Impact of knowledge economy on human development (Case of Algeria from 1990 to 2007)

BENOUNISSA Leila

PhD researcher benounissa.leila@yahoo.fr

Faculty of Economics, Commercial Sciences and Management Sciences

University of Mascara. Algeria

BENABOU Djilali

Higher Education Professor djbenabou@yahoo.fr

Faculty of Economics, Commercial Sciences and Management Sciences

University of Mascara. Algeria

Abstract:

From the important slogan: humans are a capital that must be invested, in order to take advantage of their capabilities and output their capacity for survival, exploration, analysis restoration, innovation and creativity to focus on investing the remaining natural, material, human and social capitals. We will try in this paper to address the standard study in Algeria during the period 1990 -2007 and that by exploring the evolution of the human development index, education and indicators as well as the number of patents in Algeria throw the test of the variables stability used in the study, and the correlation between these variables.

Finally causality test of Granger. The aim of this study is to address the importance of human resources and the need to invest in people to move towards a knowledge economy.

Key words: knowledge economy, investing in people, human development, education, patents.

Résumé:

Le capital humain doit être investi afin de profiter de ses capacités de production pour la survie et l'exploration, pour l'analyse et recentrage, pour l'innovation et la créativité dans l'investissement du capital naturel restant , matériel et humain, social, et nous allons essayer dans cet article de répondre à la norme de l'étude en Algérie durant la période 1990-2007 et qu'en abordant l'évolution de l'indice de développement humain, et indicateurs de l'éducation ainsi que le nombre de brevets en Algérie pour passer stabilité de test des variables utilisées dans l'étude et la corrélation entre les variables et enfin tester l'effet de la relation de causalité de Granger.donc Le but de cette étude est de répondre à l'importance des ressources humaines et la nécessité d'investir dans les êtres humains pour avoir déplacer vers une économie de la connaissance.

Mots-clés: l'économie de la connaissance, l'investissement dans le capital humain,

Le développement humain, l'éducation, les brevets.

الملخص:

انطلاقا من الشعار المهم البشر رأس مال يجب أن يستثمر ، وذلك للاستفادة من إمكانياته وإخراج طاقته للبقاء والاستكشاف والتحليل وإعادة التركيز والابتكار والإبداع في استثمار باقي رؤوس الأموال الطبيعية و المادية و البشرية والاجتماعية، سنحاول في هذه الورقة البحثية التطرق إلى الدراسة القياسية في الجزائر خلال الفترة 1990-2007م وذلك بالتطرق إلى تطور دليل التنمية البشرية، مؤشرات التعليم و كذا عدد براءات الاختراع في الجزائر، بالمرور باختبار إستقرارية المتغيرات المستخدمة في الدراسة ثم الارتباط

بين المتغيرات. وأخيرا اختبار العلاقة السببية لجرانجر. والهدف من هذه الدراسة هو التطرق إلى أهمية الموارد البشرية وضرورة الاستثمار في البشر للانتقال نحو اقتصاد المعرفة.

الكلمات المفتاحية: اقتصاد المعرفة، الاستثمار في البشر، التنمية البشرية، التعليم،براءات الإختراع.

Introduction:

Most developing countries have become in front of great challenges and knowledge economy is one of the most important challenges facing them, since it is the factor that leads the society towards progress and prosperity, especially after the alteration of the idea of survival of the fittest to survival of the fastest and this shift in focus made the individual a cornerstone of the economy. So we will try through this study to answer the following questions: What is the impact of humans on investment in knowledge- economy in Algeria?

So we divided the article into two axis:
The first axis: theoretical approach to invest in man and the knowledge economy.
The second axis: the standard variables for the study of the study.
We used descriptive analytical method in the first part of the research in order to clarify the relationship between investing in people and the knowledge economy as well as we used eviews7 program in standard study.

The significance of this study is motivated by the situation in which the world is marked by rapid changes where information has become an important competitive weapon, in addition to the great interest in human capital, which has become a way to bring wealth in an environment which is facing difficulties and obstacles to transfer technology between countries.

The aimed objectives of this study are to show the importance of knowledge and to identify the characteristics of this economy, in addition to clarifying the relationship between the knowledge economy and human capital. We Attempt to study the reality of Algeria's economy in light of the fusion in the knowledge economy.

1. **Theoretical approach**: the interest to the human resources increased because it constitutes a source and advantage of competitiveness in light of the shift towards a knowledge economy, so we will attend to study the different theories about investing in human capital theories.

