equilibrium: The numéraire matters. Economics Letters, 173, 69-72.

Veronika Antošová from Mendel University Brno, Faculty of Business and Economics.[69] This article titled "Evaluating Living Standard Indicators" aims to assess the explanatory power of selected indicators of living standards, to highlight their differences and their relationships. The main objective is to suggest factors that should be included in the assessment of living standards.

This paper deals with the evaluation of selected available indicators of living standards, divided into three groups, namely economic, environmental, and social. Six countries of the European Union for analysis were selected: Bulgaria, the Czech Republic, Hungary, Luxembourg, France, and Great Britain. The aim of this paper is to evaluate indicators measuring living standards and suggest the most important factors which should be included in the final measurement. The authors tried to determine what factors influence each indicator and what factors affect living standards. The main method chosen is regression analysis. From the study of the factors, it is possible to deduce their impact on the standard of living, and therefore the value of the standard of living indicators. Indicators with a high degree of reliability include the following factors: size and density of population, health care and spending on education. Emissions of carbon dioxide in the atmosphere also have a certain lower degree of reliability.

To achieve the objectives of this paper, the authors of this paper selected six countries and used cluster analysis to analyze their GDP by the expenditure method. Its aim was to group the individual EU members into clusters. This is a hierarchical form of clustering, comprising of subsets. Clusters are created on the basis of similarities, or on the contrary, of differences. There are several possible ways to measure separation or similarity. To cluster objects of interest, the nearest neighbour method was used,

[69] Birciaková, N., Stávkova, J., & Antosová, V. (2015). Evaluating living standard indicators. DANUBE: Law, Economics and Social Issues Review, ISSN 1804-8285, De Gruyter, Warsaw, Vol. 6, Iss. 3, pp. 175-188, http://dx.doi.org/10.1515/danb-2015-0011

aka complete linkage. The distance between clusters is governed by the distance of the two outermost objects from different clusters. The cluster analysis outcome is a dendrogram[70], which is a cluster diagram. The dendrogram reveals those that are similar and inter-correlated.

From each cluster, a representative was selected in order to clearly see the differences in GDP among the countries. These representatives include the Czech Republic, Bulgaria, Great Britain, Luxembourg, Hungary, and France. GDP is seen as a benchmark for comparing the level of the standard of living between this indicator and other indicators of living standards. The reference period for the monitoring of selected indicators in individual countries are the years 2000 to 2011. The authors then divided the individual indicators for the assessment of countries according to living standard indicators into three groups, namely economic, environmental and social indicators.

Economic indicators are represented by the Genuine Savings Index (GSI). This index is based on the gross domestic savings and Global Competitiveness Index (GCI), which is in some measure an expression of economic productivity. Environmental indicators include Ecological Footprint (EF), the Environmental Performance Index (EPI) and Happy Planet Index (HPI). Social indicators include the Human Development Index (HDI) and Sustainable Society Index (SSI). Several variables contribute to the value of individual indicators. Such variables may affect the creation of several indicators from the three groups mentioned above. The regression analysis and the determination of the coefficient (R^2) is used for the purpose of monitoring the

[70] The dendrogram is a graphical representation of the results of hierarchical cluster analysis . This is a tree-like plot where each step of hierarchical clustering is represented as a fusion of two branches of the tree into a single one. The branches represent clusters obtained on each step of hierarchical clustering.In simpler terms, a dendrogram is a branching diagram that represents the relationships of similarity among a group of entities. Each branch is called a clade. According to; Drout, M., & Smith, L. (2012). How to read a dendrogram. Wheaton College. and website: https://www.statistics.com ›glossary› dendrogram accessed June 2021.

relationships between the variables. For variables with a high coefficient of determination, the authors established a mathematical regression model, which is expressed in the form of a system of n equations by examining the model using the least squares method and subsequently testing the significance of the variables at the significance level = 0.1. Then they excluded from the model all the variables which did not respect this provision.

The conclusion of this analysis did not provide a method for measuring or comparing standards of living, but it did make it possible to assess and select the factors that influence standard of living. So that this study can contribute considerably in the choice of the variables which can determine the standard of living.

1.5. Gini coefficient

The Gini coefficient (or the Gini index) is a synthetic indicator making it possible to account for the level of inequality for a variable and for a given population. It varies between 0 (perfect equality) and 1 (extreme inequality). Between 0 and 1, the inequality is all the stronger as the Gini index is high.

It is equal to 0 in a situation of perfect equality where the variable takes an identical value over the entire population. At the other extreme, it is equal to 1 in the most unequal situation possible, where the variable is equal to 0 over the entire population except for a single individual. The inequalities thus measured can relate to variables of income, salary, standard of living, and so on.[71]

The Gini coefficient is also defined as a statistic conventionally used to describe in a synthetic way the degree of inequality in the distributions (usually of income and

[71] INSEE, Published on: 01/13/2020, extracted from the following internet link: https://www.insee.fr/fr/metadonnees/definition/c1551consulted in June 2021.

wealth).[72]

It was developed by the Italian statistician *Corrado Gini* in 1912 on the occasion of his book published in Italian under the name of "Variabilità e Mutabilità" (Variability and Mutability)[73] where he presented for the first time the index that today is known as the "Gini Index"[74]. It serves to measure the distribution of income and wealth within a population. It is often used as an indicator of economic inequalities, measuring the distribution of income or, more rarely, the distribution of wealth among a population. The coefficient ranges from 0 (or 0%) to 1 (or 100%), with 0 representing perfect equality and 1 representing perfect inequality. Values over 1 are theoretically possible (but rarely) due to negative income or wealth.

So, a country in which every resident has the same income would have an income Gini coefficient of 0. A country in which one resident earned all the income, while everyone else earned nothing, would have an income Gini coefficient of 1.

The Gini index is often represented graphically through the Lorenz curve[75], which shows income (or wealth) distribution by plotting the population percentile by income from lowest to highest income (therefore the population is represented from poorest to richest) on the horizontal axis and cumulative income on the vertical axis. Taking a typical Lorenz curve as an example, a total equality would be a straight diagonal line with a slope of 45 degrees as shown in the figure below:

[72] Marshall, G. "Gini coefficient ." A Dictionary of Sociology. Retrieved June 16, 2021 from Encyclopedia.com: https://www.encyclopedia.com/social-sciences/dictionaries-thesauruses-pictures-and-press-releases/gini-coefficient

[73] Gini, C. (1912): Variabilità e Mutuabilità. Contributo allo Studio delle Distribuzioni e delle RelazioniStatistiche. C. Cuppini, Bologna.

[74] It should be noted that the original book published in Italian has not been translated into English.

[75] In economics, the Lorenz curve is a graphical representation of the distribution of income or of wealth. It was developed by Max O. Lorenz in 1905 for representing inequality of the wealth distribution. The curve is generally convex (but varies in the degree of convexity). A Lorenz curve is usually a mathematical function estimated from an incomplete set of observations of income or wealth.

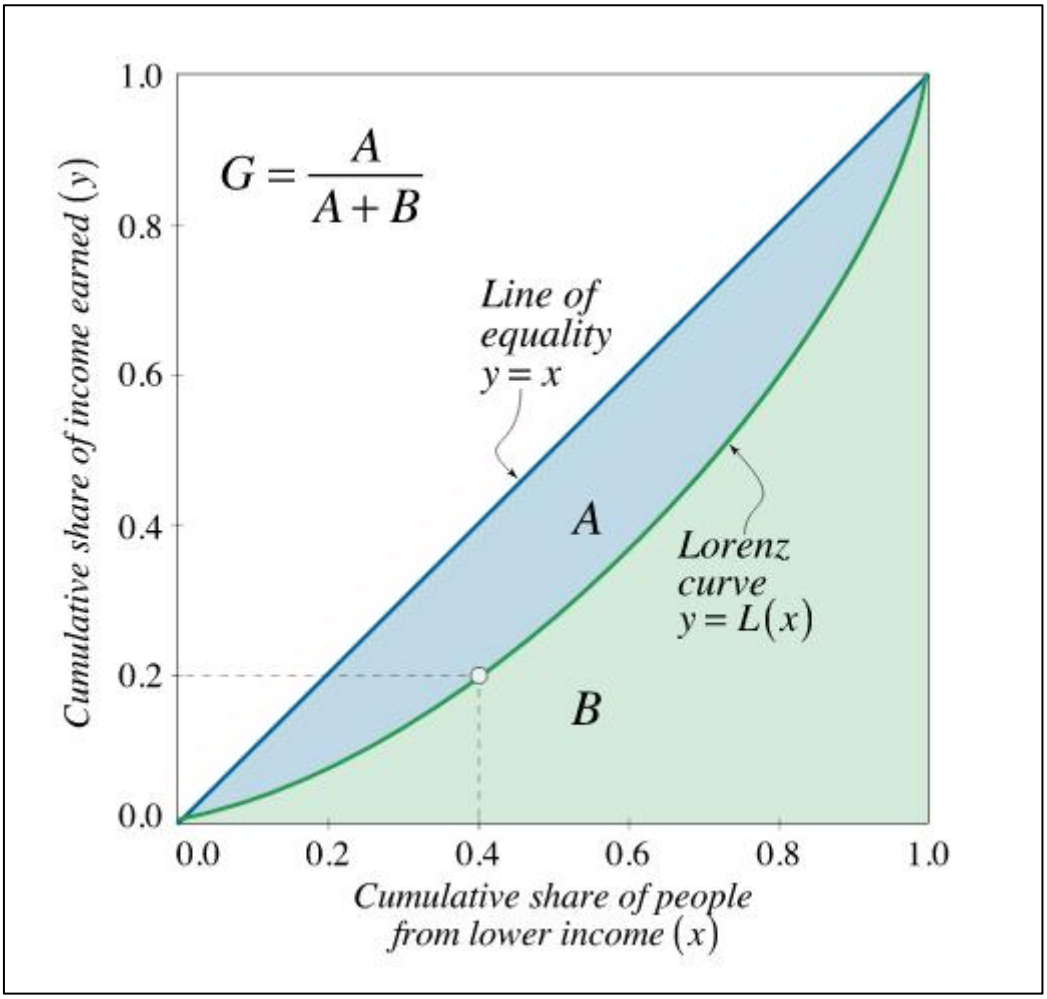


Figure 11: Lorenz curve and Gini coefficient (G). (Source: Applications of Integrals in Economics online course, available at the website: https://www.math24.net/applications-integrals-economics Accessed June 2021).

The Gini coefficient can then be thought of as the ratio of the area that lies between the line of equality and the Lorenz curve (marked *A* in the diagram) over the total area under the line of equality (marked A and B in the diagram); i.e., the Gini coefficient is equal to G = A/(A + B). It is also equal to 2A and to 1 − 2B due to the fact that by definition A + B = 0.5 (since the axes scale from 0 to 1).

For instance, if a Lorenz curve has a point with coordinates (0.4;0.2), this means that the first 40% of population (ranked by income in increasing order) earned 20% of total income. And therefore, the Gini coefficient (G) is defined as the area between the

line of equality and the Lorenz curve, divided by the total area under the line of equality according to the following equation among as many ways to calculate possible: $G=A/(A+B) = 2\ {}_0\int^1[x-L(x)]dx$.[76]

A more tangible example in the graph below which represents the Lorenz curves corresponding to Haiti and Bolivia. If we take for example the 47th percentile; it corresponds to 10.46% in Haiti and 17.42% in Bolivia, this means that the bottom 47% of Haitians take in 10.46% of their nation's total income and the bottom 47% of Bolivians take in 17.42% of theirs.

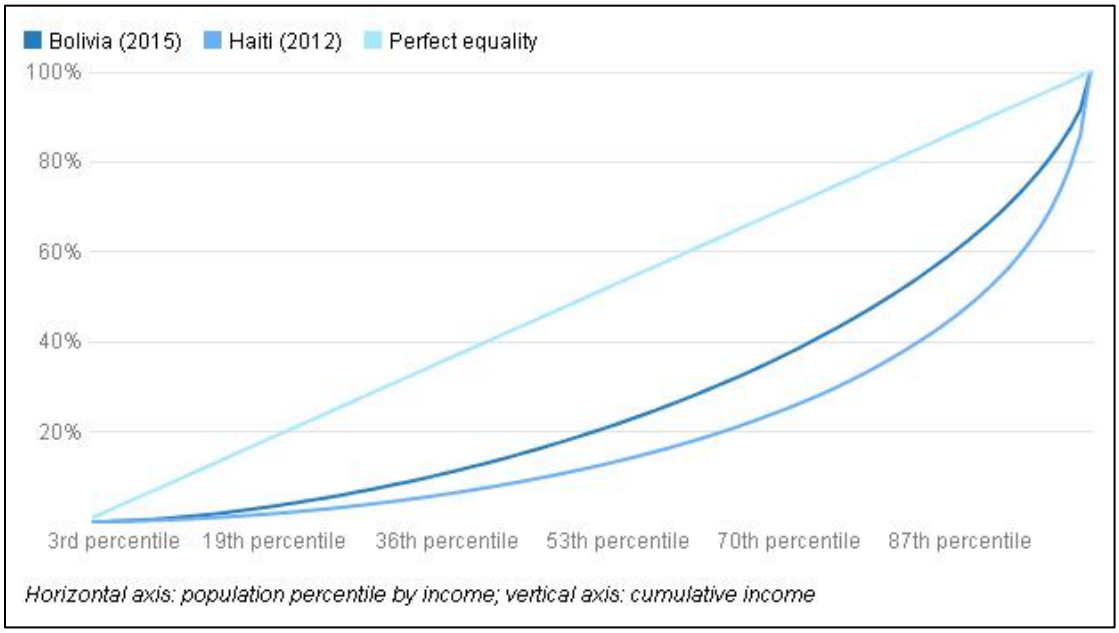


Figure 12: Lorenz curves of Bolivia and Haiti. (Source: https://www.investopedia.com/terms/g/gini-index.asp according to World Bank data, Created with "Datawrapper").

To estimate the income Gini coefficient for Haiti in 2012, we would find the area

[76] This formula is according to Alex Svirin, "Applications of Integrals in Economics" 2020, [Online].Available:https://www.math24.net/applications-integrals-economics. Accessed Juin 2021. There are as many formulas and ways of calculating this Gini coefficient. A Summary of the different formulations of the Gini index available on: Ceriani, L., & Verme, P. (2012). The origins of the Gini index: extracts from Variabilità e Mutabilità (1912) by Corrado Gini. The Journal of Economic Inequality, 10(3), 421-443.

below its Lorenz curve: around 0.2. Subtracting that figure from 0.5 (the area under the line of equality), we get 0.3, which we then divide by 0.5. This yields an approximate Gini of 0.6 or 60%.[77] Because the Gini coefficient is a measure of the deviation from perfect equality. The more the Lorenz curve deviates from the perfectly equal straight line (which represents a Gini coefficient of 0), the higher the Gini coefficient and the less equal the society. Thus, in the example above, Haiti is more unequal than Bolivia.

The Gini index around the world, it is generally called in this case "Global Gini". *Lakner, C* of the World Bank and *Milanovic, B* of the City University of New York estimate that the global income Gini coefficient was 0.705 in 2008, down from 0.722 in 1988.[78] Figures vary considerably, however *Bourguignon, F and Morrisson, C* estimate that the figure was 0.657 in both 1980 and 1992[79]. *Bourguignon* and *Morrisson*'s work shows a sustained growth in inequality since 1820 when the global Gini coefficient was 0.500. *Lakner and Milanovic*'s shows a decline in inequality around the beginning of the 21st century, as shown in the following figure:

[77] Example taken from the same source as the figure (investopedia.com).
[78] Lakner, C., & Milanovic, B. (2016). Global income distribution: from the fall of the Berlin Wall to the Great Recession. The World Bank Economic Review, 30(2), 203-232.
[79] Bourguignon, F., & Morrisson, C. (2002). Inequality among world citizens: 1820-1992. American economic review, 92(4), 727-744.

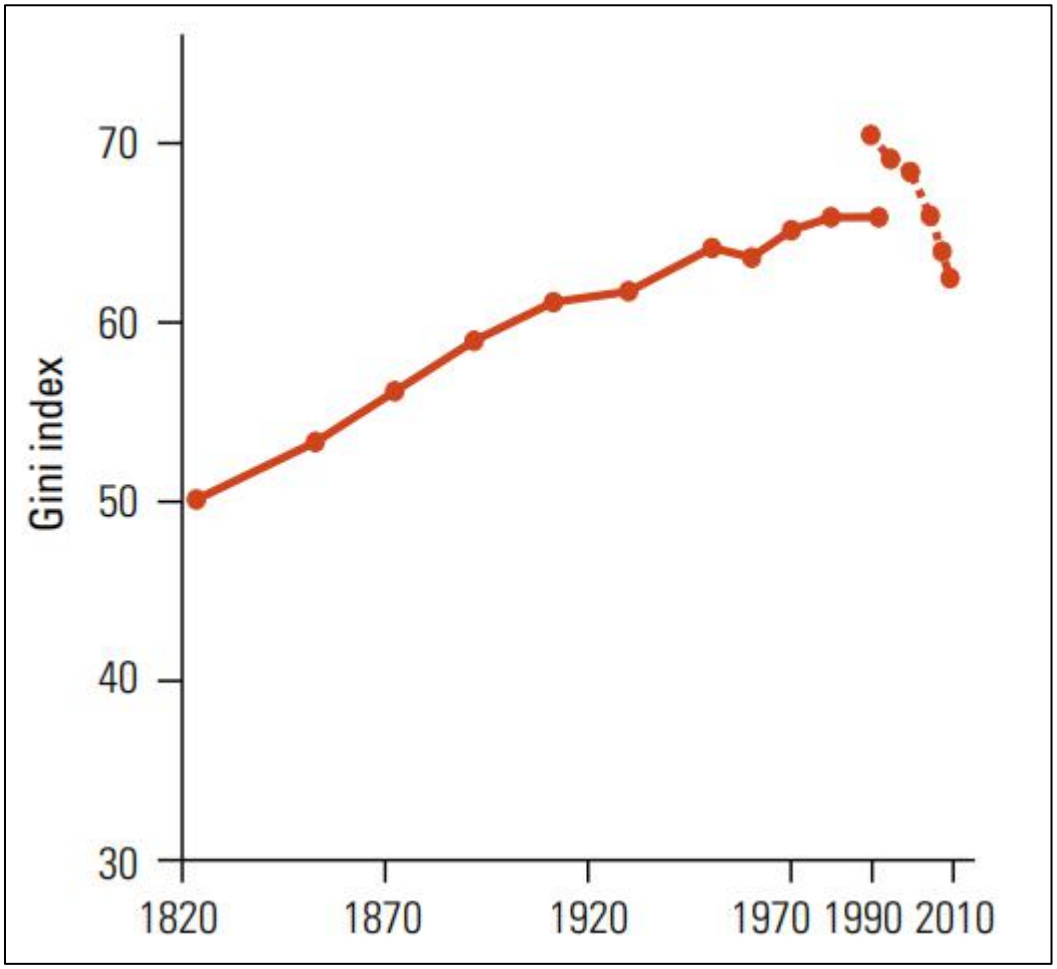


Figure 13: Global inequality[80], 1820-2010. (Source: World Bank. 2016. Poverty and Shared Prosperity 2016: Taking on Inequality. Washington, DC: World Bank. doi:10.1596/978-1-4648-0958-3. License: Creative Commons Attribution CC BY 3.0 IGO. Page 9).

Moatsos, M of Utrecht University and *Baten, J* of Tuebingen University show that from 1820 to 1929,[81] inequality rose slightly then tapered off as GDP per capita increased. From 1950 to 1970, inequality tended to fall off as GDP per capita rose above a certain threshold. From 1980 to 2000 inequality fell with higher GDP per

[80] Note: The discontinuity in the series represents the change in the base year of the purchasing power parity (PPP) exchange rates from 1990 to 2005. The figure uses GDP per capita in combination with distributional statistics from household surveys, and also uses income (or consumption) per capita directlyfrom household surveys (in 2011 PPP exchange rates).

[81] Moatsos, M., et al. (2014), « Income inequality since 1820 », dans van Zanden, J., et al. (dir. pub.), How Was Life? : Global Well-being since 1820, Éditions OCDE, Paris, https://doi.org/10.1787/9789264214262-15-en

capita then curved back up sharply. On the whole; global inequality as measured by the Gini index increased over the 19th and 20th centuries, but has declined in more recent years.

The Gini coefficient is an important tool for analyzing income or wealth distribution within a country or region, but it should not be mistaken for an absolute measurement of income or wealth. A high-income country and a low-income one can have the same Gini coefficient, as long as incomes are distributed similarly within each, for example: Turkey and the U.S. both had income Gini coefficients around 0.39-0.40 in 2016, according to the OECD, though Turkey's GDP per person was less than half the U.S.'s (in 2010 dollar terms).

Though useful for analyzing economic inequality, the Gini coefficient has some shortcomings. The metrics accuracy is dependent on reliable GDP and income data, because of data, the Gini index may overstate income inequality and can obscure important information about income distribution.

Another flaw may arise in the estimation of the Gini index due to the presence of parallel economies and informal economic activities in almost all countries. Since informal economic activity tends to account for a larger portion of true economic production in developing countries and at the lower end of the income distribution within countries, this means that the Gini index measured income will overestimate true income inequality. Thus, it is even more difficult to obtain accurate data on wealth due to the popularity of tax havens.

Given the limitations of the Gini coefficient, other statistical methods are used in combination or as an alternative measure of population dispersion (for example; Atkinson inequality measures "or simply Atkinson index" proposed by Atkinson in

1970).

The Gini coefficient is not a tool for measuring living standards, but an essential comparison tool, as it is useful in the analysis and comparison of living standards in order to show the effect of inequalities during comparing the living standards of entire populations. More recent data[82] shows that some of the world's poorest countries (e.g. Central African Republic) have some of the highest Gini coefficients in the world (61.3), while many of the wealthiest (e.g. Denmark) have some of the lowest (28.8). So the type of correlation between the Gini coefficients and the GDP per capita can help us in our study of the standard of living so that it is possible that the value of the Gini coefficient can be as an explanatory variable of the standard of living.

This is where the importance of this subject lies in our study. Although the values of the Gini index over time should be used with caution, as *van Zanden*[83]demonstrates the real complexity of the link between income inequalities and GDP per capita in their study of global well-being since 1820.

