

Bachelor thesis

**Informal Economy, Gross National Income and  
Human Development in Sub-Saharan Africa: a  
theoretical and empirical study**

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Author:

Xènia Colomer Martín

Supervised by Prof. Dr. Irene Maestro Yarza



## **ABSTRACT**

This research paper tackles (both qualitatively and quantitatively) the causes that make the economic growth of a country in Sub-Saharan Africa go up or down, bringing one of the main pillars of the Human Development Index, the Gross National Income, into the spotlight, in order to improve the lives of the people that live in this territory, that has the lowest Human Development Index in the world. It first deals with the main factors that can cause this economic growth indicator vary, to then gather the appropriate data of Sub-Saharan Africa countries to compute an econometric model to prove the hypothesis that the variables discussed qualitatively are, in effect, proven to be determinant to shape the Gross National Income. After that, the inclusion of a factor difficult to measure is introduced: the informal economy. It is included through the importance that institutions have on economic outcomes, proving that they are very correlated with the informal or black economy and play a significant role in the economic growth of a country.

### **KEY WORDS**

Human development

Economic growth

Gross National Income

Informal economy

Sub-Saharan Africa

Malaria

Education

Life expectancy

## **TÍTOL**

Economia Informal, Renda Nacional Bruta i Desenvolupament Humà a l'Àfrica Subsahariana: estudi teòric i empíric.

### **PARAULES CLAU**

Desenvolupament humà

Creixement econòmic

Renda Nacional Bruta

Economia informal

Àfrica Subsahariana

Malària

Educació

Esperança de vida

## **RESUM**

Aquest treball tracta (qualitativament i quantitativament) les causes que fan que el creixement econòmic d'un país de l'Àfrica Subsahariana sigui positiu o negatiu, posant en el punt de mira un dels grans pilars de l'Índex del Desenvolupament Humà: la Renda Nacional Bruta. Mitjançant aquest estudi, es podran conèixer amb més detall els punts forts i dèbils dels països de l'Àfrica Subsahariana des d'una perspectiva econòmica, per així millorar la vida de les persones que viuen en aquest territori, que és l'àrea del món on l'Índex de Desenvolupament Humà és més menor. Primerament, es tractaran els principals factors que poden fer que aquest indicador econòmic mencionat abans variï, per tal que després es recopili i es tracti el conjunt de dades adient (de l'Àfrica Subsahariana) per crear un model economètric per determinar si l'hipòtesi que les variables explicades qualitativament són, en efecte, determinants per la variabilitat de la Renda Nacional Bruta. A continuació, es durà a terme la introducció d'un factor difícil de mesurar: l'economia informal. S'inclourà al model mitjançant la importància que tenen les insitucions en l'economia d'un país, ja que aquestes tenen una alta correlació amb l'economia en negre o informal i tenen una gran importància en el creixement econòmic dels països on l'economia informal representa una gran part de l'activitat econòmica.

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# 1. INTRODUCTION: DEVELOPMENT AND HUMAN DEVELOPMENT

The vast topic of development has been one of the main centres of debate when it comes to topics and questions in the field of economics nowadays. For centuries, development was conceived only from an economic and business perspective, while now it is known for a fact that it involves so much more digging.

In the past, the development of a society was directly thought as an improvement in the economic conditions of that society. Specialists used to focus their studies on GDP levels, not taking into account the fact that there could be the chance that an increase in the GDP of a society may not affect the people in that society, since there can be the possibility that a very few group of wealthy people in that society increased their income tremendously. That would be the case of the United Arab Emirates or Qatar, that holds the highest level of income per capita, PPP<sup>1</sup> adjusted, today (\$130.475).

In fact, development can be acknowledged from very different perspectives, not all of them economic, all leading to one same outcome: the improvement of the lives of people. Development can be appreciated, for instance, in the cure of epidemics, such as malaria, that disappeared in Europe about a century ago; and also, in the increase on the life expectancy of a population; or in the democratization of the institutions of a certain country. All these improvements, and many others, constitute the so-called human development, that embraces development in all fields with the aim of improving the lives of people.

Today, the study of this broad field is not only of an economic matter, but also social, and therefore human. Thus, since the creation of the Human Development Index in 1990, focused on three main sources of data that will be explained further in the paper, specialists began to focus their studies in the human aspects of development.

This paper will tackle the case of Sub-Saharan Africa countries, a very particular case when it comes to development, since Sub-Saharan Africa is the region of the world with a lowest level of human development (Sub-Saharan Africa holds a level of human development equal to 0.537 in 2017, according to the Human Development Index). According to the United Nations in their Human Development Index data, the variable that is more prone to changing and therefore has a higher variability is the one concerning economic development, particularly the variability of Gross National Income.

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<sup>1</sup> PPP stands for Purchasing Power Parity, an economic theory created to compare different countries' currencies through a basket of goods approach.

Hence, the main focus of this study will be the research of the factors that make this index particularly volatile. The structure of the paper will be based on the following lines: first, an introductory explanation of the components and the calculation of the Human Development Index will be done, in order to check and prove that the aspect that has the most variability when computing the index is the Gross National Income. After that, the factors that make the Gross National Income vary will be tackled for a better understanding of the issues that Sub-Saharan Africa countries have and how their living conditions can be improved.

With the data and the aspects collected, a regression analysis describing the variability of the Gross National Income for the Sub-Saharan Africa countries will be computed to check whether the hypotheses described before are corroborated.

Then, the inclusion of other variables, specially the inclusion of the informal or black economy, that are difficult to translate into numbers for the econometric model will be discussed in order to improve the model done before, and therefore improve the Human Development Index, so that it can reflect the reality of a society and its human development at its best. This way, the paper will finally tackle the importance of the inclusion of this factor in the index of the United Nations and will leave room for further research on the topic.

## 2. THE HUMAN DEVELOPMENT INDEX

Several measures and indexes of development have been forged in the past century, but certainly the most relevant to comment on is the United Nation's Human Development Index. First, for its wide scope, as it comprehends numerous types of data; and second, for its scholar usage today, since it has unquestionably become a widely used index for the elaboration of papers on development issues.

In this section of the paper, a brief introduction to this Index will be undertaken in order to conceptualise the moment at which it was forged and the economic tendencies to explain development until then. In addition, the components of the index will be carefully explained so that there is a better understanding of the reasoning and theoretical background behind the hypothesis set.

### 2.1. Background

For decades, the greater part of development indexes were of an economic nature; the vast majority of them focused on GDP levels. Classical economy stated that if an economy was open, it was enough to exploit its natural and human resources and capabilities to develop economically. Development was only thought as an economic liberalisation: profit maximisation and higher international and national trade levels.

They lacked the fact that development may appear in other forms, such as the educational attainment of a society or the life expectancy of a group of people, among many other factors. This way, it can be stated that development can not only appear economically, but also socially and politically, and therefore in a human way, as the improvement of the lives of the people in a certain location.

The Human Development Index was first introduced in 1990 in one of the Human Development Reports written by the Pakistani economist Mahbub ul Haq<sup>2</sup> inside the United Nations Development Programme, which at that time this side of the United Nations was making remarkable progresses in the field of development economics.

It was the first time development was associated not only to economic progress but also to human well-being. Therefore, the concept of human development was presented as a progress towards greater human well-being (Stanton, 2007, p. 3). In order to simplify the collection and treatment of data, three types of data were evaluated, seen as the three essential indicators of

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<sup>2</sup> Mahbub ul Haq (1934-1998) was a Pakistani economist, international development theorist and game theorist who served as a Special Adviser at the UNDP (United Nations Development Programme) from 1988 and led the establishment of the Human Development Index in 1990. He is considered to be one of the major development economists of all time, since many policy proposals of the United Nations come from his development theories (such as the UN Economic and Social Council or the Global Compact).

human development: schooling, life expectancy, and economic progress, seen as improvement of the Gross National Income levels.

