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**THE ROLE OF HUMAN CAPITAL ON ECONOMIC GROWTH IN SUDAN (1970–2015).**

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**Abstract**

This study dealt with the role of human capital on economic growth in Sudan during the period 1970–2015. It's defined the human capital as average years of schooling of population aged 15 years and above. .This study handled some of the theoretical and empirical literature of human capital and economic growth on the local and international context. The study was depended on secondary data which were collected from official sources. In order to achieve the purposes of this study, the simple–regression model was specified and then the Ordinary Least Squares technique (OLS) was applied on the model. By estimation of the model, the study found the human capital has positive and significant effect on economic growth in Sudan in the period of study. The most important recommendations for this study include: improving the quality of education, training the labor force in order to develop their skills. Also, find out the mechanisms of increasing the GDP per capita.

**Key words:** Human capital, Economic Growth, Labor force.

## المستخلص:

بحثت هذه الدراسة دور رأس المال البشري في النمو الاقتصادي في السودان خلال الفترة من العام 1970 وحتى العام 2015. عرف رأس المال البشري في الدراسة كمتوسط السكان للفئة العمرية من 15 سنة فما فوق. ولقد تناولت الدراسة بعض الأدبيات النظرية والتطبيقية لرأس المال البشري والنمو الاقتصادي علي المستوى المحلي والعالمى. وتم الاعتماد على بيانات ثانوية تم جمعها من مصادر رسمية. ولتحقيق أهداف الدراسة، تم توصيف نموذج إنحدار خطى بسيط، ومن ثم تم تطبيق طريقة المربعات الصغرى العادية لتقدير النموذج. وتوصلت الدراسة إلى أن رأس المال البشري له تأثير إيجابي وجوهري علي النمو الاقتصادي في السودان خلال فترة الدراسة. وأهم توصيات الدراسة تضمنت: تحسين جودة التعليم، تدريب القوى العاملة من أجل تطوير مهاراتهم وأيضاً العمل علي إيجاد آليات لزيادة متوسط نصيب الفرد من الناتج المحلي الإجمالى.

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## Introduction

Sudan, as one of the less developed countries (LDCs) shares many of the same characteristics of other (LDCs), such as volatile economic growth, low average per capita income, low average of human development indicator ...*ect*.

Since 1956 when Sudan became independent, the various national governments have tried to work out development plans to increase the per capita income and to raise government revenue to create more development and to establish more social services. As a result of these plans, hundreds of schools were opened, as reflected in the increase in the number of the students in schools (students sitting for school certificates less than 1000 in 1956, compared to 297793 in 2005), (Central Bureau of Statistics, 2007), this sometimes means over crowded in the school which leads to adversely effect of the quality of the education.

The central concern of this study is to examine the relationship between Human Capital and Economic Growth in Sudan.

The concept of "human capital" is defined in this study as: average years of schooling of population aged 15 years and over.

The significance of this study is based on the importance of the topic with which it deals. In addition, the role of human capital in economic growth has not been well

documented on the macroeconomic level in the country and the study can be useful in providing some relevant recommendations in order to address the economic and social problems in regard to human capital in Sudan.

### **The main objectives:**

- a) To shed light on the impact of Human Capital on Economic Growth in Sudan.
- b) to provide some information for planning future development in the Sudan in regard to Human Capital.

### **Statement of the Problem:**

Noticed that the stock of human capital in Sudan witnessed progress and an increase in recent years but economic growth is still low and volatile in the country. In view of what was mentioned, the problem of the study requires answer for the following question: what is role of Human Capital (Educational attainment) on Economic Growth in Sudan?

This study assumed that the increase of Human Capital (educational attainment) has a positive effect on Economic Growth in Sudan.

### **Methodology and Data Collection:**

The study was used statistical methodology, by applying econometrics techniques depending on Ordinary Least Squares on Secondary data which were collected from

official sources as: Annual Reports, Periodicals and Working Papers in the field of the study. The model was used was specified as follows:

$$Y_t = f(H)_t, f_1 > 0 \rightarrow (1)$$

Where:

$Y_t$  : Represents GDP per capita in period (t).

$H_t$  : Represents human capital per worker in period (t).