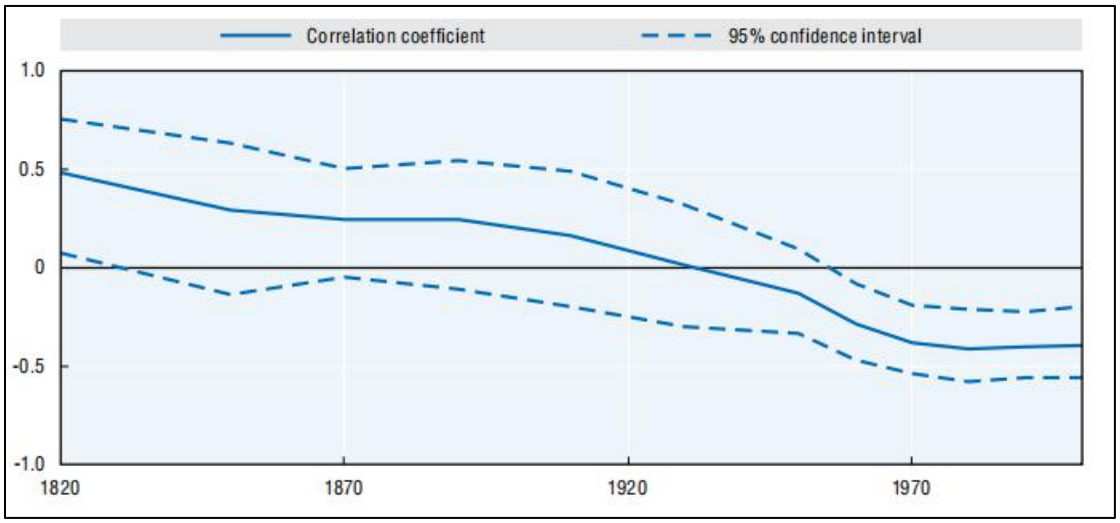


Figure 14: Correlation between Gini coefficients and GDP per capita from 1820

[82] For example data from the World Bank.
[83] van Zanden, J.L., et al. (eds.) (2014), How Was Life?: Global Well-being since 1820, OECDPublishing.doi: 10.1787/9789264214262-en.

to 2000; Pearson correlation coefficient and upper/lower bounds of 95% confidence interval. (Source: van Zanden, J.L., et al. (eds.) (2014), How Was Life?: Global Well-being since 1820, OECD Publishing. doi: 10.1787/9789264214262-en).

This figure shows the correlation of GDP per capita and the Gini coefficient across all the available countries over time. From 1820 until 1910, income inequality appears generally positively correlated with GDP per capita: the wealthiest countries are also relatively more unequal. This relationship reverses at the turn of the century, and after the Second World War the relation turns mostly negative, remaining negative for the entire period until the most recent available data.

Stiglitz in his article "The Price of Inequality"[84] shows that inequalities generate costs for society as a whole and lists quite a few consequences of growing inequality on the performance of a country's economy, and therefore on the standard of living of a population. It suffices that he said in his article that inequalities are harmful to economic performance, it undermines our economies and our democracies, divides our societies and slows down sustainable growth. We can use this to show the interest of the Gini index in our subject and that we can not do without the effect of inequalities in our study on the standard of living.

1.6. Purchasing power parity (PPP)

International comparisons of living standards involve the search for price deflators that make it possible to compute comparable real incomes. Pragmatic convenience motivates approaches in which indexes are computed directly from prices and quantities, without depending on an estimation of consumer preferences. The theory

[84] Stiglitz, J. E. (2012). The price of inequality: How today's divided society endangers our future. WW Norton & Company.

of index numbers[85] is an important source of inspiration for such indexes. Pragmatic convenience also encourages seeking formulae that make the comparison of two countries independent of data from third country.

It is good to remind first that the purchasing power according to the neoclassical theory is the real wage, i.e. the wage divided by the price level.

International comparisons of living standards require the use of PPP exchange rates to convert national currencies into a common numéraire[86], because market exchange rates are particularly poorly suited to comparing living standards. They tend to undergo large fluctuations over short periods, so that their use results in variations in relative standards of living that are too rapid to be plausible. Therefore, GDP per capita comparisons are generally based on PPPs. Even though GDP per capita is often criticized as an incomplete measure of economic well-being, it is nonetheless an essential indicator of a country's economic performance. The growing use of this indicator in economic and policy analysis is a major reason for the importance of PPPs as a statistical tool.

According to INSEE[87] the Purchasing Power Parity (PPP) is a currency conversion rate that allows the purchasing power of different currencies to be expressed in a common unit. This rate expresses the ratio between the quantity of monetary units necessary in different countries to procure the same "basket" of goods and services.

Krugman, P and Obstfeld, M[88]state that purchasing power parity is an economic term

[85] Initiated by Fisher (1922) and developed by Diewert (1976, 1992).
[86]Anand, S., & Segal, P. (2015). The global distribution of income. In Handbook of income distribution (Vol. 2, pp. 937-979). Elsevier.
[87] INSEE, Published on: 13/10/2016, extracted from the following internet link:https://www.insee.fr/fr/metadonnees/definition/c1923consulted in June 2021.
[88] Krugman, P. R., & Obstfeld, M. (2009). International economics: Theory and policy. Pearson Education.

for measuring prices at different locations. It is based on the law of one price, which says that, if there are no transaction costs nor trade barriers for a particular good, then the price for that good should be the same at every location. They define it as a measurement of prices in different countries that uses the prices of specific goods to compare the absolute purchasing power of the countries' currencies. In many cases, PPP produces an inflation rate that is equal to the price of the basket of goods at one location divided by the price of the basket of goods at a different location. According to the same authors; the PPP inflation and exchange rate may differ from the market exchange rate because of poverty, tariffs, and other transaction costs.

So, in simpler terms; Purchasing Power Parity (PPP) is a popular metric used by macroeconomic analysts that compares the currencies of different countries through a "basket of goods" approach (whose content may be subject to discussion). This means that the PPP is a currency conversion rate which makes it possible to express in a common unit the purchasing powers of the different currencies. For example: if the same basket of goods costs 100 euros in France and 120 dollars in the United States, the PPP will be 1 euro = 1.20 dollar, even if, on the foreign exchange market, 1 euro = 1 , 4 dollar.

In practice, the calculation of purchasing power parity is done through the following formula (the relative version of PPP): " PPPrate = P1 / P2 " where: *"PPPrate" is "Exchange rate of currency 1 to currency 2", "P1" is "Cost of good X in currency 1" and "P2" is "Cost of good X in currency 2".*

Purchasing power parity (PPP) allows for economists to compare economic productivity and standards of living between countries. Some countries adjust their gross domestic product (GDP) figures to reflect PPP.[89] Thus, to make a meaningful

[89] Please see: Schreyer, P., & Koechlin, F. (2002). Parités de pouvoir d'achat: mesure et utilisations. Cahiers statistiques de l'OCDE, 3.

comparison of prices across countries, a wide range of goods and services must be considered. However, this one-to-one comparison is difficult to achieve due to the sheer amount of data that must be collected and the complexity of the comparisons that must be drawn. To help facilitate this comparison, the University of Pennsylvania and the United Nations joined forces to establish the International Comparison Program (ICP) in 1968.[90]

This conversion rate of PPP may be different from the "exchange rate"; indeed, the exchange rate of one currency against another reflects their reciprocal values in international financial markets and not their intrinsic values for a consumer. Also, the nominal exchange rate can vary suddenly without the economic fundamentals having been changed in similar proportions. Or the exchange rate may be fixed and therefore not adapt to changes in this economy.

This does not make it without drawbacks, for example countries do not all consume the same goods (do not have the same consumption habits), which makes it difficult to choose a basket of reference goods. In addition, government sales taxes, level of market competition, labor costs, the quality of the goods that constitute the reference basket and so on, are all factors which vary from one economy to another and which can distort the prices and therefore the cost of the reference basket and ignore the performance of this economy.[91]

This is why we can replace a full basket of goods with a basket that contains only the Big Mac because this product is present in most countries and of the same quality and generally its price contains approximately the same amount of tax. The Big Mac

[90] World Bank. "International Comparison Program (ICP): History" https://www.worldbank.org/en/programs/icp#2 Accessed June, 2021.
[91] Please see: Taylor, A. M., & Taylor, M. P. (2004). The purchasing power parity debate. Journal of economic perspectives, 18(4), 135-158.

Index is a survey created by "The Economist" magazine[92] in 1986 to measure purchasing power parity between nations, using the price of a McDonald's Big Mac as a benchmark. The Economist's BigMac Index is a well-known example of a single-product comparison: The BigMac's PPP is the conversion rate that would mean the cost of the burger is the same in and outside the US.

In short, PPPs serve either as a conversion rate to generate volume measures that compare levels of economic performance, growth and productivity, or as indicators of price convergence and competitiveness. PPPs are also used to measure the relative size of economies and they are useful, even necessary in the comparison of living standards and economic well-being. It should be noted that although well-being has dimensions other than the monetary component, but the fact remains that there is now a growing interest in PPPs from a wide range of national users, and that most economic data is expressed in the majority of cases globally in PPP.

If purchasing power parity solves the problem of monetary-metric divergence between nations. In an issue of the OECD Statistical Notebooks[93], to examine methods of measuring well-being, the authors of this paper have proposed two alternative approaches to the analysis and assessment of well-being; according to monetary indicators of well-being and according to non-monetary indicators. So the way in which the "monetary" parameter is treated is crucial in the study of the standard of living, and becomes more crucial as the study expands to the international level. Because the currency is a unit of measurement, and if it was not correctly standardized it makes the results biased.

By way of conclusion for this section, to solve this problem of the inexistence of a

[92] Economist. "The Big Mac Indexhttps://www.economist.com/big-mac-index." Accessed April, 2021.
[93] Boarini, R., Johansson, Å., & d'Ercole, M. M. (2006). Les indicateurs alternatifs du bien-être.CahierStatistique n° 11. l'OCDE.

variable representative of the standard of living, we see that economists generally construct indexes or equivalence scales by assigning "fairest" weights to the factors they estimate most crucial in determining a standard of living (e.g. sometimes they just use GDP "or disposable income" per capita) . Thus, each index constructed or method used depends primarily on the researcher's view of the standard of living. It is very difficult to take everything into consideration, but an effort must be made to include as many factors and information as possible in the most efficient way possible to represent this standard of living variable or even compare it.

The table below proposed by Curcio, C gives some brief definitions on the possible ways to measure the standard of living according to the vision of their authors:

Author	Standard of Living Measure	Range
Bernard (1928)	Based on nine separate measures broken down into three categories: Standard material requirements Standard Non-material requirements and standard adventitious requirements.	Universal
Bennett (1937)	Based on 14 measures broken down into three categories: Professional services, transportation and communication, and luxury food consumption.	National
Ogburn (1951)	Four measures: productivity cost of living, population density, and technological development.	National
Pope (1993)	Two measures: mortality age and height changes as a proxy for nutrition.	National (Over Centuries)
Grave and Jenkins (2002)	Three measures: education, income, and productivity.	National

Table 2: Theoretical methods proposed the literature to measure the standard of living according to the vision of their authors. (Source: Curcio, C. (2005). A New Economic Measure of the Standard of Living Ranking US Metropolitan Areas. Duquesne: Duquesne University).

On the other hand, the following table lists some empirical models proposed in the literature to measure the standard of living according to the conceptions of their authors:

Author	Model name (or study title)	The equation as conceived by its author	The main variables used	Estimation method
Boarini, R., Murtin, F., Schreyer, P., & Fleurbaey, M. (2016)	Multi-Dimensional Living Standards (MDLS)	$MDLS = \left(\frac{1}{n}\sum_i Y_i^*\right)(1-I) = \left(\frac{1}{n}\sum_i y_i - \delta^U - \delta^T\right)(1-I)$	Degree of inequality, income, employment and life expectancy.	OLS, FE et VSL (panel regression model)
Jensen, J., Spittal, M., & Krishnan, V. (2005)	Economic Living Standard Index (ELSI)	Construction of the ELSI scale (Direct measure of standard of living without econometric equation)	Housing adjusted equivalised disposable income, Equivalised disposable income, Savings capacity, Borrowing capacity..etc.	Confirmatory factor analysis (CFA) (surveys are carried out)
Curcio, C. (2005)	A new measure of the standard of living for U.S. metropolitan areas (PCISLI)	SOLt = α + β1BKBt + β2UNEMPt + β3DPOPt + β4DPOPA^2 t + β5DPOPDENSt + β6DBKPt + β6DBKP/POP + ut	Standard of living (Sol) = per capita income divided by cost of living, Number of business bankruptcies, Unemployment rate, Population..etc	Panel least squares (panel regression model)
Ogwumu, D., James, F. (2014)	Mathematical model for determining the effect of government policies on Nigerians' standard of living.	$S = \frac{\alpha I}{F} + \frac{\beta TI}{E} - g_p$	E = Expenditure level, F = Family size, T = Social status, I = Income Gp = government parameter, S =standard of living, and α and β are constants	Mathematical procedures (Lagrange multiplier, partial derivation ..) and least squares method.

Table 3: Empirical models proposed in the literature that attempt to measure the standard of living. (Source: author's own from what we managed to collect as models).[94]

2. Overview and analysis of the Algerian economy

To be able to model any standard of living, it is necessary to first present the geographical area and its living conditions. In simpler terms, the standard of living of which economy do we want to explain through our model.

We have already explained that the place is an essential factor in determining the standard of living, because it first determines the socioeconomic system in force, the

[94] There are other empirical models for studies in French such as: Eudeline, J. F., Garbinti, B., Lamarche, P., Roucher, D., & Tomasini, M. (2011). L'effet d'une naissance sur le niveau de vie du ménage. INSEE-Les Revenus et Le Patrimoine Des Ménages.; and : Martin, H. (2017). Calculer le niveau de vie d'un ménage: une ou plusieurs échelles d'équivalence?. Économie et Statistique, 491(492), 93-108.

lifestyle, the mode of management and the nature of governance, therefore the degree of effectiveness of the economic and macroeconomic policies put in place to meet the needs of households and reduce their cost of living and therefore support their standard of living, So to understand the standard of living of a region (or a population), it is first necessary to know their characteristics and their specificities.

The purpose of this section is therefore to review the general macroeconomic structure of Algeria, examine its economic performance and measure the degree of effectiveness of economic and macroeconomic policies designed to meet the needs of households and reduce their cost of living and thus promote their standard of living.

We have designed to do this by giving an overview of the Algerian economy by first recalling its history, its characteristics, then illustrating some statistics related to this economy and its classifications at different levels. It is a question of deducing the general state of health of the Algerian economy in order to be able to model (and measure) the standard of living of its population.

2.1. A historical glance

Algeria, the largest country in Africa, located in the northwest of the African continent, it covers an area of 2,381,741 km², with a coastline of 1,200 km which opens onto the Mediterranean. The country is divided into two very distinct zones: the North, the Mediterranean region which is home to almost the entire population, and the South which includes the Sahara and which constitutes 85% of the entire territory. In 2019, the Algerian population is estimated[95] at 43,053,054. The capital, Algiers It is the most populous city in the country.

[95] According to World Bank data, available in link: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=DZ Accessed in June 2021.

Ranked as the third most important economy in the MENA region and a leader in the Maghreb, Algeria is one of a handful of countries that have achieved 20% poverty reduction in the past two decades[96]. Following its independence, it adopted the socialist system, and the 1962-1971 period was characterized mainly by the nationalization of key sectors of the economy and the creation of public enterprises and an industrial structure, as well as the establishment of a centralized planning process, introduced by the Algerian Development Strategy (ADS)[97]. While 1971 was marked by the nationalization of hydrocarbons, the state acquired 51% of the assets of French oil companies present in Algeria. In November of the same year, the government launched the "Agrarian Revolution" and the "Socialist Management of Enterprises" (SME)[98].

At the end of the 1970s and the beginning of the 1980s, the Algerian economy began to be restructured, following the oil shock in 1986 and the failure of the so-called modernization and industrialization project of the country (Algerian Development Strategy "ADS"). The steady fall in the price of crude oil has brutally exposed the structural dysfunctions of the Algerian economy and reduced to nothing the illusions of power of the Algerian industrial potential, and reveals the dependence and the fragility of a system built on the sole performance of the hydrocarbon sector[99]. These restructurings are based on two flagship measures: the "organic restructuring" of public enterprises; the Anti-Shortage Plan (PAP). By taking certain actions, including[100]: agrarian reforms with a five-year plan 1980-1984; organic and financial

[96] World Bank, "Algeria at a Glance", from the website: https://www.worldbank.org/en/country/algeria Accessed June 2021.

[97] Known much more under the name of "SAD" in French: "Stratégie Algérienne du Développement".

[98] Pironet, O. (2006). Algérie: chronologie historique. Manières de voir, Monde Diplomatique,vol 86. Available on the website: https://www.monde-diplomatique.fr/mav/86/PIRONET/14100

[99] Benderra, O. (2002). Économie Algérienne 1986-1998: Les réseaux aux commandes de l'État. Extrait de la Méditerranée des réseaux, Marchands, entrepreneurs et migrants entre l'Europe et le Maghreb, sous la Direction de Jocelyne Cesari. Paris: Maisoneuve et Larose. Available on the online article: https://algeria-watch.org/?p=54524 published DECEMBER 13, 2009. Updated June 4, 2018. Accessed June 2021.

[100] Mourad Ouchichi (2018) Support pédagogique du module "Économie Algérienne". Université de

restoration of national companies and attempt to promote the private sector through a new legislative and regulatory system put in place.

After obtaining financial assistance from the IMF and associated measures, which reinforced the urgent need for reforms. The burden of debt service[101] continues to increase, especially with the political crisis of 1988 which led to the deterioration of the economic situation in times of crisis when oil prices have not yet recovered. As a result, the State has not succeeded in maintaining the standard of living of the population while the debt service during the period 1989-1993 absorbed more than 70% of Algeria's resources.

Subsequently, 1989-1993 was the most important turning point in the history of the Algerian economy, the period of voluntary transition towards a market economy "capitalism" and the application thereafter of an economic stability program (1994-1998) known as: "Structural Adjustment Plan" dictated by the IMF so that the country can from restoring its macroeconomic balances and paying off its external debts. This period was also marked by an attempt to democratize the political sphere, but these reforms did not last, because from 1991 the governments which took office thereafter called into question most of the reforms undertaken in attempt to regain economic control (return to socialism) under the pretext of reducing the social costs of the transition, since the country is going through a period of multi-dimensional crises, political, economic and social. Thus, within a few years this led to the decimation of the middle class, which consisted mainly of civil servants.

After the hesitant transition to a market economy, the political field began to stabilize, especially after the adoption of the Charter for Peace and National Reconciliation in 2000. The country also succeeded in this same period of time in repaying its external

Bejaia.

[101] Debt servicing is a service established by the state at that time to manage external debt.

debts after the financial ease that followed the recovery of oil prices, which has allowed to enter a period of financial prosperity (thanks to upward trend in oil prices and not for anything else). It is true that this financial improvement has allowed the leaders to initiate various economic recovery plans since the beginning of the 2000s, but without adopting a well-thought-out economic plan, with poor governance, a return to centralization, excessive dependence on hydrocarbon revenues, and a lack of revenue diversification that pushed the country in less than ten years (2000-2010) from a financial boom to facing several financial crises, forcing leaders to adopt austerity policies since 2014.

Regarding the current period, the Algerian economy remains dominated by the state, inherited from the post-independence socialist development model of the country. In recent years, the Algerian government has halted the privatization of public industries and imposed restrictions on imports and foreign participation in its economy despite its full openness to the outside world compared to previous periods. Like most of the world's economies, the Algerian economy is currently going through a period of recession since the emergence of the Covid-19 pandemic and the relapse in oil prices at the end of 2019. Political tension has also increased since the start of popular protests in early 2019 (the so-called "Hirak"), which has increased the economic burden of the country due to the policies followed to try to absorb the anger of the people.

2.2. General Economic data overview

The Algerian economy can be described at present as dominated by the state, its overall performance as good, but it is still highly dependent on the oil and gas sector for growth, and the Central Bank of Algeria really little independent in its actions. The latest available economic data (for 2020) shows that the GDP stands at 145.16 billion "USD in current value", at 191.31 billion "USD in constant 2010 value", at 494.12

billion "USD international current PPP", at 468.40 billion "USD in constant 2011 international PPPs", at 18.40 trillion (in current local currency units) and at 18.08 trillion (in constant local currency units).[102]

It should be noted that a large volume of production and activities has certainly escaped the GDP due to the informal economy, because the Algerian economy is developing in an environment where the formal and informal economy coexist. It is visible every day in our daily life, and it is enough for a foreigner to live a short time in Algeria to notice this. Moreover, this is one of the most prominent characteristics of the developing countries to which Algeria belongs, which encourages corruption and harms the business climate.

Oil rents are still a very important part of building GDP over time. In 2019, it represented around 14.4%. From 1970, the trend was not constant, the share of oil rents increasing and decreasing several times, but the Algerian economy remains heavily dependent on oil revenues as shown in the figure below:

[102] This data is from the World Bank, and we have intentionally presented the value of GDP calculated in different ways to show that its value varies greatly depending on the method of calculation used, which is why we must be careful with what we will use in the next chapter.

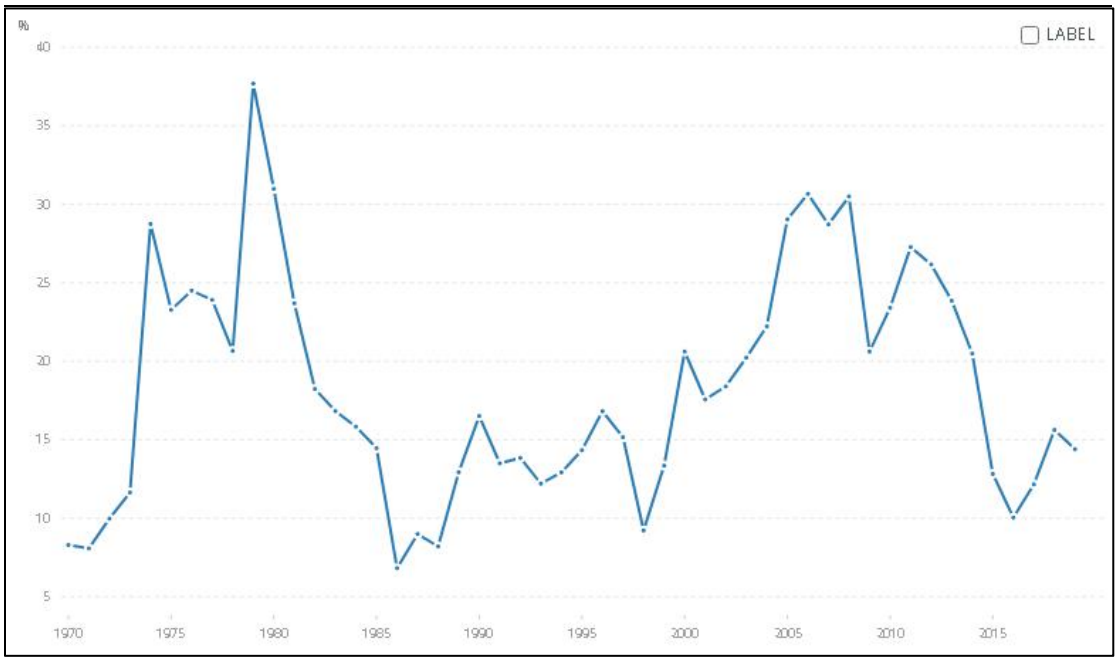


Figure 15: Oil rents as a percentage of GDP in Algeria from 1970 to 2019. (Source:https://data.worldbank.org/indicator/NY.GDP.PETR.RT.ZS?end=2019&locations=DZ&start=1970&view=chart Accessed July, 2021).