Today, this index, that goes from 0 (no development at all) to 1 (maximum development), comprehends these three kinds of data of three different fields, all with the same weight when computing the index. In addition, the United Nations have created some “groups” of indexes in order to put countries into categories:

- Very high human development: from 0.8 until 1
- High human development: from 0.7 until 0.799
- Medium human development: from 0.55 until 0.699
- Low human development: from 0 until 0.549

The HDI has been thought and created for comparing the human development (which includes the economic development) of a given country or group of countries at a given moment in time with others. With its disaggregation, specialists can check for the weak points that make a country struggle to develop and to tackle them accordingly.

In this paper, the focus of the research will be the territories with a low human development, which many of them appear to be located in the Sub-Saharan Africa region, in order to study the factors that are making them stagnate in their human development levels, which are very low.

## **2.2. Structure of the Human Development Index**

As abovementioned, the index is made up by weighing equally three indexes (life expectancy, education and Gross National Income indexes):

$$HDI = (life\ expectancy\ index * education\ index * GNI\ index)^{1/3}$$

In this section, the calculations to develop the index and the reasoning behind the selection of the variables by UI Haq in 1990 will be explained for a better understanding of the following sections of the paper.

### *2.2.1. Life expectancy index*

Life expectancy is a relevant variable when it comes to human development for a vast amount of reasons. A developed society has a high life expectancy, and an improvement in it in these kinds of societies does not mean a high improvement in the lives of people; while in a developing country the contrary occurs: a little increase in the life expectancy, which is low already, means a big difference in the life quality of the population of a given country.

Countries with a medium and low human development are prone to having diseases with a high mortality, which lead the people in these countries to have a lower life expectancy. The cure of these diseases, or advancements in them, make these countries improve their life expectancy.

This is the reason why this index is crucial. While it states the life expectancy of a given country, it also involves the improvement of many more factors: the allocation of public resources towards the eradication of the most lethal diseases or the improvement of food crops and the eradication of malnutrition are among many other factors that make the life expectancy improve.

Its calculation is not difficult to compute. The first thing to do in order to create this index and any other index of the Human Development Index is to create a maximum and a minimum value for, in this case, the life expectancy of a society.

The United Nations Development Programme has set 20 as the minimum life expectancy (since in the 20th century there was no country with a life expectancy lower than 20) and 85 as the maximum life expectancy in a given country. This way, the index for the life expectancy for a given country will be computed as follows:

$$\text{Health index} = \frac{\text{LifeExpectancy} - 20}{85 - 20}$$

### 2.2.2. Education index

Education is another essential factor that encompasses many others when assessing the human aspects of a country's development. Countries with high and very high human development tend to have a stable schooling system, and therefore a net enrolment rate near 100%, as well as a high number of years of schooling (both expected and mean).

The importance of the education index, though, goes beyond the education years people in a country receive on average. Having a high net enrolment rate<sup>3</sup> means that kids are benefitted from good living conditions, not having issues with school absenteeism, or with malnutrition, that would mean they cannot attend school, and may cause damages in their cognitive

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<sup>3</sup> The net enrolment rate refers to the total amount of children enrolled in the school age group they should be assigned to.

development, which is prone to act as a poverty trap<sup>4</sup> in developing countries, or with diseases, among many other factors.

Therefore, it can be stated that the relevance of the education index computed for the Human Development Index goes beyond checking whether some countries' population tend to attend schools for a longer period. Attending school in developing economies means much more than that. It means better physical infrastructures, less famine and malnutrition, and therefore poverty, and less disease infection.

When it comes to the calculation of the index for the education level, the United Nations considers two different kinds of data: 1) expected years of schooling and 2) mean years of schooling.

The range for the expected years of schooling has a minimum of 0 and a maximum of 18, while the range for the mean years of schooling varies between 0 and 15. In order to include both measures to the same index, the following calculations are undertaken:

$$\text{Expected schooling years index} = \frac{\text{value} - 0}{18 - 0}$$

$$\text{Mean years of schooling index} = \frac{\text{value} - 0}{15 - 0}$$

The mean of these two results will be the Education Index used in the Human Development Index:

$$\text{Education index} = \frac{\text{Expected schooling years index} + \text{Mean years of schooling index}}{2}$$

### 2.2.3. Gross National Income index

The third source of data used to calculate the Human Development Index is the Gross National Income, which is all the output claimed by the residents of a country abroad and domestically. It represents the economic side of development, and it is also crucial for the understanding of human development and the HDI as a whole.

The input claimed by the residents of a country is a sign of economic growth, since the more input is claimed, the more circulation of money there is within a country. When Gross

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<sup>4</sup> A poverty trap is a self-reinforcing mechanism that causes poverty to persist. In the case of malnutrition, it implies that you have insufficient resources to buy enough quantity or quality of food. This in turn will negatively affect your energy intake and capacity to work and thus your future earnings.

National Income increases, the more a country is open to trade and foreign investments, a relevant sign of globalisation.

In order to develop the Gross National Income index that is used in the HDI for a given country, the same methodology will be used, taking the natural logarithms of the values for the GNI. The minimum value for the GNI per capita (taking 2011 PPP in dollars as constant) is 100\$ and its maximum value is 75000\$.

$$\text{Income index} = \frac{\ln(\text{value}) - \ln(100)}{\ln(75000) - \ln(100)}$$

