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REVISION OF THE WORKING PAPER FROM 2006

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MICROECONOMICS OF KNOWLEDGE. AFRICAN CASE¹

By Eduardo G. Manuel²

ABSTRACT

This paper has as objective to approach the theme “**Microeconomics of Knowledge**” and having the African case as reference.

We concluded that, in general analysis, South Africa and Tunisia are the countries of the selected with better performance in microeconomics of knowledge, and Angola, Chad and Ethiopia are the poor countries in this area of knowledge.

High rates of adult alphabetization can stimulate the companies to employ skilled personal according to their necessities and this personal could and it will be ready to work with advanced technology and to do R&D for development of activities that these companies are engaged.

Keywords: Economic of Knowledge, Macroeconomics, Microeconomics, and Microeconomics of Knowledge

JEL Codes: D29, D89, L29, M 19, O12, O32

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¹ Everything that it has been referred in this paper is the responsibility of the author.

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INTRODUCTION

We know that with advance of the process of globalization that we are living in a world and an economy based or founded on knowledge.

The cycle of economics founded on knowledge are composed by three components: the investment in knowledge; the production and the diffusion of information technology and communication (ITC) and the institutional mechanisms that favour the access to knowledge (Foray, 2004).

Economics of knowledge is a science that studies the interaction between firms, companies, people, etc, at the level of acquisition, absorption, change, dissemination of knowledge on time and space.

As we know, *Economics* are divided in *Microeconomics* and *Macroeconomics*, so this paper has as objective to approach theme “**Microeconomics of Knowledge**” having the African case as reference.

It begins to give a definition of microeconomics of knowledge doing first the distinction between microeconomics and macroeconomics. And to follow, it shows the state of microeconomics of knowledge in African countries that has been selected for this work.

METHODOLOGY

The methodology adopted is based on method scientific of Thomas Khun that permits us through statistical data to see the state of a paradigm that in this case are intellectual property, technology (Manuel, 2006), knowledge, etc.

The methodology is based in Statistical data from World Economic Forum (2004 and 2005) as well as Statistical data from United Nations through their Human Development Reports (2004, 2005 and 2006).

I. MICROECONOMICS OF KNOWLEDGE

1.1. Definition of Macro and Microeconomics of Knowledge

As we had seemed in the introduction, economics of knowledge is a science that studies the interaction between firms or companies, people, etc, at the level of acquisition, absorption, change, dissemination of knowledge on time and space.

Robbins stating that: “*Economics* is the science which studies human behavior as a relationship between ends and scarce means which have alternative uses” (Granstrand, 1994).

We had seemed that the Economics are divided in two parts: *Microeconomics* and *Macroeconomics*.

Microeconomics studies the behavior of economics agents such as consumers, firms, workers, markets, industries on the local determined and time, or according to Samuelson and Nordhaus (1992), microeconomics analyses the behavior of individual components like industries, firms and household.

Microeconomics studies of the economics decisions the people and enterprises, as well as good markets, services, and productive factors where those decisions of confront. Studies too of the processes of affectation the resources to possible alternatives and the paper of the prices and markets in this process (Mateus and Mateus, 2001).

Already *Macroeconomics* studies the functioning of the economy as whole, or according to Stiglitz (1997), macroeconomics looks at the behavior of such aggregate measures as overall rates of unemployment, inflation, economic growth and the balance of trade.

By fact of Economics are divided in Micro and Macroeconomics, we can divide too Economics of Knowledge in two parts: *Microeconomics of Knowledge* and *Macroeconomics of Knowledge*.

In the table below (table 1), we can see some examples of factors commonly related and studied in Economics of Knowledge also considered by Granstrand (1994)³, at the level

³ Granstrand (1994) had used these factors for evaluation of countries, markets, industries, firms, etc in **Economics of Technology**. This author define **Economics of Technology** as the field of inquiry that focuses on he causal nature of the interactions between changes in various technologies and natural sciences on one hand and economic changes of various

macro and micro. So we can see that at the **level macro**, we have as technology factors, variables, activities, etc, Rate of adult alphabetization, Science and Technology institutions, Patent System (where we can speak about protection of intellectual property), among others.