By breaking down the 2019 GDP according to the contribution of each economic activity, we find that hydrocarbons represented the first economic activity in terms of GDP contribution, with a share of 19%. Social services followed at 15 percent. Moreover, the trade, agriculture, and construction sectors contributed 12 percent to the country's GDP each.

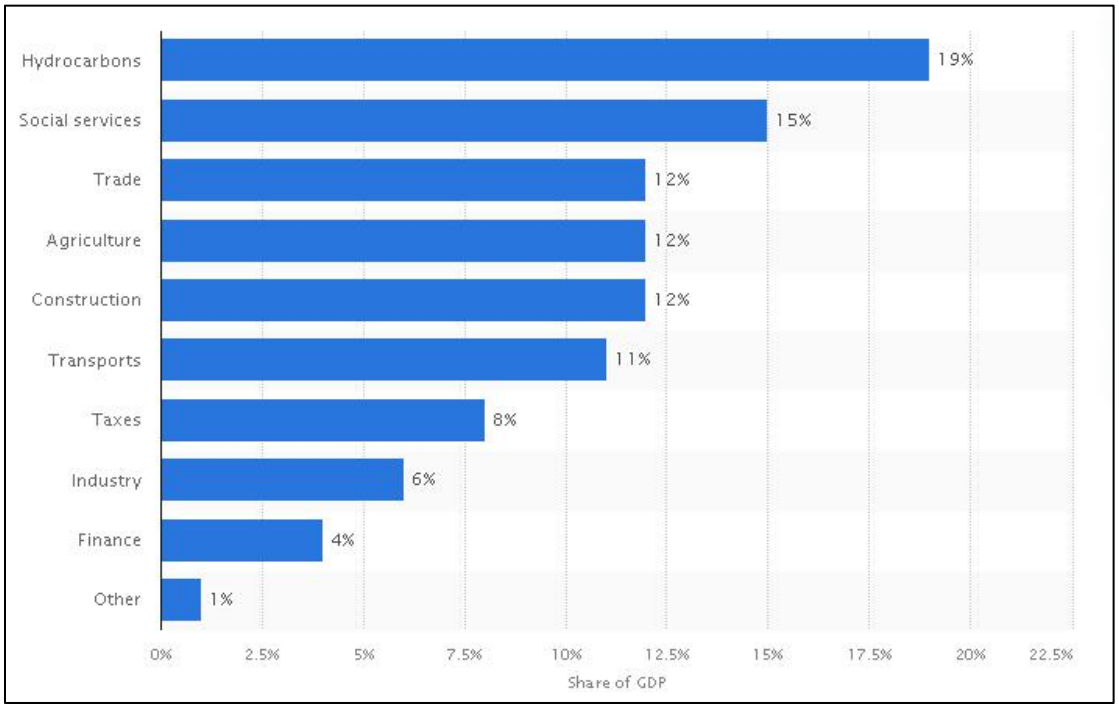


Figure 16: Distribution of the GDP of 2019 in Algeria by economic activity. (Source:https://www.statista.com/statistics/1203523/distribution-of-the-gdp-in-algeria-by-sector/ Accessed July, 2021).

Based on the share of each sector in GDP, the statistics presented in the figure below show the distribution of GDP across economic sectors in Algeria from 2009 to 2019.

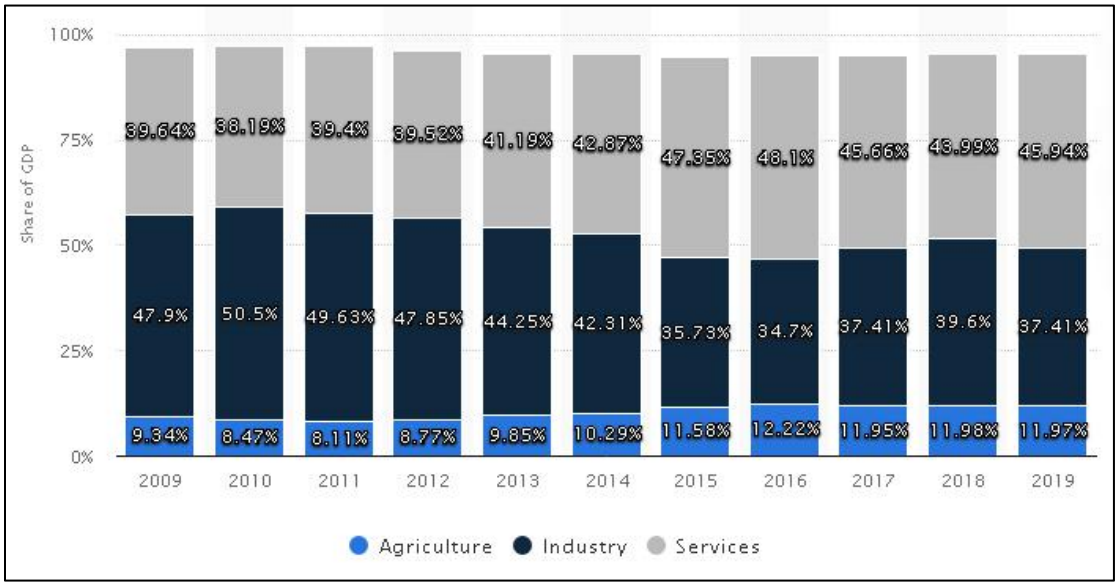


Figure 17: Distribution of Algeria's GDP among economic sectors from 2009 to

2019.(Source:https://www.statista.com/statistics/408037/algeria-gdp-distribution-across-economic-sectors/ Accessed July, 2021).

Although Algeria is known for its vast agricultural land, Algeria's GDP has been mainly distributed for a long time between the industrial and service sectors. For example, in 2019, agriculture contributed only 11.97% of the GDP and employs 9.7% of the workforce. On the other hand, the size of the industry represents 37.41% of the GDP, employing 30.7% of the working population, the oil and gas sector accounts for the bulk of federal revenue and almost all of its export revenue (over 90% of total exports). The tertiary sector (service) contributes nearly 45.94% of the GDP and employs 59.6% of the working population. However, Algeria is not famous for tourism and does not have a modern industrial fabric.

The aim is to show the anomaly that the country has agricultural capacities, but it is the industrial and service sectors that occupy the majority share of the GDP. In fact, this is because it is the hydrocarbon sector which has inflated the share of industry, while subsidies, various expenses and burdens of administrative services inflated the share of the service sector. Furthermore, the military sector still absorbs the largest share of the state budget without owning a military industry. As for the Algerian banking sector, it is dominated by public banks, which suffer from high levels of non-performing loans to state-owned enterprises. Of the twenty banks operating in Algeria, six state-owned banks have the lion's share of the market. The benefit of all this is to distinguish between the strong sectors and the weak sectors in order to be able to infer the performance of the Algerian economy.

The table below shows the most recent main indicators of the Algerian economy, the values are in current USD.

Main Indicators	2018	2019	2020	2021 *(estimate)**
GDP per capita	4153.956	3975.509	3310.387	**4032**
GNI (*Billion*)	170.995	166.956	141.855	
GNI per capita	3980	4010	3550	
GDP growth (annual %)	1.2	0.8	-5.481	**3.6**
GNI growth (annual %)	0.223	0.8	-5.201	
Adjusted net national income (*Billion*)	135.974	134.071	No data	
Adjusted net national income per capita	3219.975	3114.081	No data	
Inflation (CPI annual %)	4.27	1.952	2.415	**4.9**
Inflation (GDP deflator annual %)	7.065	-0.91	-2.415	
Unemployment, total (% of total labor force)	11.89	11.81	12.83	**14.5**
Imports (*Billion*)	56.329	50.033	40.85	
Exports (*Billion*)	45.234	39.014	24.805	
External trade balance (*Billion*)	-11.095	-11.019	-16.04	

* (Values are estimated by the IMF)

Table 4: The main indicators of the Algerian economy. (Source: Author's own based on World Bank data).

Since 2014, Algeria's external trade balance has been in deficit. With regard to the distribution of imports by trading partner, the top six suppliers of Algeria often represent more than 50% of imports global.

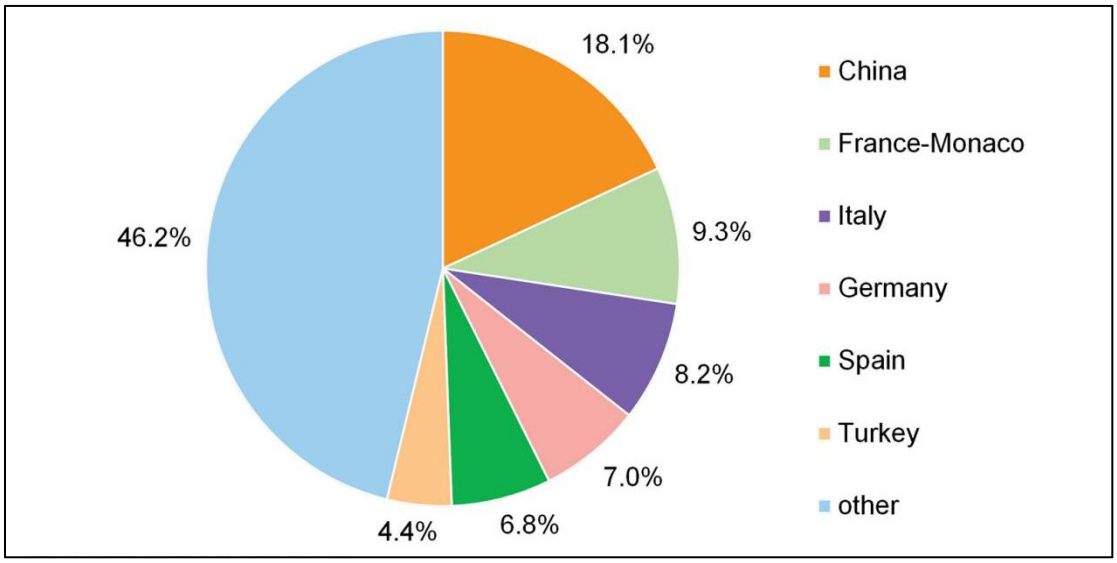


Figure 18: Algeria: Major import sources (2017). (Source: Encyclopædia Britannica,Inc.URL:https://www.britannica.com/place/Algeria/images-videos#/media/1/15001/208376 Accessed July 2021).

On the other hand, Algeria's first three client states; France, Italy and Spain are often in the lead and account for nearly 40% of Algeria's exports.

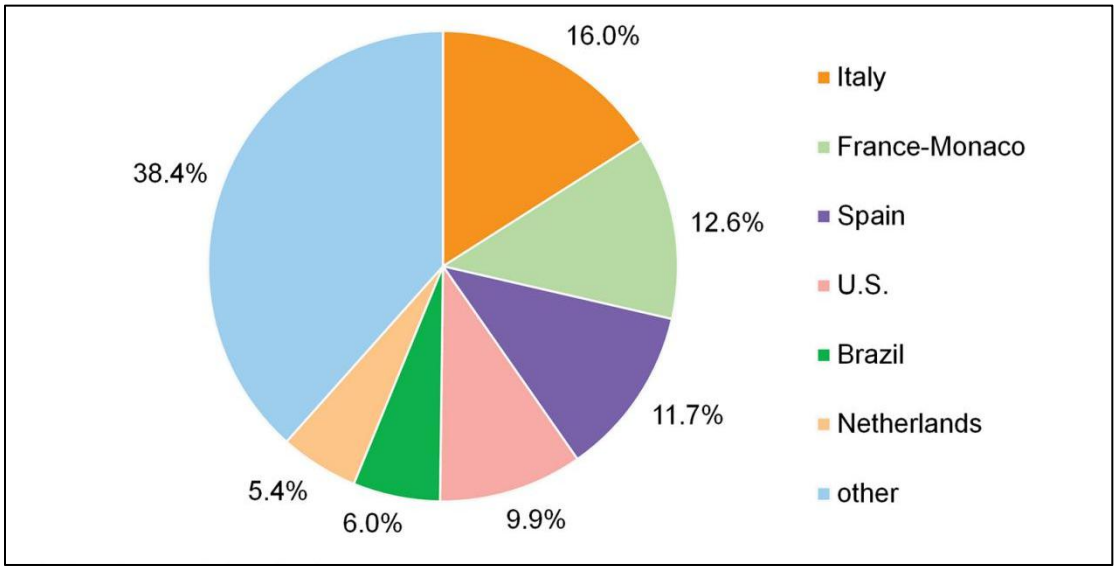
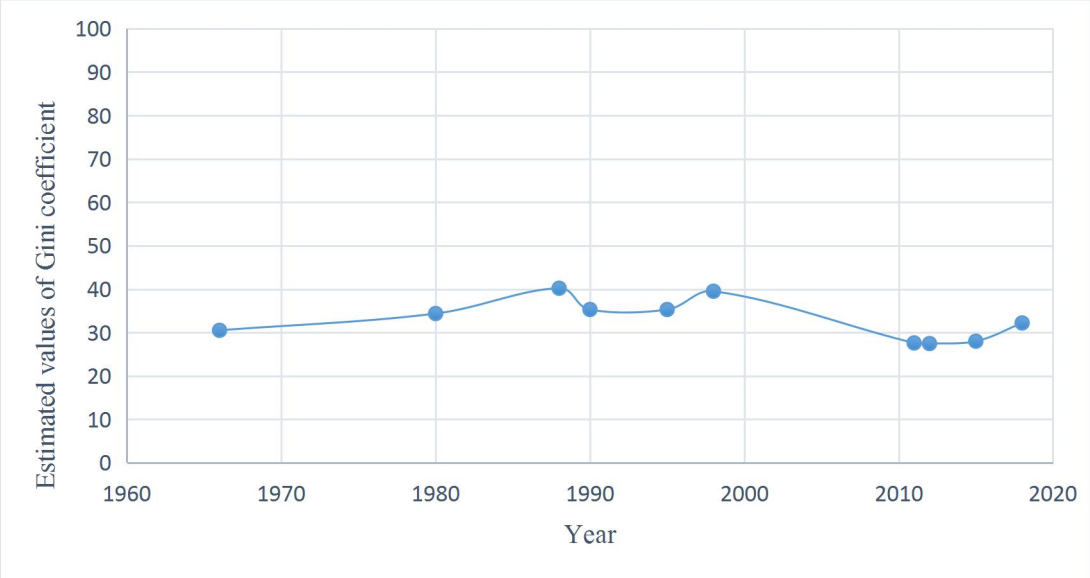


Figure 19: Algeria: Major export destinations (2017). (Source: Encyclopædia Britannica,Inc.URL:https://www.britannica.com/place/Algeria/images-videos#/media/1/15001/208377 Accessed July 2021)

Natural gas and crude oil account for almost all of the exports, while Algeria's main imports are wheat, automobiles, petroleum products, dairy products and medicines.

2.3. Inequality

On the topic of inequality, the World Bank has estimated Algeria's Gini index three times, first in 1988 it was estimated at 40.2 *(0.402)*, then 35.3 in 1995 and 27.6 in 2011. Superficially, these figures tell us that inequalities in Algeria are decreasing. But by looking for more estimation of Algeria's Gini coefficients in the literature, we find that the Gini coefficient reached 30.51 in 1966, then increased from 34.37 in 1980 to 35.3 in 1990[103]. Then, in the 2000s, the Gini coefficient fell to 27.46 in 2012[104] and 28 in 2015. It was finally increased again to 32.2 in 2018 according to the most recent estimate[105].



[103] Ameur, A. A., & Seffih, S. (2021). Income Inequality and Economic Growth in Algeria: Empirical Study during the Period 1980-2015. Management Dynamics in the Knowledge Economy, 9(1), 39-49. https://www.ceeol.com/search/article-detail?id=943513

[104] Miliani, Y. (2012). La Question Des Inégalités économiques En Algérie: Mesure Et Analyse. *Algerian Economic Review*, *10*(1), 190-209. https://www.asjp.cerist.dz/en/article/16171

[105] https://knoema.com/atlas/Algeria/topics/Poverty/Income-Inequality/GINI-index Accessed July, 2021

Figure 20: Algeria's estimated Gini coefficients. (Source: Author's own based on the sources cited above).

In a publication[106] by the "National Office of Statistics"[107] resulting from a survey on household income, consumption expenditure and standard of living carried out on a representative sample of 12,150 Algerian households, the Gini index estimated for the year 2011 amounts to 0.305517 (30.5517%). While the World Bank estimated it for the same year as previously indicated at 27.6%.

This is to say that these Gini coefficients cannot be interpreted as raw numbers because it is possible that two different Lorenz curves give rise to the same Gini coefficient. So this type of data is not strictly comparable between countries or even between years of the same country, because the surveys can differ in many respects, including whether they use income or consumption expenditure as an indicator of the standard of living. The distribution of income is generally more unequal than the distribution of consumption. In addition, the definitions of income used differ more often from one survey to another. This is why the World Bank considers consumption as a much better indicator of well-being, especially in developing countries.

Thus, to interpret figure (20) more accurately, it is better to first analyze the inequality at the national level in terms of the distribution of national income between social classes. Despite the poor quality of the data[108], but the diagram provided by the WID in the figure below can give us an idea of how social class evolves over time.

[106] Office National des Statistiques (2014), Revenus salariaux et caractéristiques individuelles «Enquête sur les dépenses de consommation et le niveau de vie des ménages 2011», Collections Statistiques N° 189 Série S : Statistiques Sociales.

[107] It is the official government agency responsible for the country's statistics. In French : Office national des statistiques (ONS).

[108] All data provided by WID is evaluated and classified according to its origin; zero star for data derived from **"**regional imputation**"**; one to two stars for data derived from an **"**adjusted survey**"**; three to four stars for data derived from **"**survey and tax data**"**; five stars for **"**survey and tax micro data**"**. Data for Algeria has only one star. For more information, please see: https://wid.world

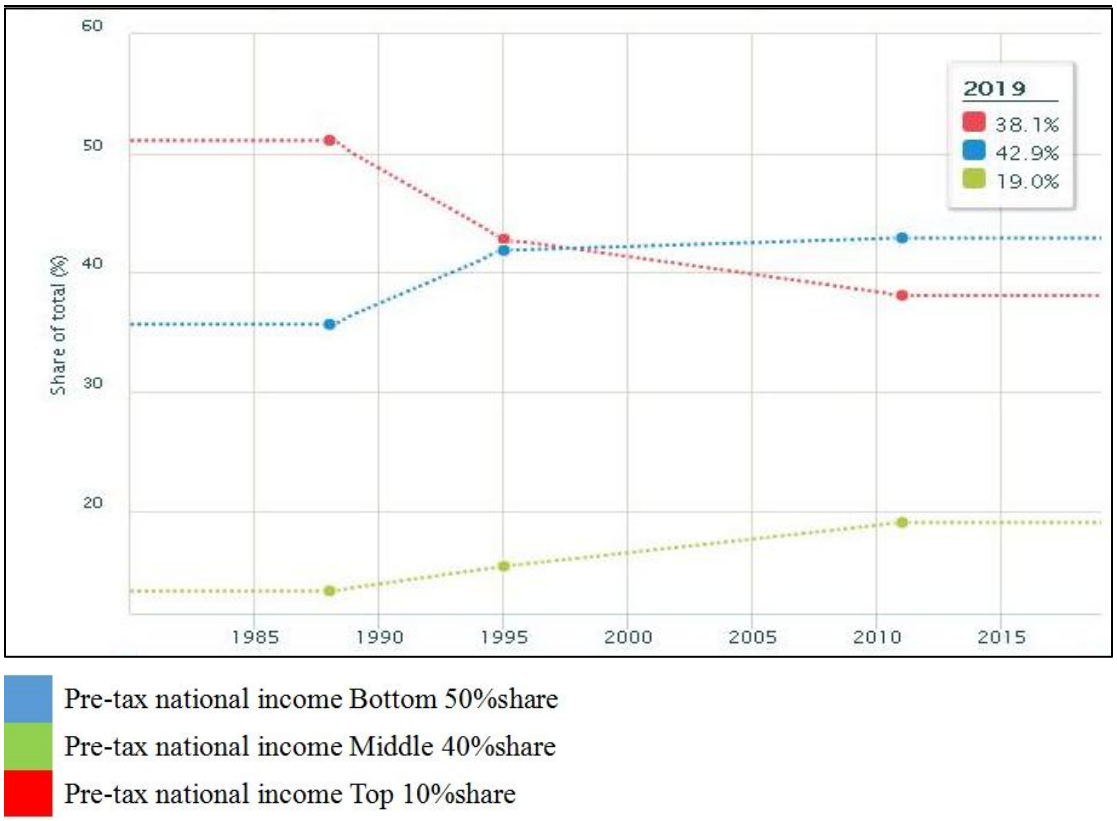


Figure 21: Income inequality, Algeria, 1980-2019. (Source: World Inequality Database "WID", available in: https://wid.world/country/algeria/ Accessed July 2021).

This graph shows that between 1980 and 2019, the share of income going to the top 10% of the income distribution decreased by 13% (from 51.1% in 1980 to 38.1% in 2019). On the other hand, the share of income received from 1980 to 2019 by the middle 40% increased by 7.3% (from 35.6% in 1980 to 42.9% in 2019). Thus, the bottom 50% in 1980 earned 13.3% of national income and this increased by 5.7% to reach 19% in 2019.

This would mean that the share of the top 10% (the richest) has a downward trend unlike the share of the bottom 90% (the middle class and below) which has an uptrend. Which means, that Algeria tends to be a more egalitarian country, in the sense that the disparity between the highest and lowest incomes seems to be narrowing over time. This allows us to conclude that the Gini coefficients represented in the graph of figure

(20) show a stability (or maybe even a decrease) of the income inequalities in the country.

But these results are not definitive and may be biased, since the data provided by the WID are only obtained by three available surveys[109], for the following years: 1988, 1995, 2011. Income shares are interpolated linearly when surveys are available at the beginning and at the end of a given period. Inequality series are extrapolated backwards to 1990 and forwards to 2019 by keeping income shares constant when no data is available for these years. In addition to this, the large size of the informal economy in the country can also skew the outcome of these few existing data and change the reality.

What is certain and more important is that the presence of inequalities influences economic growth in one way or another. The nature of the link between them is still debatable, but many authors defend the idea of the negative impact of inequalities on growth. For example, *Barro*[110] argues that inequality encourages economic growth in advanced economies, but retards it in developing ones. According to *Keynes*[111] (1936) income inequality leads to slower economic growth via the demand channel. *Malinen*[112] agrees and explains that more inequality will diminish economic growth because it lowers aggregate consumption. *Ostry et al*[113] see that lower net inequality seems to drive higher and more sustainable growth. Further, *Rajan*[114] said that greater inequality leads to the financial crisis and the current economic downturn. Even in the

[109] These are survey tabulations provided by the World Bank (PovcalNet) corrected by WID to take into account conceptual differences and the under-representation of high incomes.
[110] Barro, R. J. (2000). Inequality and growth in a panel of countries. Journal of Economic Growth, 5, 5–32. https://doi.org/10.1023/A:1009850119329
[111] Keynes, J. M. (1936). The General Theory of Employment, Interest, and Money. Atlantic.
[112] Malinen, T. (2007). A comment on the relationship between inequality and growth. (Discussion papers / Helsinki Center of Economic Research; No 193). University of Helsinki. http://ethesis.helsinki.fi/julkaisut/eri/hecer/disc/193
[113] Ostry, M. J., Berg, M. A., & Tsangarides, M. C. G. (2014). Redistribution, inequality, and growth. IMF .https://www.imf.org/en/Publications/Staff-DiscussionNotes/Issues/2016/12/31/Redistribution-Inequality-and-Growth-41291
[114] Rajan, R. (2010). How inequality fueled the crisis. Project Syndicate, Vol 9.

reverse causal direction, *Piketty*[115] argues that slow growth rates lead to increasing inequality.