Also it's formulated in logarithms form as:

$$\log Y_t = \log \alpha + \log(H)_t + \mu_t \rightarrow (2)$$

This study conducted in Sudan to capture the impact of human capital on economic growth during the period 1970–2015.

This study consisted four sections: Section one of this paper is the introduction, section two presented the literature review. Section three dealt with the analysis of empirical data. Finally section four devoted to the empirical results, conclusions and recommendations.

### **Theoretical background** <sup>(1)</sup>

The importance of Human Capital as a source of progress and economic growth has long been recognized in the economic literature. Adam Smith (1776) was the first Classical Economist to include Human Capital in his definition of capital. He included

in the capital stock of a nation the inhabitants acquired and useful talents, because human skills increase wealth for society as well as for the individual .The concept of Human Capital was largely forgotten by economists until its re-birth in the early1960s with the writings of Becker(1962,1964); Schultz (1961,1962) <sup>(2)</sup>. These economists rekindled this old concept by reaffirming its importance in explaining earnings differentials. During the same period, the development of Neo-Classical (Solow-Swan) Growth Theory failed to provide a framework for incorporating human capital as an engine of growth. Such a framework became available later with the work of Romer (1986) and Lucas (1988) and the emergence of a New Endogenous Growth literature which stimulated the interest of economists in the role of Human Capital as a determinant of Economic Growth. In some of these models, human capital induces growth by stimulating technological advancement or by enhancing labor productivity. Recent empirical studies of economic growth also suggest that the skills and knowledge of a nation's population are important in determining its economic performance.<sup>(3)</sup>.

#### **Definitions of Human Capital<sup>(4)</sup>**

Lawrence J.Lau, Dean T. Jamison& Frederic F.Louat (1991), among others, used educational attainment as proxy of human capital in production function as an input.

(i.e. human and physical capital, labor force & technological progress). The Human Capital is broad in its scope.<sup>(5)</sup>

For the purposes of this study, the study considered human capital that attained through education, which emphasized as critical determinant of economic progress.

The selection of appropriate definition is need empirical and theoretical evidence to support it. So the study used a standard definition of human capital which is the average years of schooling of population age 15 years and above. The study belief that's relevant definition of human capital because the age group is appropriate for developing countries (Sudan one of them), which a persons aged 15 and above are in the labor force and it well-assessment practically in the international comparison.

### **Measurements of Human Capital**<sup>(6)</sup>

There is no widely held consensus on how to measure human capital, which is one of its weaknesses. In recent years, several researchers have developed measures of the stock of human capital to facilitate empirical studies on the role of human capital for cross-countries growth comparisons (Barro & Lee 1993, Barro 1991, Psacharopoulos and Arrigada 1986, 1992, Lau et al. (1991) and Nehru et al. (1995)).

The measures of Human Capital are subject to considerable data limitations, which censuses are the best source of educational data; they are generally performed every five or ten years and, in some countries, are not performed regularly.

Macklem (1997) estimated human wealth as present value of aggregate labor income net of government expenditures; while Beach, Boadway and Bruce (1988) produced a human capital wealth series from 1964 to 1981 by estimating the discounted present value of real income after-tax per capita earnings over individual's lifetime. These measures are useful to assess human and physical wealth. Clearly, the measure of human capital must extend beyond formal education. But as education remains at the core of human capital formation, the measure of human capital should start with a measure of educational investments. In this regard, mentioned Two Measures.

**Firstly**, the most common approach is Cost –Based Methodology which consists of summing direct expenditures on schools and universities to which is added the opportunity costs of students attending schools. This gives a measure of the flow of resources invested in educational sector, which can be very useful for Cost–Benefit Analyses. But this measure have a shortcoming, it is ignores the length gestation period between the application of educational inputs and the emergence of human capital embodied in the graduates of educational institutions.



