Journal of Economic Integration | Vol: 09 - N°: 03 / (Septembre 2021) | pp: 632-643

Economic complexity as a principle of measuring the amount of productive knowledge

التعقيد الاقتصادي كمبدأ لقياس كمية المعرفة الانتاجية

Tagraret Yazid [1], Messiliti Nabila [2], Belgacem Mhamed[3]

[1] university of Oum el bouaqui (Algeria), yazidtagraret400504@gmail.com
[2] university of Mostaganem (Algeria), dadimesnab@hotmail.fr
[3] university of Mostaganem (Algeria), belgamhamed@gmail.com

Received: 05/07/2021 **Accepted:** 27/09/2021 **Published:**30/09/2021

Abstract:

To measure the amount of productive knowledge in a society, the principle of economic complexity was invented, which is based on the fact that the more productive knowledge that exist in a society, the more products it can produce, and through the process of comparison between the diversity of the country's products and their development enables researchers o arrive at an equation through which they can measure the productive knowledge that exists in each country.

This study aims to shed light on how to use the economic complexity atlas methodology for exploration, to reach sustainable development through economic transformation using the best strategy, which represents bigger and more fierce leaps in areas of the more dense and more related product space to push a country closer to the high complexity products.

Keywords: productive knowledge; product space; diversity and ubiquity; index of economic complexity; product basket.

JEL Classification Codes: A10, Z

ملخص:

لقياس كمية المعرفة الانتاجية لدى المجتمع تم ابتكار مبدأ التعقيد الاقتصادي الذي يقوم على أنه كلما زادت المعرفة الانتاجية الموجودة في المجتمع، زاد عدد المنتجات التي يستطيع انتاجها، و من خلال عملية المقارنة بين تنوع منتجات الدولة و تطورها تمكن الباحثون من الوصول إلى معادة يمكن من خلالها قياس المعفة الانتاجية الموجودة في كل دولة.

تهدف هذه الدراسة إلى تسليط الضوء على كيفية استخدام منهجية أطلس التعقيد الاقتصادي للاستكشاف، للوصول لتنمية مستدامة من خلال التحول الاقتصادي باستخدام أفضل استراتيجية و التي تمثل قفزات أكبر و أكثر شراسة في مناطق فضاء المنتجات الأكثر كثافة و الأكثر ارتباطا لدفع بلد ما إلى مكان أقرب إلى المنتجات العالية التعقيد.

كلمات مفتاحية: المعرفة الانتاجية.، فضاء المنتجات.، التنوع و الوفرة.، مؤشر التعقيد الاقتصادي.، سلة المنتجات.

تصنيفات JEL : A10، Z

Corresponding author: Messiliti Nabila, **e-mail:** dadimesnab@hotmail.fr

INTRODUCTION:

Over the past two centuries, mankind has achieved a long list of achievements that have been, unimaginable, ever. This progress and evolution are exemplified by the fact that humanity has become more intelligent than it was, and during the same period, the amount of productive knowledge was known to have increased markedly. Since this phenomenon has not been an individual, only a collective phenomenon, we are individuals who are not more capable than our predecessors, but as societies we have acquired the ability to reach the above-noted achievements.

Modern societies, can accumulate a great deal of productive knowledge because they are distributing parts of it among themselves. To benefit from this knowledge, it must be reassembled through markets and organizations. Therefore, individual specialization generates diversity at the internal and global stages. The most prosperous modern societies are those that are wiser, not because their citizens are smart individually, but because these communities have a variety of knowledge and are able to reintegrate them to create a wide range of the best and smartest products.

The social accumulation of productive knowledge is not a global phenomenon. It has occurred in some areas of the Earth, not in others. Wherever it takes place, a striking increase in existing standards has been sustained, while regions that do not experience the accumulation of productive knowledge have not differed much from the point of the past centuries. The huge income gaps between rich and poor countries reflect significant differences in the accumulation of productive knowledge among different countries. These differences appear in the variety and complexity of things manufactured by each country.

As countries differ in the amount of combined product knowledge and products, the amount of product knowledge needed to produce a product can vary significantly from commodity to another. Most modern products require more knowledge of what one individual can own. For a society working at a high level of total productive knowledge, individuals must know different things. Nevertheless, the diversity of productive knowledge remains insufficient. In order to employ knowledge for productive use, communities must assemble units distributed through organizations and markets.