The empirical study on the link between inequalities and growth carried out by *Ameur, AA, & Seffih, S*[116] for the case of Algeria offers the result that in the long run, inequality has a significant negative impact on economic growth in the period 1980-2015. Whereas, increasing inequality by 1% will reduce growth by 0.52%. These findings confirm the hypothesis that high inequality hurts the economic growth in low and middle income countries.

These authors explain the negative impact of income inequalities on economic growth in Algeria through the channel of rent-seeking and through social and political unrest.

Even if the distribution of income does not seem very unequal following the State's wage policies which aim to absorb social anger and to stop the series of strikes generally carried out by public sector employees. But according to *Millani, Y*[117], capital inequalities remain high, especially after the 1990s, although no one can so far confirm or deny it, due to the lack of data allowing a study to be carried out in this direction.

2.4. Economic living conditions

The PPP for private consumption is the purchasing power parity conversion factor for private consumption (i.e. final consumption expenditure of households). For this, the

[115] Piketty, T. (2014). Capital in the 21st Century. Harvard University Press, Cambridge,166-168. www.hup.harvard.edu/features/capital-in-the-twenty-first-century-introduction.html

[116] Ameur, A. A., & Seffih, S. (2021). Income Inequality and Economic Growth in Algeria: Empirical Study during the Period 1980-2015. Management Dynamics in the Knowledge Economy, 9(1), 39-49. https://www.ceeol.com/search/article-detail?id=943513

[117] MILIANI, Y. (2018). La question des inégalités économiques en Algérie: Mesure et Analyse. Université d'Oran 2.

graph below can give us an idea of the purchasing power situation in Algeria and its evolution over time:

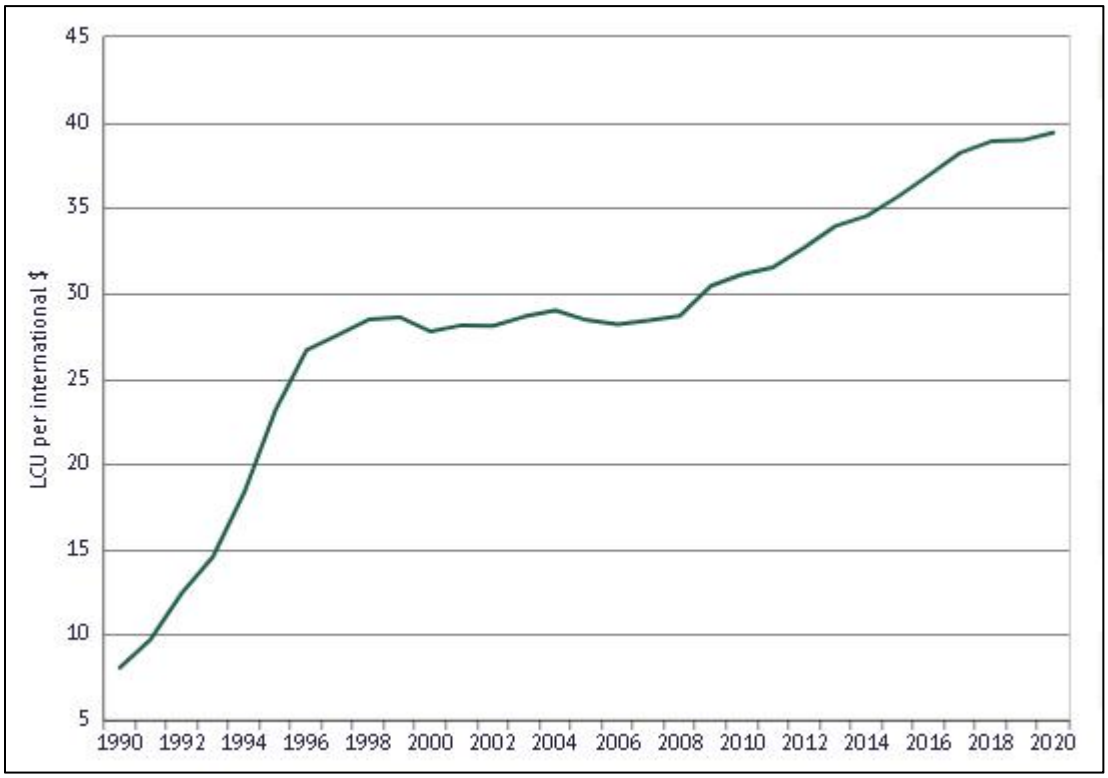


Figure 22: Algeria - Purchasing power parity conversion factor for private consumption .(Source:https://knoema.com/atlas/Algeria/topics/Economy/Inflation-and-Prices/PPP-for-private-consumption Accessed in August 2021).

The graph shows a very clear upward trend (strong pace before 1996 and weak after that), going from 8.1 LCU per international dollar in 1990 to 39.4 LCU per international dollar in 2020 (the minimum growth rate recorded over the past 10 years is 0.14%) . Which can strongly mean that Algerian purchasing power in general has been declining for more than 30 years.

To verify the validity of this assumption, due to the lack of necessary data, we appeal to "Numbeo"[118] database, which is one of the largest cost-of-living databases in the

[118] The Numbeo.com website is maintained by Numbeo doo incorporated in Serbia with business registration number 20853514. It was launched in April 2009 by *Mladen Adamovic*. The research and available data at Numbeo.com are not influenced by any governmental organization. This website was mentioned or used as a source by many international newspapers and magazines including BBC, Time,

world, providing global information on quality of life among many other statistics. *Numbeo*'s data sources and references used are: links to relevant government data; links to local supermarket websites with prices; links to local restaurant menus with prices and other relevant sources; links to official information on public transport prices; links to official taxi fares (or regulated fare); other links that can be used to manually verify the data provided on its website; other links that can be used to automatically update data on its website. In addition to that, *Numbeo* gives the possibility to the general public to insert the prices of a large basket of goods and services for each region in a given country (by first verifying the locality of the subscriber) in order to be able to improve their databases and to check them.

Regarding the case of Algeria, *Numbeo* provides very recent data, which are summarized in the table below:

Purchasing Power Index	22.99	Very Low
Safety Index	47.77	Moderate
Health Care Index	53.08	Moderate
Climate Index	94.82	Very High
Cost of Living Index	27.61	Very Low
Property Price to Income Ratio	17.55	Very High
Traffic Commute Time Index	48.89	High
Pollution Index	65.00	High
Quality of Life Index:	97.82	Moderate

Table 5: Quality of life index and its components in Algeria[119]. (Source: https://www.numbeo.com/quality-of-life/country_result.jsp?country=Algeria Accessed in August 2021).

The Week, Forbes, The Economist, Business Insider, San Francisco Chronicle, New York Times, The Telegraph, The Age, The Sydney Morning Herald, China Daily, The Washington Post, USA Today and dozens more.

[119] Data for each country is based on all entries for all cities in that country (last update: August 2021). For more information on the weights used in the formula, please visit the web page: https://www.numbeo.com/common/motivation_and_methodology.jsp

The Quality of Life Index (higher is better) is an estimation of overall quality of life by using an empirical formula[120] which takes into account purchasing power index (higher is better), pollution index (lower is better), house price to income ratio (lower is better), cost of living index (lower is better), safety index (higher is better), health care index (higher is better), traffic commute time index (lower is better) and climate index (higher is better).

This can also be confirmed by using the data on the evolution of household consumption expenditure as presented in the figure below:

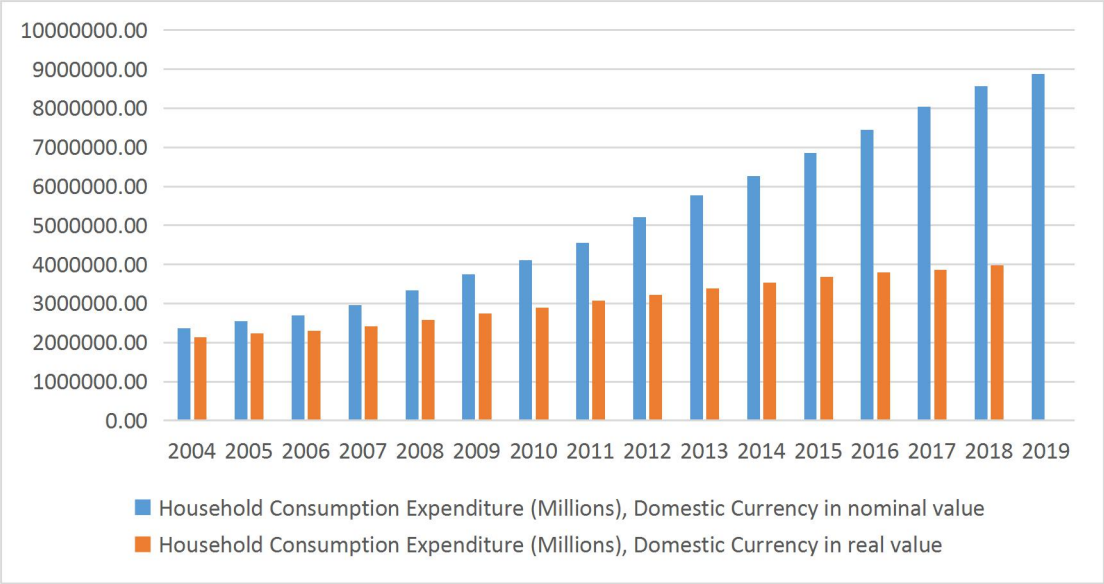


Figure 23: Consumption expenditure of Algerian households. (Source: author's own based on data provided by the IMF).

This illustration shows a very strong increase in nominal value, versus a very slow increase in real value, and the gap between the two keeps widening. Which means that the Algerian household pays even more over time without consuming more. Perhaps

[120] This current formula (there are formulas used before) is written in Java programming language as follows: index.main = Math.max(0, 100 + purchasingPowerInclRentIndex / 2.5 - (housePriceToIncomeRatio * 1.0) - costOfLivingIndex / 10 + safetyIndex / 2.0 + healthIndex / 2.5 - trafficTimeIndex / 2.0 - pollutionIndex * 2.0 / 3.0 + climateIndex / 3.0). For more details on the calculation of each index, please visit: https://www.numbeo.com

this is because the rise in wages did not keep pace with the rise in prices. This may make it difficult to maintain the required level of consumption.

As an example on the cost of living, we cite the latest study carried out by "Surfshark"[121] on "How many hours do you have to work to pay for the Internet". In Algeria, the working time required to afford the cheapest broadband internet is 8 hours and 47 minutes. While globally, it takes only an average of 3 hours 48 minutes. According to this same source, Algeria is ranked 77th out of 85 countries where this study was carried out. In most of the developed countries 2 hours of labor is more than enough to meet this load (only 7 minutes of work are needed to cover this cost in Canada, 48 minutes in France and 52 minutes in the USA).

It is also interesting to refer to the "Afrobarometer"[122] surveys in order to be able to conclude the living situation of households. Among several surveys, we have chosen those that we think will provide us with useful information.[123]

Let's start with a survey about the general point of view on the current direction of the country (general direction of the country).Some people might think the country is going in the wrong direction. Others may feel it is going in the right direction. So the main question in the survey is: "*Would you say the country is going in the wrong direction or going in the right direction?*". The results are presented in the following table:

[121] Surfshark is a non-profit organization, which has been recognized by a number of globally recognized independent organizations. Its goal is to improve the quality of digital well-being. For more details please see: https://surfshark.com/dql2020

[122] "Afrobarometer" is a pan-African, nonpartisan research network that has provided reliable data on African experiences and evaluations of democracy, governance, and quality of life since 1999. Data sets and analysis from nationally representative surveys in 38 African countries are accessible free of charge. "Afrobarometer" provides a pan-African series of national public attitude surveys on democracy, governance, and society. "Afrobarometer" is recognized by the World Bank and many other organizations. Please see: https://afrobarometer.org/about

[123] All the results of these surveys are available in: https://afrobarometer.org/online-data-analysis/analyse-online Accessed in August 2021.

		Round	
Category	Total	R5 2011/2012	R6 2014/2015
Going in the wrong direction	26.0%	10.1%	41.9%
Going in the right direction	60.6%	72.2%	49.1%
Don´t know	13.4%	17.8%	9.0%
(N)	2,404 (100%)	1,204 (100%)	1,200 (100%)

Table 6: Results of the survey on the overall direction of the country of Algeria. (Source: Afrobarometer surveys, available at: https://afrobarometer.org/online-data-analysis/analyse-online Accessed August 2021).

Overall, the majority of the surveyed population still feel that the country is going in the right direction. However, according to the results of this survey, this segment of people who have adopted this view is steadily decreasing. In the same context, the number of people who feel that the country is going in the wrong direction is increasing as shown in the following graph:

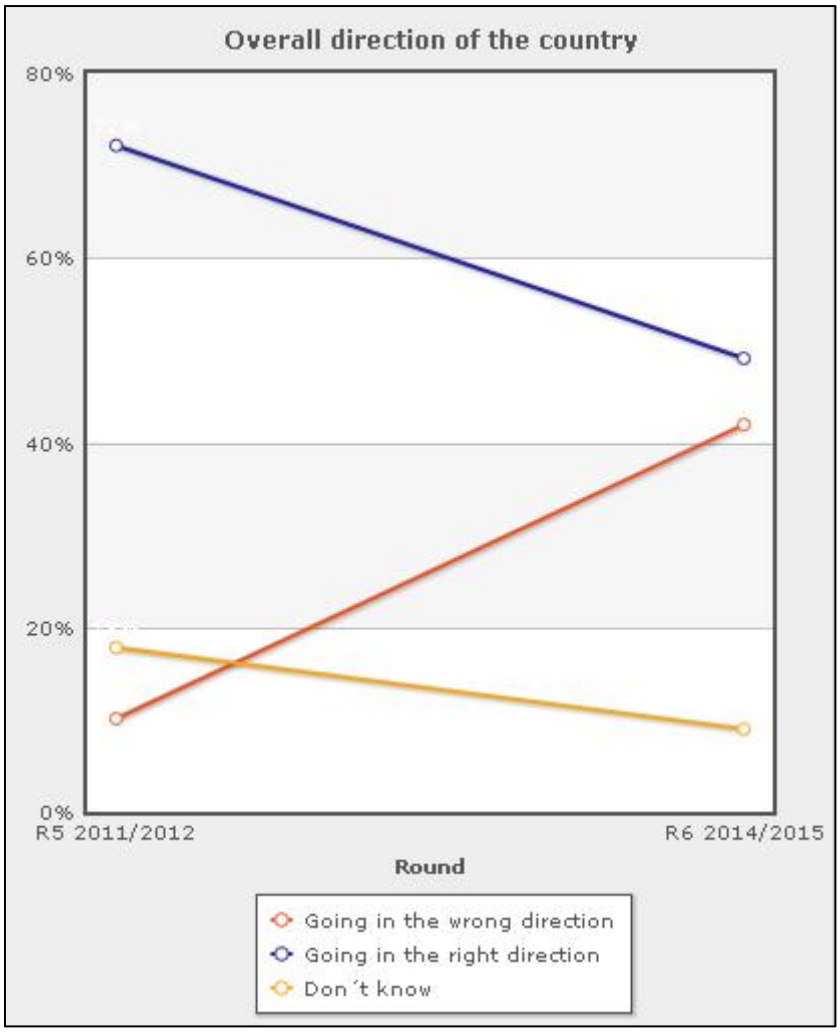


Figure 24: Evolution of the feeling of the population on the general direction of the country. (Source: Afrobarometer surveys, available at: https://afrobarometer.org/online-data-analysis/analyse-online Accessed August 2021).

The second survey is about the country's economic condition (the economic situation of the country). The main question of the survey is: "*Looking ahead, do you expect the following to be better or worse: Economic conditions in this country in twelve months time?* ". The results are presented in the following table:

		Round	
Category	Total	R5 2011/2012	R6 2014/2015
Much Worse	5.5%	0.5%	10.6%
Worse	9.7%	0.8%	18.6%
Same	15.5%	10.2%	20.7%
Better	39.9%	53.2%	26.5%
Much Better	21.5%	29.2%	13.8%
Don't know	7.9%	6.1%	9.7%
(N)	2,404 (100%)	1,204 (100%)	1,200 (100%)

Table 7: Results of the survey on the economic situation of the country of Algeria in 12 months. (Source: Afrobarometer surveys, available at: https://afrobarometer.org/online-data-analysis/analyse-online Accessed August 2021).

The results of this survey are almost similar to those of the previous survey. The majority therefore expect the economic situation to be *better* or *much better*. But in a short time, this slice of people has shrunk to only 40.3% of the total, and the slice of people who expect the economic situation will be *worse* or *much worse* or the same is nearly 50% whereas before, they represented only 11.5%. of the total.

The graph below shows the increase in the percentage of all categories of people who expect the country's economic conditions will be: *much worse*; *worse*; the *same* or those who have no opinion. Except the category of person who expects the economic conditions of the country to be *better* or *much better* are in decrease.

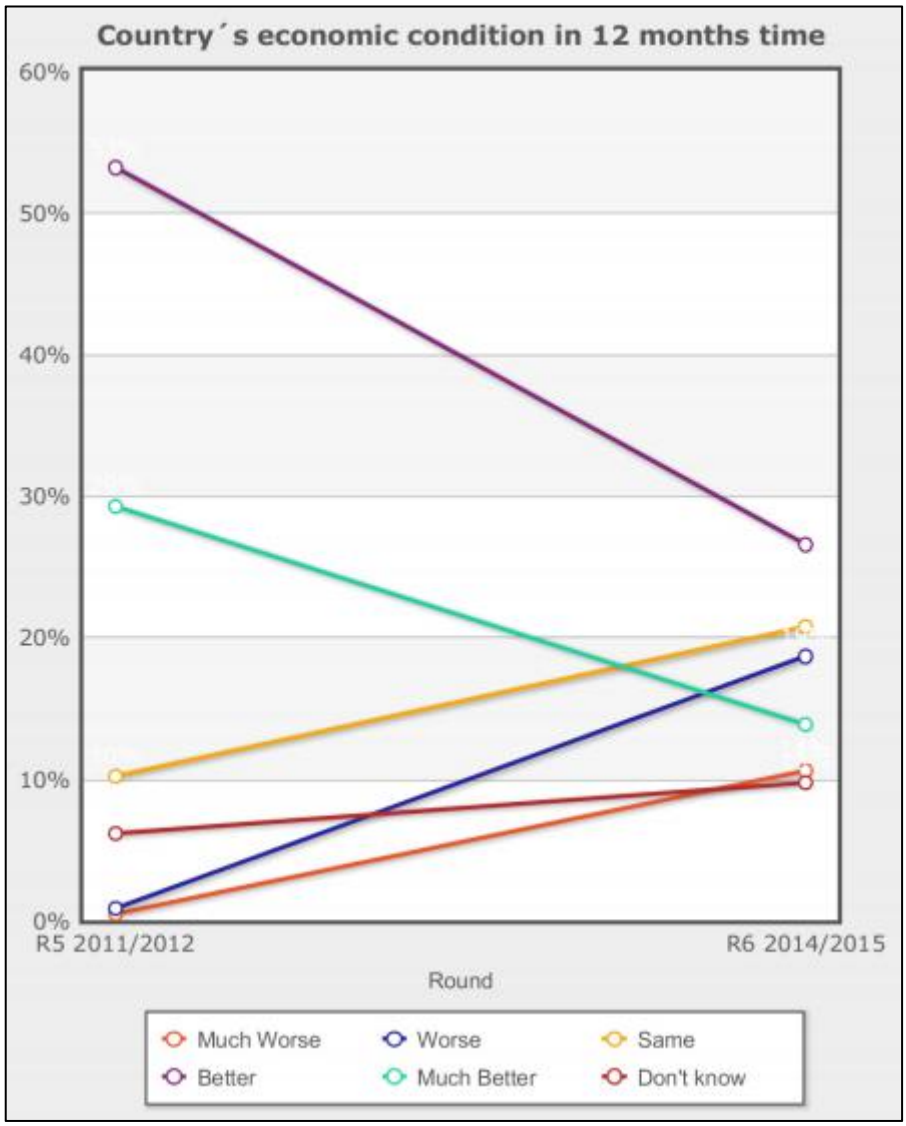


Figure 25: Evolution of expectations on the Algerian economic situation. (Source: Afrobarometer surveys, available at: https://afrobarometer.org/online-data-analysis/analyse-online Accessed August 2021).

The last survey we are discussing concerns the view that citizens have of their current living conditions. The citizen is questioned as follows: "*In general, how would you describe: Your own current living conditions?* ". The answer is to choose between the following five: *Very Bad*; *Fairly bad*; *Neither good nor bad*; *Fairly good*; *Very good* or *Don't know*. The results are presented in the following table:

		Round	
Category	Total	R5 2011/2012	R6 2014/2015
Very Bad	6.3%	3.0%	9.7%
Fairly bad	17.8%	16.0%	19.5%
Neither good nor bad	35.4%	42.6%	28.1%
Fairly good	32.6%	33.9%	31.2%
Very good	7.4%	4.0%	10.7%
Don't know	0.6%	0.5%	0.7%
(N)	2,404 (100%)	1,204 (100%)	1,200 (100%)

Table 8: Results of the survey on the vision of living conditions in Algeria. (Source: Afrobarometer surveys, available at: https://afrobarometer.org/online-data-analysis/analyse-online Accessed August 2021).