**Secondly**, An Income-Based Approach, educational investment is defined as an increment in the value of human assets. (Or the present value of life-time income resulting from an increment in education).this approach captures the benefits of human capital investment as reflected in transactions in the labor market. This method originates with Petty (1690) who calculated the human capital of England as the difference between his estimates of the national income and property income, capitalized in perpetuity at a 5% interest rate. The modern version of this measure by (Lee, Gibson, and Oxley, 2003:p.273).A typical example of income-based approach has been applied by Dagum and Slottje (2001) to arrive at an estimate of the average human capital stock of the USA in 1982.They define human capital as the discounted sum of future earnings, corrected for the probability of survival. In their original article, the authors apply this method as a first step to determine the average human capital stock from a household survey and this was followed by a latent variable estimation (Partial Least Squares or Structural Equation Modeling) to estimate the distribution of human capital within the population. Since this last step requires good quality data that is rarely available, it is only the first step that has been used by other authors, such as Wei (2001) for Australia, Oxley and Zhu (2002) for New Zealand, and Foldvari and Van Leeuwen (2005) for a set of Eastern European countries.<sup>(7)</sup>

Kruger (1968) used the Income-Based Approach, she classifies workers by education level, age and sector, where they work (urban or rural) in a sample of 21 countries, with the same type, across countries as well within a country, supply the same human capital input. She derives the aggregate human capital input for each country by weighing the inputs of different type of workers by their average labor incomes in the US. This method, unlike the method based on the years of schooling, allows the differences in human capital formation per year of schooling across education levels since these differences would be reflected in income differences. However, this method still assumes that differences among workers in the skills acquired outside schooling and in health are zero and the quality of schooling is the same across-countries. A more recent example of the Income-Based Approach to measuring human capital input is by Jeong (2002), following Mulligan and Sala-I-Martin (1997), estimated a human capital index for 39 countries in 1995 relative to the USA. He assume that all countries have the same Cobb-Douglas type production function, and therefore the difference in the observed real wages must be attributed only to difference in human capital endowment and aggregate output. His results suggest that the human capital stock in Africa was roughly 52.3 % (average of 11 countries), in Asia 66.2% (average of 10 countries), and in Europe 90.2% (average of 9 countries)

of the human capital stock in the USA. Also, Gollop and Jorgenson (1980), Jorgenson, Gollop, and Fraumeni (1987), and Mulligan and Sala-i-Martin<sup>(8)</sup> used this method to estimate the human capital stock of the United States. This measure, however, is not widely applicable to international comparisons due to the limited availability of detailed wage data for most countries.

In addition recent empirical studies of growth have attempted to assess the role of human capital as determinant of long-term economic performance using measures of human capital based on, among other things, School Enrolment Rates (Barro1991), Literacy Rates (Romer1989), and Educational Attainment (Koman and Marin1997). These measures are subject to considerable data limitations and only capture certain aspects of human capital.

The majority of empirical studies use either Literacy or Formal Schooling data to proxy for human capital famous examples are Barro (1991) used the Average Years of School Attainment at the upper (secondary and tertiary) levels for males aged 25 and over, subsequent analysis introduced several alternative educational measures into the model, and Mankiw, Romer and Weil (1992) used Secondary School Enrolment data, and Azariadis and Drazen (1990) and Romer (1990), who rely on Adult Literacy

Rates. The Average Years of Schooling has been proposed as a relatively easy way to construct a variable that captures the Population's Average Educational Attainment. Finally, The Historical Measures means those variables that are thought to be correlated with Human Capital Endowment and are available over very long periods (often several hundred years).

The study mentioned three Measures that were used to approximate the amount of Human Capital in different societies and make cross-country comparisons possible even in the early modern period: First: the number of people who could sign a document (Johansson, 1991). Second: the number of published books (Baten and Van Zanden, 2007). Third, the historical measurement of age heaping (Budd and Guinnane, 1991). Age heaping is the tendency of the respondents in surveys to round their ages to the closest number ending on 5 or 0. Age heaping measurement has not been develop as historical measure, but rather as a proxy of literacy applied to developing countries and consequently has been adopted by the UN. These measures will not supply us with any useful information about Human Capital.

Today's most popular Human Capital proxies, especially those related to Educational Attainment, reflected the amount or share of resources devoted to formal education expressed in terms of non-monetary measurement unit (years of schooling). In this

context, the study used this measure of Human Capital based on educational attainment, for more than one reason; **First**, because it is at best a proxy for the component of the human capital stocks obtained at schools. **Second**, it is widely used to investigate the effects on economic growth of educational attainment (human capital). **Third**, as I mentioned before, the data on educational attainment still provide the best available information about the amount of human capital stock for Sudan and for long period (1950–2010). **Forth** it has consistent theoretical foundation, so good measure yields good data and good results.