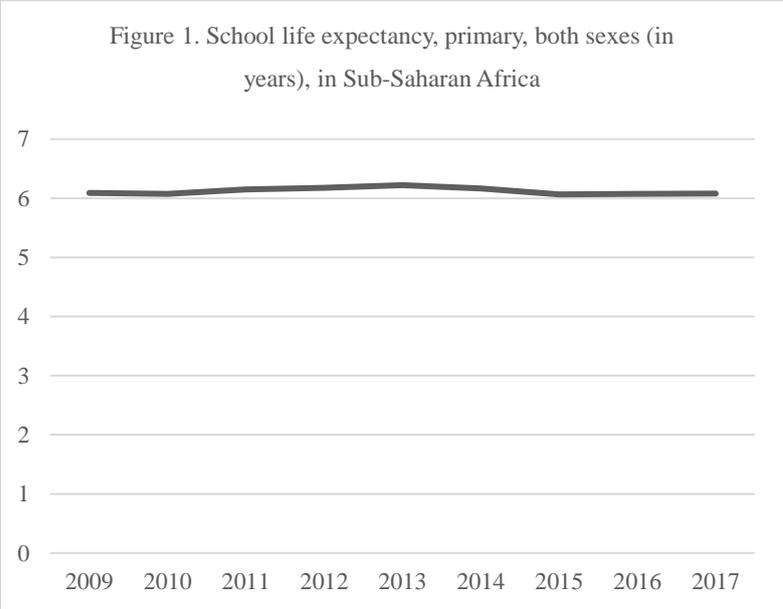
## 2. THE MODEL FOR THE GROSS NATIONAL INCOME INDEX IN SUB-SAHARAN AFRICA

### 3.1. Reasoning

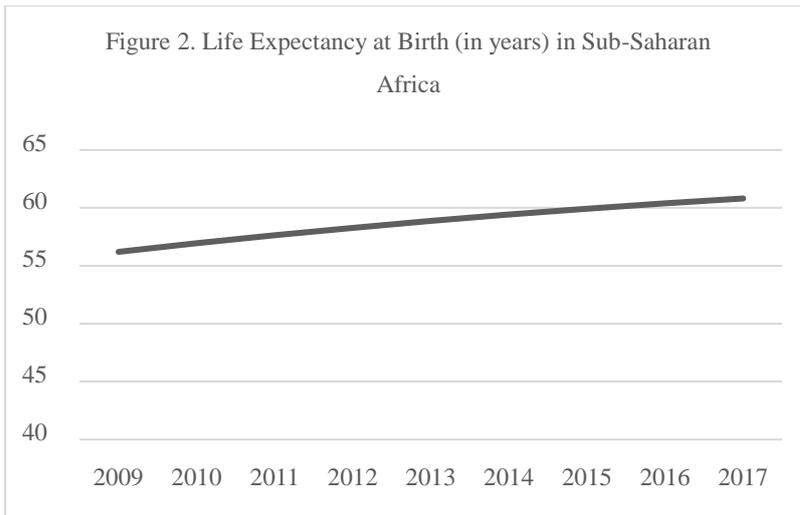
The Human Development Index, as a relevant index to measure human development today, varies tremendously across countries, since a vast number of factors can affect the increase or decrease of any of the variables that make it up. The focus of this section of the paper will be the analysis of the specific factors that shape it in the Sub-Saharan Africa area, and specially targeting the ones that concern the variability of the economic input that is used when calculating the Human Development Index: the Gross National Income.

The Human Development Index, which its computation has been explained before, has been found to have some sort of pattern of growth. When looking at the increase of each of the inputs that make it up, one can appreciate a certain trend in their variability over time.

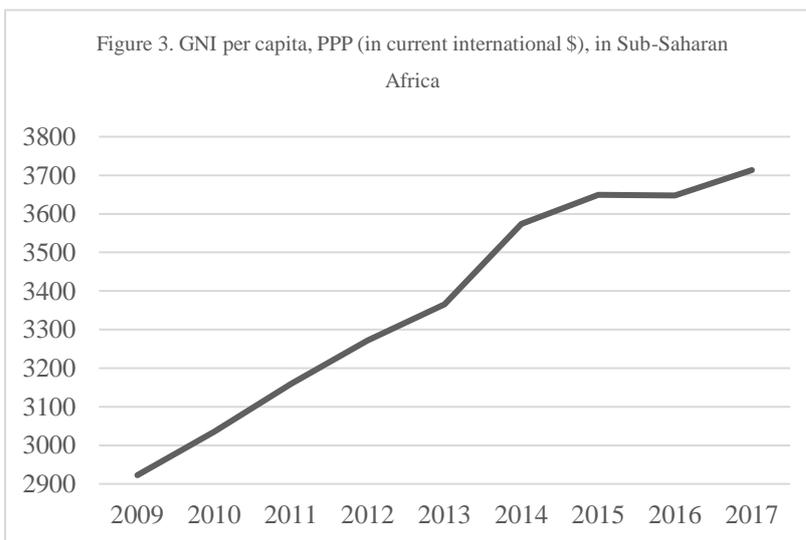
In the graphs below, whose data is retrieved from the World Bank Database and are regarding Sub-Saharan Africa, one can appreciate that the input that constitutes the Human Development Index that has the highest variability is the Gross National Income, which will be the variable analysed in this paper. For this reason, it seems to be the variable that can make the Index go up or down and the one that can help improve more the other two variables that constitute the HDI.



1.Source: own elaboration with data retrieved from the World Bank Data.



Source: own elaboration with data retrieved from the World Bank Data.



2. Source: own elaboration with data retrieved from the World Bank Data.

Determining the factors that cause this economic growth indicator to move upwards or downwards is crucial for many aspects. First, it is very important for the United Nations' index itself. This factor that represents one third of the total value of the Human Development Index also appears to be the component that has a highest variability, which means that it is the most sensitive aspect to changes. By analysing the causes of these changes in Sub-Saharan Africa, the competent authorities (i.e. national banks, governments or NGOs) will have it easier to design and implement the policies that will best help improve the lives of the people in this area.

Second, the research on the variables that shape the Gross National Income is also compelling for the study of the aspects that make this indicator move up or down, showing the strengths and weaknesses that the Sub-Saharan Africa countries may have as well as common patterns that could determine their economic growth.

Last, this research will be useful for determining the specific variables that can be used in the regression model that will be developed further in the paper and that will corroborate mathematically the theories and statements made in this section of the research project.

After that, an introduction to the broad concept of informal economy will be made and the inclusion of this relevant factor to the model will be further discussed in order to improve the Human Development Index.

### **3.2. Causal factors of the variability of the Gross National Income in Sub-Saharan Africa**

The Gross National Income<sup>5</sup> is an indicator of the economic growth of a given country at a given time. As an economic growth indicator, its variability is caused by several factors that can turn its shape into a decrease or increase.

In this section of the research project, the main causal factors for its variability will be discussed and exposed, which will then be used in order to compute the regression (empirical evidence) that will corroborate the theories proposed in this section.

#### *3.2.1. A high economic openness*

Historical economic analysis states that an open economy tends to converge to the rest of the world, which results in pressures for better and more open policies to counter worldwide competitiveness, as thought by Adam Smith (Sachs and Warner, 1995). This openness of the economy is translated into a higher Gross National Income, a sign of economic growth.

In the case of Sub-Saharan Africa, many economies are closed or slightly open with bad regulations (and therefore institutions) that will probably not back them in case of need. This, in turn, could lead to big losses for companies and civil society, whose rights may be directly

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<sup>5</sup> The Gross National Income (GNI) is all the output claimed by the residents of a given country both domestically and abroad. It is calculated by adding to the Gross Domestic Product (GDP) the income earned by residents abroad and by subtracting the income earned by foreigners domestically.

affected. Therefore, there is a strong relationship between bad institutions and market openness, and thus, economic growth and human development.

### *3.2.2. Life expectancy at birth*

Life expectancy at birth is certainly a relevant factor that shapes Gross National Income. In poor economies, therefore also in the Sub-Saharan Africa economies, life expectancy is lower than the world average (the world average was 72 years in 2016), which has a direct relationship with the income that a given country has (World Bank, 1993).

This can lead one to believe that this relationship exists up to a threshold, since a discrete increase in the life expectancy of the population of a given poor country can drive the population to a notorious increase in their income, while a discrete increase in the life expectancy of the population of a highly developed country does not drive its population to a significant increase in their income. This may suggest that the effect that life expectancy has on income could be of a non-linear nature, as stated by Wilkinson in 1996, and by Rodgers, in 1979, when he defined the threshold in which life expectancy starts to have a less significant effect on income at the point when this income is less than 10,000\$.

### *3.2.3. Net enrolment rate*

The net enrolment rate refers to the division between the number of children that are enrolled in their official school age group and the total number of children that are in the official school age group.

In a developed country, this number is equal or very close to 1 (so in developed countries this number is not significant to explain the variability of the Gross National Income), while in developing countries this number is significant since there is fewer people that attend and enrol schools and this fact translates into a lower income, not only because the population is less prepared and literate to encounter better salaries and job opportunities, but also because a society that is not educated is more eager to have diseases for the lack of information received, which can turn to a higher mortality rate and disease burden.

On the other hand, raising the average level of education in developing countries has two outcomes: first, it makes low-skilled workers scarcer, which turns in an increase on the wages of works that require lower skills; second, it increases the supply of highly educated workers, which turns into a decrease on the wages for highly skilled workers. Therefore, increasing the

level of education (thus the enrolment rate) leads to a reduction on the dispersion of wages, which means less inequality (De Gregorio and Lee, 2002).

#### *3.2.4. Urbanisation*

One of the factors that seems to shape more and more the development of a poor economy is the urbanisation. For the past 30 years, an exponential increase of the cities in these countries has been witnessed, having relevant outcomes for the economy.