The results are a little different this time around. The majority are in the middle (*Neither good nor bad*), then the balance tilts in favor of those who have a positive vision of their living conditions (*fairly good* and *very good*). But the evolution of an individual's view of their living conditions between the 2012 survey and the 2015 survey illustrated in the figure below will bring us more deductions:

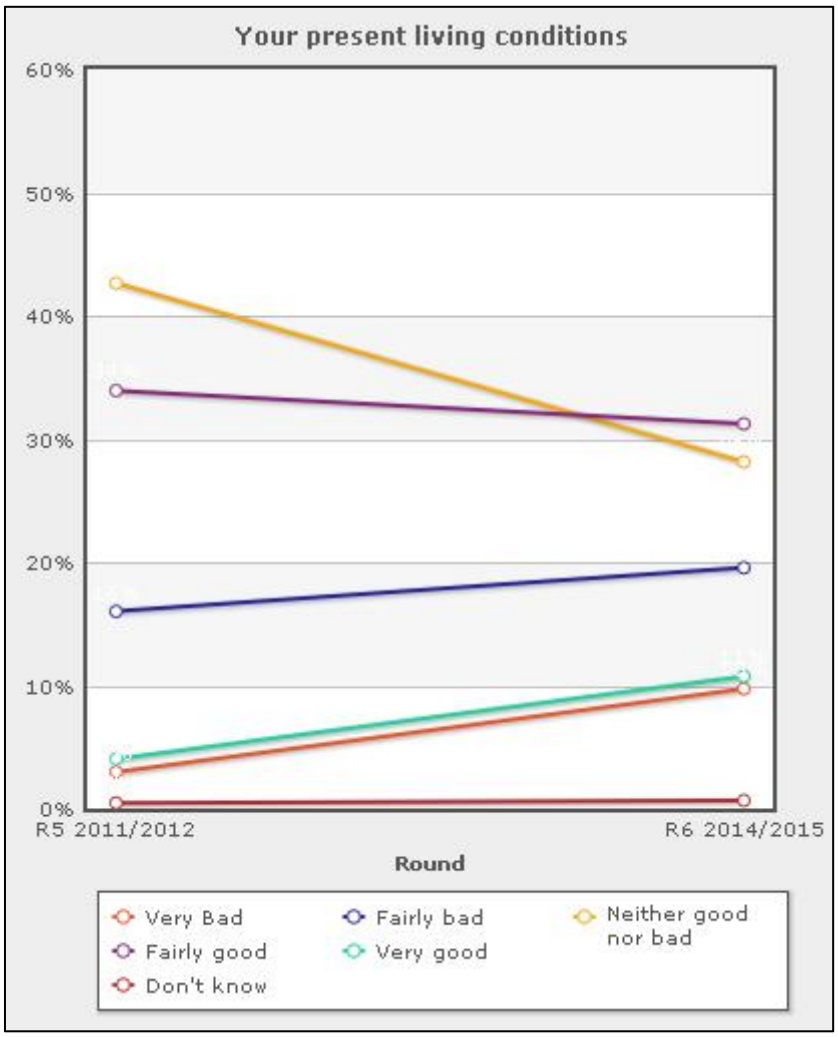


Figure 26: Evolution of the individual's vision of his living conditions in Algeria. (Source: Afrobarometer surveys, available at: https://afrobarometer.org/online-data-analysis/analyse-online Accessed August 2021).

The percentages of all categories are increasing (at different rates), except the two categories "*Neither good nor bad* " and "*Fairly good* " whose their percentages are decreasing (i.e. those in the middle are declining). The categories that varied the most are: those of extremes ("*Very bad* " and "*Very good* " with "+ 6.7%" for both); and the category of the middle "*Neither good nor bad* " which lost 14.5%. This means that what the middle category loses, the extremes gain (but with a little more for the "*Very bad* " category because it has been multiplied by 3, however the "*Very good* "

category has been multiplied by only 2, which means that the category "*Very bad* " which increases faster). All this means that, the gaps between the two extremities increase, it is thus the inequalities which are reinforced.

What we can deduce from all this is that the economic conditions of this country do not allow its citizens to improve or even maintain their standard of living. since the solution of doing business or investing is not quite effective in maintaining his standard of living. In the World Bank's Doing business report (2019), Algeria is placed 157th out of 190 countries for the ease of doing business there (still below average). It is ranked 179th for the protection of small investors, 152nd for the ease of setting up businesses there. Even the index of the solidity of legal guarantees (0 = weak and 12 = solid) of Algeria (which are worth 2 according to the World Bank) does not encourage to start a project or to carry out any investment. This explains the citizen's resort to the parallel economy to protect what can be protected from his standard of living.[124]

We can confirm this decline in terms of economic conditions via the following statistic which shows Algeria's share in the global gross domestic product (GDP) adjusted for purchasing power parity (PPP) from 2016 to 2026:

[124] The informal economy is present in the daily life of Algerian citizens regardless of their standard of living or their social status. For example, sometimes you will find that it is better to buy fruits and vegetables from vendors who have settled informally outdoors on the side of the road rather than a well-presented store. Because by buying from these roadside vendors, you not only save money but also time.

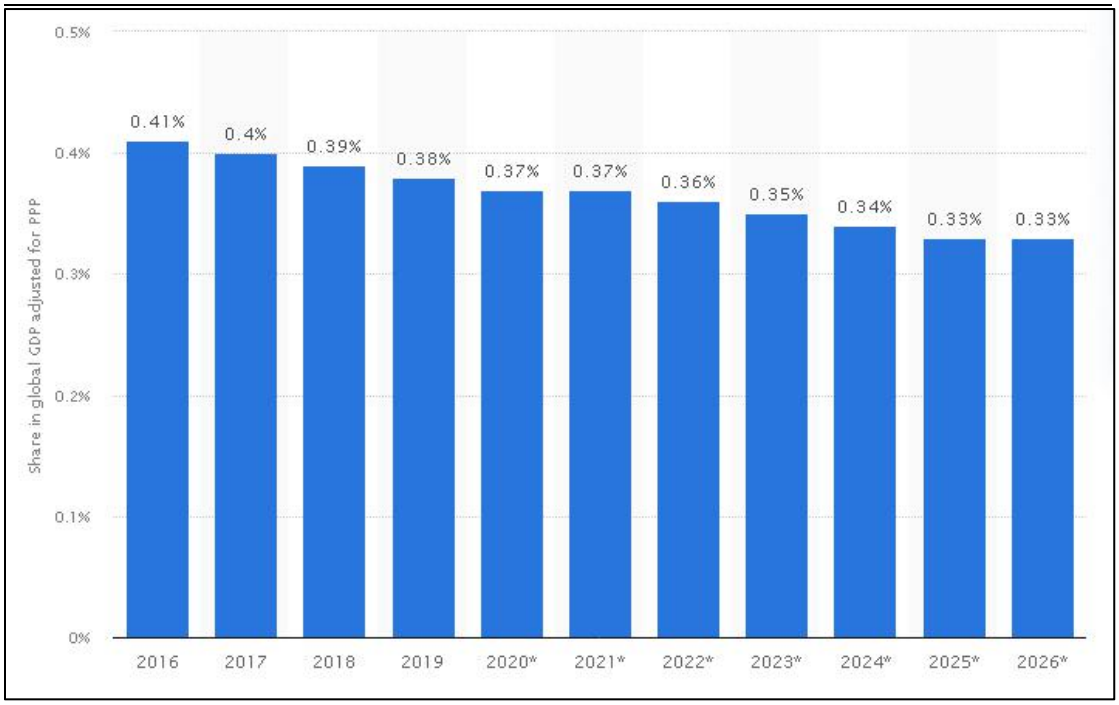


Figure 27: Algeria: Share in global gross domestic product (GDP) adjusted for Purchasing Power Parity (PPP) from 2016 to 2026. (Source: https://www.statista.com/statistics/408047/algeria-share-in-global-gdp-adjusted-for-ppp/ Accessed August 2021).

As this figure clearly shows, Algeria's share in world GDP is not only very low, but it also has a downward trend (even in terms of forecasts). This means that in terms of living conditions and the cost of living, the Algerian economy is also declining, because these data are adjusted for PPP.

According to a report issued by the World Economic Forum[125], Algeria has an Inclusive Development Index (IDI)[126] of 4.22 and its economy is classified among the "slowly shrinking" economies.

[125] World Economic Forum (2018) "Inclusive Development Index: Summary and Data Highlights". Available at: https://www.weforum.org/reports/the-inclusive-development-index-2018 Accessed August 2021.

[126] IDI scores are based on a 1-7 scale: 1=wors; 7=best. Trends are based on percentage change between 2012 and 2016 (using indicators available during both years). Advanced and emerging economy IDI scores are not strictly comparable due to different definitions of poverty. The (IDI) is an annual assessment of 103 countries' economic performance that measures how countries perform on eleven dimensions of economic progress in addition to GDP. It has 3 pillars; growth and development; inclusion and; inter-generational equity and sustainable stewardship of natural and financial resources.

Another indicator which is the "Global Innovation Index (GII)"[127] which tells us about the innovation capabilities of an economy. In 2020, Algeria's score on this indicator was 19.5% (very low) and it ranked 121 globally (out of 131). This Index is a ranking of the innovation capabilities and results of world economies. It measures innovation based on criteria that include institutions, human capital and research, infrastructure, credit, investment, linkages; the creation, absorption and diffusion of knowledge; and creative outputs. The GII has two sub-indices: the Innovation Input Sub-Index and the Innovation Output Sub-Index, and seven pillars, each consisting of three sub-pillars. According to a very detailed report on Algeria published in 2020, lately this country continues to lose its score and fall back in the ranking. In addition, in relation to its GDP, Algeria displays performance below expectations for its level of development as shown in the following figure:

[127] The Global Innovation Index (GII) is co-published by Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations. The report provides an annual ranking of the innovation capabilities and performance of economies around the world. The web address: https://www.globalinnovationindex.org

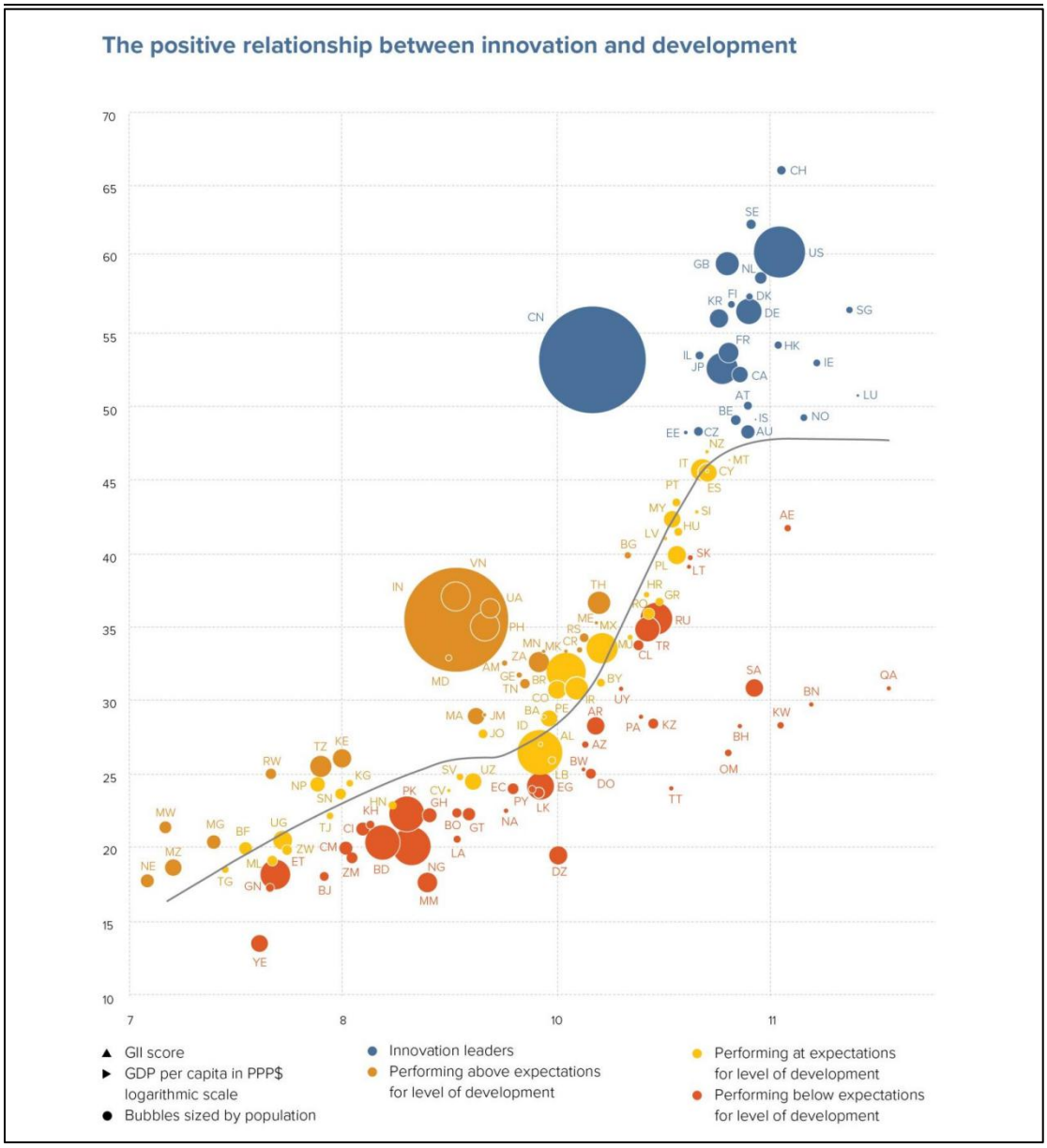


Figure 28: Expected innovation performance compared to observed innovation performance. (Source: Global Innovation Index report (2020) "Algeria", available in: https://www.globalinnovationindex.org/analysis-economy Accessed August 2021).

The bubble chart above shows the relationship between income levels (GDP per capita) and innovation performance (GII score). The trend line gives an indication of the expected innovation performance according to income level. Economies appearing above the trend line are performing better than expected and those below are performing below expectations. Algeria (displayed by the abbreviation “DZ”) is

below and far from this line.

What we can conclude so far, is that the economic conditions in which the Algerian people live are completely unsatisfactory, especially given the capabilities and advantages that Algeria enjoys.

3. Hypothesis and empirical evidence

The World Bank classifies Algeria as a lower-middle income economy (Developing/Emerging nation). The country is heavily reliant on energy exports in natural gas and oil. However, it faces many economic challenges, including high unemployment for women and youth and inequality among its different regions.

The Algerian economy is mainly driven by hydrocarbons and public investment. Even before the arrival of the virus of «COVID-19» in Algeria, the weakening of GDP growth was explained by the negative trend in hydrocarbon production and prices, as well as by the weak diversification of the Algerian economy.

Traditionally, Algeria has drawn on its foreign exchange reserves (managed through the Foreign Resource Regulation) to offset fluctuations in global hydrocarbon prices and its insufficient economic diversification. The country's foreign exchange reserves have therefore continued to decline. Algeria had forecast its foreign exchange reserves to fall to USD 44.2 billion by the end of 2020, below a previous forecast of USD 51.6 billion, hit by a sharp drop in global crude prices. Falling prices also explain energy export revenues for the year 2020 at USD 20.6 billion, far below the USD 37.4 billion projection announced before the pandemic broke out. The current account deficit was estimated at 10.5% of GDP in 2020. Algeria is financing its budget deficit with "unconventional" measures and an attempt to drain funds from the informal sector

(40% of GDP).[128]

After a decade-long slide, Algeria's economic freedom score turned upward this year, but it only reached 49.7[129] (between 0 and 49.9 is not at all free "repressed"), making its economy the 162nd freest in the 2021 Index[130]. It remains repressed but is very close to the threshold for a higher ranking. To put the country on the path to greater economic freedom, the government needs to strengthen the judicial system and other rule-of-law institutions. Greater openness and increased financial freedom would improve the investment climate. Because there are many layers of non-tariff barriers to foreign trade, and foreign investors are generally confined to minority status, and restrictions on foreign ownership continue to limit much-needed investment dynamism. Capital markets are underdeveloped, and the financial sector is still under the control of public banks. The index of freedom of trade reached 57.4, while the index of freedom of investment reached only 30.0, and the same is true for the index of financial freedom of 30.0.

Adding to that, the government controls most real property in Algeria, and unclear titles and conflicting ownership claims make the purchase of private real estate difficult. Although secured interests in property are generally recognized and enforceable, court proceedings can be lengthy, and the results can be unpredictable. The judiciary is generally weak, slow, and subject to political pressure. Cronyism and corruption plague the business and public sectors, especially in energy. So that the

[128] See as example Santander Bank report about Algeria at: https://santandertrade.com/en/portal/analyse-markets/algeria/economic-political-outline

[129] Economic freedom is measured on the basis of 12 quantitative and qualitative factors, grouped into four broad categories, or pillars, of economic freedom: Rule of Law (property rights, government integrity, judicial effectiveness); Government Size (government spending, tax burden, fiscal health); Regulatory Efficiency (business freedom, labor freedom, monetary freedom); Open Markets (trade freedom, investment freedom, financial freedom).
Each of the twelve economic freedoms within these categories is graded on a scale of 0 to 100 (From 0 to 49.9 is repressed; 50 to 59.9 is mostly unfree; 60 to 60.9 is moderately free; 70 to 70.9 is mostly free and from 80 to 100 is free). A country's overall score is derived by averaging these twelve economic freedoms, with equal weight being given to each. More information on the grading and methodology can be found in: https://www.heritage.org/index/about

[130] Please see: https://www.heritage.org/index/ranking

judicial effectiveness index reached 41.6, also the Index of the solidity of legal guarantees (0 = weak and 12 = solid) of Algeria provided by the world bank, is frozen at 2.5 since 2013. The property rights index was 34.0, while the government integrity index was only 32.7.[131]

This is to say, that according to *SEN*'s modern approach, the standard of living in Algeria has lost one of its most important components, which is "freedom". This is due not only to bureaucratic hindrances, but also to the hindrances of mismanagement and lack of will to carry out real and comprehensive reforms and settle for temporary solutions. This is what led to the situation described above.

Although the main objective of any economic activity is to meet the infinite needs of human beings through the optimal utilisation of various resources available, this activity remains social, and the results of the economics evolution and political events constrain it. Since the development in the world of today no longer seeks to meet only the physical needs of individuals, but seeks to meet even their sensory needs. This is called the "welfare economy" which will certainly help to solve many social problems and advance the daily life of community members to reach advanced stage of quality of life.

In this context, the Algerian economy can be classified as a "subsistence economy" that adds to the standard of living of its citizens only basic necessities such as food, housing and clothing. If we start from the idea that a successful economy is one in which everyone gets his fair share. This implies the need to give priority to filling data gaps involving the indicators of economic well-being of the system of national accounts in order to be able to carried out studies more focused on households and individuals. The low rate of digitization from which our country suffers makes it

[131] This is all based primarily on data from "The Heritage Foundation", for more details please see: https://www.heritage.org/index/country/algeria

difficult to obtain data, especially concerning worrying subjects such as economic performance, inequalities, poverty, environmental impacts, well-being and so on. So, the lack of such data on households and individuals is the first problem with which we have to deal in our study.

Thus, to represent the standard of living; among the OECD equivalence scales, it seems that the square root scale is the most appropriate for the case of Algeria. Because it has the lowest elasticity, and therefore its consumption economies of scale are greater. This opinion is justified by the nature of the social characteristics possessed by the Algerian family, since family members (sometimes even large families) still live together and share their resources. Thus, economies of scale are strongly present in the Algerian household. It is true that this tradition has started to fade over time, which makes the use of this scale open to criticism. But it is not only here that the problem appears, also the lack of reliable and up-to-date household data makes its use impossible without resorting to a field survey to collect the data necessary for its use. Which is not possible for our study given the lack of resources and time.

On the other hand, among *Engel* scales we think that the share of expenditure on food in total household expenditure (expenditure on food as a proportion of total expenditure) is the most efficient. Because it is the most apt to reveal the real living situation of Algerian households. Since the measure of "spending on luxury" can skew the results, as the Algerian consumer is somewhat far from being rational in his spending[132]. Also, the scale of "volume of savings in the total income of the household" (The ratio between the amount of savings and total income) is not efficient since the majority of households do not have the savings culture. Moreover,

[132] Neoclassical theory is strongly criticized for assuming the consumer in general to be rational. It is necessary to mention that concerning the Algerian household, this supposition remains ours and it is based only on the experience of daily life and not on any well-founded study.

the banking system is ineffective. But this does not allow us to use this Engel scale of "share of household food expenditure in their total expenditure" since these data are not available.

The KONÜS index is also not a good choice for our empirical study for two reasons: first, because it reflects more the cost of living and depends mainly on the utility of the consumer (it is therefore not a complete indicator of the standard of living), and secondly because its construction is complex and exceeds our capacities in terms of time.

In the same vein, cluster analysis does not build a model but provides an analysis that allows data to be evaluated and selected. It is more useful in the case of a comparative study between regions (or countries), which is why we will not present it in our study.

Regarding the Gini index, it will be much more efficient as an explanatory variable (endogenous) in the model to take into account the effect of inequalities on the standard of living. But the few observations available will make its use difficult because we will have to estimate more observations to be able to exploit it. We managed to find seven observations in the literature without counting the three available in the data of the World Bank.

In terms of purchasing power parity, it can be used in two ways; to deflate or convert GDP (or any other variable in the monetary unit); or to directly use it as an explanatory variable of the standard of living as a PPP conversion factor for the local currency (or any other monetary variable).

On the basis of all these facts, the option of GDP per capita to represent the national standard of living seems to be the most reasonable choice for our case, not only for

the nature of the data available, but also to benefit from the advantages of GDP per capita as a measure that we have provided in detail in the first section of this chapter. Thus, we can justify our choice by the following main points:

- The GDP per capita reflects the health of the country's economy with good precision, so it can at the same time reflect the general standard of living of the country. This means that in the long run, any increase in GDP per capita inevitably means an improvement in the general economic situation and, consequently, an improvement in the general standard of living in the country, and vice versa (No high-income country is poor, and no low-income country is rich).

- GDP per capita as a measure of well-being is often criticized because it measures the material (or monetary) aspect of human life, and neglects the qualitative side such as health, happiness and education. But before considering GDP as a strict measure of wealth, here's something to think about. Increases in GDP per capita are also correlated with improvements in those things that money can't buy. This means that as GDP per capita increases, a country also tends to gain advantages in the quality aspect of the lives of its citizens. Because as the value of GDP per capita increases, the longevity of people tends to increase with it and citizens tend to be better educated. As a result, in the long run, per capita GDP growth is also correlated with an increase in the non-material aspects of a nation's standard of living. For example, it is clear that people are living longer in countries with high GDP per capita. No high-income country has a short life expectancy (or less educated citizens), and no low-income country has a long life expectancy (or better educated citizens).

This does not make GDP per capita a perfect measure of well-being and human progress. It can also have some flaws that we will try to find solutions to. The two main drawbacks are:

- First is that GDP per capita, can consider that two countries have almost the same standard of living, while the poverty rate is much higher in one of the two. Here it is not a question of income, but of income distribution, an issue that GDP per capita cannot fully address. In order to remedy this problem, we have thought of introducing the Gini index as an explanatory variable in order to be able to take into account the effect of inequalities. Or even also the poverty rate.

- The second is that the GDP per capita cannot take into account the activities of the informal economy. Although in the Algerian case, a significant part of the citizens succeed in maintaining (or promoting) their standard of living thanks to the economic activity that they exercise informally. For this, it will also be necessary to introduce into the model an exogenous variable which will be able to represent the volume of the informal economy in order to be able to control its effect on the standard of living.

Before designing the model, we will first perform a correlation test and a co-integration test between the following three variables: GDP per capita, life expectancy and HDI,[133] to find out the nature of their long-term evolution, and get an idea of the ability of the measure: "GDP per capita" to fulfill its role of representing the standard of living. If these three variables prove that they are co-integrated and positively correlated, in this case, our assumption that the GDP per capita is a good measure of standard of living will be correct[134].