1.1 Investing in human capital:

The Chinese sage (Tzu kiwah) Said in the fifth century BC[i] "If you plan for one year ingrain a seed, if you plan for ten years plant a tree, but if you're planning for hundred years, educate a human being, because when you sow one seed you produce one crop, but when you educate people you harvested a hundred crop, " This statement shows that the best investment is to invest in human capital because it is a long term investment. This is the reason of disparities between developed and underdeveloped countries. In other terms; accustom human beings to use their intelligence in the production of knowledge and wealth.

This is known as investment in human capital which means "spending on the development of capabilities and human skills and talents in order to increase productivity."[ii]

The investment process is a collection of ways and methods in production and productivity that can be repeated several times during a limited period[iii]. Thus, education is an investment process of the human element. During his school career, man develops his acquired skills and abilities. At the end of his education, he / she becomes an exploitable potential.

From the previous definitions, we can divide the human capital into two main components: the first part is innate and includes all knowledge and information got from birth due to the excellence of the human mind. The second part is an acquired one, its degree varies among individuals because of the

differences in Knowledge, education, training, experience, and the experience gained during the period of life.

Concerned international bodies such as the "World Economic Forum" the development of the human capital index to 2015 to prepare annual reports to classify States below recent annual ranking, which shows the status of Algeria.

Table (01): classification of the top 10 States in HCI 2015

Order	State	Rate
1	Finland	85.78
2	Norway	83.84
3	Switzerland	83.58
4	Canada	82.88
5	Japan	82.74
6	Sweden	82.73
7	Denmark	82.47
8	Netherlands	82.30
9	New Zealand	81.84
10	Belgium	81.12
114	Algeria	52.14
124	Yemen	40.72

Source: World Economic Forum, Annual Human Capital Report 2015

Many economists such as Schultz[iv] TN, Mincer, J [v] and Becker Becker, GS [vi] were interested in subject of investment in human capital and education too being part of this investment. We will we will outline the main theories that have evoked investment in human capital:

Schultz's Theory:

The investment theory in human capital was developed thanks to the researches carried out by the economic Schultz because it gave more realistic interpretations to explain the increase in income. He explained and interpreted the non physical mean of production, i.e human capital which is considered non physical component, despite of being part of the wealth of mankind. He said in his lecture "Investing in human capital," displayed in the seventy-third forum ofteh American Economic Association in St. Louis on December 28, 1960:

"Although it is obvious that people acquire useful skills and knowledge, it is not obvious that these skills and knowledge are a form of capital, that this capital is in substantial part a product of deliberate investment, that it has grown in Western societies at a much faster rate than conventional (nonhuman) capital, and that this growth may well be the most distinctive feature of the economic system."

it has been widely observed that increases in national output have been large compared with the increases of lab, man-hours and physical reproducible capital, investment in human capital is probably the major explanation for this difference.[vii]

Schultz explained this concept of human capital on three key points [viii]:

- Economic growth, which can not be explained by the increase in material inputs
- Differences in income can be explained by the accordance with the differences in the amount of human capital invested in the individuals.
- Fairness can be achieved in income by increasing human capital relative to the top of the conventional capital.

Schultz focused in his research on education process as a necessary investment in human capital. Spending on education is an investment not consumer spending because education brings additional economic value.

Mincer's Theory

Mincer's [ix] theory was designed to measure the rate of return on human capital, and since that time, economists began to explain and apply the theory, such as Schultz 1996 and Beker 1993. The goal of the development of human capital theory is to understand the role of individual decisions in explaining the disparity in wages. This model adopted the model basic hypotheses:

- The length of the period of training or education, are the primary source of variation in the income of workers.
- Individuals expect when making a decision to training they will get higher wages as a compensation for the cost of training.
- The stability of the interest rate used by individuals in the resolution of future flows on the basis of these assumptions, and in the framework of competitive balance, will be the fair distribution of the income on workers, equal the present value and future flows.

Mincer reach the following conclusions[x]:

- The higher the educational level of the individual more likely to get more training in the field of work.
- Whenever work turnover rate and the unemployment increase; the cost of investment in training increases too.
- More the investment in training is important; the more the chances of individuals to remain in the system and the probabilities of their stability become significant.

Bekers's Theory

All Baker's research on human capital development were put in his famous book "human capital" 1964. He stressed all forms of investment in human capital through education, health, immigration, and focused in particular on training.