The accumulation of productive knowledge is a difficult process, as it is not available in books or on the Internet. It is present at the level of brains and the human network. They are implicit and difficult to transfer and acquire, and are acquired with years of experience and not through the years of study. Therefore, productive knowledge cannot be easily taught, but requires radical changes, the development of a new industry requires changes in interaction patterns within an organization or company.

Increasing the amount of productive knowledge available in the state includes expanding the range of activities that a State can undertake. This process is complex and industries cannot be if the necessary product knowledge is absent.

By measuring the amount of product knowledge of each country, it is possible to know the difference in production between different countries of the world and to try to estimate the growth rate of each country. In fact, this indicator is more predictive than well-known development indicators, as it is part of the so-called economic complexity.

Problematic

What do we mean by economic complexity?

Sub-Question

1. How can the economic complexity be measured?
2. What are the factors influencing the economic complexity?
3. How can the diversity of state products be compared?

Study Hypotheses

1. The index of economic complexity enables the prediction of future growth;
2. The product currently produced by States determines the product that you can produce in the future ;
3. The index of economic complexity is proportional to the development of the product basket of goods,

The objective of the study

This research paper aims to measure economic growth through productive knowledge away from traditional factors such as land... etc

Previous studies

The most important study in this topic is to:

- Hausman, Hidalgo et al – The Atlas of Economic Complexity- Cambridge, center for international development, Harvard university, 2011.print site : https://atlasmedia.mit.edu/static/pdf/atlasofeconomiccomplexity_part_I.pdf consulted: 13/01/2017.

1- Definition of economic complexity:

Economic complexity is the measure of the productive knowledge that exists in the society and is localized in the form of the products it produces, as this knowledge is measured by the diversity and sophistication of the state's industrial product basket (11 صفحة ،2017 ،الثقافة)

Economic complexity is a new focus of research that radically relies on a new methodology, describing the economy as an evolutionary process for ecosystems that are fragmented from industrial and financial technologies as well as comprehensively interconnected infrastructures (Pietronero, 2017, p. 1)

The complexity of the economy is linked to the multiplicity of knowledge contained therein, so this economic complexity can be expressed in a country's productive efficiency components and reflect emerging structures so that it can combine knowledge (Hausmann, 2011, p. 18)

Through previous definitions, it can be said that economic complexity and the theory of economic complexity depend on the industrial sector and the productive knowledge of each country.

To explain the principle of economic complexity and the role of product knowledge in the production of different products, the "Atlas of Economic complexity" by researchers Ricardo Haussmann and Cesar Hidalgo used the crossword game as a metaphor. In this game, players use separate characters to install different words, for example if the player owns the letters "M", "I", "R", "A" he can create the word "Mira" or (RIMA) in this example each product represents the word and characters represent the ability or part of the knowledge of

production, and we consider that each player has many copies of Characters that he owns, so the measure of economic complexity tries to estimate the number and variety of alphabetic characters each player owns to see how much words he can install, how many other players can install the same words, and which players with more characters can compose more words, so it can be said That the variety of words (products) that a player can install gives us a direct indication of the amount of characters (capabilities) they possess. And here the long words tend to be rare because they can only be installed by a few players who have a large number of characters, so the number of players who can install a certain word, which gives us an indication of the amount of variety (or scarcity) of the characters required by each word, the longer words tend to be less prevalent while shorter words tend to be more prevalent, by a few players who have a large number of characters, and so the number of players who can install a certain word in the same way, the more prevalent products tend to need less production capabilities, either Less prevalent and rarer products require a greater variety of production capabilities. Therefore, the main factors influencing the economic complexity of the state were concluded: (الثقافة, 2017, p. 12)

Diversity: Which shows the number of products produced by the state, the amount of different knowledge contained in the country is represented by the number of various products produced by this country.

Ubiquity: which indicates the spread of a particular product among the countries of the world, while the more sophisticated products need a greater amount of the productive knowledge that these products need and that they can produce.

2- Measuring economic complexity:

To measure the economic complexity of a country, the economic Complexity Index (ECI) (Hausmann, 2011, p. 20), which represents a numerical value for the complexity of the state economy, has been designed. The higher its value, the greater the complexity and sophistication of the state economy. It is a measure of the intensity of the relative knowledge of the economy given the intensity of the relative knowledge of its exports. The product complexity index (PCI) is a measure of the relative knowledge intensity of the product, given the knowledge intensity of the exporters. (MIT)

Table 01 show the index of economic complexity of the world's countries in the period 2013 – 2017, where Japan topped the rankings and Algeria ranked 94th due to the non-diversity of its product basket.