After that, we will estimate the model which will be based on three independently

[133] We have chosen these two variables to put them as endogenous next to the GDP per capita for three reasons: First, for the availability of their time series which is quite rich in number of observations; Second, because they are not explanatory variables of the standard of living but on the contrary they represent it, that is to say that it is not because life expectancy has increased that it will improve the standard of living, but rather because the standard of living has improved it will generate an increase in life expectancy; Third, because they are of a different nature, especially in terms of the unit of measurement.

[134] If not, we will have to find other variables which have the status of an output of standard of living and which will be co-integrated and positively correlated with the GDP per capita to be able to validate our supposition.

estimated linear regressions. Thus, its general functional form will be as follows:

$$\mathrm{SOL} = f(\mathrm{X1}, \mathrm{X2}, \mathrm{X3}, \mathrm{X4}, \mathrm{X5}, \mathrm{X6}, \mathrm{X7}, \mathrm{X8}, \mathrm{X9}) \quad [1]$$

Where:

SOL: represents the level of the standard of living of the population.

X_1 : an explanatory variable of an economic nature.

X_2 : an explanatory variable of a social nature.

X_3 : an explanatory variable of an environmental nature.

X_4 : an explanatory variable of a governmental nature.

X_5 : an explanatory variable of an educational nature.

X_6 : an explanatory variable of a health nature.

X_7 : an explanatory variable of a technological nature.

X_8 : volume of the informal economy.

X_9 : economic freedom score.

So that the variable to be explained (endogenous) "SOL" will be made up of the three variables: GDP per capita, life expectancy and HDI. The detailed functional form of the model will therefore be as follows:

$$\begin{cases} GDP\ per\ capita = f(X1, X2, X3, X4, X5, X6, X7, X8, X9) \\ Life\ expectancy = f(X1, X2, X3, X4, X5, X6, X7, X8, X9) \\ HDI = f(X1, X2, X3, X4, X5, X6, X7, X8, X9) \end{cases} \quad [2]$$

After estimated the three equations with the ordinary least squares method, whenever a variable will be statistically non-significant, it will be replaced by another of its same nature in order to be able to deduce the nature of factors that have more impact on standard of living.

Finally, it is necessary to note that the number of explanatory variables (exogenous) may vary depending on the statistical requirements of the following study.

CHAPTER THREE
Empirical Framework

In this chapter, the objective is to verify first the degree of robustness of the dependent variables: GDP per capita, life expectancy and human development index in the representation of the standard of living in Algeria, by checking for the case of Algeria the concordance of the assumption which states that the GDP per capita can be a good measure of the well-being of the population. This assumption is only valid if the series of GDP per capita is strongly correlated and cointegrated with other factors of a non-material nature, which can give a picture of the standard of living of the population. This is why we have chosen the life expectancy and the HDI, so that they are different in nature (even their units of measure are different) and can be good measures to get an idea of the standard of living of any society. So we assume that they can enrich the standard of living modeling.

After having validated this hypothesis, we will proceed to the selection of the independent variables which will explain our phenomenon to be studied (the standard of living). The selection method will be as follows: First, select a variable from each of the factors already specified in equation [1] in order to build a model that will be able to illustrate the type and degree of influence of each factor on the standard of living. In addition to these factors, we have chosen to add the variables of economic freedom and the volume of the informal economy, the first given its importance according to *Sen*'s modern approach; the second for the importance it has, given the particularity that Algeria has, since a significant part of the population turns to the informal sector to protect its standard of living. Second, in factors where data for more than one usable variable is widely available, the causality test will be the deciding factor in choosing which variable will show that it causes the maximum of the three dependent variables.

Finally, after having determined the order of integration of the series to be used and made all the statistical requirements to avoid a spurious regression, we will proceed to the estimation, the validation and the interpretation of the three linear equations

presented in the model [2]. For this, we will use the Eviews. 12 software in all the statistical processing that follows.

1. Dependent variables

Our study is conducted on annual data from 1990 to 2020. It is considered preferable to first give a brief presentation of the three variables to be explained in this study:

- The GDP per capita[135] time series we will use is based on the purchasing power parity of the constant international dollar for 2017, in order to isolate the effect of inflation, especially with regard to the continued depreciation of the national currency. The unit of measurement of these data are therefore "USD in constant PPP" and are taken from World Bank data.

- Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. The unit of measurement of these data are therefore "years" and are also taken from World Bank data.

- The Human Development Index is a composite index that measures three basic dimensions of human development: a long and healthy life, knowledge and a decent standard of living. Four indicators are used to calculate the index: life expectancy at birth, average years of schooling, expected years of schooling and gross national income per capita. The source of the data is the United Nations.

[135] We draw attention that it is also "real GDP per capita" since it is taken at its constant value. We will not use the term "real" just for short.

1.1. Correlation test

The correlation test shows that there is a very strong positive correlation between each pair of variables as shown in the following table:

Correlation t-Statistic	HDI	GDP_PER_...	LIFE_EXPE...
HDI	1.000000 ----		
GDP_PER_CAPITA	0.968892 20.71613	1.000000 ----	
LIFE_EXPECTANCY	0.999130 126.7729	0.965164 19.51930	1.000000 ----

Table 9: Result of the correlation test between GDP per capita, life expectancy and HDI. (Source: Output of Eviews 12 software after correlation test).

The values of all the correlation coefficients are close to 1 with high t-statistics (greater than 1.96), which means that there is a strong positive and significant correlation between all variables.

1.2. Unit root test

Before proceeding with the application of the cointegration test, it is first necessary to ensure that the three series are integrated of the same order *I(d)*. Because if one of the series is stationary *I(0)*, there is no possibility that it will be cointegrated with the other two series.[136] For this purpose, we will use the unit roots test (stationarity) of Augmented Dicky-Fuller (ADF).

But also before launching the stationarity test series by series, it is preferable to transform the two series GDP per capita and life expectancy into Log-series for two

[136] Harris, R. I. (1995). Using cointegration analysis in econometric modelling.

reasons: the three series to be studied do not have the same unit of measurement; there is a large gap between the intervals in which each series evolves (i.e. GDP per capita varies between [7000; 12000], life expectancy varies between [50; 80], and HDI varies between [0; 1]). Which makes it important to reduce the series to a close intervals and isolate the effect of the units of measure.

1.2.1. Stationarity test for the GDP per capita series

The evolution of the log-GDP per capita series is visualized in the graph below:

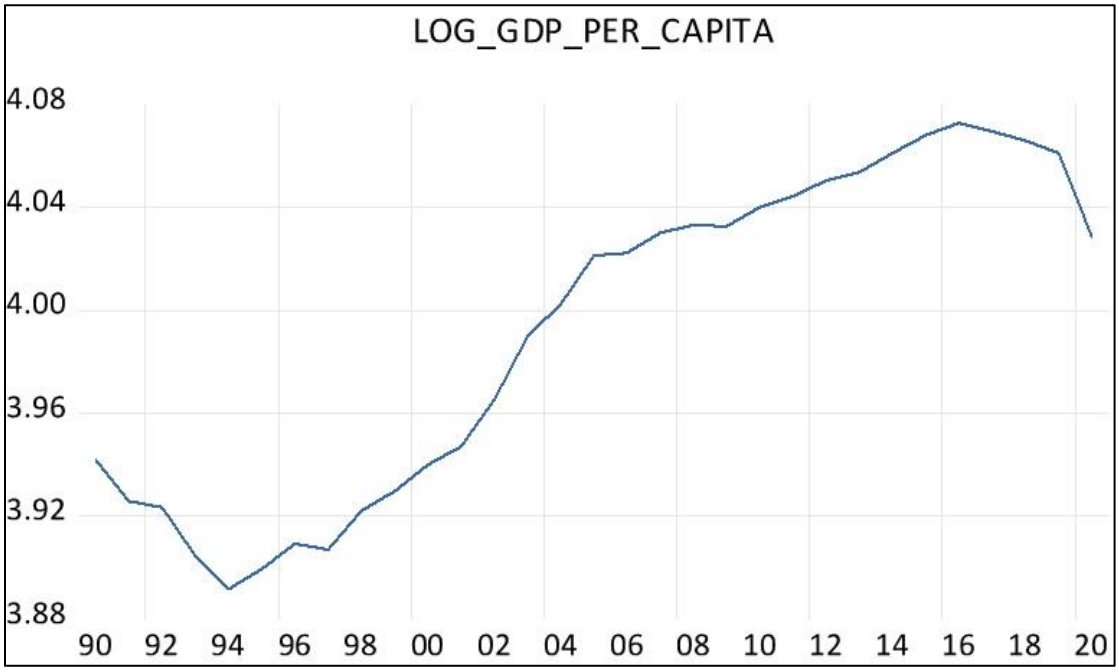


Figure 29: Evolution of Log-GDP per capita. (Source: Output of Eviews 12 software).

The general trend of this series is upwards with some fluctuations, especially on the ends. This makes it very possible that this is not a stationary series.

Thus, the application of the ADF test on this series at the level gives the following main results:

Log-GDP per capita series	Model (3) «trend test»	Model (2) «constant test»	Model (1) «Ø test»
prob $\{H_0\}$	0.5009 > 0.05	0.0591 > 0.05	0.9882 > 0.05
t-statistc	0.682241	1.98169	0.014956
critical value (tabulated)	3.18	2.89	-1.95
decision rule	H_0: t ≤ c-value : trend coefficient = 0 H_1: t > c-value : trend coefficient ≠ 0	H_0: t ≤ c-value : constant = 0 H_1: t > c-value : constant ≠ 0	H_0: t > c-value : Ø = 1 H_1: t < c-value : Ø < 0
Conclusion	We go to the model (2)	We go to the model (1)	**The series is not stationary, generated by a DS process**

Table 10: Results of the stationarity test on the Log-GDP per capita series. (Source: Author's own, according to results obtained by Eviews software).

This table is read by column, its results show that the series at the level is not stationary and generated by a "Difference Stationary" (DS) process. Which means it has a stochastic trend. So, we will proceed with the differentiation to generate a new differentiated series on which the stationarity is tested again.

The results of the application of the unit root test on the first difference series are summarized in the following table:

The series Log-GDP per capita in first difference.	Model (3) «trend test»	Model (2) «constant test»	Model (1) «Ø test»
prob $\{H_0\}$	0.1255 > 0.05	0.9623 > 0.05	0.0454 < 0.05
t-statistc	1.582904	0.047784	-2.094
critical value (tabulated)	3.18	2.89	-1.95
decision rule	H_0: t ≤ c-value : trend coefficient = 0 H_1: t > c-value : trend coefficient ≠ 0	H_0: t ≤ c-value : constant = 0 H_1: t > c-value : constant ≠ 0	H_0: t > c-value : Ø = 1 H_1: t < c-value : Ø < 0
Conclusion	We go to the model (2)	We go to the model (1)	**The series in first difference is stationary.**

Table 11: Results of the stationarity test on the series Log-GDP per capita in first difference. (Source: Author's own, according to results obtained by Eviews

software).

The table shows that the Log-GDP per capita series is stationary[137] in first difference, which means that it is integrated of order 1: *I(1)*. The graph below visualizes the evolution of the differentiated series:

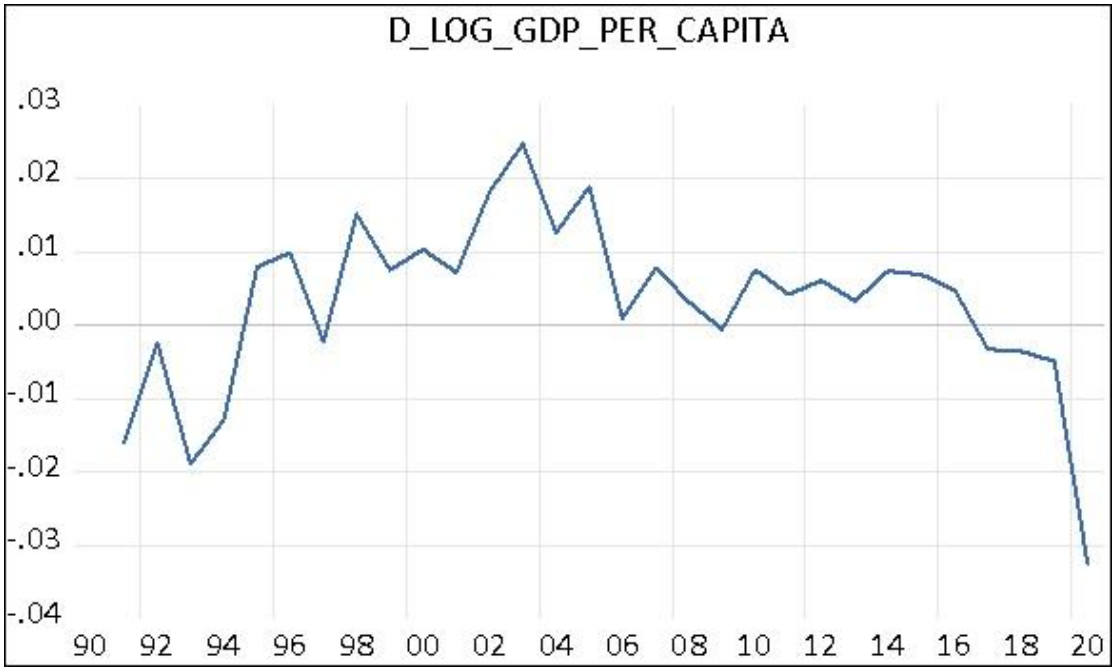


Figure 30: Evolution of the differentiated series Log-GDP per capita. (Source: Output of Eviews 12 software).

1.2.2. Stationarity test for the life expectancy series

The evolution of the log-life expectancy series is visualized in the graph below:

[137] The ADF test shows that this series is stationary after the first difference, but at the risk threshold of 5%, below this threshold this series will be considered non-stationary.

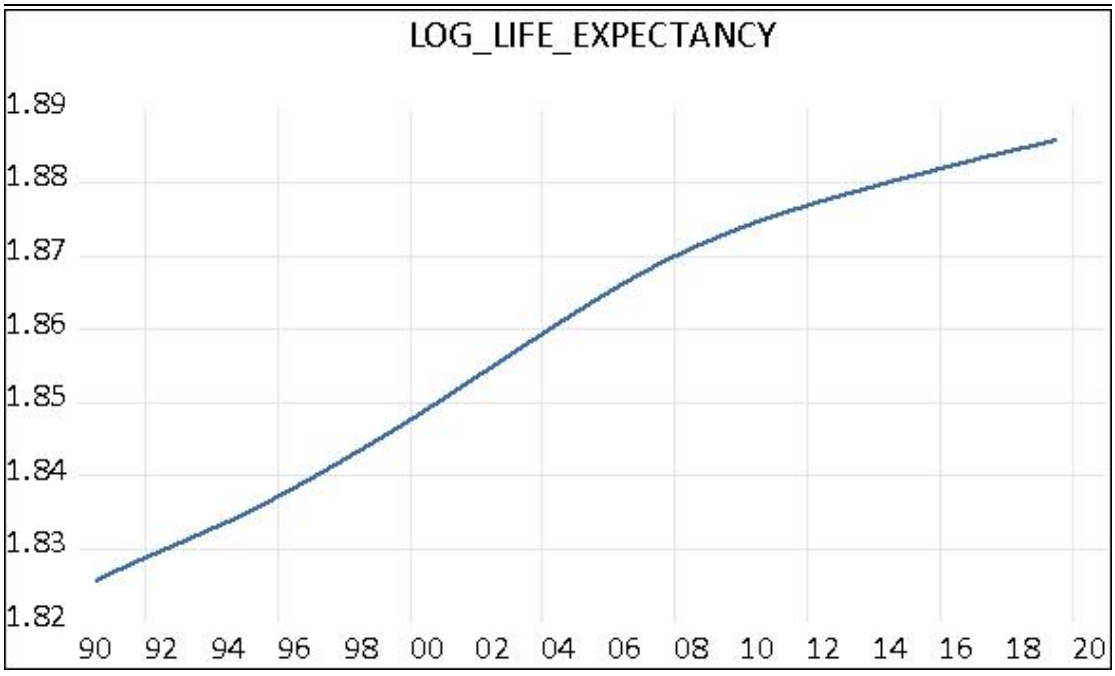


Figure 31: Evolution of Log-life expectancy. (Source: Output of Eviews 12 software).

The general trend of this series is upward with no obvious fluctuations. This makes it very possible that this is not a stationary series.

Applying the ADF test to this series at the level gives the following main results:

Log-life expectancy series	**Model (3) «trend test»**	**Model (3) « | Ø | test»**
prob $\{H_0\}$	$0.0003 < 0.05$	$0.0001 < 0.05$
t-statistc	4.278798	4.778586
critical value (tabulated)	3.18	3.50
decision rule	H_0: t ≤ c-value : trend coefficient = 0 H_1: t > c-value : trend coefficient ≠ 0	H_0: t ≤ c-value : Ø = 1 H_1: t > c-value : | Ø | < 0
Conclusion	We stay in the model (3)	**The series is not stationary, generated by a TS process**

Table 12: Results of the stationarity test on the Log-life expectancy series. (Source: Author's own, according to results obtained by Eviews software).

The results show that this series is also non-stationary at the level, but this one is generated by a "Trend Stationary"(TS) process. Which means it has a constant linear trend. Series of this type are stationary not by differentiation but by estimation of the trend by OLS. This means that we will generate a new series from which we will subtract the equation of the estimated residuals with respect to the trend (i.e. we will remove the effect of the deterministic trend from the series). Then we test the stationarity again (the results are provided by the table below):

The log-life expectancy series devoid of the effect of the deterministic trend.	**Model (3) «trend test»**	**Model (2) «constant test»**	**Model (1) «Ø test»**
prob $\{H_0\}$	0.4792 > 0.05	0.4482 > 0.05	0.00 < 0.05
t-statistc	0.718887	0.770493	-6.36533
critical value (tabulated)	3.18	2.89	-1.95
decision rule	H_0: t ≤ c-value : trend coefficient = 0 H_1: t > c-value : trend coefficient ≠ 0	H_0: t ≤ c-value : constant = 0 H_1: t > c-value : constant ≠ 0	H_0: t > c-value : Ø = 1 H_1: t < c-value : Ø < 0
Conclusion	We go to the model (2)	We go to the model (1)	**The series is stationary.**

Table 13: Results of the stationarity test on the log-life expectancy series with no effect of the deterministic trend. (Source: Author's own, according to results obtained by Eviews software).

Thus, the log-life expectancy series is stationary after removing the linear trend effect, which means that it is integrated of order 1: *I(1)*. The graph below shows the evolution of the stationary series:

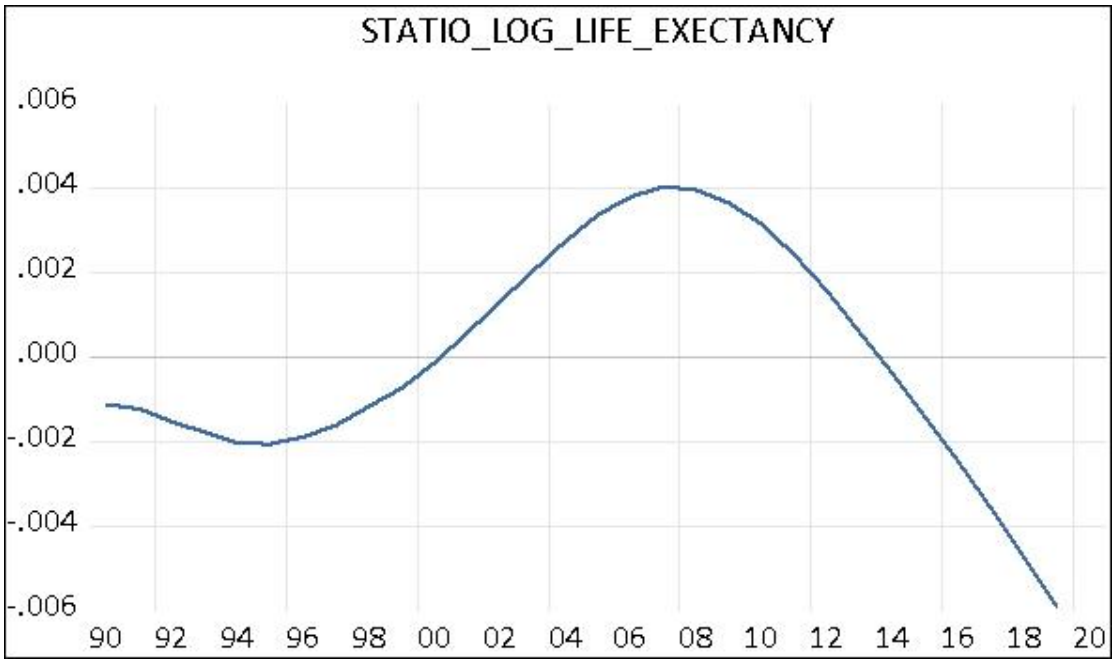


Figure 32: Evolution of the log-life expectancy series with no deterministic trend effect. (Source: Author's own, according to results obtained by Eviews software).

1.2.3. Stationarity test for the HDI series

The evolution of the HDI series[138] is visualized in the graph below:

[138] This time, this series does not need to be transformed into a log, because its variation interval is close to the other two logarithmic series. In addition to that, its transformation into a log will lead to negative values and we want to avoid that.

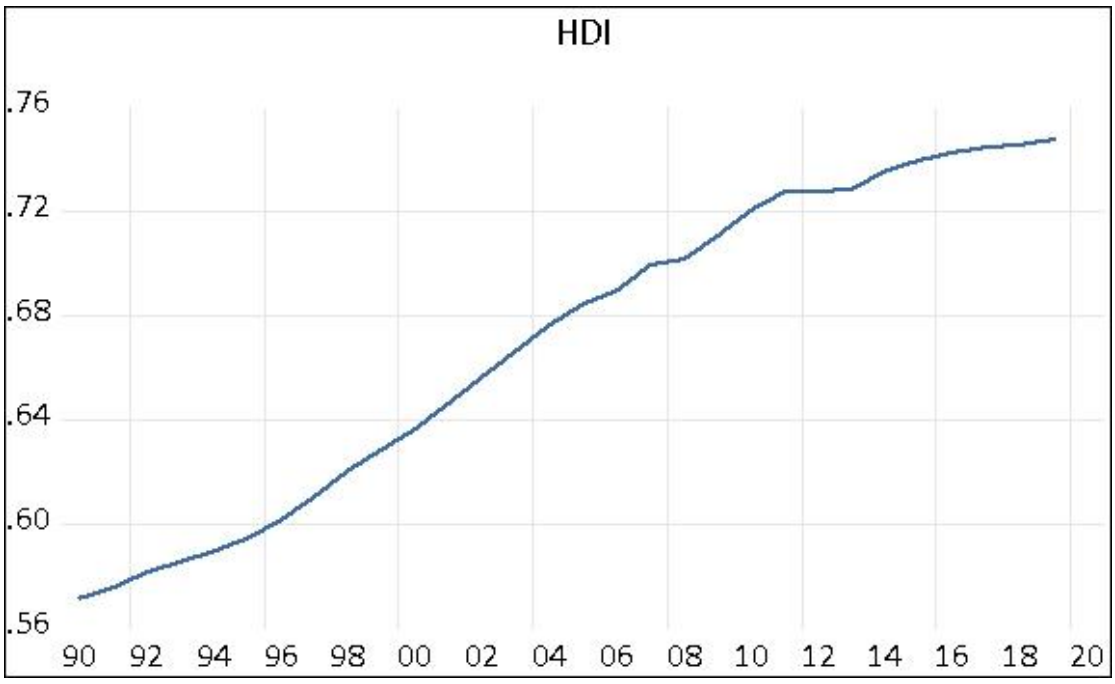


Figure 33: Evolution of the HDI series. (Source: Output of Eviews 12 software).