Baker formulates hypotheses as follows:

- The perfect wage for a worker is directly proportional to the level of competencies and is growing at a decreasing rate with age.
- The unemployment rate is inversely proportional to the level of the individual worker efficiency.
- Young people are changing their positions more than elder persons, so they have more opportunities for education and training.
- The division of labor is closely linked to the size and capacity of the labor itself.
- Investment in human capital brings greater returns than investment in physical capital.

He made a Difference between the two types of training [xi]:

- General training: increases the marginal productivity of the individual in the organization, he/she can use the skills gained in his/her organization or the firm that assured that training.

- Specialized training: increases the limited productivity by allowing workers to acquire new skills, new knowledge, and acquire new technology. [xii]

1.2 Knowledge Economy:

The economic development during the second half of the last century, based mainly on human capital, accompanied by technical and scientific development and intensive use of information and communication technologies, has led to the emergence of a new concept, called "knowledge economy" where of knowledge plays an essential role in generating wealth.

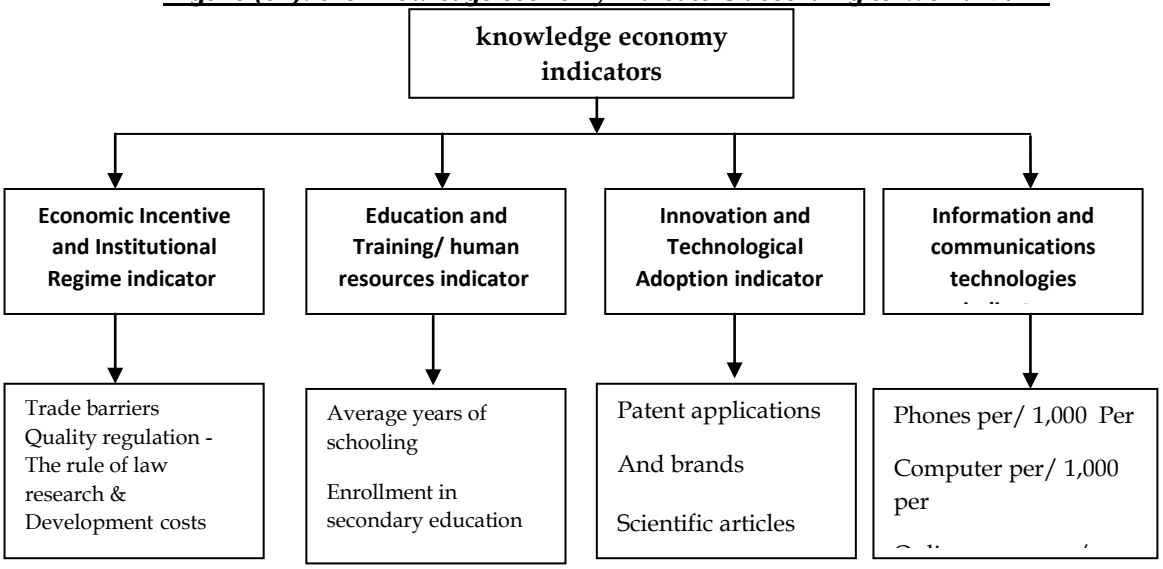
M-Parken defined knowledge economy as "the study and understanding of the process of accumulation of individual's information to discover and learn the knowledge and access to what others know." [xiii]

Knowledge economy indicators from the perspective of Dr. Maral Tutelian [xiv] director of The Lebanese Center for Policy Studies are as follows:

1. Science and technology indicators.
2. Indicators taken from researches on the organization of innovation activities.
3. Indicators related to human resources.
4. Indicators of dissemination of information and communication technology.

To measure the progress in a country in transition towards a knowledge economy, the World Bank established the so-called "knowledge assessment methodology " which is about indicators to assess the importance of the knowledge economy in a country and its global ranking. It includes four main pillars (Economic Incentive and Institutional Regime (EIR) ,Innovation and Technological Adoption, Education and Training, Information and Communications Technologies (ICT) Infrastructure). Knowledge economy index shows whether the environment is conducive for the dissemination of knowledge to be used effectively in economic growth.

Figure (01): the knowledge economy indicators according to World Bank



The following table shows the global rank of Algeria concerning the knowledge economy during three years 1995,2000, 2012, among 145 countries data from the World Bank.

we notice that Algeria fell by two positions, she held the rank 108 in 1995 to occupy the 110 position in 2000 and has advanced 14 positions to be in the 96 rank in the world.