People in Sub-Saharan Africa countries are moving from the countryside to big agglomerations with more frequency than ever, and this may cause a so-called Malthusian Catastrophe. An exponential growth in the population (in 1990 the population in Sub-Saharan Africa was of 512,177,101 people, while in 2017 it was of 1.061 billion people), with less and less people working in the primary sector, which means a lower growth in food production, inevitably leads to a point in time in which food productivity growth will not be able to keep up with the population growth.

This fact can lead to Malthusian Catastrophes since there can be food shortages, conflicts, famine, and definitely a reduction in the population size, leading to a new equilibrium between population growth and food production growth. Therefore, it can be stated that the population growth is endogenously determined by food production.

Then, an important question is raised: why do people in developing economies move from the countryside to cities, where there is a very high unemployment rate?

There are many theories to answer the question above, but there are two views that have had an important scholar relevance.

The first answer can be found in the Harris-Todaro Model (1970), an old model which has been found to be valid in order to explain the willingness and the reasoning of the people in poor economies to move to cities. It explains that an individual will migrate if the expected urban wage is higher than that of the rural area.

With some mathematical operations, they found that if urban wages are twice as high, it is economically rational for rural migrants to move even when unemployment is close to 50%. Moreover, if urban wages are four times as high, it is economically rational for rural migrants to move even when unemployment is close to 75%.

Therefore, there is a so-called “Migration hump”: economic development and growth in poor countries leads to an increase in the migration of its population, but this happens up to a threshold (Clemens, 2014).

The other view, more recent, regards the relationship between natural resource abundance and migration. Developing economies, especially in Sub-Saharan Africa, that have natural resource abundance (i.e. Angola, which is Africa’s second largest exporter of oil and the world’s fifth largest producer of diamonds) tend to have corrupted institutions that are prone to encouraging rent-seeking activities<sup>6</sup> and the so-called “white elephants”<sup>7</sup>.

Property rights in these economies are usually unguaranteed since contracts are not the usual way to enforce property rights and acquisitions of land. Governments help big, foreign corporations, buy land (i.e. food crops or woods) that they take from peasants that have lived there for generations without any land acquisition contract and therefore they see themselves forced to leave their homes to look for another job and life. Due to this, these people end up in the new cities’ suburbs, every day messier, dirtier, and more polluted, where there is a very high unemployment rate.

### 3.2.5. *Geography*

The geographical location of a country also plays an important role when it comes to determining the economic growth of a country. According to Diamond (1997), there are 2 factors in geography that shape the development of a country:

- The abundance of domesticable plants and animals.

Depending on the geographical location of the human settlements, there can be more varieties and abundance of grasses that are larger seeded, more nutritious. This leads to an earlier development of food production and technologies to store food.

In addition, it is easier to develop when there are more terrestrial mammals that can be domesticated, in order to improve food, transport, leather or wool, among many

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<sup>6</sup> Rent-seeking activities are those activities aimed to a self-enrichment from natural resource extraction rather than increasing the productive potential of the economy. Resources and effort in an economy are re-allocated from productive activities towards rent-seeking, including bribery and lobbying.

<sup>7</sup> White elephants are the inefficient investment projects from governments and companies that have a negative social surplus for a country. They are usually focused on the physical transformation of a country and they are the niche for tremendous corrupt activities.

other improvements. While in Eurasia there are horses and dogs, in Sub-Saharan Africa there are zebras and cheetahs.

- The orientation: East-West versus North-South.

Africa has a major North-South axis, since the ecological area varies greatly from one point to the other of the same continent (streaks of Mediterranean climate, deserts, tropics). Therefore, the spread of technologies was much slower than that of the Eurasian continent, that has the same ecological zone from east to west, which led to a faster spread of the technologies and therefore a faster development.

In addition, the fact of being a landlocked country or a country with sea is also a determining factor that shapes the development of a poor country. No navigable routes to sea mean less trade opportunities and higher transportation costs. This results in the fact that nearly all landlocked countries are poor (except for Switzerland, that has “good neighbours”). To back this theory with data, in 1999 the average income per capita (excluding Western and Central Europe) was \$1.771 for landlocked countries and \$5.567 for coastal countries (Gallup, Sachs & Mellinger, 1999).

Another geographical variable that one must consider when it comes to the factors that affect economic development is ruggedness<sup>8</sup>. It affects transportation costs, the ease of the diffusion of technology, the mobility of production factors (capital and labour) and the development of agriculture (since the soil is not suitable). Therefore, countries with a high ruggedness are often poor countries.

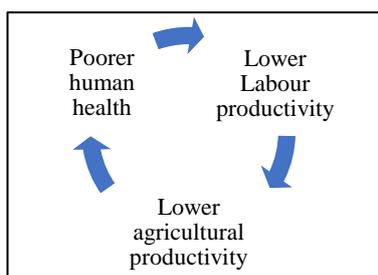
The ecological zone is also a relevant variable of geography, since it alters the agricultural productivity: temperature, soil quality, rainfalls...

Tropical areas are generally characterised by high temperatures, absence of winter frost, and a higher disease burden for humans, crops and animals, which results in a poorer human health, that prompts a lower labour productivity, which contributes to a lower agricultural productivity (and therefore less food). This results in the following poverty trap:

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<sup>8</sup> Ruggedness refers to a large variation in elevation and slope, uneven or broken terrain.

*Figure 3. Tropical climate poverty trap.*



*Source: own collection.*

### 3.2.6. Disease burden

In Sub-Saharan Africa there are mainly two diseases that create an economic and social burden: malaria and HIV/AIDS.

According to Sachs & Malaney (2002), Malaria is geographically determined, which means that some regions are more eager to be affected by it, which is the case of Sub-Saharan Africa.

Malaria is caused by a parasite and is transmitted by mosquitoes, that need high temperatures and water to survive and infect people. Therefore, malaria is easier to control in temperate zones rather than in the tropics. In addition, a lot of investment is needed to eradicate malaria, but poor economies already face other economic challenges: poor sanitation and hygiene, housing, no access to prevention, diagnosis and treatment of diseases, less government funding or malnutrition.

As reported by Gallup and Sachs (2001), the annual income per capita in 2001 was 1.3% lower in malarious countries than in non-malarious ones. In the long run, this can lower the income per capita by nearly 50%.

Malaria has important social and economic costs for a society: there can be a substantial loss of physical capital, since there are high medical expenses needed to cure the population, people lose working days, and FDI and tourism are reduced. In addition, there is a high loss of human capital as well: there is an increased school absenteeism, a damaged cognitive development and learning ability, an increased vulnerability to other diseases and malnutrition. Malaria has become a poverty trap in Sub-Saharan Africa.

Hence malaria can be stated as a fundamental cause of the variability of economic growth of a developing country, especially in Sub-Saharan Africa.

When it comes to AIDS/HIV, it is a relevant issue to mention. The Sub-Saharan African countries account for more than 70% of its worldwide burden infection (Kharsany & Karim, 2016). In the past, the deaths caused by this disease were abruptly growing until retroviral therapy (ART) became common in the world. With this therapy, deaths have decreased substantially, even though the deaths for HIV in Sub-Saharan Africa still account for three out of every four AIDS cases.

## **4. REGRESSION ANALYSIS**

### **4.1. Definition of the variables**

A regression analysis must be performed in order to corroborate and provide with quantitative results the theories exposed from the variables that are believed to shape the Gross National Income. This way, one will be able to check whether the hypothesis that all the variables are relevant is correct, and therefore prove the model adjusts to reality.