This series also has a general trend which is increasing with no obvious fluctuations, which makes it very possible that it is not stationary.

The application of the ADF test to this series at the level gives the following main results:

The HDI series	Model (3) «trend test»	Model (2)		Model (1) «Ø test»
		«constant test»	«Ø test»	
prob $\{H_0\}$	0.2093 > 0.05	0.007 < 0.05	0.0594 > 0.05	0.053 > 0.05
t-statistc	1.287382	2.880192	-1.968241	2.006626
critical value (tabulated)	3.18	2.89	-2.93	-1.95
decision rule	H_0: t ≤ c-value : trend coefficient = 0 H_1: t > c-value : trend coefficient ≠ 0	H_0: t ≤ c-value : constant = 0 H_1: t > c-value : constant ≠ 0	H_0: t > c-value : Ø = 1 H_1: t < c-value : Ø < 0	H_0: t > c-value : Ø = 1 H_1: t < c-value : Ø < 0
Conclusion	We go to the model (2)	According to the prob $\{H_0\}$: we accept $H_1(C \neq 0)$. But cccording to t-statistc we accept H_0 (C = 0); We will therefore test for both cases.	**In this case: the series is non-stationary generated by a DS process.**	**Even in this case: the series is non-stationary generated by a DS process.**

Table 14: Results of the stationarity test on the HDI series. (Source: Author's own, according to results obtained by Eviews software).

The series at the level is therefore not stationary and generated by a "Differency Stationary" (DS) process. We will proceed with the differentiation to generate a new differentiated series on which the stationarity is tested again.

The results of the application of the unit root test on the first difference series are summarized in the following table:

The HDI series in first difference	**Model (3) «trend test»**	**Model (2)**		**Model (1) «Ø test»**
		«constant test»	«Ø test»	
prob $\{H_0\}$	0.0833 > 0.05	0.0245 < 0.05	0.0106 < 0.05	0.2137 > 0.05
t-statistc	1.804262	2.388324	-2.755285	-1.273477
critical value (tabulated)	3.18	2.89	-2.93	-1.95
decision rule	H_0: t ≤ c-value : trend coefficient = 0 H_1: t > c-value : trend coefficient ≠ 0	H_0: t ≤ c-value : constant = 0 H_1: t > c-value : constant ≠ 0	H_0: t > c-value : Ø = 1 H_1: t < c-value : Ø < 0	H_0: t > c-value : Ø = 1 H_1: t < c-value : Ø < 0
Conclusion	We go to the model (2)	According to the prob $\{H_0\}$: we accept $H_1(C \neq 0)$. But cccording to t-statistc we accept H_0 (C = 0); We will therefore test for both cases.	According to the prob $\{H_0\}$: we accept H_1 : the series is stationary. But according to t-statistic we accept H_0: the series is not stationary	In this case, the series is not yet stationary. **It is concluded that the series is stationary only at a risk threshold equal to or greater than 10%. Below this threshold, the series is not stationary.**

Table 15: Results of the stationarity test on the HDI series in first difference. (Source: Author's own, according to results obtained by Eviews software).

The ADF test results show that this series is not yet stationary[139] at its first differentiation (the figure below shows the shape of its evolution), so a second differentiation is necessary.

[139] This series can be considered stationary at the 10% risk threshold. This means that it is integrated of order 1 I (1), but with a risk of 10%.

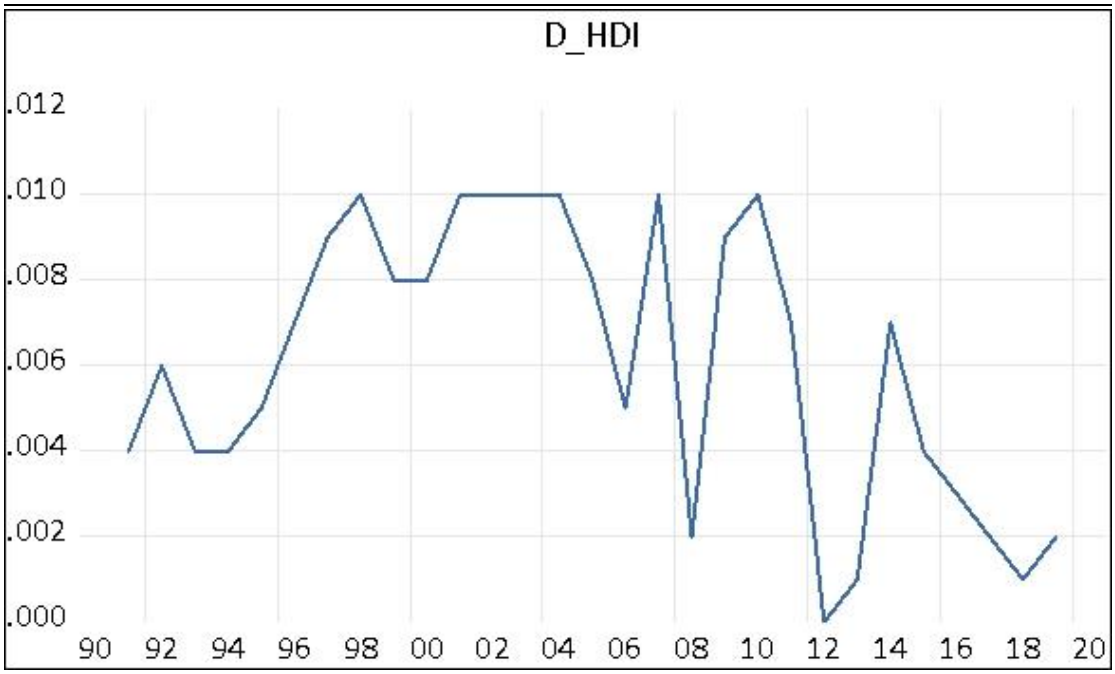


Figure 34: Evolution of the HDI series in first difference. (Source: Output of Eviews 12 software).

The results of the stationarity test on the series, in second difference are summarized in the following table:

The HDI series in second difference	**Model (3) «trend test»**	**Model (2) «constant test»**	**Model (1) «Ø test»**
prob $\{H_0\}$	0.0742 > 0.05	0.7261 > 0.05	0.0000 < 0.05
t-statistc	1.884122	0.355080	-7.197063
critical value (tabulated)	3.18	2.89	-1.95
decision rule	H_0: t ≤ c-value : trend coefficient = 0 H_1: t > c-value : trend coefficient ≠ 0	H_0: t ≤ c-value : constant = 0 H_1: t > c-value : constant ≠ 0	H_0: t > c-value : Ø = 1 H_1: t < c-value : Ø < 0
Conclusion	We go to the model (2)	We go to the model (1)	**The series is stationary.**

Table 16: Results of the stationarity test on the HDI series in second difference. (Source: Author's own, according to results obtained by Eviews software).

Thus, the HDI series is stationary after the second difference, which means that it is integrated of order 2: *I(2)*. The graph below shows the evolution of the stationary

series:

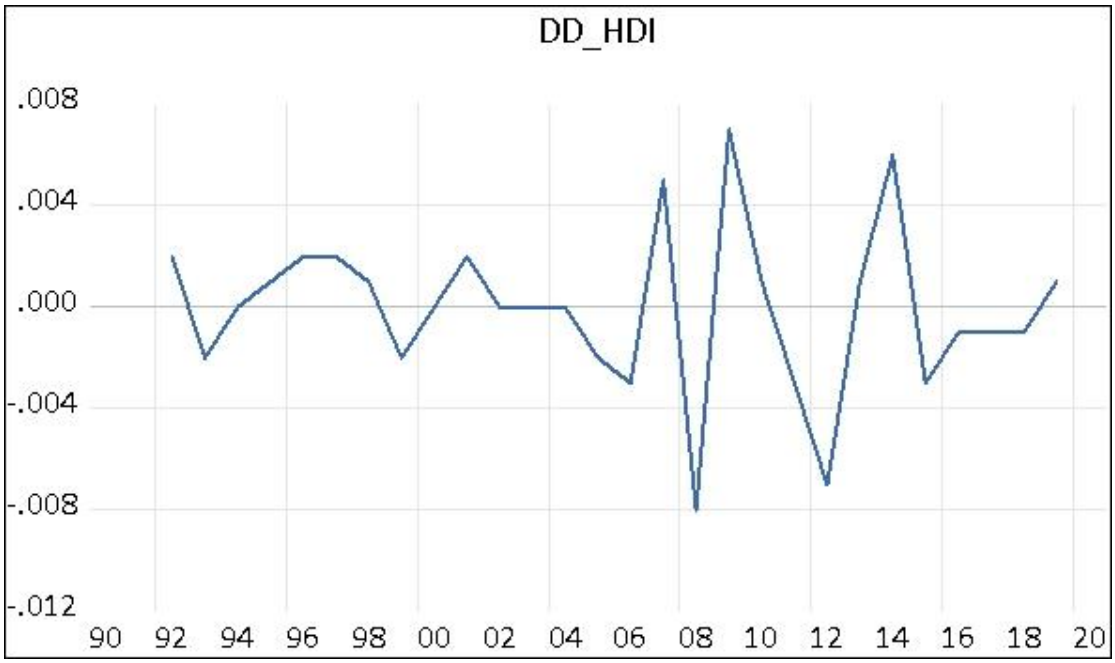


Figure 35: Evolution of the HDI series in second difference. (Source: Output of Eviews 12 software).

To summarize, we have in front of us two variables which are generated by a DS process (GDP per capita and HDI) and one variable by a TS process (life expectancy). Two variables are *I (1)* (GDP per capita and life expectancy) and one variable is *I (2)*. But, according to *Harris, R* (1995)[140] there is always a possibility of cointegration between these three variables even if the HDI series does not have the same order of integration with the other two variables.

1.3. Cointegration test

It is advisable to first visualize the graphs of the three series together in order to get an idea if the gap between the three series is more or less constant during their evolution over time:

[140] *Harris, R* argue that it is possible that cointegration is present when there is mix of I(0), I(1) and I(2) variables in the model.

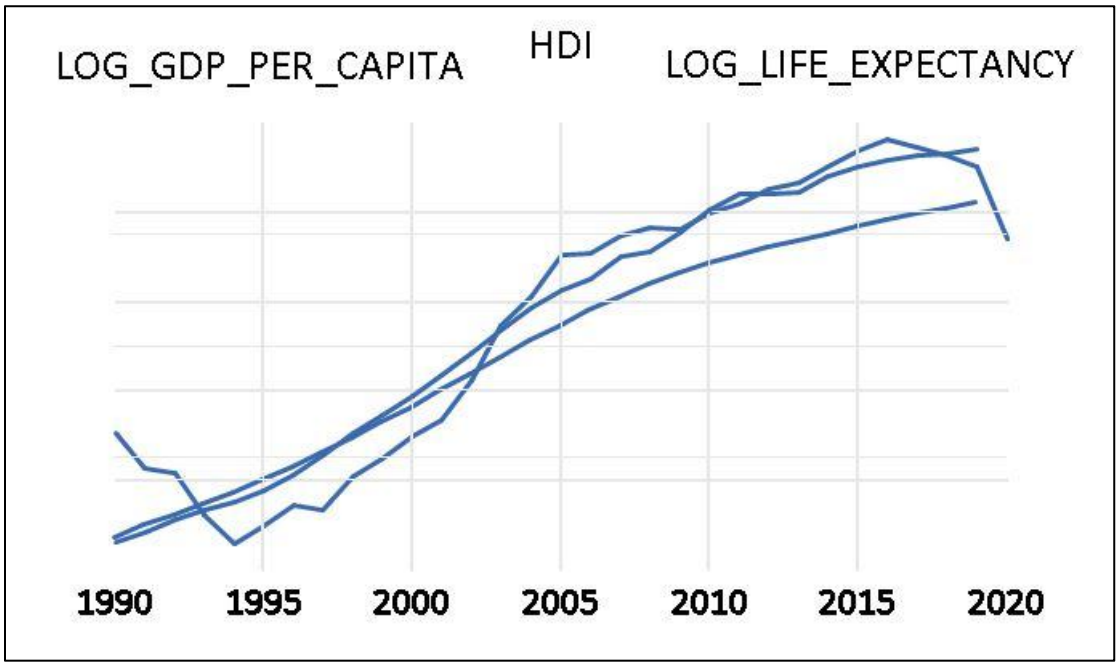


Figure 36: The combined time evolution of the three series: GDP per capita, life expectancy, and HDI. (Source: Output of Eviews 12 software).

For the most of the time, the three series have a common evolutionary trend, but not so constant. The gap between the three series is not as completely constant but it is more or less limited by a fairly stable range. However, the co-integration of variables is still possible.

1.3.1. Engel and Granger cointegration test

The procedure is to estimate by OLS the long-term relation defined by the equation:

LOG_GDP_PER_CAPITA = C(1) + C(2)*LOG_LIFE_EXPECTANCY + C(3)*HDI

In order to a cointegration relation be accepted, the series of the residue resulting from this regression must be stationary. For this, the ADF test results on the residue series are presented in the table below:

Series of residuals generated by regression of log-GDP per capita on log-life expectancy and HDI	Model (3) «trend test»	Model (2) «constant test»	Model (1) «Ø test»
prob $\{H_0\}$	0.2408 > 0.05	0.5720 > 0.05	0.0038 < 0.05
t-statistc	1.200292	0.572055	-3.160190
critical value (tabulated)	3.18	2.89	-1.95
decision rule	H_0: t ≤ c-value : trend coefficient = 0 H_1: t > c-value : trend coefficient ≠ 0	H_0: t ≤ c-value : constant = 0 H_1: t > c-value : constant ≠ 0	H_0: t > c-value : Ø = 1 H_1: t < c-value : Ø < 0
Conclusion	We go to the model (2)	We go to the model (1)	**The series is stationary.**

Table 17: Results of the stationarity test on the Series of residuals generated by regression of log-GDP per capita on log-life expectancy and HDI. (Source: Author's own, according to results obtained by Eviews software).

The results from the application of the ADF test on the residues show that they are stationary in level[141]. Therefore the cointegration relationship is confirmed.

Even, repeating the same procedure, but this time by pair of variables (i.e. testing the stationarity of the residue for each regression between a pair of variables) it still gives us series of residuals that are stationary. This means that according to this test, the variables are cointegrated in pairs.[142]

1.3.2. Johansen cointegration test

Conducting this test by summarizing the 5 data specifications assumptions gives rise to the following table:

[141] Even by referring to the table of MacKinnon (1996) the series of residuals is stationary.

[142] We draw attention to the fact that the results will be a little different if we proceed by the cointegration regression "fully modified OLS" (FMOLS). So that the cointegration relationships accepted at the 5% risk threshold are that resulting from: the regression of the log-gdp per capita on log-life expectancy, and on the HDI (significant only with the Engle-Granger tau-statistic) and the regression of the HDI on the log-life expectancy but without constant (significant only with the Engle -Granger z statistic).

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	2	3	3	2	3
Max-Eig	2	3	3	1	1

Table 18: Result of the Johansen cointegration test on the variables: Log-gdp per capita, Log-life expectancy and HDI. (Source: Output of Eviews 12 software after performing the Johansen cointegration test).

According to the table, at the risk level 0.05, the number of cointegration relationships selected by model are:

- ✓ Two cointegration relations selected according to the value of the trace and even also the eigenvalue in the 1st specification (no deterministic trend in the data: no terend and no intercept in the cointegration equation).
- ✓ Two cointegration relations selected according to the value of the trace, and only one according to the eigenvalue in 4th specification (allow a linear deterministic trend in the data: intercept and trend in the cointegration equation).
- ✓ Only one cointegration relation selected in the 5th specification according to the eigenvalue (allow a quadratic deterministic trend in the data: intercept and trend in the cointegration equation).

What matters in our case is not the cointegration relationship itself, but rather the extent to which it can exist. This test and the one before, confirms that at least there is one cointegration relationship between GDP per capita and the other two variables.

In conclusion, we can confirm the hypothesis that the GDP per capita for the case of Algeria makes it possible to draw a picture of the situation of the standard of living in the country, since the time series of this variable is very well correlated and cointegrated with series of factors of other kinds which determine the standard of living;

2. Independent variables

After a long research on the variables which one supposes useful and which can explain (or influence) the standard of living in Algeria, we propose the following non-exhaustive list:

The variable	Unit of measure	Source	Time interval
Economic growth	percent	World Bank	1961-2020
Unemployment rate	percent		1991-2020
Inflation rate (CPI)	percent		1970-2020
Inflation rate (GDP deflator)	percent		1970-2020
Household consumption	% of GDP		1960-2020
Government spending	% of GDP		1960-2020
Labor force participation rate	% of people aged 15-64		1990-2020
Foreign Direct Investment	% of GDP		1970-2019
Food imports	% of imports		1992-2017
Food exports	% of exports		1992-2017
Government effectiveness index	Points: (-2.5 weak; 2.5 strong)		1996-2019
Rule of law index	Points: (-2.5 weak; 2.5 strong)		1996-2019
Political stability index	Points: (-2.5 weak; 2.5 strong)		1996-2019
Internet users	% of population		1990-2018
Health spending	% of GDP		2000-2018
Health spending per capita	U.S. dollars		2000-2018
Primary completion rate	% of relevant age		1972-2019

	group		
Food production index	Index points	FAO	1961-2018
Shadow economy	% of GDP	Medina and Schneider (2018)	1991-2015
Economic freedom	Index points (0-100)	Heritage Foundation	1995-2021
Government integrity			1995-2021
Civil liberties index	Points: 7 (weak) 1 (strong)	Freedom House	1972-2020
Population growth	percent	UNDP	1962-2020
Mobile phone subscribers	per 100 people	International Telecommunication Union	1975-2019
Electricity consumption	billion kilowatthours	U.S. Energy Information Administration	1980-2018
Electricity production capacity	million kilowatts		1980-2018
Suicide mortality rate	per 100,000 population	WHO	2000-2019
Innovations index	Index points (0-100)	Cornell University, INSEAD, and the WIPO	2011-2020
Quality of roads	Points: 1(low) 7(high)	World Economic Forum	2006-2019

Table 19: List of independent variables.

We have tried to diversify our list since the standard of living is influenced by several phenomena that are difficult to control them all (see Chapter 1), so we have made an effort to collect some variables for each factors: economic, governmental, technological, social, demographic, health, environmental, and educational. The

procedure of selecting was guided not only by the nature of the variables, but also by the size of their time series available, since there were many other variables that were too important to be used and entered into the model, but the small size of their time series prevented this.

Since the time interval of these variables is not uniform, so the use of this data will be as follows; Initially, we will build a model of which we will only use the variables which have the largest time series without taking into account their nature, in order to have a model which extends over a sufficient period (i.e. built according to an acceptable number of observations) to have it as a reference on the behavior of variables. For this we will choose the variables that extend at least from 1970 to 2020.

After that, we will build a model for each type of variable (economic, technological ...) in order to be able to extract from each type the most statistically significant in the explanation of the standard of living (the dependent variables of the section above) and conclude their signs and become aware if there is any change in the sign of a coefficient from one model to another. This is because the degree of impact of each phenomenon on the standard of living depends mainly on its nature (such as economic or technological ... etc.). For example, *SEN* (1985) attaches more importance to freedom, and *Stiglitz* to equality (without neglecting the principe of equal opportunity). This is what prompts us to give more weight to economic and government factors, because the freedom that *SEN* talks about is mainly of an economic type and is given (or withdrawn) by the government, so this can be translated statistically by the variables: economic freedom, civil liberties, rule of law, integrity of government, etc.). In the same perspective, the same conclusion will be deduced from *Stiglitz'*s vision, since equal opportunities can also be represented by rule of law, on the other hand inequalities in the distribution of wealth and income can be represented by government effectiveness.

In addition, the majority of economic growth models give great importance to technical progress (e.g. Solow model, Keynes model) to achieve further growth[143], which is why we will give a third importance to technological factors since a decent standard of living is closely related to countries that register at least acceptable growth rates and improving well-being undoubtedly requires improving the speed of growth[144]. This is why we will use the variables Internet users, mobile phone subscribers and electricity production capacity to reflect the impact of this factor since we do not have much choice regarding this factor.

It is clear that well-being is also impacted by health, educational and social factors, it is therefore in this logic that we will try to carry out our modeling by separating the variables of each factor in order to be able to conclude results that will be interpreted under this perspective.