## Economic growth

### Origins of the concept of Economic Growth <sup>(9)</sup>

In 1377, the Arabian economic thinker Ibn Khaldun provided one of the earliest descriptions of economic growth in his famous Muqaddimah (known as *Prolegomena* in the Western world): "When civilization [population] increases, the available labor again increases. In turn, luxury again increases in correspondence with the increasing profit, and the customs and needs of luxury increase....." (Dieter & Weiss, 1995).

Economic growth is a term used to indicate the increase of per capita gross domestic product (GDP) or other measure of aggregate income. It is often measured as the

rate of change in GDP. Economic growth refers only to the quantity of goods and services produced.

Economic growth can be either positive or negative. Negative growth can be referred to by saying that the economy is shrinking. Negative growth is associated with economic recession and economic depression. Economic Growth Rate defined as the pace at which economic growth increases during a given interval.

Economists draw a distinction between short-term economic stabilization and long-term economic growth. The topic of economic growth is primarily concerned with the long run. The short-run variation of economic growth is termed the business cycle.

### **Theories on Economic Growth**

#### **Exogenous Growth Model**

The study will try to cover some of relevant growth models. The most well known model of Economic Growth, the Solow Growth Model which is a so-called "Neo-Classical" model and it – as most of the other models of modern Growth Theory – generalises the production of an economy with the Production Function. This idealized aggregate production function can be represented for instance by the following equation:

$$Y = F (K, L * E) \dots \dots \dots \text{eq}(1)$$

Output depends on the capital stock,  $K$ , the labor,  $L$ , and the efficiency of labor  $E$ .  $E$  depends on education, knowledge, skills and health of the labor force and thus includes the elements of human capital. The term  $L * E$  is the labor force measured in so called efficiency units. Advancement in  $E$  is called labor augmenting technological progress, i.e. the production function eq (1) Assumes that technological progress is labor augmenting. According to the Neoclassical Model, one source of economic growth is the accumulation of physical capital. Accumulating physical capital more rapidly will raise the growth rate of the economy, but only for a while before a new steady state is reached.

### **Endogenous Growth Theory**

Growth theory advanced again with the theories of economist Paul Romer in the late 1980s and early 1990s. Other important new growth theorists include Robert E. Lucas and Robert J. Barro. Unsatisfied with Solow's explanation, economists worked to "endogenize" technology in the 1980s. They developed the endogenous growth theory that includes a mathematical explanation of technological advancement. This model also incorporated a new concept of human capital, the skills and knowledge that make workers productive. Unlike physical capital, human capital has increasing rates of return. Therefore, overall there are constant returns to capital, and economies never

reach a steady state. Growth does not slow as capital accumulates, but the rate of growth depends on the types of capital a country invests in. Research done in this area has focused on what increases human capital (e.g. education) or technological change (e.g. innovation)<sup>(10)</sup>.

The essence of endogenous growth theories can be described by the following simple equation:

$$Y = AK \text{----- eq.(2)}$$

Where A ( $A > 0$ ) is constant reflecting the level of technology and K is a broad capital parameter including human and physical capital. Linear growth models do not assume any decreasing (or increasing) returns to factor inputs. The incorporation of human capital into the capital parameter K in eq. (2) can be considered a factor eliminating diminishing returns to capital. Technology A is now applied to the production of both human and physical capital.(Mankiw,1995),p.297.

Recent empirical analyses suggest that differences in cognitive abilities, related to schooling and other factors, can largely explain variations in growth rates across countries<sup>(11)</sup>. Cognitive abilities comprise intelligence and knowledge and are more important than education itself. Cognitive abilities are more relevant than the classical growth factor "economic freedom".