In this section, the set of countries analysed, and the variables used in the model that explains the causal factors of the variability of the Gross National Income will be mentioned and explained for a better understanding of the section that follows this one: the Regression Analysis.

First of all, due to the lack of quantitative data that exists for the different countries of Sub-Saharan Africa, this study analyses the countries that were found to have more quantitative data, which are the following: Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Central African Republic, Djibouti, Gambia, Guinea-Bissau, Liberia, Namibia, Mozambique, Zimbabwe and Zambia.

Of this set of countries, their data consists of a panel from the last 19 years (from 1999 until 2017), that has been gathered and treated one by one, which can give some perspective of future tendencies by interpreting the results that are shown further in the paper.

The variables used for this research project are the following:

- The variable that tackles economic openness in the regression is the Foreign Direct Investment (FDI), taken from the International Monetary Fund and the Balance of Payments Statistics Yearbook.

The FDI is widely believed to be a factor that determines whether an economy is more open or closed. It is a variable that represents all investments that go to a certain country or region but come from abroad. A globalised, internationalised economy should have a higher FDI compared to a closed economy. Therefore, the level of Foreign Direct Investment is directly (and positively) related to the Gross National Income growth.

- The variable that tackles life expectancy is the Life Expectancy at Birth of a given country at a given year, taken from the United Nations Population Division, from Census reports and other statistical publications from national statistical offices, from Eurostat: Demographic Statistics, from the United Nations Statistical Division, from the

U.S. Census Bureau of International Database, and from the Secretariat of the Pacific Community: Statistics and Demography Programme.

- The one that deals with the net enrolment rate explained above is the Primary Net Enrolment Rate of a country at a given year, taken from the UNESCO Institute for Statistics.

The Primary Net Enrolment Rate of a country at a given year is a good measure that represents the number of kids enrolled at their primary school age group, which is a basic schooling period that everyone should attain. Unfortunately, in Sub-Saharan Africa not all kids can attend primary schools, and not all of them are enrolled in the courses they should.

This factor definitely shapes the GNI of a given country or region, since better prepared kids will become an asset for that region in the future. Therefore, the assumption of this variable is that the higher the Primary Net Enrolment Rate, the higher the Gross National Income.

- The variable that engages with urbanisation is the Urban Population of a given country at a given year, taken from the World Bank staff estimates based on the United Nation's Population Division's World Urbanization Prospects: 2018 Revision.

Cities in developing countries have been found to be continuous and exponentially increasing in number of people, due to the reasons explained above. Population in urban areas, thus, seems to have some sort of relation with the GNI growth of Sub-Saharan Africa nowadays, since peasants are moving their homes to bigger, messier cities.

- The variable that tackles geography is the dummy for Landlocked countries (1 if Landlocked, 0 otherwise).

There are many factors that can make one believe that landlocked countries present different (and opposite) results when it comes to the level of Gross National Income. By including the dummy for landlocked countries, one will be able to determine if landlocked countries present higher or lower levels of GNI.

- The variable that deals with the disease burden is the Malaria Incidence (per 1000 population at risk), taken from the World Health Organization, the Global Health Observatory Data Repository, and the World Health Statistics.

Even though two of the most important diseases have been explained above, Malaria has been chosen to be the one introduced in the model due to its high and long-lasting prevalence, for which many people are dying every day, and also for the fact that

it affects all age groups, while HIV (explained above) mainly affects people above 15 years old.

In addition, it is a disease that is easier to compare with the human development of an area, since in areas that today have a very high human development, years ago they had this disease prevalent. Therefore, the eradication of this disease would mean an improvement in the human development of a society.

This variable selection does not try to undermine the relevance of this terrible disease, but instead tries to link one specific disease to the economic growth of a country. Indeed, some studies show that HIV has lowered life expectancy in some countries in recent years, due to the high cost of treating the disease.

Despite this, the UN's Sustainable Development Goals of 2015 that were dedicated to improve the lives of the people in areas strongly affected by AIDS, were found to have positive effects in the lives of the people in Sub-Saharan Africa countries, increasing their life expectancy thanks to the help received (A. B. M. Kharsany and Q. A. Karim, 2016). This way, HIV is starting to be more controlled and taken care of, even though it is still a lethal disease.

## **4.2. Regression analysis**

The Regression Analysis section of the research project consists of the development of different regressions in order to check for non-linearities and to check how the variables respond to different analyses. The explanation of each of the regressions and their results will be explained after the table of results. Here are the regression results:

**Table 1. Pooled OLS estimates**

Dependent variable: GNI

	(1)	(2)	(3)	(4)
const	-1.595e+08 (1.273e+010)	-1.039e+011* (5.100e+010)	-2.243e+011*** (3.955e+010)	-2.101e+011*** (4.304e+010)
FDI	3.894*** (0.3485)	3.895*** (0.3461)	3.761*** (0.2661)	4.092*** (0.1984)
UrbanPopula tion	4356*** (514.1)	4275*** (518.0)	4487*** (419.0)	4320*** (393.7)
NetEnrolmen tRate	-6.703e+06 (5.466e+07)	4.229e+06 (6.140e+07)	2.821e+08*** (6.780e+07)	2.980e+08*** (7.019e+07)
Landlocked	3.666e+09* (2.067e+09)	3.930e+09* (1.917e+09)	6.674e+08 (2.010e+09)	-2.628e+09 (2.172e+09)
MalariaIncid ence	-2.922e+07*** (6.123e+06)	-3.062e+07*** (6.949e+06)	1.472e+08*** (4.769e+07)	1.797e+08*** (5.349e+07)
LifeExpectan cy	4.506e+07 (1.973e+08)	3.440e+09* (1.687e+09)	6.773e+09*** (1.207e+09)	6.321e+09*** (1.322e+09)
sq_LifeExpe ctancy		-2.764e+07* (1.409e+07)	-5.535e+07*** (9.773e+06)	-5.206e+07*** (1.055e+07)
Malaria*Life Expectancy			-1.340e+06* (6.896e+05)	-1.741e+06* (8.291e+05)
Malaria*Enr olment			-1.348e+06*** (2.826e+05)	-1.413e+06*** (2.779e+05)
FDI*Landlo cked				-5.260*** (1.247)
n	70	70	70	70
Adj. R <sup>2</sup>	0.8393	0.8452	0.8796	0.8890
lnL	-1674	-1672	-1662	-1658

Standard errors in parentheses

\* indicates significance at the 10 percent level

\*\* indicates significance at the 5 percent level

#### 4.4.1. Ordinary Least Squares linear model

Table 1 (1) shows the results of the first regression performed, which is of a linear nature:

$$GNI = \alpha_0 + \beta_1 FDI + \beta_2 UP + \beta_3 NER + \beta_4 L + \beta_5 M + \beta_6 LE + \varepsilon$$

Where GNI refers to Gross National Income, FDI is the Foreign Direct Investment, NER refers to Net Enrolment Rate, L is the dummy for Landlocked countries (1 if landlocked, 0 otherwise), M refers to Malaria Incidence, LE refers to Life Expectancy, and  $\varepsilon$  is a random error term.

Following the results displayed in the table above, FDI, Urban Population and Malaria are all significant at all levels in explaining the variability of the GNI. This means that for every dollar more in FDI, GNI will increase by 3,8 dollars; for every person more moving to a city, GNI increases by 4355,97 dollars; and for every increase in 1 case per thousand people of malaria, GNI decreases by 2.92 dollars. This way, we see that urbanisation has a very big effect on the economic development of poor countries.

In the case of the dummy for landlocked countries, its significance is lower than that of the abovementioned. It is significant at 10%, and it brings a very little positive effect for landlocked countries when it comes to GNI, probably due to historical reasons.