TABLE 1
Examples of factors commonly related and studied in Economics of Knowledge

Level of observations/analysis	Economic factors/variables/activities/ processes/phenomena	Technology factors/variables/ activities/phenomena
A. Macro (national, international)	Welfare; Growth; Employment; Investment; Income distribution; Business cycles; Trade; Inflation; Interest rate; Productivity; Competitiveness; Development; etc.	Rate of Adult Alphabetization; S&T institutions; Patent System; National Systems of Innovation; Technology System; Innovation clusters; Innovativeness; etc.
B. Micro (markets, industries, firms, products, technologies, etc)	Market structure; Concentration, Size of firm; Growth; Profitability, rate of return; Productivity; Competitiveness; Investments; Organization; etc.	Creativity; Discovery; Invention; R&D; Innovation; Innovativeness; Imitation; Adoption; Diffusion; Patenting; Licensing; Technology; diversification; etc.

Source: Edited by Granstrand, 1994 and Author

At the **level micro** we have much technology factors, variables, activities, etc, that can be considered for evaluation the state of markets, industries, firms, products,

kinds on the other. Economics of Technology encompasses the economic analysis of technological change as well as the analysis of economic change, focusing on technology.

technologies in economics of knowledge, and this level of economics of knowledge we can call of microeconomics of knowledge.

After we saw in the table 1, we can define macro and microeconomics of knowledge.

Macroeconomics of Knowledge will study the behaviour of economic agents as whole, having in consideration, regions⁴, countries and continents. Macroeconomics will look, for example for evolution of rate of adults alphabetization (% 15 years and older) in Europe and Africa, as well as Science and Technology institutions in both continents, Innovation clusters, etc.

Microeconomics of Knowledge will be the science that analyse the different behaviors of the firms and working of markets in the activities of absorption, use, creation, diffusion, search, definition, expansion, and maintenance of their knowledge.

Microeconomics of Knowledge will look at the Expenses in Research and Development (R&D) by firms, as well as the Firm-level technology absorption, etc.

1.2. State of Microeconomics of Knowledge in African Countries

⁴ Here we can speech about NAFTA, European Union (EU-27), OECD, African Union (UA), Southern Common Market, ASEAN etc.

In this point we will see the state of microeconomics of knowledge in African countries.

For evaluation the state of microeconomics of knowledge in Africa has been selected 23 countries, and used the following indicators:

- 1) **Business Investment in R&D Index;**
- 2) **Firm-level Technology absorption Index;**
- 3) **Subsidies for firms-level research and development Index;**
- 4) **Company Spending on Research and Development Index.**

1) Business Investment in R&D Index

According to information available from World Economic Forum (2005), South Africa is the African country where existed most business investment in R&D in 2004, and it is in 24th on world ranking, to follow Kenya (32nd) and Tunisia (37th). (See annex – table 1).

Ethiopia (104th), Chad (103rd) and Angola (102nd) are the African countries where had existed less business investment in R&D in 2004 and are poor countries of the World in this subject.

2) Firm-level Technology Absorption Index

Tunisia is the African country of the selected where firms absorbed most technology in 2004, and it was in 24th on world ranking, to follow we have South Africa (28th) and Egypt (37th).

Angola (103rd), Chad (99th) and Ethiopia (96th) are the poor countries of the selected in absorption of technology by firms in 2004, and according to World Economic Forum (2005), these countries was poor at world level (See annex – table 1).