Table (02): the knowledge economy indicators and the global rank of Algeria

indicators / years	Rank	knowledge economy indicator	Knowledge Indicator	Economic Incentive and Institutional Regime indicator	Innovation and Technological Adoption indicator	Education and Training / human resources indicator	Information and communications technologies indicator
1995	108	3,50	4,05	1,85	3,41	3,88	4,87
2000	-)110 (2	2,85	3,44	1,09	3,25	3,96	3,11
2012	14+)96 (	3,79	4,28	2,33	3,54	5,27	4,04

Source: prepared by researchers based on the World Bank site

The Increasing use of information and communication technology in all activities characterizes the word of today. It is based on a new more profound understanding of the role, the importance and the necessity of knowledge and human capital in the development of the economy, the development of society, as well as in generating wealth.

2. An Empirical Study of the impact of investment in humans on knowledge economy in Algeria (1990-2007):

In our study we relied on eviews7 program, the following table (03) represents the variables used in the study:

variables	Study period	Symbol	source
Human development indicator	1990-2007	HDI	United nations reports
Education indicator	1990-2007	I-Education	World bank
Patent	1990-2007	PATENT	World bank

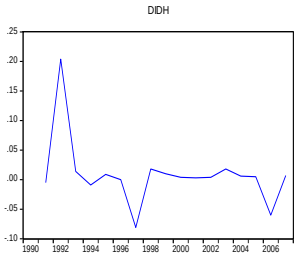
Source: prepared by researchers

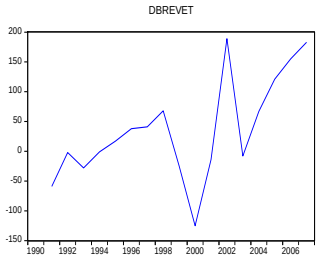
Table (03): testing the stability of the time series and its differences between stable and becoming stable

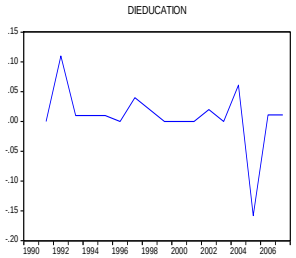
variables	Stable		Became stable	
	Yes	No	Difference 1	Difference 2
HDI		X	X	
I-Education		X	x	
Patent		x		x

Source: prepared by the researchers based on eviews7 program

- The following figures show the stability of the time series







The variables of this model are a chain. Often enter the time series in the regression model causes misleading results, such as the high value of the coefficient of determination (R^2) even in the absence of a real relationship between the variables. This situation is called Spurious regression. This is why you must be sure about the stillness of time series for each variable separately.

After introducing in ***eviews*** program specific information of the variables we need to examine the hypothesis; we dealt with the first phase of the study data analysis: a preprocessing study. By observing the table above we conclude that all variables are unstable.

We notice that both variables: development index and the index of education have non static and unstable series. We have re-examined the basis of the analysis of the differences of the series; and we observed stability of the first difference.
The patents index chain is not static and unstable. We have re-examined the basis of the analysis of the differences of the series; and we observed stability of the second difference.

According to the results obtained from the study of chain's stability; we can carry on the process of analysis by evoking the causality element, taking into account in the knowledge that we rely on stable chains for all the variables.

Table (04): the link between the variables of the study

	D HDI	D I-Education	D PATENT
D HDI	1	0.371882	0.053419
D I-Education	0.371882	1	0.078773
D PATENT	0.053419	0.078773	1

Source: prepared by the researchers based on eviews7 program

From the table above, we notice that there is a positive correlation between education index and the number of patents index, but a very weak one because it is close to zero. We also note a weak positive correlation between the human development index and the index of education equal to 0.371882. As well we observe that there is a weak positive relationship in the link between patents and the human development index.

- But correlations coefficients do not give sufficient economic interpretation; because they do not always indicate or determine the direction of the impact. The variables associated within causal relationship. We examine the causality between variables in order to determine, to which extent a particular variable influences another variable growth, or vice versa. There is a reciprocal effect. This study aims to find out the direction of the causal relationship between the variables. The appropriate test for the study of causality is the **Fisher test**; we apply it according to the following hypotheses:

H_0 : Y_{2t} does not cause Y_{1t} / H1 : Y_{2t}: causes Y_{1t}

Table (05): Granger's causal relationship

Pairwise Granger Causality Tests / Sample: 1990 2007 / Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
DEDUCATION does not Granger Cause DIDH	15	3.24766	0.0819
DHDI does not Granger Cause DEDUCATION		0.07130	0.9317
DD PATENT does not Granger Cause DIDH	14	0.06450	0.9380
DHDI does not Granger Cause DDBREVET		0.27525	0.7655
DDPATENT does not Granger Cause DEDUCATION	14	4.13334	0.0533
DEDUCATION does not Granger Cause DDBREVET		0.73909	0.5044

- ✓ **Causality test between the education index and Development Index**:

Since the prob first hypothesis is equal to 0.0819 and is greater than 0.05, if we accept the probability of nothingness H_0, which points out that education index does not cause the development index, and since the prob of the second hypothesis is equal to 0.6827 and is also greater than 0.05 if we accept the probability of nothingness H_0 at the abstract level of 5 %; we conclude that the development index does not cause the education Index.