If we define M_{CP} , as a matrix that is 1 if country c produces product p , and otherwise, we can measure diversity and ubiquity simply by summing over the rows or columns of that matrix. Formally, we define: (Hausmann, 2011, p. 24)

$$\text{Diversity} = K_{c,0} = \Sigma_p M_{cp} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$\text{Ubiquity} = K_{p,0} = \Sigma_c M_{cp} \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

To generate a more accurate measure of the number of capabilities available in a country, or required by a product, we need to correct the information that diversity and ubiquity carry by using each one to correct the other. For countries, this requires us to calculate the average ubiquity of the products that it exports, the average diversity of the countries that make those products and so forth. For products, this requires us to calculate the average diversity of the

countries that make them and the average ubiquity of the other products that these countries make. This can be expressed by the recursion: (Hausmann, 2011, p. 24)

$$K_{C,N} = 1/K_{c,0} \Sigma_p M_{cp} K_{P,N-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

$$K_{P,N} = 1/K_{P,0} \Sigma_C M_{cp} K_{C,N-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$

We then insert (4) into (3) to obtain

$$K_{C,N} = 1/K_{c,0} \Sigma_p M_{cp}\ 1/K_{P,0} \Sigma_{C'}\ M_{c'p} K_{C',N-2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

$$K_{C,N}=\Sigma_{C',N-2}\Sigma_P(M_{CP}M_{C'P})/(K_{C,0}K_{P,0})\ldots\ldots\ldots\ldots\ldots\ldots...(6)$$

And rewrite this in the following way:

$$K_{C',N} = \Sigma_{C'} \tilde{M}_{CC'} K_{C',N-2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots(7)$$

Where:

$$\tilde{M}_{CC'} = \Sigma_p(M_{CP}M_{C'P})/(K_{C',0}K_{P,0})\ldots\ldots\ldots\ldots\ldots\ldots(8)$$

Note that equation (7) is satisfied when $K_{C',N}=K_{C,N-2}=1$. This is the eigenvector of $\tilde{M}_{CC'}$ which is associated with the largest eigenvalue. Since this eigenvector is a vector of ones, it is not informative. We look, instead, for the eigenvector associated with the second largest eigenvalue. This is the eigenvector that captures the largest amount of variance in the system and is our measure of economic complexity. Hence, we define the Economic Complexity Index (ECI) as: (Hausmann, 2011, p. 24)

$$ECI=(\vec{K} - < \vec{K} >)/stdev(\vec{K})\ldots\ldots\ldots\ldots\ldots..(9)$$

Where :

< >: represents an average

Stdev : stands for the standard deviation and $\vec{K}$: eigenvector of $\tilde{M}_{CC'}$ associated with second largest eigenvalue …….(10)

Analogously, we define a Product Complexity Index (PCI). Because of the symmetry of the problem, this can be done simply by exchanging the index of countries (c) with that for products (p) in the definitions above. Hence, we define PCI as: (Hausmann, 2011, p. 24)

$$PCI=(\vec{Q} - < \vec{Q} >)/stdev(\vec{Q})\ldots\ldots\ldots\ldots\ldots..(11)$$

Where:

$\vec{Q}$: eigenvector of $\tilde{M}_{PP'}$ associated witht second largest eigenvalue…….(12)

3- Building product space:

The product space is a map that illustrates the similarity of different products in terms of the product knowledge needed for their production and export. This map provides pathways that make it easier to assemble productive knowledge to reach out to produce new products that build on previous product knowledge. (OEC, 2010)

When linking countries to products, it is important to take into account the volume of exports of these countries as well as the global trade of products. Because, even for the same product, we expect the volume of exports of a large country like China to be larger than that of a small country like Uruguay. In the same vein, we expect that the volume of exports of products representing a large share of world trade, such as automobiles or sports footwear, is to represent a large portion of the country's exports of products that represent only a small fraction of world trade, such as cotton, seeds or potato flour. (Hausmann, 2011, p. 25)

To make countries and products identical, we use the Bela Balassa * definition of the apparent revealed comparative advantage (RCA) * *. The definition of Palasa states that a country that has an RCA in a product when its exports are more than the fair share and this share is equal to the total sum of the world trade represented by the product (Hausmann, 2011, p. 25)

For example, in 2008, the export volume of soybeans amounted to $24 billion, soybeans accounting for 0.35% of world trade. Of this total, Brazil exported almost $11 billion, and since Brazil's total exports that year amounted to $140 billion, soybeans accounted for 7.8% of Brazil's exports. This represents my mobile 21 times "fair share" of Brazil's soybean exports (7.8% divided by 0.35%), so it can be said that Brazil has a visible comparative advantage in soybeans.