3) Subsidies for Firms-level research and development Index

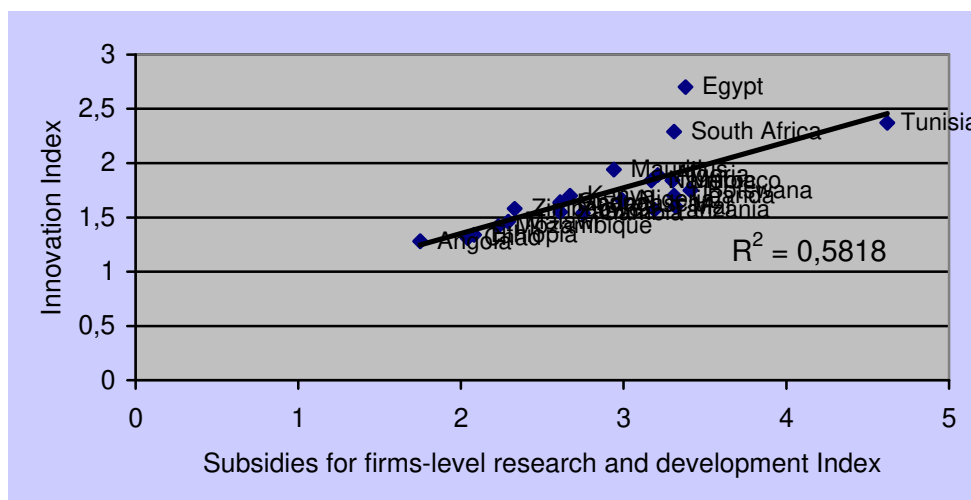
According to information from World Economic Forum (2005), we can see that Tunisia is the African country where the government conceded most subsidies for firms for research and development than others countries, and it is on 13th on world ranking, to follow we have Botswana (34th) and Egypt (35th).

Angola (94th), Chad (89th) and Ethiopia (87th) are the countries where government conceded fewer subsidies for firms for research and development. Theses countries are on poor position on world ranking elaborated by World Economic Forum (2005). (Se

annex - table 2).

The graphic 4.1 shows us a relationship between one of variables that we saw above for divers countries with their innovation index. And we can see that countries with high subsidies for firms for research and development index have high innovation index (such as Tunisia, Egypt and South Africa), in contrast with countries that have low value index of subsidies for firms for research and development (such as Angola, Ethiopia, etc).

GRAPHIC 4.1 – Subsidies for firms-level research and development Index in Africa countries vs Innovation Index for African countries



It is important to refer that in some African countries like Mozambique, Angola, Malawi, among others, there are low rates of adult alphabetization (% 15 years and older) as well as low protection of intellectual property (see annex – tables 3, 4 and 5).

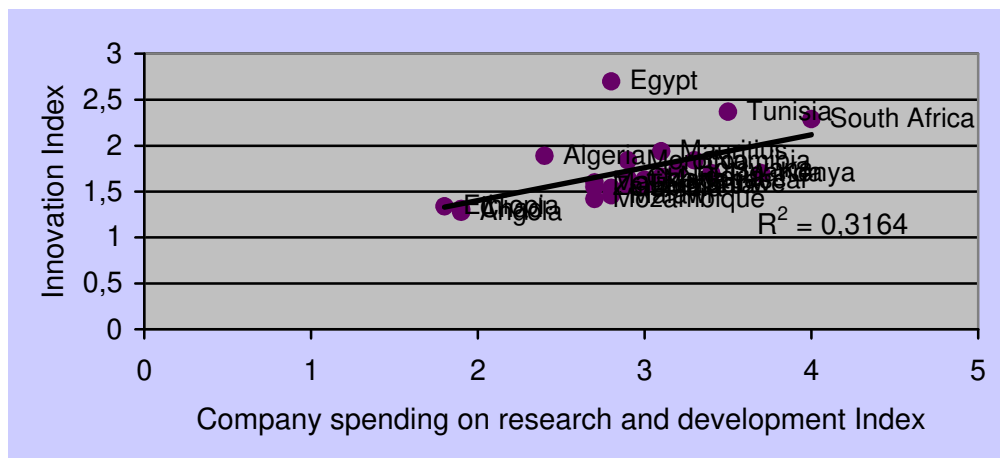
4) Company spending on research and development Index

According to table 2 (see annex), we can see that South Africa is the African country where company is spending more on research and development, and it is in 24th on world ranking, to follow we have Kenya (32nd) and Tunisia (37th).