## Sudan profile

Sudan is the third largest country in Africa with an area of 1,886,068 km<sup>2</sup> (728,215 sq mi), (after Algeria and Democratic Republic of the Congo) and the sixteenth largest in the world. The country has lengthy borders with ten countries, namely: Egypt and Libya to the north , Chad, The Republic of Central Africa and Democratic Republic of Congo to the west, South of Sudan, Uganda, Kenya to the south and Ethiopia and Eritrea to the east. The Red Sea separates the country from the kingdom of Saudi Arabia. In terms of latitudes and longitudes, the country lies between latitude 3.5 and 23 degrees north of the Equator and between longitudes 21.75 and 38.5 degrees east of Greenwich,(Central Bureau of Statistics,2005). The basic natural characteristic of Sudan is the River Nile and tributaries. Its Climate is equatorial in South and extremely dry desert in central and northern part. The total population of the country as in 2008 is calculated at 36.2 million with an annual percentage growth rate of 2.8. (CBS, 2007). Country's demographic and social indicators in (2005) are as follows:

**Table (1): Sudan Demographic and Social Indicators (2005)**

List of Indicators	2005
Population, total(million)	36.2
Population growth (annual%)	2.8
Life expectancy at birth, total(years)	57.9
Fertility rate, total (birth per woman)	4.6
Mortality rate, infant(per 1000 live births)	71.0
Mortality rate,under5(1000)	110
Human development indicator (%)	.383
Adult Literacy rate (%aged 15 and above)	60.9
Primary completion rate both sexes (%)	46.9
Total net enrolment ratio in primary education (%)	44

Source: Central Bureau of Statistics (2009), Human Development Report (2008)&CIA World Fact book(2011). Table (1) above explains the demographic structure and the major social characteristics for Sudan. The choice of the year 2005 is deliberate because it's the Millennium start and the Sudanese economy witnessed progress and stability in economic performance in this year. Sudan generally has higher population number coupled with lower standard of economic development (high mortality rate, high illiteracy rate and low HDI about.383%). The World Bank classification of

economies puts Sudan among the lower medium–income economies. Moreover, the UNDP human development index.(HDI ) shows that the average GDP per capita for Sudan falls within the world medium–income bracket and is, on average, lower than for those of the world and Arab countries. This also holds for other HDI components: average life expectancy, literacy rate and combined enrolment ratios. Moreover, according to UNDP indicators and estimates from International Monetary Fund’s World Economic Outlook <sup>(12)</sup>, as in most other typically poor developing countries Sudan continued to suffer from low rates of economic growth, (capture in low level growth trap).The UNDP and the World Bank shows the low GDP per capita income in Sudan which is in excess of only least developing countries, but less than all other World regions. According to, Sudan central bureau of statistic (2007) population census data for 2005 indicate the low skill level and differences in skill level in Sudan that appear in term of low school attendance, literacy rate and educational attainment .In this context, according to school attendance and literacy implies that only little above half of Sudan population 6 years of age and over are currently and/or previously school attending school (50.87%) and are literate (51.59%), while near to half of Sudan population 6 years of age and over have never attended school (44.62%) and are illiterate (45.19%).

In addition, the distribution of population 6 years of age and over according to current school attendance implies that the majority are with primary education and less than secondary education (73.59%), followed by secondary education (15.09%), and finally followed by only minority with above secondary education (6.72%).

### **Historical Background** <sup>(13)</sup>

Sudan, with its current international borders, became independent on the first of January 1956. As such it was one of the first countries in Sub-Saharan Africa to gain independence from the late colonialism that targeted Africa in the 1860s. Unlike many Sub-Saharan African countries, Sudan was nominally under a Condominium rule of Britain and Egypt over the period 1899–1956. Prior to that, some parts of Sudan were under a Turko–Egyptian rule that lasted for just over 60 years (1824–1885) before it was overthrown by a religious–nationalist revolution in 1885, (the Mahdist revolution). During the Turko–Egyptian rule a centralized administration emerged in the northern part of the country with Khartoum serving as the capital. In the southern (historically known as Equatorial in British colonial parlance) and western (Darfur) parts of the present country less formal, and traditional, administrations were prevalent. The second half of the nineteenth century witnessed improvements in transport and communications with Egypt that resulted in the opening of the country to foreigners.

As a result trade in goods (e.g. gum–Arabic) and slaves (at the hands of Egyptians, British and Austrian traders) increased rapidly. The flourishing international trade, however, was disrupted during the Mahdist rule of 1885–1898.