But before that we first detect the order of integration of each variable with the ADF test, the following table summarizes that:

Unit root test on the series in level		Model (3)		Model (2)		Model (1)	Conclusion
		Trend test *c-value* = *3.18*	Ø test *c-value* = *-3.50*	Constant test *c-value* = *2.89*	Ø test *c-value* = *-2.93*	Ø test *c-value* = *-1.95*	
Economic growth	p-value	0.0239		0.00	0.00		Non stationary, «DS»
	t-statistic	2.33		4.81	-8.49		
Food	p-value	0.0307	0.043	0.2811	0.942	0.131	Non

[143] Mankiw. N. G (2019), Macroeconomics, MacMillan International Higher Education, Tenth edition, Harvard University.
[144] Stevenson, B., & Wolfers, J. (2008). Economic growth and subjective well-being: Reassessing the Easterlin paradox (No. w14282). National Bureau of Economic Research.

production index	t-statistic	2.23	-2.08	1.09	-0.07	1.53	stationary, «DS»
Government spending	p-value	0.1007		0.0085		0.94	Non stationary, «DS»
	t-statistic	1.67		2.73		-0.06	
Household consumption	p-value	0.64		0.11		0.56	Non stationary, «DS»
	t-statistic	0.46		1.59		-057	
Inflation rate (CPI)	p-value	0.30		0.13		0.14	Non stationary, «DS»
	t-statistic	1.04		1.53		-1.57	
Inflation rate (GDP deflator)	p-value	0.0744		0.0022	0.00		Stationary *I(0)*
	t-statistic	1.82		3.23	-4.84		
Population growth	p-value	0.00	0.00				Non stationary, «TS»
	t-statistic	5.55	-6.005				
Unemployment rate	p-value	0.6031		0.74		0.41	Non stationary, «DS»
	t-statistic	1.94		0.32		-0.83	
Foreign Direct Investment	p-value	0.142		0.0085	0.0002		Stationary *I(0)*
	t-statistic	1.49		2.74	-4.0636		
Labor force participation rate	p-value	0.13		0.0096	0.0088		Stationary *I(0)*
	t-statistic	1.60		2.94	-2.98		
Government effectiveness index	p-value	0.25		0.06		0.1005	Non stationary, «DS»
	t-statistic	1.16		1.98		-1.71	

Food imports	p-value	0.0517		0.24		0.0526	Stationary
	t-statistic	2.05		1.19		-2.06	*I(0)*
Food exports	p-value	0.46		0.07		0.302	Non
	t-statistic	0.73		1.84		-1.05	stationary, «DS»
Rule of law index	p-value	0.88		0.006	0.0042		Stationary
	t-statistic	0.14		3.26	-3.46		*I(0)*
Political stability index	p-value	0.024	0.0043	0.20		0.06	Non
	t-statistic	2.46	-3.26	1.3		-1.97	stationary, «TS»
Internet users	p-value	0.011	0.0046				Non
	t-statistic	4.15	3.41				stationary, «TS»
Health spending (%GDP)	p-value	0.18		0.29		0.20	Non
	t-statistic	1.39		1.07		1.31	stationary, «DS»
Health spending per capita	p-value	0.96		0.09		0.46	Non
	t-statistic	0.04		1.8		0.75	stationary, «DS»
Primary completion rate	p-value	0.0004	0.0001				Non
	t-statistic	3.86	-4.43				stationary, «TS»
Shadow economy	p-value	0.003	0.0016				Non
	t-statistic	3.78	-4.14				stationary, «TS»
Economic freedom	p-value	0.03	0.029				Non
	t-statistic	2.31	-2.32				stationary, «TS»
Government	p-value	0.24		0.18		0.31	Non

integrity	t-statistic	1.18		1.37		-1.03	stationary, «DS»
Civil liberties index	p-value	0.052		0.001	0.0008		Stationary *I(0)*
	t-statistic	2.027		3.79	-3.89		
Mobile phone subscribers	p-value	0.025	0.012	0.16		0.69	Non stationary, «DS»
	t-statistic	2.40	-2.7	1.44		-0.4	
Electricity consumption	p-value	0.12		0.69		0	Non stationary, «DS»
	t-statistic	1.58		0.39		7.26	
Electricity production capacity	p-value	0.27		0.32		0	Non stationary, «DS»
	t-statistic	1.11		0.99		5.42	
Suicide mortality rate	p-value	0.97		0.52		0	Stationary *I(0)*
	t-statistic	0.02		0.64		-6.07	
Innovations index	p-value	0.0557		0.029	0.0206		Stationary *I(0)*
	t-statistic	2.67		2.96	-2.97		
Quality of roads	p-value	0.56		0.12		0.28	Non stationary, «DS»
	t-statistic	0.59		1.68		1.11	

Table 20: Results of unit root test on the series in level

As shown in the table, the majority of the series are non-stationary, for this we test again the stationarity of the non-stationary series in first difference (the TS series are stationarised with the OLS method), the table below presents the results:

Unit root test on the series in first difference		Model (3)		Model (2)		Model (1)	Conclusion
		Trend test *c-value = 3.18*	Ø test *c-value = -3.50*	Constant test *c-value= 2.89*	Ø test *c-value = -2.93*	Ø test *c-value = -1.95*	
Economic growth	p-value	0.26		0.99		0.00	Stationary *I(1)*
	t-statistic	1.13		0.0098		-18.32	
Food production index	p-value	0.506		0.12		0.00	Stationary *I(1)*
	t-statistic	0.67		1.57		-5.53	
Government spending	p-value	0.54		0.81		0.00	Stationary *I(1)*
	t-statistic	0.61		0.23		-4.93	
Household consumption	p-value	0.48		0.74		0.00	Stationary *I(1)*
	t-statistic	0.706		0.32		-6.53	
Inflation rate (CPI)	p-value	0.52		0.99		0.00	Stationary I(1)
	t-statistic	0.64		0.00051		-6.7	
Population growth	p-value	0.012		0.39		0.01	Stationary *I(1)*
	t-statistic	2.62		0.86		-2.62	
Unemployment rate	p-value	0.75		0.42		0.0003	Stationary *I(1)*
	t-statistic	0.31		0.81		-4.09	
Government effectiveness index	p-value	0.19		0.25		0.0001	Stationary *I(1)*
	t-statistic	1.35		1.16		-4.89	
Food exports	p-value	0.108		0.92		0.00	Stationary *I(1)*
	t-statistic	1.67		0.089		-6.59	
Political stability	p-value	0.7		0.98		0.002	Stationary *I(1)*
	t-statistic	0.37		0.01		-3.43	

index							
Internet users	p-value	0.63		0.11		0.21	Non stationary, «DS»
	t-statistic	0.24		1.36		-1.1	
Health spending (%GDP)	p-value	0.95		0.29		0.004	Stationary *I(1)*
	t-statistic	0.57		1.09		-3.29	
Health spending per capita	p-value	0.33		0.36		0.001	Stationary I(1)
	t-statistic	0.99		0.94		-2.61	
Primary completion rate	p-value	0.44		0.80		0.00	Stationary *I(1)*
	t-statistic	0.77		0.25		-4.54	
Shadow economy	p-value	0.18		0.41		0.002	Stationary *I(1)*
	t-statistic	1.42		0.84		-3.73	
Economic freedom	p-value	0.46		0.76		0.02	Stationary *I(1)*
	t-statistic	0.74		0.29		-2.41	
Government integrity	p-value	0.56		0.5		0.00	Stationary *I(1)*
	t-statistic	0.58		0.67		-5.04	
Mobile phone subscribers	p-value	0.73		0.15		0.14	Non stationary, «DS»
	t-statistic	0.34		1.45		-1.5	
Electricity consumption	p-value	0.45		0.18		0.12	Non stationary, «DS»
	t-statistic	0.24		1.15		-1.1	
Electricity production capacity	p-value	0.79		0.19		0.17	Non stationary, «DS»
	t-statistic	0.36		1.47		-1.8	
Quality of	p-value	0.65		0.42		0.02	Stationary

roads	t-statistic	0.45		0.83		-2.64	*I(1)*

Table 21: Results of unit root test on the series in first difference

Most of the series are therefore stationary after the first differentiation, so they are *I(1)*. We carry out a second differentiation for the three series which are not yet stationary and we test again to see if they are integrated of order two or more. After having discovered the order of integration of all series, we can now use them for modeling without fear of spurious regressions.

3. Estimation of the model

The first model to be estimated is based on the variables that have the longest time series (at least from 1970 to 2020). For this, we will regress the GDP per capita[145] on the following eight variables: economic growth, household consumption, inflation (CPI), foreign direct investment, primary level completion rate, population growth, government spending and food production index. The model is estimated on the basis of stationary series and taking only the observations from 1970 to 2020. The results of the regression are presented in the following table:

The dependent variable: real GDP per capita Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value
constant	28.53501	1.422813	0.1629
economic growth	10.52349	5.742133	0.0000
household consumption	-2.202689	-0.463830	0.6454
inflation (CPI)	0.099763	0.036026	0.9715
foreign direct investment	30.72086	1.343966	0.1869

[145] The GDP per capita used here is in USD constant value and not in constant PPP. Because the series of GDP in constant PPP is only available from 1990.

primary level completion	-0.701195	-0.263361	0.7937
population growth	-40.38961	-1.035104	0.3072
government spending	-4.563604	-0.431644	0.6684
food production index	-1.249995	-0.504810	0.6166
R-squared: 0.545496 Adjusted R-squared: 0.449810 F-statistic: 5.700944 Prob(F-statistic): 0.000088 Durbin-Watson stat: 0.966416			

Table 22: Regression results for GDP per capita on the variables with the longest time series.

The positive sign of the three variables is logical except for inflation, because it is not logical that inflation improves the standard of living of the population, but since the coefficient is small (less than 1) it can change sign in the next estimates, adding to this that its coefficient is not statistically significant. Eventually this model cannot be used because only the coefficient of the variable: economic growth that is statistically significant (greater than critical value: 2.30), even the R-squared is a little weak, so we will proceed to eliminate the variables with the highest p-values until we get a model which only has statistically significant coefficients around the 5% risk threshold. The results of the last regression obtained are those presented in the following table:

The dependent variable: real GDP per capita Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value
constant	63.46033	2.914851	0.0056
economic growth	11.14321	7.427578	0.0000
household consumption	-14.16673	-3.504783	0.0011

inflation (GDP deflator)	-4.009954	-3.431640	0.0013
foreign direct investment	33.63537	1.968427	0.0553
R-squared 0.679772 Adjusted R-squared 0.650660 F-statistic 23.35051 Prob(F-statistic) 0.000000 Durbin-Watson stat 1.034594			

Table 23: Results of the regression of GDP per capita on the significant variables with the longest time series.

All the coefficients of this equation are significant (except foreign direct investment which is significant at the 6% threshold), overall are also significant (Prob *F* equal to 0) and the *R*-squared is acceptable. *Breusch-Godfrey* test results show no autocorrelation of errors (Prob *F* = 0.2288), and *White*'s test shows that errors are homoscedastic (Prob *Chi-Square* =0.0568), also *DW*-stat is greater than *R*-squared, hence the regression is not spurious and therefore it is econometrically usable.

3.1.1. Model with economic explanatory variables

After regressing each dependent variable on all the variables of economic type (from 1990 to 2020), we obtained a regression with a mixture of significant and non-significant coefficients. We will therefore proceed to eliminate the variables with the highest p-values until obtaining a model which only has statistically significant coefficients at a risk threshold of 5%. The results of each last regression obtained are those presented in the following tables:

The dependent variable: real GDP per capita Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value
economic growth	0.003143	7.086706	0.0000
household consumption	-0.001723	-5.034339	0.0001

unemployment	-0.001807	-3.976275	0.0007
inflation(GDP deflator)	-0.000576	-4.618057	0.0001
food importation	0.000404	6.221064	0.0000
R-squared 0.803958 Adjusted R-squared 0.766617 Durbin-Watson stat 1.897103			

Table 24: Regression results for GDP per capita on economic variables.

All the coefficients of this equation are significant, and the R-squared is high. *Breusch-Godfrey* test results show no autocorrelation of errors (Prob *F* = 0.48 and Prob *Chi-Square* = 0.38), also the value of *DW*-statistic is in the area of no error autocorrelation[146] (1.88 <DW <2.12). *White*'s test shows that errors are homoscedastic (Prob *Chi-Square* =0.0549). The series of residuals of this estimate are normally distributed since the *Jarque-Bera* statistic is equal to 3.53 (Prob = 0.17). Eventually, *DW*-stat is greater than R-squared, hence the regression is not spurious and therefore it is econometrically usable.

The coefficients of the three variables economic growth, household consumption and inflation (GDP deflator) have kept the same signs as the previous model. No coefficient is greater than 1, they therefore all have a less than proportional impact on the standard of living. It is obvious that economic growth has a positive impact, importing food also improves the standard of living but on the other hand generates food dependency.

The dependent variable: life expectancy Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value
constant	0.006845	5.775901	0.0000

[146] The result of the DW test is not important in this case since this model does not contain a constant.

household consumption	-0.000222	-2.961055	0.0080
food importation	-0.000257	-5.272413	0.0000
shadow economy	-0.000348	-3.450279	0.0027
Government spending	0.000375	2.136271	0.0459
R-squared 0.827182			
Adjusted R-squared 0.790799			
F-statistic 22.73559			
Prob(F-statistic) 0.000001			
Durbin-Watson stat 1.101594			

Table 25: Regression results for life expectancy on economic variables.

The R squared of this model is high, its coefficients are globally significant. The series of residuals of this regression are normally distributed according to *Jarque-Bera* statistic which equal to 3.69 (Prob = 0.15) and they are homoscedastic according to *White*'s test (Prob *Chi-Square* =0.23 and Prob *F* = 0.20). Concerning the autocorrelation errors test, the test of *Breusch-Godfrey* show that there is no autocorrelation (Prob *F* = 0.32 Prob *Chi-Square* = 0.23), while the *DW* statistic is in doubt area (1.02<DW<1.78). Which makes that econometrically this model can be used.

The two variables that have kept their significance in this model compared to the previous one are household consumption and food imports, the first has even kept its sign unlike food imports which have changed sign, which means that according to this model, food dependence degrades life expectancy and consequently the standard of living deteriorates. Contrary to our expectations, the shadow economy shows a negative impact in this model.

Regression tests for the third dependent variable (HDI) on economic variables did not give us any equation containing one (or more) statistically significant variables. Despite the non-significance, but we noticed that: the economic growth variable kept

its positive sign (significant only in the first model); household consumption has changed sign in the latter model (significant in the first two models); unemployment has kept its negative sign from the first model (significant than in the first model); food imports kept its positive sign from the first model, but changed its sign in the second model (significant in both models 1 and 2); inflation (GDP deflator) kept its negative sign of the first model (significant than in the first model); the shadow economy kept its negative sign from the second model (significant only in the second model) and finally, government spending changed its positive sign from the second model (significant only in the second model). All other economic variables were not significant in any of the regressions.

3.1.2. Model with government explanatory variables

The first regression of GDP per capita on government variables gave rise to the following results:

The dependent variable: real GDP per capita Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value
Government effectiveness	0.028250	2.027360	0.0555
Rule of law	-0.006381	-3.523338	0.0020
R-squared 0.076870 Adjusted R-squared 0.032911 Durbin-Watson stat 1.088732			

Table 26: Regression results for GDP per capita on government variables.

The R-squared of this regression is very low, the variables are significant (rule of law significant at the risk threshold of 6%), The series of residuals of this regression are normally distributed according to *Jarque-Bera* statistic which equal to 3.76 (Prob = 0.15) and they are homoscedastic according to *White*'s test (Prob *Chi-Square* =0.66

and Prob *F* = 0.71). Concerning the test of autocorrelation errors, the test of *Breusch-Godfrey* show that there is no autocorrelation (Prob *F* = 0.14 Prob *Chi-Square* = 0.11), while the *DW* statistic is in the positive autocorrelation of errors area (0 <DW <1.17) "a little close to the zone of doubt", But its result is not significant since this model has no constant. So econometrically this model can be used.

The positive sign for the government effectiveness variable is expected as it makes sense that this leads to an improvement in the standard of living. However, the rule of law has a negative sign, which leads us to thought that the State laws are ineffective, and therefore compliance to them does not improve the standard of living.

The dependent variable: life expectancy Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value
constant	0.004129	1.925662	0.0685
Government spending	0.000706	2.225196	0.0377
Rule of law	0.006612	2.298471	0.0325
Political stability index	0.004312	1.788042	0.0889
R-squared 0.392731 Adjusted R-squared 0.301641 F-statistic 4.311447 Prob(F-statistic) 0.016865 Durbin-Watson stat 0.393268			

Table 27: Regression results for life expectancy on government variables.

The R-squared of this regression is also very low, the variables are significant (at the risk threshold of 10%), The series of residuals of this regression are normally distributed according to *Jarque-Bera* statistic which equal to 5.78 (Prob = 0.055) and they are homoscedastic according to *White*'s test (Prob *Chi-Square* =0.61 and Prob *F*

= 0.51). Concerning the test of autocorrelation errors, the test of *Breusch-Godfrey* show that there is autocorrelation (Prob *F* = 0.00 Prob *Chi-Square* = 0.002), also the *DW* statistic is in the positive autocorrelation of errors area (0 <DW <1.1). So, econometrically, this model suffers from an autocorrelation of errors.

All the coefficients of this equation are positive, even that of rule of law. As a result, government spending has kept the positive sign even in these government models. Political stability is clear that it improves the standard of living, but the nature of the impact of the rule of law is so far unclear.

Regression of the third dependent variable (HDI) on government variables yielded positive but insignificant coefficients. Which makes us think that the government has no really significant impact on improving the country's HDI.

3.1.3. Model with technological explanatory variables

The regression of the GDP per capita on variables of a technological nature leads to equations with series of residuals that are normally distributed and homoscedastic and without autocorrelation. But no coefficient was significant.

The coefficients were positive (except the variable capacity of electricity production) which means that the technological factor may positively affect the GDP per capita.

Moreover, the regression of life expectancy on these variables did not lead to an equation with large coefficients either.It is true that the residuals are normally distributed but autocorrelated. Interestingly, all coefficients were negative.

The dependent variable: HDI Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value

Mobil phone subscribers	0.000158	2.273302	0.0312
R-squared 0.160235 Adjusted R-squared 0.160235 Durbin-Watson stat 2.182113			

Table 28: Regression results for HDI on technological variables.

This third regression shows that the errors are normally distributed "*Jarque-Bera* statistic equal to 0.24 (Prob = 0.88)" and homoscedastic "*White*'s test (Prob *Chi-Square* =0.082 and Prob *F* = 0.88)"without being autocorrelated "*Breusch-Godfrey* (Prob *F* = 0.1 Prob *Chi-Square* = 0.098) and (1.48 <DW <2.52)".

This model, unlike the first two, has good econometric characteristics except for the R squared which is very low. The coefficient of the variable shows a positive influence on the HDI.

3.1.4. Model with social explanatory variables

The dependent variable: real GDP per capita Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value
Suicide rate per 100,000 people	-0.052885	-4.322547	0.0004
R-squared 0.163945 Adjusted R-squared 0.163945 Durbin-Watson stat 1.086055			

Table 29: Regression results for GDP per capita on social variables.

This regression shows that the errors are normally distributed "*Jarque-Bera* statistic equal to 0.49 (Prob = 0.78)" and homoscedastic "*White*'s test (Prob *Chi-Square* =0.37 and Prob *F* = 0.39)"without being autocorrelated "*Breusch-Godfrey* (Prob *F* =0.17

Prob *Chi-Square* = 0.13). But the coefficient is not significant.

The dependent variable: life expectancy Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value
Constant	-0.002643	-3.523226	0.0028
Suicide rate per 100,000 people	-0.008785	-1.566774	0.1367
Population growth	0.040991	4.494461	0.0004
R-squared 0.683261 Adjusted R-squared 0.643669 F-statistic 17.25741 Prob(F-statistic) 0.000101 Durbin-Watson stat 0.320403			

Table 30: Regression results for life expectancy on social variables.

This regression has good econometric characteristics except that it suffers from an autocorrelation of errors and one of these coefficients is not significant.

The dependent variable: HDI Method: Least Squares			
The independent variable	Its coefficient in the model	t-statistic	p-value
constant	0.003634	2.838911	0.0113
Suicide rate per 100,000 people	-0.020976	-2.191930	0.0426
R-squared 0.220346 Adjusted R-squared 0.174484 F-statistic 4.804555			

Prob(F-statistic)	0.042595
Durbin-Watson stat	1.372677

Table 31: Regression results for HDI on social variables.

Econometrically, this model can be used since it suffers from nothing except that its R squared is very small.

We notice that the suicide variable had a negative impact on the three dependent variables, on the other hand population growth had a positive impact, which allows us to say that the phenomena which have a negative impact on society may also have a negative impact on standard of living of the society.

3.1.5. Model with health explanatory variables

All the regressions on the health variables gave insignificant coefficients and sometimes the equations suffer from autocorrelation of errors, which makes the interpretation of this type of regression a bit risky since the equations are not econometrically reliable.

4. Analysis and interpretation of results

The results show that the variables of economic and government models are more significant. Which can mean that these two factors have more impact on the standard of living. This is mainly due to the strong presence of the state in the country's economy, which has minimized the impact of other factors.

According to Stiglitz, the State must be less present but efficient to ensure a better allocation of resources(to reduce inequalities), and the improvement of the standard of living is done by the households themselves but on condition that they have the necessary liberty so that they can seize the opportunities that the market economy offers.

Conclusion

Conclusion

In today's world, the conflict is between those who have and those who do not. In other words, the gaps in the acquisition and distribution of wealth lead to costs that the entire society must endure. In this context that appear the importance of the themes on the economy of well-being.

The purpose of this work is to provide some explanation of the standard of living in Algeria by facing the problem of the non-existence of a single statistical variable which could represent the phenomenon. For this we first tried to remove the overlap and the illusion on the concept, so we concluded that the of quality of life is the broadest and the most difficult to measure because it is more qualitative, and it includes the standard of living, the latter in turn includes the cost of living. It has been found that standard of living in its general term refers to the quantity and quality of material goods and services available to a given population. It is influenced by different factors, according to the most modern approach, the standard of living is beyond the question of material prosperity or opulence, but also a question of what a person is able to do or to be, it is therefore synonymous with freedom.

The economic situation of the country leads us to three adequate methods of measuring the standard of living (square root scale of the OECD, food expenditure as a proportion of total household expenditure and real GDP per capita) but the availability of data has forced us to choose GDP per capita as a measure of standard of living. This measurement was validated for the case of Algeria after having noted that it is strongly correlated and cointegrated with other immaterial aspects of Algerian life. We have chosen life expectancy and the HDI to represent this immaterial aspect.

The empirical study of the last chapter led to confirm the supposition that the economic and governmental factors which have more impact on the Algerian standard

of living. This is due to the heavy presence of the central state in the daily and economic life of Algerians. This means that *Sen*'s vision is validated for the Algerian case due to the fact that the population is condemned by the series of abusive (and sometimes unjustifiable) laws which condemn economic freedom and restrict the solutions available to households to improve their standard of living by themselves. This is confirmed by the continuing increase in the size of the informal economy as the only escape from state restrictions.

The results of our empirical study are strongly linked to the reliability of the databases used, especially as the country suffers from less reliable and incomplete statistics. This is why we find that it is recommended to conduct this kind of study on the basis of data from field surveys carried out by the researcher himself in order to be able to collect and control all the necessary data. Especially since the equivalence scales of the OECD and Engel will harmonize perfectly with such a method.

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The ultimate and distant goal of any economist or any economic policy is to improve the well-being and therefore the standard of living of every individual in society. This work tries to understand this phenomenon and to face the challenge of nonexistence of a single statistical variable which can represent it. Therefore, after reviewing the economic visions and the economic situation of Algeria, it is found that the GDP per capita can effectively represent the situation of standard of living. Both economic and governmental factors are the most decisive in its determination.
Keywords: equivalence scale, equivalent income, GDP per capita, inequality, standard of living, wealth, well-being

L’objectif ultime et lointain de toute économiste ou de toute politique économique est d’améliorer le bien être et donc le niveau de vie de chaque individu dans la société. Ce travail essaye de comprendre ce phénomène et de faire face au défie de non existence d'une variable statistique unique qui peut le représenter. Donc, après avoir revue les visions économique et la situation économique de l'Algérie, il est trouvé que le PIB par habitant peut représenter avec manière efficace la situation de niveau de vie. Les deux facteurs économique et gouvernemental sont les plus décisif dans sa détermination.

الهدف النهائي بعيد المدى لأي اقتصادي أو أي سياسة اقتصادية هو تحسين الرفاهية وبالتالي مستوى المعيشة لكل فرد في المجتمع .يحاول هذا العمل فهم هذه الظاهرة ومواجهة التحدي المتمثل في عدم وجود متغير إحصائي واحد يمكنه تمثيلها .لذلك، بعد مراجعة الرؤى الاقتصادية والوضع الاقتصادي للجزائر، يتبين أن نصيب الفرد من الناتج المحلي الإجمالي يمكن أن يمثل بشكل فعال حالة مستوى المعيشة. كل من العوامل الاقتصادية والحكومية هي الأكثر تأثيرا على مستوى المعيشة.