If X_{CP} represents the exports of state C of the P product, the country RCA of the product p can be specified as follows: (Hausmann, 2011, p. 25)

$$RCA_{CP} = (X_{CP}/\Sigma_C X_{CP})/(\Sigma_P X_{CP}/\Sigma_{C,P} X_{CP}) \quad \ldots\ldots\ldots\ldots\ldots(1)$$

We use this measure to construct a matrix that connects each country to the products that it makes. The entries in the matrix are 1 if country exports product with Revealed Comparative Advantage larger than 1, and o otherwise. Formally, we define this as the matrix, where: (Hausmann, 2011, p. 25)

$$\ldots\ldots\ldots\ldots (2) M_{CP} = \begin{cases} 1 \text{ if } RCA\ cp \geq 1; \\ 0 \text{ otherwise} \end{cases}$$

M_{CP} is the matrix that summarizes which country is produced, used to build the product space and to measure the economic complexity of countries and products.

4- The importance of economic complexity:

Through the definition of economic complexity, the latter reflects the amount of knowledge contained in the productive structure of the economy. It is not coincidental, then, that there is a strong correlation between the measurement of economic complexity and the share of gross domestic product (GDP) per capita that states can generate.

Figure 01 illustrates the relationship between the index of economic complexity and the per capita income of GDP in the 128 countries studied by the "Atlas of Economic Complexity." (Hausmann, 2011, p. 27)

Figure 01, separate countries according to their export intensity of natural resources. In red, countries that represent natural resources, such as metals, gas and oil, have at least 10% of GDP gross domestic product (GDP). For 75 countries whose exports are not dependent on natural resources and that appear in blue. Economic complexity represents 75% of the variation in per capita income from GDP. However, since figure 10 illustrates states with a significant presence of natural resources, they are relatively rich without the need for their economy to be complex. If we observe the revenues obtained through strategic activities, which have more to do with geology than knowledge, the economic complexity can explain 73% of the variation in the share of income for all 128 countries (Hausmann, 2011, p. 27)

Figure 2 illustrates the strong correlation between economic complexity and the share of GDP income that emerges after taking into account income from natural resources.

Therefore, the economic complexity is linked to the level of prosperity in the country. As such, it is just a corollary to the things that we care about. The relationship between income and complexity is deeper than this, countries are more economically complex than we expect,

and given their level of income, they tend to grow faster than those very rich with their current level of economic complexity. (Upadhyay)

By studying the economic complexity of the impact of the economic complexity index on future growth, Harvard University Development Center researchers have used their findings to show that the diversity and sophistication of state exports are pivotal in determining their future economic growth, as they have developed the growth index The future, "which measures the growth of the expected economy for the next 10 years for all countries of the world. (Hausmann, 2011, p. 30)

In short, it can be said that the importance of economic complexity lies in the fact that it helps explain the differences in the rate of income of countries, and more than that it expects future economic growth. Economic complexity is therefore not easy to achieve, but the states that are able to achieve it tend to reap significant gains.