The period 1899–1956, under the British colonial administration, saw the laying of the foundation of the modern economy of Sudan. Brown (1992:80) As for the political context since independence in 1956 and over the past five decades Sudan was ruled by three civilian governments (1956–1958, 1964–1969 and 1985–1989) and three Military governments (1958–1964, 1969–1985, 1989–2005). Sudan suffered from political instability, as the short–lived three civilian governments were often removed and overthrown by military governments. For instance, the first civilian government after independence (1956–1958) was overthrown in 1958 by the Abbud Military Government (1958–1964), the second elected civilian government (1964–1969) was overthrown in 1969 and by the Nimeiri Military Government (1969–1985) and once again the third elected civilian government (1985–1989) was overthrown in 1989 by Al Bashir Military Government (1989till now). Since the signing and implementation of the Comprehensive Peace Agreement (CPA) in January 2005 the Sudan is ruled by the Government of National Unity (GNU) which represents a power–sharing

government between the National Congress Party (NCP) of the north and Sudan People's Liberation Movement (SPLM) of the south.(Satti,2007).

### Economic structure and sectoral growth in the Sudan

This Section presents a brief discussion on the economic structure and sectoral growth in the Sudan during the period (1956 and 1970–2005). The choice of this period is deliberate because reform of economic started in 1956 and period (1970–2005) the time border of the study.

**Table (2). Sudan: 1955/56 GDP Composition (current prices)**

Sector	GDP(million Ls)	GDP share (%)
Agriculture	172.6	60.7
Industry	3.0	1.1
Construction	16.2	5.7
Transport	37.6	13.2
Public Utilities	1.0	0.4
Government	17.2	6.0
Real estate	8.2	2.9
Other	28.4	10.0
Total	284.2	100.0

Source: Ministry of Finance(1993)<sup>(14)</sup>

From table(2), in 1956 the production structure of the Sudan economy was dominated by agriculture, which contributed about 61% of GDP, the contribution of industrial sector about 1.1% of GDP, and the services sector accounting for the remaining 37.9% of GDP.<sup>(15)</sup> Clearly, Sudan has dual economy structure in that period and up to now. The agriculture sector has lion share of GDP and considered pillar of Sudan economy. At independence, on the 1<sup>st</sup> of January 1956, Sudan's GDP was estimated at Ls. 284, million (US\$795 million). Per capita GDP amounted to Ls.28 or about US\$78 classifying Sudan among the poorest countries in the world.(Bank of Sudan, Annual report 2003). Thus, effort that was made during the past decades toward changing the structure of the Sudan's economy, but unfortunately, has at best been frustrated.

In recent years, both agriculture and oil production has contributed a lot of country's economy. The advent of oil in late 1990s have contributed to a large extent to the relative economic stability that the country has witnessed since then.(Mahran,2006)

Agriculture remains the backbone of the Sudan's economy. It constitutes the main source of livelihood for more than 80% of the population. Furthermore, the sector supplies most of raw materials for Sudanese agro-industries such as sugar , textile, leather, and food-processing, and plays massive role in national food security.

Arable land, estimated at 245 million hectares, represents 14.5% of the total area of the Sudan, and 51.2% of the total arable land, is currently under cultivation <sup>(16)</sup>.

Sudan's agriculture is pervasive, and is divided into three main subsectors, namely the traditional rainfed subsector (10million hectares), mechanized rainfed subsector (5million hectares), in addition to the forest and livestock subsector with an area of 25million hectares. Diverse climate zones, the available water resources from the rain and the river Nile and its tributaries, together with fertile soil allowed the cultivation of a variety of crops, including cotton, sorghum, groundnut sesame, gum Arabic, wheat, and sunflower.() (Mahran,2006)

During the 1960s up to 1980s, the government intervened overall economic sectors such as: the agriculture sector, dictating even the patterns of production of various crops. Also, exports and imports of various commodities were banned or subject to quota or prior approval. Thus, the public sector played a vital role in the economy in that period.



Table (3): Sudan Economic Indicators, 1970–2005.