As it happened at the level of firm-level technology absorption, Angola (102nd), Chad (103rd) and Ethiopia (104th) are poor countries of the selected where company is spending less on research and development.

The graphic 4.2 shows us that countries where company is spending more on research and development are those that are high innovation index, and we have, for example, Tunisia, Egypt and South Africa case, and countries where company is spending less on research and development have low innovation index, and we have, for example, as happened at the level of firm-level technology absorption, Angola and Ethiopia case, among others.

GRAPHIC 4.2 – Company spending on research and development Index in the African countries vs Innovation Index for African countries



CONCLUSION

We saw in this paper the definition of microeconomics of knowledge and their state in African countries that had been selected for this work.

We concluded that, in general analysis, South Africa and Tunisia are the countries of the selected with better performance in microeconomics of knowledge, and Angola, Chad and Ethiopia are the poor countries in this area of knowledge.

Angola, Chad and Ethiopia as well as others countries with poor performance, such as Mozambique and Algeria, for example, should promote absorption of technology by firms and reinforce subsidies for firms for R& D, because as we had seemed in this work, it exist a positive relationship between innovation index and those variables. So, these countries can promote their innovation and consequently their competitiveness.

Companies should spending more on R& D for same reasons above referred. The governments should, also promote adult alphabetization and protection of intellectual property by fact in these countries have low rates of adult alphabetization (% 15 years and over) and low protection of intellectual property.

High rates of adult alphabetization can stimulate companies and firms to employ skilled personal according to their necessities and this personal can and it is ready to work with advanced technology and to do R&D for development of their activities.

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ANNEX

TABLE 1

Business Investment in R&D and Firm-level Technology absorption

Business Investment in R&D, 2004			Firm-level Technology absorption, 2004	
(1)			(2)	
Country	Ranking	Score	Ranking	Score
Tunisia	37	3.46	24	5.31
South Africa	24	4.03	28	5.22
Kenya	32	3.66	71	4.21
Uganda	38	3.42	66	4.27
Namibia	42	3.29	45	4.77
Botswana	44	3.21	70	4.22
Nigeria	47	3.15	75	4.05
Mauritius	50	3.12	55	4.47
Madagascar	55	3.03	48	4.70
Zimbabwe	62	2.97	90	3.57
Morocco	66	2.94	74	4.11
Ghana	67	2.92	60	4.40
Tanzania	69	2.90	69	4.22
Egypt	72	2.85	37	5.05
Gambia	73	2.85	86	3.81
Malawi	77	2.81	88	3.64
Zambia	80	2.73	64	4.29
Mozambique	81	2.72	97	3.16
Mali	82	2.68	72	4.17
Algeria	94	2.42	57	4.47
Angola	102	1.93	103	2.78
Chad	103	1.91	99	3.13
Ethiopia	104	1.85	96	3.26

Source: World Economic Forum, 2005

TABLE 2

Subsidies for firms-level research and development and Company spending on research and development

Subsidies for firms-level research and development, 2004 (1)			Company spending on research and development (2)	
Country	Ranking	Score	Ranking	Score
Tunisia	13	4.62	37	3.5
Kenya	67	2.67	32	3.7
Gambia	61	2.75	73	2.8
Botswana	34	3.41	44	3.2
Morocco	42	3.30	66	2.9
Ghana	69	2.61	67	2.9
Mauritius	54	2.94	50	3.1
Namibia	47	3.17	42	3.3
Uganda	41	3.31	38	3.4
Zimbabwe	79	2.33	62	3.0
Nigeria	52	2.99	47	3.1
Zambia	72	2.61	80	2.7
South Africa	39	3.31	24	4.0
Malawi	81	2.29	77	2.8
Algeria	45	3.21	94	2.4
Egypt	35	3.38	72	2.8
Ethiopia	87	2.08	104	1.8
Tanzania	46	3.19	69	2.9
Mozambique	84	2.23	81	2.7
Mali	38	3.32	82	2.7
Madagascar	69	2.61	55	3.0
Chad	89	2.04	103	1.9
Angola	94	1.75	102	1.9