Table (1): World economic complexity index or the period 2013-2017

N°	Countries	2013	2014	2015	2016	2017
01	Japan	2.37352	2.31842	2.29751	2.27406	2.30938
02	Switzerland	2.05181	1.99456	2.15805	2.22117	2.24386
03	Germany	1.84608	1.81367	2.09809	2.08459	2.07537
04	Singapore	1.71717	1.71171	1.746	1.79973	1.86534
05	Sweden	1.75214	1.6459	1.92429	1.86277	1.80773
06	South Korea	1.82762	1.90646	1.65462	1.69142	1.77613
07	United States	1.43702	1.30167	1.8166	1.78168	1.75541
08	Finland	1.57477	1.49895	1.77048	1.72464	1.70679
09	Czech Republic	1.53381	1.52129	1.67011	1.66047	1.6431
10	Austria	1.72767	1.64981	1.68354	1.63921	1.62894
11	United Kingdom	1.45544	1.40296	1.6425	1.5493	1.53259
12	Slovenia	1.4359	1.41088	1.42499	1.44739	1.4319
13	Ireland	1.28901	1.22044	1.35298	1.40903	1.40023
14	France	1.24155	1.15748	1.41803	1.40465	1.38964
15	Hungary	1.43941	1.38229	1.35493	1.37204	1.38444
16	Slovakia	1.21794	1.20436	1.31956	1.34513	1.3402
18	Netherlands	0.818227	0.756212	1.31596	1.28874	1.30343
19	Denmark	0.995356	0.95349	1.23141	1.21947	1.1577
20	Italy	1.21525	1.24155	1.11574	1.10767	1.11743
21	Mexico	0.846744	0.953003	1.15387	1..16038	1.09955
22	Norway	0.614676	0.667969	1.21126	1.19882	1.09466
23	Poland	0.817343	0.839266	1.10641	1.09864	1.09432
24	Canada	0.421886	0.411362	1.12953	1.08488	1.05671
25	Malaysia	0.810485	0.828817	0.938148	0.995461	0.971372
26	Estonia	0.68394	0.752262	0.86561	0.843983	0.898488
27	Russia	0.048022	0.008439	0.855036	0.8547	0.852045
28	Spain	0.700457	0.701443	0.820536	0.80013	0.777415
29	Saudi Arabia	-0.462099	-0.369927	0.870754	0.819673	0.747155
30	Belarus	0.689295	0.731427	0.836874	0.743585	0.743075
31	Romania	0.751166	0.787654	0.561038	0.620618	0.713669