This said, as some coefficients appear to be very high, it is important to check if the functional form of this regression is correct. In order to do so, some other non-linear regressions have been performed in the following section.

#### 4.4.2. Ordinary Least Squares non-linear models

Following the theory abovementioned that life expectancy has a quadratic effect on economic growth, three more models have been created in order to improve the first one.

The second regression results come from the following regression equation, that includes a quadratic effect of life expectancy, following the theory of the quadratic form of life expectancy by some scholars, such as Rodgers in 1979 and Wilkinson in 1996:

$$GNI = \alpha_0 + \beta_1 FDI + \beta_2 UP + \beta_3 NER + \beta_4 L + \beta_5 M + \beta_6 LE + \beta_7 LE^2 + \varepsilon$$

In this case, the regression has slightly improved since the Adjusted R-squared is equal to 0.845, while in the linear model its value was of 0.839. In addition, new variables have appeared to be significant apart from those that already were in the linear model. Life expectancy is now significant at 10% in both its linear and quadratic forms.

After that, it is convenient to perform some interactions between the variables that can be related in order to improve the veracity of the model. This way, three interactions have been performed: the first one relates the presence of malaria with the life expectancy of the population of a given country, since malaria definitely plays a role in the variability of the life expectancy in developing countries; the second relates the presence of malaria with the net enrolment rate, because malaria can make less kids enrol their schools, and even less their school age group; and the third interaction performed is the one between the dummy for landlocked countries and the foreign direct investment; in order to investigate whether landlocked countries are prone to having more or less FDI than countries with sea in the Sub-Saharan African countries analysed.

The third regression adds the first two interactions, that correspond to the effects that malaria has on life expectancy and the net enrolment rate:

$$GNI = \alpha_0 + \beta_1 FDI + \beta_2 UP + \beta_3 NER + \beta_4 L + \beta_5 M + \beta_6 LE + \beta_7 LE^2 + \beta_8 M * LE + \beta_9 M * NER + \varepsilon$$

Its results show an increased significance in the regression overall (since the Adjusted R-squared is now 0.8795, 0.03 points higher than in the second model), giving significance at all levels to all the coefficients except for the dummy regarding Landlocked countries and the first interaction (Malaria \* Life Expectancy), that appears to be significant at 10%.

This suggests that the assumption of 1) giving a quadratic form to life expectancy is totally relevant, since it makes the variable significant at all levels in order to explain the variability in the Gross National Income; 2) creating an interaction that relates the presence of malaria for every 1000 people at risk with the net enrolment rate at schools is very relevant for explaining the variability of the Gross National Income, because it suggests that the fact of having a high presence of malaria with a net enrolment rate that is low, makes countries even more prone to lowering their Gross National Incomes and thus their economic development.

On the other hand, even though the interaction between malaria and life expectancy has been created, it is only relevant at 10%, which suggests that although it is quite significant in explaining the variability of the Gross National Income, maybe its effect is overcome by the big effect that malaria and the net enrolment rate have on Gross National Income variability.

The fourth regression performed includes the interaction between the Foreign Direct Investment and the dummy for Landlocked countries, which has been created in order to test if landlocked countries suffer from lower foreign direct investments. The equation regressed is the following:

$$GNI = \alpha_0 + \beta_1 FDI + \beta_2 UP + \beta_3 NER + \beta_4 L + \beta_5 M + \beta_6 LE + \beta_7 LE^2 + \beta_8 M * LE + \beta_9 M * NER + \beta_{10} FDI * L + \varepsilon$$

The results of the regression show a much higher Adjusted R-squared, which now equals to 0.889, a quite better level than that of the other regressions performed. This suggests that the inclusion of this third interaction is relevant to explain the variability of the regressor: the Gross National Income. All variables appear significant at all levels except for the Landlocked dummy and the interaction between life expectancy and the malaria incidence, that is still significant at 10%.

Therefore, after seeing the results of this fourth regression, it can be stated that landlocked countries receive much less foreign direct investment than countries with sea, a fact that directly impacts the level of Gross National Income at all levels of significance. Translated into numbers, it means that on average, and keeping all the other variables equal, landlocked countries lose 1.168 dollars of Gross National Income for every dollar invested from Foreign Direct Investment compared to countries with sea in the Sub-Saharan Africa area.

If we check for the hypothesis that there is no difference between landlocked and not landlocked countries in explaining the variability of the GNI ( $H_0 = \beta_4 = \beta_{10} = 0$ ) (see Annex 2), the results show that the null hypothesis that there is no difference between landlocked countries and those with sea is rejected according to the p-value of 0.000231. Therefore, it can be stated that the inclusion of the dummy and the interaction are justified.

While just the inclusion of the dummy for Landlocked countries alone does not appear to be significant for explaining the variability of the regressor, when it comes to explaining the effect that being landlocked has on the foreign direct investment, things change. With this interaction, one can conclude that the theory that Gallup, Sachs and Mellinger developed in 1999 is still valid, since FDI is much lower for landlocked countries.

## **5. LIMITATIONS OF THE MODEL: INSTITUTIONS AND THE INFORMAL ECONOMY**

This section of the research paper tackles the possible limitations of the model described above: variables that were found missing and that could improve the other models, and variables that could give a completely new perspective to the research developed.

Even though many factors can and do affect the variability of the Gross National Income apart from those explained and used in previous sections, this paper will only focus on some, specially those regarding the relationship between institutions and the informal or black economy, since they can have an important role in determining the economic and human growth of a territory.

By beginning with the explanation and discussion of other possible aspects that can influence the intercept of the model computed in section 4 of the research paper, this section will mainly tackle the role that institutions have in human development, and particularly in economic growth, and the relation it can have with the informalisation of the economy.

### **5.1. Possible omitted variables**

After performing a regression analysis on the factors that shape the GNI of Sub-Saharan Africa countries, some other aspects that could influence the intercept were found to be worth mentioning.

First of all, there is one factor that cannot be measured but is certainly something to bear in mind: culture. Different groups of people (or ethnic groups) have different cultures since they have different shared experiences and religions. Culture determines the preferences, beliefs and values of people, which can influence the economic performance of a country.

Another variable that has not been considered when computing the regression before is another aspect strongly related to culture: chauvinism and the role of women. Chauvinistic societies tend to leave women apart, which means not taking into consideration half of the population in a given country, and this, in fact, represents a huge human capital loss for a country, apart from being an enormous cultural barrier for foreigners to invest in that country.

Both variables, and many others, are worth mentioning for further studies on the effects that these factors have on the economic performance and development of a country.

### **5.2. Institutions and the informal economy**

Economic institutions are a determinant of the incentives and constraints on economic activities, and they certainly shape the outcomes on economic matters. Therefore, economic

institutions and how they perform in an economy are determined by social decisions, which can turn into social conflicts that end up favouring those with more political power.

North (1990, p. 3) defines institutions the following way: “Institutions are the rules of the game in a society, or, more formally, are the humanly devised constraints that shape human interaction. They structure incentives in human exchange, whether political, social, or economic”. Thus, institutions play a very relevant role in economic performance, and consequently, in economic growth: they determine profit allocation, revenues, and resource allocation.

This way, it can be stated that the big question in development economics (why are some countries much poorer than others?) is very related to the question of why some countries have worse economic institutions than others. In order to explain this relationship, some facts have been considered.

First, as stated above, institutions play a relevant role for economic growth: they determine economic performance today, but they also determine the future distribution of resources (and who gets more resources). They determine the investments in a given country and the production organisation, and on the other side, the economic outcomes of that country.