Economic Indicators Listing	1970	1980	1990	2000	2005
Population, total(in million)	14.70	18.68	25.75	32.9	36.23
Population growth rate (%)	1.9	2.6	2.9	2.1	2.1
Labor Force(in million)	5.78	6.57	8.03	10.22	11.1
GDP(at constant prices, SDG Billion)	7.962	7.006	8.724	14.08	20.43
GDP per capita(at constant prices, SDG)	475.00	375.04	338.778	452.718	236.776
Growth rate of GDP (%)	0.9	4.4	6	8.4	8

Source: CBS (1990–2009) & CIA World fact book 2011

From table (3), observed that during the fourth decades, the population was increased rapidly, which is a common feature of all developing countries. Similarly, the labor force was increased. Also, GDP was increased over decades from 7.962 billion during 1970 to 7.006 billion during the 1980 to 8.724 billion during 1990 to 14.08 billion during 2000 and further to over 20 billion during 2005. On the other hand, according to Ali & Elbadawi (2003), the period 1975–1979 registered an overall average growth rate of 4.1% per annum. The period 1981–1990 registered negative and highly volatile growth rates. While second half of 1990s registered sustained and stable positive growth rates. This outcome may be attributed to the effort that made in the last decade toward development, or due to the strict demand management policies that adopted

over the 1990s, coupled with some supply measures, were meant to stabilize the economy.

Furthermore, in recent years the increasing dependence on oil leads to sound economic growth. Consequently, Sudan's real economic growth averaged about 9% during (2005), putting Sudan among the fastest growing economies in Africa (WB, 2008). According to the World Bank (2008) Sudan is one of the newest significant oil producing countries in the World; Sudan is the third largest oil producers in Sub Saharan Africa (SSA) behind Nigeria and Angola. As a result, in recent years, the structure of the Sudanese economy has shifted over time, from predominantly reliant on agriculture for growth and exports, to its current reliance on the oil sector (WB, 2008). In terms of the production structure of the economy, preliminary projections by the IMF show that the share of the oil sector in GDP will increase from about 4% in 2000 to 6.4% in 2005 and that the value of crude oil exports will increase from about US\$ 813 million in 2000 to about US\$ 1.1 billion in 2005. The share of oil exports has already started to dominate the exports composition where it reached 35.4% in 1999 (having been US\$ 275.9 million out of US\$ 780 million).<sup>(17)</sup>

Given the above, it is generally believed that the sustained growth that was registered during the second half of the 1990s was related to private investment flows to the oil

sector. Despite the recent impressive real growth and rapid increase in per capita incomes following oil exploitation but emerging vulnerabilities and little progress in socio-economic indicators.

In the context of such studies it is found that steady state growth is a feature of advanced countries while volatile growth is a characteristic of the growth process in developing countries. The study believed that civil war might played major role which associated with the volatile growth performance of the country.

Accordingly, this study confirms that, Sudan has volatile economic growth rate .This volatility in absence of contribution of human capital in GDP.

### **The analysis and empirical results**

This chapter presents the analysis and empirical results. It highlights the factors that have significant effect on the growth performance of the country.

$$\log Y = 2.32 + 1.25 \log H$$

$$(11.49) \quad (2.38)$$

$$F=5.66, R^2=0.45, D.W=0.76$$

In view of the above equation, observed that the overall model is significant at 1% level, (the calculated value of  $F=5.66$ ) .the expected signs of the intercept and the estimated parameter of human capital (H) is confirmed by empirical result. The

estimated model shows that 45% of the variations in economic growth in Sudan during study period have been explained by human capital. The Durbin– Watson test for auto–correlation problem was made and shown there is no problem, the parameter of  $D.W = .75$  (which lay in unsure zoom). Also, the percentage change of human capital by 1% lead to 1.25% percentage change of economic growth in Sudan during study period. This result reflects high responsibility of economic growth to change in human capital (elastic) ,so the human capital has positive and significant effect on economic growth in Sudan in the period of study which is compatible with economic theory and some of previous studies.

### **Conclusion and recommendations**

This study dealt with the impact of human capital on economic growth in Sudan during the period 1970–2015.

It's defined the human capital as average years of schooling of population aged 15 years and above. .This study handled some of the theoretical and empirical literature of human capital and economic growth on the local and international context. The study was depended on secondary data which were collected from official sources. In order to achieve the purposes of this study, the simple–regression model was specified and then the Ordinary Least Squares technique (OLS) was applied on the

model. By estimation of the model, the study found the human capital has positive and significant effect on economic growth in Sudan in the period of study.

The most important recommendations for this study include: improving the quality of education, training the labor force in order to develop their skills. Also, find out the mechanisms of increasing the GDP per capita.



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