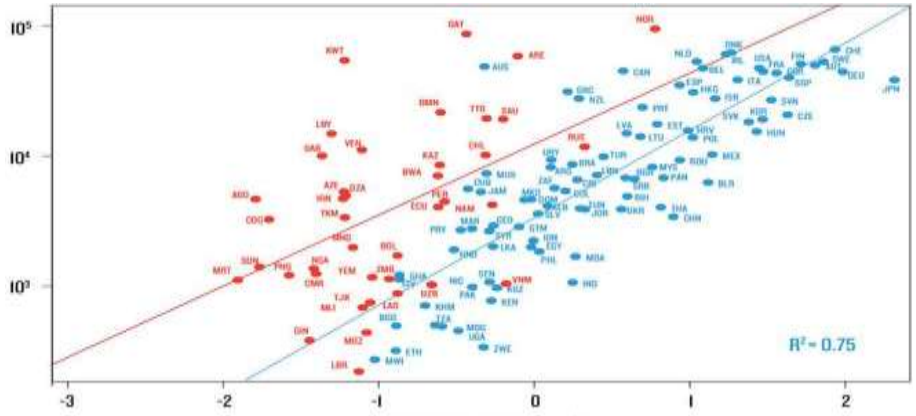
32	**Thailand**	**0.87724**	**0.955651**	**0.590169**	**0.650521**	**0.711704**
33	**China**	**1.04036**	**1.16379**	**0.60941**	**0.642376**	**0.691307**
34	**Lithuania**	**0.673455**	**0.63807**	**0.667051**	**0.627923**	**0.675449**
35	**Latvia**	**0.478137**	**0.431584**	**0.629273**	**0.649569**	**0.653054**
36	**Croatia**	**0.822129**	**0.837178**	**0.657789**	**0.666972**	**0.623091**
37	**Brazil**	**0.032264**	**-0.151225**	**0.696066**	**0.648284**	**0.608252**
38	**Hong Kong**	**1.26313**	**1.35236**	**0.426902**	**0.520167**	**0.594188**
39	**Ukraine**	**0.28954**	**0.268345**	**0.658954**	**0.619115**	**0.556886**
40	**Serbia**	**0.361921**	**0.366673**	**0.520936**	**0.546327**	**0.532947**
41	**New Zealand**	**-0.096978**	**-0.119421**	**0.59338**	**0.488085**	**0.483484**
42	**Qatar**	**-0.41667**	**-0.264365**	**0.322636**	**0.499297**	**0.396207**
43	**Philippines**	**0.341858**	**0.477815**	**0.111666**	**0.220265**	**0.381087**
41	**Bosnia and Herzegovina**	**0.562599**	**0.578374**	**0.32009**	**0.328647**	**0.372865**
42	**India**	**-0.134587**	**-0.014696**	**0.254162**	**0.31413**	**0.359807**
46	**Bulgaria**	**0.278113**	**0.290812**	**0.358694**	**0.327278**	**0.347659**
47	**South Africa**	**-0.192079**	**-0.204966**	**0.303549**	**0.28477**	**0.268797**
48	**Portugal**	**0.433862**	**0.4937**	**0.255319**	**0.26363**	**0.258555**
49	**Costa Rica**	**0.158575**	**0.093993**	**0.135131**	**0.231586**	**0.237988**
50	**Argentina**	**-0.495613**	**-0.502072**	**0.462111**	**0.360496**	**0.232335**
51	**Uruguay**	**-0.330617**	**-0.349791**	**0.220677**	**0.177011**	**0.207869**
52	**Turkey**	**0.287393**	**0.378481**	**0.133999**	**0.150909**	**0.175726**
53	**Colombia**	**-0.234596**	**-0.194463**	**0.0953318**	**0.11439**	**0.144356**
54	**United Arab Emirates**	**-0.090032**	**-0.362895**	**0.124122**	**0.0911202**	**0.128674**
55	**Greece**	**-0.210378**	**-0.167862**	**0.113201**	**0.106201**	**0.125884**
56	**Panama**	**0.710402**	**-0.558959**	**0.0789054**	**0.124958**	**0.119062**
57	**Kuwait**	**-0.149314**	**-0.836979**	**0.25958**	**0.235139**	**0.11607**
58	**Kazakhstan**	**-0.961147**	**-0.100924**	**0.0243757**	**0.157371**	**0.0883664**
59	**Australia**	**-0.816851**	**-0.846322**	**0.0971997**	**0.146237**	**0.0863035**
60	**Lebanon**	**0.107992**	**0.177455**	**0.11624**	**0.0486427**	**0.0803256**
61	**Chile**	**-0.499261**	**-0.532363**	**0.0316813**	**0.0611241**	**0.0443139**
62	**Trinidad and Tobago**			**-0.219598**	**-0.174918**	**-0.0506048**
63	**Georgia**	**-0.419841**	**-0.457954**	**-0.13572**	**-0.104348**	**-0.0587891**
64	**Oman**	**-0.874505**	**-0.774658**	**-0.297732**	**-0.0404026**	**-0.0609077**
65	**Jordan**	**-0.140418**	**-0.010019**	**-0.0543591**	**-0.101439**	**-0.149852**
66	**Iran**	**-0.934617**			**-0.157821**	**-0.158083**
67	**Jamaica**	**-0.64931**	**-0.787602**	**-0.285952**	**-0.258965**	**-0.239734**
68	**Kyrgyzstan**			**-0.430339**	**-0.33118**	**-0.286814**
69	**Tunisia**	**0.16411**	**0.214778**	**-0.323836**	**-0.323494**	**-0.287626**
70	**Macedonia**	**-0.323051**	**-0.216515**	**-039802**	**-0.379236**	**-0.290303**
71	**Indonesia**	**-0.160233**	**-0.102013**	**-0.382548**	**-0.359668**	**-0.305644**
72	**Egypt**	**-0.488663**	**-0.341403**	**-0.376617**	**-0.346329**	**-0.319753**
73	**El Salvador**	**-0.145168**	**-0.070683**	**-0.518145**	**-0.491815**	**-0.336211**
74	**Dominican**	**-0.406432**	**-0.40546**	**-0.422355**	**-.0382253**	**-0.363374**