Source: World Economic Forum, 2004 and 2005

TABLE 3

**Rate of adult alphabetization
(15 year and older)**

Countries	Rate of adult alphabetization (15 years and older)		
	1990	2003	2004
Tunisia	59,1	74,3	74,3
Kenya	70,8	73,6	73,6
Gambia	n.a	n.a	n.a
Botswana	68,1	78,9	81,2
Morocco	38,7	50,7	52,3
Ghana	58,5	54,1	57,9
Mauritius	79,8	84,3	84,4
Namibia	74,9	85,0	85,0
Uganda	56,1	68,9	66,8
Zimbabwe	80,7	90,0	n.a
Nigeria	48,7	66,8	n.a
Zambia	68,2	67,9	68,0
South Africa	81,2	82,4	82,4
Malawi	51,8	64,1	64,1
Algeria	52,9	69,8	69,9
Egypt	47,1	55,6	71,4
Ethiopia	28,6	41,5	n.a
Tanzania	62,9	69,4	69,4
Mozambique	33,5	46,5	n.a
Mali	18,8	19,0	19,0
Madagascar	58,0	70,6	70,7
Chad	27,7	25,5	25,7
Angola	n.a	66,8	67,4

Source: United Nations, 1993, 2005 and 2006

TABLE 4

Protection of Intellectual Property on different countries of the World

Countries	Protection of intellectual property	
	Ranking	Score
Sweden	1	6.3
Denmark	2	6.3
United States	3	6.2
Germany	4	6.2
Finland	5	6.1
United Kingdom	6	6.1
Netherlands	10	6.0
Singapore	13	5.7
France	14	5.7
Austria	15	5.7
Canada	16	5.7
Luxembourg	17	5.6
Belgium	18	5.5
Ireland	21	5.2
South Africa	22	5.0
Malaysia	25	4.8
Tunisia	26	4.8
Estonia	29	4.7
Portugal	30	4.6
Spain	31	4.5
Slovenia	32	4.5
Namibia	33	4.5
Hungary	37	4.2
Egypt	38	4.1
Thailand	39	4.0
Czech Republic	43	3.9
Ghana	44	3.9
Italy	45	3.9
Indonesia	47	3.9

Source: World Economic Forum, 2004

TABLE 4
(Continuing)

Countries	Protection of Intellectual Property	
	Ranking	Score
Malta	50	3.7
Brazil	51	3.7
Uruguai	53	3.6
Mauritius	55	3.5
Malawi	57	3.5
Botswana	58	3.5
Lithuanian	61	3.4
Mexico	62	3.3
Mali	66	3.3
Gambia	67	3.2
Madagascar	69	3.1
Zimbabwe	70	3.1
Kenya	71	3.1
Latvia	72	3.1
Nigeria	73	3.0
Tanzania	74	3.0
Zambia	75	3.0
Algeria	77	2.9
Poland	79	2.8
Philippines	82	2.7
Uganda	85	2.7
Argentina	88	2.5
Mozambique	89	2.5
Peru	90	2.4
Vietnam	93	2.4
Equador	95	2.3
Paraguai	97	2.2
Ethiopia	99	2.2
Chad	102	2.0
Angola	104	1.8

Source: World Economic Forum, 2004

TABLE 5

Innovation Index of African countries

Innovation Index		
Countries	Ranking	Score
Mauritius	74	1.94
Tunisia	50	2.37
Algeria	76	1.89
South Africa	55	2.29
Egypt	38	2.70
Namibia	78	1.84
Bostwana	84	1.75
Ghana	91	1.64
Uganda	86	1.70
Zimbabwe	94	1.58
Kenya	87	1.70
Madagascar	92	1.63
Nigeria	90	1.66
Gambia	99	1.54
Tanzania	96	1.57
Zambia	98	1.55
Malawi	100	1.46
Angola	104	1.28
Chad	103	1.31
Ethiopia	102	1.34
Mozambique	101	1.42
Mali	93	1.60

Source: World Economic Forum, 2004