Second, one must bear in mind that the kind of institutions that exist will always depend on the actors that hold the political power in that territory. This means that institutions are endogenous, since they are determined by the choices of groups of people. Therefore, not everyone in that territory will want the same economic institutions and their same performance: depending on who holds the political power, they will act one way or another. This fact can lead to a conflict of interest, since people that hold a political power will certainly not use it in the best interests of the whole society.

Third, there is a relevant distinction between the two kinds of political power that coexist. There is the *de jure* political power, which refers to the sphere in which political action takes place (the institutions themselves), that serves as a limit for political action, since political actors will act differently whether in a country there is a democracy or a dictatorship, for instance; and there is also the *de facto* political power, which involves the assumption that there is no need to be a political institution to have political power. This means that any group of people (a group of neighbours of a given town, a trade union, or the military, among many others) can revolt, protest, or use arms to impose their ideas.

Fourth, when institutions place the power to one or few individuals, who holds this political power can shape the hierarchy of the institutions in a given territory, meaning that political institutions influence economic institutions and therefore the outcomes of these economic institutions. This can lead to a so-called institutional persistence.

Institutional persistence refers to those institutions that keep existing over time even though economic and political conditions and powers change. There are two sources of institutional persistence, according to Acemoglu, Johnson and Robinson (2005):

- The fact that political institutions are durable means that only a huge change in the distribution of political power can lead to a change in institutions (for instance, a change from a dictatorship to a democracy).
- The power of a specific group relative to others increases. This, in turn, increases the *de facto* political power of that group relative to the rest, leading to institutional persistence. The only way to modify this balance is through “shocks”, such as a technological improvement or changes in the international environment.

All these factors lead one to believe that the institutional framework of a territory can lead to the appearance of corruption and the informalisation of the economy when these institutions are corrupted by a group that seeks only for personal interests and holds the political power.

An informal or black economy is that economy based on the lack of regulation, out-of-the-law activities. Dysfunctional institutions create incentives for the existence of this kind of economy. There is a big distinction between two major sorts of informal economy.

The interstitial black economy is based on benefitting the few groups in power through deregulation, out-of-the-law activities, a lack of binding contracts and tax avoidance, among many practices. It is the so-called big-scale black economy, that happens around registered or formal businesses or state bureaucracies but appears outside the ambit of formal regulation. This kind of black economy creates informalized laws that result from practices that are socially legitimated (and formal law is ignored), and it also deliberately violates regulation (mainly taxation).

The other kind of informal economy is the small-scale informality, that involves small firms that have minimum formal registration and below taxation minimums. It uses low capital levels, technology and skills. Usually, the firm is not distinguishable from the household controlling it, since production, consumption and investment are interrelated, and no results of the firm can be calculated.

Certainly, while the two sorts of informalized economy have some common features (they both go beyond the limits of the *de facto* political power and institutions), it is relevant to mention the fact that the interstitial black economy has a background related to the *de facto* political power.

Therefore, a way to measure the level of black economy in a specific country is by measuring the quality of the institutions of that territory. In this paper, two institutional indicators have been used to perform a regression analysis to corroborate the relevant role

institutions have on determining the economic growth of a country and the part the black or informal economy has on economic growth:

- Voice and Accountability, which captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association and free media. The normal ranges on this indicator go from -2.5 to 2.5, and the data is taken from detailed documentation by Kaufmann, Kraay & Mastruzzi (2010).

This variable is relevant to include in the model since it determines the extent to which *de facto* political power is restrictive, giving freedom of speech and considering the population's opinions on controversial matters.

- Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and politically motivated violence, including terrorism. The normal ranges of the indicator also go from -2.5 to 2.5, and the data is taken from detailed information by Kaufmann, Kraay & Mastruzzi (2010).

The relevance of the variable for the model that explains the economic growth in Gross National Income regards the representation of the *de jure* political power, since stable institutions have no political instability regarding violence issues.

This way, two more regressions have been performed. The regression equations computed are the following:

$$1) \text{ GNI} = \alpha_0 + \beta_1 \text{FDI} + \beta_2 \text{UP} + \beta_3 \text{NER} + \beta_4 \text{L} + \beta_5 \text{M} + \beta_6 \text{LE} + \beta_7 \text{LE}^2 + \beta_8 \text{M} * \text{LE} + \beta_9 \text{M} * \text{NER} + \beta_{10} \text{FDI} * \text{L} + \beta_{11} \text{VA} + \beta_{12} \text{PSAV} + \varepsilon$$

$$2) \text{ GNI} = \alpha_0 + \beta_1 \text{FDI} + \beta_2 \text{UP} + \beta_3 \text{NER} + \beta_4 \text{L} + \beta_5 \text{M} + \beta_6 \text{LE} + \beta_7 \text{LE}^2 + \beta_8 \text{M} * \text{LE} + \beta_9 \text{M} * \text{NER} + \beta_{10} \text{FDI} * \text{L} + \beta_{11} \text{VA} + \beta_{12} \text{PSAV} + \beta_{13} \text{VA} * \text{PSAV} + \varepsilon$$

The regression results are displayed below, with the first regression being the last regression performed in the first model computed to make easier comparisons, and a fourth and last regression with the Gross Domestic Product as the intercept to check for sensitivity:

**Table 2. Pooled OLS estimates**

Dependent variable	(1) GNI	(2) GNI	(3) GNI	(4) GDP
const	-2.101e+011*** (4.304e+010)	-2.481e+011*** (6.533e+010)	-2.071e+011*** (5.888e+010)	-2.043e+011*** (6.367e+010)
FDI	4.092*** (0.1984)	4.301*** (0.1437)	4.162*** (0.1484)	4.686*** (0.1969)
UrbanPopulation	4320*** (393.7)	4313*** (390.4)	4483*** (360.3)	4908*** (388.7)
NetEnrolmentRate	2.980e+08*** (7.019e+07)	1.947e+08** (8.501e+07)	1.422e+08 (8.398e+07)	1.288e+08* (6.421e+07)
Landlocked	-2.628e+09 (2.172e+09)	-1.710e+09 (2.358e+09)	-2.085e+09 (2.171e+09)	-2.153e+09 (2.154e+09)
LifeExpectancy	6.321e+09*** (1.322e+09)	7.876e+09*** (2.114e+09)	6.735e+09*** (1.892e+09)	6.702e+09*** (2.069e+09)
sq_LifeExpectancy	-5.206e+07*** (1.055e+07)	-6.505e+07*** (1.708e+07)	-5.698e+07*** (1.550e+07)	-5.694e+07*** (1.697e+07)
MalariaIncidence	1.797e+08*** (5.349e+07)	2.145e+08*** (6.448e+07)	1.243e+08* (6.018e+07)	1.221e+08* (6.673e+07)
MalariaLifeExpectancy	-1.741e+06* (8.291e+05)	-2.691e+06** (1.089e+06)	-1.199e+06 (1.003e+06)	-1.159e+06 (1.139e+06)
MalariaEnrolment	-1.413e+06*** (2.779e+05)	-1.124e+06*** (2.523e+05)	-1.044e+06*** (2.579e+05)	-1.086e+06*** (2.143e+05)
FDILandlocked	-5.260*** (1.247)	-5.500*** (1.300)	-6.877*** (1.211)	-7.031*** (1.277)
PoliticalStabilNoViolence		1.528e+09 (1.817e+09)	3.639e+09* (1.742e+09)	4.074e+09** (1.873e+09)
VoiceAccountability		1.208e+09 (1.814e+09)	8.730e+08 (1.481e+09)	7.141e+08 (1.529e+09)
StabilityVoice			3.315e+09** (1.362e+09)	3.527e+09** (1.364e+09)
n	70	70	70	72
Adj. R <sup>2</sup>	0.8890	0.8914	0.8972	0.9197
lnL	-1658	-1656	-1654	-1705

Standard errors in parentheses

\* indicates significance at the 10 percent level

\*\* indicates significance at the 5 percent level

\*\*\* indicates significance at the 1 percent level

As seen with the results, the adjusted R-squared keeps improving model by model, which is a good sign, since it means that the inclusion of these new variables have positive effects on the regression.