- ✓ **causality test between the human development index and the number of patents:**

Since the prob first hypothesis is equal to 0.9380 and is greater than 0.05, if we accept the probability of nothingness H_0, which points out that human development index does not cause the number of patents, and since the prob of the second hypothesis is equal to 0.7655 and is also greater than 0.05 if we accept the probability of nothingness H_0 at the abstract level of 5 %; we conclude that human development index does not cause the number of patents.

- ✓ **causality test between education index and the number of patents**

Since the prob first hypothesis is equal to 0.0533 and is equivalent to 0.05, if we accept the probability of nothingness H_0, which points out that the number of patents index does not cause the education index, if we accept H1 alternative hypothesis which points out that the number of patents index causes the education index, and is less than 0.1 confirming the previous hypothesis. And since the prob first hypothesis is equal to 0.5044 and is greater than 0.05, if we accept the probability of nothingness H_0 , i.e the education index does not cause the number of patents

- Conclusion:

The results of the empirical etudy, case of Algeria from 1990 to 2007in Algeria came to a causal relationship between education and human development index, the number of patents and education index only. We find that there is a causal relationship between education and human development, and this reflects our reality, because education is one of the most important human development lines. A Society which works to improve its members through education and training to work, employment and investment in energies and resources whether natural or human; aims to build a strong environment where prevail stability, security and well-being of the community. We realize that there is a close relationship between education and sustainable development (economic development, social development and environmental development). Development can not be achieved only if qualified human power is wisely invested. So the learning process is the basis of the sustainable development process. There is a causal relationship between patents and education because patents are considered as the starting point to invest in product innovation and opportunity of investment for firms.

Therefore the Ministry of Higher Education urges to focus on the center of innovation and increase business to spread, among students of higher education, the culture of the utmost importance of innovations that contribute frankly to the development of the economy.

Références :

[1] Prof. Dr. HAKEM Mohsen , (2013), the cultivation of knowledge and investment in human capital and their role in facing monopoly of knowledge. An applied study on a sample of Arab Board students (PhD), Kufa University, College of Business and Economics, p. 01.
[2] Kubaisi Salah al-Din, (2005), knowledge management, the Arab Organization for Administrative Development, Cairo, Egypt, p. 136.
[3] G.R.R.E.C, (1983).Crise et régulation. Receuil de textes. Grenoble : D.R.U.G, p.199.
[4] Schultz, T.w (1961) , investisement in humain capital , american economic review , 51 (1), p1.
[5] MINCER, J. (1958). Investment in Human Capital and Personal Income Distribution. Journal of Political Economy , 66, P 281.
[6] Becker G.S (1993), humain capital, chicago : university of chicago press combs, J.G & skill , M.S 2003 Managericalist and humain capital explanations for key educative pay premiums: A contingency perspective Academy of Management journal, P 08.
[7] Schultz, T.w, Op.Ct, Pp 01-17.
[8] Hassan ROAWA, the entrance to the strategic planning and human resources development, Alexandria, University house, 2002, p. S65-69 Website: www.hrdiscussion.com/hr2598.html in 08/16/2015
[9] MINCER, J, Op.Ct, p302.
[10] NICK, BONTIS., (2002)« Intellectual Capital ROI : a causal map of human capital antecedents and consequents" ., JOURNAL OF INTELLECTUAL CAPITAL.,vol 3.,N°3, p243.
[11] Becker , G.S, Op.Ct, Pp 8-29 .

[12] Milan Milan COOPER, (1985), development of administrative institutions management, translation Qayraouti Mohammad Qasim, Ibrahim Abdul-Jabbar, Oman, the Arab region Administrative Sciences, p. 65.

[13] Abdul Rahman al-Hashemi, Faiza Mohammed al-Azzawi, (2007), Curriculum and knowledge economy, Al Massira publishing, distribution and printing Oman 0.1, p. 26.

[14] Dr. Maral Tutelian, (2006), knowledge- economy indicators and the role of women in its development, the Arab Central Administration for Statistics, p. 19-26