The variable that takes into account the perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as certain freedoms, seems to not have significance in determining both the variability of the GNI and the GDP, while the variable that tackles political stability and absence of violence is significant at 10% in the regression that includes the last interaction and at 5% in the regression that has the GDP as intercept. This means that the variable that tackles the *de jure* political power is relevant for economic growth, corroborating the theories stated above.

A remarkable fact is that the interaction between the two variables that tackle institutions is significant at 5 percent in all the regressions, a fact that indicates, first, the close relation there is between the participation of citizens in politics and the political stability and violence threat there is in a country; and second, it can suggest a possible relation between interstitial informality and small-scale informality.

Small-scale informality can be seen as the *de facto* political power, the freedom of doing what people feel is best for themselves, while interstitial informality can be seen as the *de jure* political power, whose extension goes beyond what laws state. The equilibrium of these two forces, indeed, could lead to some political stability, since all the actors are benefitted from this "agreement": the presence of informality.

## 6. CONCLUSION

As checked throughout the paper, development is a vast research topic. Not only it involves economic aspects; but also many other factors that seem not related to growth at a first glance, but appear determinant for the development of a country or region. It is certainly a complex issue to address.

Therefore, it can be stated that development appears in many forms. In the qualitative analysis of the aspects that could shape the economic growth of a country, some characteristics were found to be determinant for the development of a society and particularly its Gross National Income growth, such as whether a country had the presence of the sea, apparently a factor that seemed not relevant for the variability of the Gross National Income, but that in the quantitative analysis through the different models computed appeared significant when related to the Foreign Direct Investment of a country in Sub-Saharan Africa.

Indeed, different regions in the world will have very diverse determinants for their development (whether economic, social, political, or human, for example), which can be appreciated, for instance, in the case when comparing the effect that the Net Enrolment Rate has on GDP levels in Western Europe against the effect it has in Sub-Saharan Africa. That is one of the many reasons for the relevance of the study of how the same set of variables can affect in such a diverse manner whether one is studying an area of the world or another.

The study of the case of Sub-Saharan Africa is particularly important to tackle since it is the region less humanly developed in the world, but at the same time it is the region in which there is more population growth as well. Thus, detecting the points in which the countries in this region are weaker is a determinant factor to truly apply policies designed for each particular issue and improve the living conditions of this growing population. It is especially important the study of how and why economic growth is happening at this pace.

This is the point in which Informal Economy appears. Through this paper, the hypothesis that the informalized economy plays a relevant role in determining the economic outcomes of a country in Sub-Saharan Africa has been proved to be right. Even though the inclusion of specific data on the informalisation of the economy has not been able to be added to the model to explain the variability of the Gross National Income, some relevant assumptions that apply to all those countries that have a high level of informalized economy have been made in order to understand the reality of the economy of Sub-Saharan Africa. These assumptions involve the fact that highly informalized economies have bad institutions.

These institutions, indeed, tend to be ruled by few people that hold the political power, and they make laws that benefit them. Therefore, they control the *de jure* kind of political power (which are the institutions), in order to increase the presence of the so-called interstitial informal economy, which is the informalization of the institutions and the big corporations that have power in the state.

Besides, another sort of informalized economy has been found and its effect has also been found relevant for the study of this research paper. It is the case of the small-scale informal economy, that refers to those small scale informalized activities that are out of the law because they do not arrive to minimum investments and are difficult to distinguish from households.

Many studies relate the presence of these two kinds of informalized economy in the world with the lack or diminution of the economic growth of a country. It is especially relevant to mention the study of Harriss-White (2010), that made a rigorous study of their presence and their effect on institutions in India, and that inspired the sphere of the study of this paper.

This way, through the inclusion of the variables of measurement of the quality of the institutions (Voice and Accountability and the Absence of Violence/Terrorism), some sort of approximation to the extent to which the informalized economy has power over the economic outcomes of a given country in Sub-Saharan Africa has been able to be made. Indeed, the quantitative results show a significant relation between the economic outcomes (both the Gross National Income and the Gross Domestic Product) and the quality of the institutions in Sub-Saharan Africa countries.

All in all, informalized economy plays a relevant role in the outcomes that the economy has in Sub-Saharan Africa. Bad institutions cause the informalisation of the economy to persist, alongside with corruption and bad resource allocation by the state and the political powers in Sub-Saharan Africa. Thus, bad institutions cause a poverty trap in this territory, since their prevalence causes very big income differences and a retracting economic growth, as well as higher and higher economic differences among people.

Although it is true that many aspects of Sub-Saharan Africa countries have been found relevant to determine the economic outcomes of that territory, further research should be performed in order to tackle even more specifically those aspects that need to be changed or improved for better living conditions of the population in Sub-Saharan Africa. In today's world, it is especially relevant to stress the importance of the study of the aspects that shape the economic outcomes of a country or territory in the world that does not do well relative to other areas in the world, in order to improve the lives of people, who find themselves worse off in a world that is constantly changing and where inequality is higher each day.

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## 8. ANNEX 1

### Descriptive statistics of all the variables used

Summary Statistics, using the observations 1:01 - 16:19  
(missing values were skipped)

Variable	Mean	Median	S.D.	Min	Max
FDI	-3.49e+008	-1.22e+008	1.47e+009	-1.08e+010	8.75e+009
UrbanPopulation	2.97e+006	1.47e+006	3.43e+006	2.24e+005	1.93e+007
NetEnrolmentRate	73.4	78.6	19.0	26.9	99.6
GNI	9.91e+009	4.76e+009	1.94e+010	2.10e+008	1.37e+011
GDP	1.01e+010	4.52e+009	2.05e+010	2.24e+008	1.46e+011
PoliticalStabilNoViolence	-0.242	-0.0857	0.900	-2.70	1.22
VoiceAccountability	-0.484	-0.578	0.710	-1.67	0.986
Landlocked	0.375	0.00	0.485	0.00	1.00
MalariaIncidence	192.	172.	161.	0.0100	607.
LifeExpectancy	56.7	57.0	6.48	43.7	73.0

## 9. ANNEX 2

Test of the null hypothesis that being a landlocked or a country with sea has no relevance in determining the variability of the Gross National Income.

Restriction set

1: b[Landlocked] = 0

2: b[FDILandlocked] = 0

Test statistic: Robust F(2, 13) = 17.0694, with p-value = 0.000231034

Restricted estimates:

	coefficient	std. error	t-ratio	p-value	
const	-2.22136e+011	7.98037e+010	-2.784	0.0139	**
FDI	3.77341	0.446989	8.442	4.41e-07	***
UrbanPopulation	4486.06	243.423	18.43	1.03e-011	***
NetEnrolmentRate	2.97062e+08	7.06214e+07	4.206	0.0008	***
Landlocked	0.00000	0.00000	NA	NA	
MalariaIncidence	1.47830e+08	9.14697e+07	1.616	0.1269	
LifeExpectancy	6.69768e+09	2.50582e+09	2.673	0.0174	**
sq_LifeExpectancy	-5.49700e+07	1.96978e+07	-2.791	0.0137	**
MalariaLifeExpectancy	-1.26699e+06	1.60696e+06	-0.7884	0.4427	
MalariaEnrolment	-1.40945e+06	299274	-4.710	0.0003	***
FDILandlocked	0.00000	0.00000	NA	NA	

Standard error of the regression = 5.29871e+009