	Republic					
75	**Cuba**				**-0.274702**	**-0.379871**
76	**Moldova**	**-0.019913**	**-0.103664**	**-0.388113**	**-0.475939**	**-0.464417**
77	**Uganda**			**-0.379853**	**-0.383244**	**-0.512514**
78	**Zambia**	**-0.731336**	**-0.544915**	**-0.219831**	**-0.367271**	**-0.514087**
79	**Senegal**	**-0.744196**	**-0.721723**	**-0.498182**	**-0.583953**	**-0.518687**
80	**Mauritius**			**-0.666129**	**-0.638339**	**-0.579654**
81	**Peru**	**-1.01445**	**-0.956349**	**-0.645699**	**-0.565693**	**-0.598962**
82	**Guatemala**	**-0.505798**	**-0.412311**	**-0.55447**	**-0.57015**	**-0.616793**
83	**Vietnam**	**-0.231462**	**-0.129961**	**-0.707104**	**-0.669703**	**-0.623084**
84	**Azerbaijan**	**-1.44358**	**-1.7818**	**-0.674689**	**-0.650166**	**-0.654587**
85	**Venezuela**	**-0.942948**			**-0.667168**	**-0.655229**
86	**Paraguay**	**-0.982503**	**-1.10231**	**-0.63956**	**-0.767192**	**-0.676455**
87	**Honduras**	**-0.429599**	**-0.370913**	**-0.844833**	**-0.765916**	**-0.744556**
88	**Syria**				**-0.633554**	**-0.744963**
89	**Kenya**	**-0.616658**	**-0.51908**	**-0.690631**	**-0.705736**	**-0.747829**
90	**Mali**			**-1.29791**	**-0.99785**	**-0.767797**
91	**Malawi**			**-0.438195**	**-0.468412**	**-0.768715**
92	**Albania**	**-0.684933**	**-0.542079**	**-0.896511**	**-0.90769**	**-0.781571**
93	**Mongolia**	**-1.67769**	**-1.55696**	**-0.851358**	**-0.767706**	**-0.78801**
94	**Algeria**	**-2.08154**	**-1.77252**	**-1.01136**	**-0.937221**	**-0.811671**
95	**Zimbabwe**	**-1.04674**	**-0.844104**	**-0.697917**	**-0.707958**	**-0.811801**
96	**Uzbekistan**			**-0.873889**	**-0.895987**	**-0.847152**
97	**Liberia**			**-0.719266**	**-0.98089**	**-0.854269**
98	**Pakistan**	**-1.03613**	**-0.86519**	**-0.922811**	**-0.935143**	**-0.859978**
99	**Morocco**	**-0.774475**	**-0.559651**	**-0.5877951**	**-0.861004**	**-0.89235**
100	**Republic of the Congo**	**-0.675039**	**-0.730753**	**-1.03802**	**-1.07835**	**-0.898092**
101	**Sri Lanka**	**-0.530163**	**-0.369437**	**-1.05527**	**-0.972538**	**-0.901589**
102	**Ecuador**	**-1.06674**	**-1.30875**	**-0.768335**	**-0.950771**	**-0.933232**
103	**Mauritania**				**-0.833422**	**-0.963114**
104	**Libya**				**-1.26778**	**-0.965428**
105	**Yemen**	**-1.34438**		**-0.9122604**	**-0.757001**	**-0.97195**
106	**Cameroon**	**-0.69924**	**-0.841034**	**-1.0069**	**-0.814567**	**-1.01371**
107	**Tanzania**	**-0.919298**	**-.1.03347**	**-0.879252**	**-0.97857**	**-1.01705**
108	**Bolivia**	**-1.16084**	**-1.18122**	**-1.06538**	**-1.06344**	**-1.07744**
109	**Tajikistan**			**-1.17436**	**-1.03731**	**-1.10384**
110	**Cote d'Ivoire**	**-1.05279**	**-1.17654**	**-0.965066**	**-0.987537**	**-1.12772**
111	**Ghana**	**-1.27263**	**-1.47184**	**-1.04762**	**-1.21682**	**-1.15388**
112	**Turkmenistan**			**-1.48447**	**-1.27173**	**-1.19506**
113	**Gabon**			**-1.06145**	**-1.36159**	**-1.22477**
114	**Mozambique**	**-1.22607**	**-1.2084**	**-1.18598**	**-1.18114**	**-1.24908**
115	**Laos**			**-1.21682**	**-1.19835**	**-1.25108**
116	**Ethiopia**	**-1.46341**	**-1.56239**	**-1.31886**	**-1.30394**	**-1.27445**
117	**Angola**			**-1.25745**	**-1.16876**	**-1.3177**
118	**Nicaragua**	**-0.955061**	**-1.00073**	**-1.31615**	**-1.34285**	**-1.33756**

119	**Cambodia**	**-0.904026**	**-0.723043**	**-1.47629**	**-1.44677**	**-1.37692**
120	**Sudan**	**-1.873**	**-1.84461**	**-1.53738**	**-1.63482**	**-1.45787**
121	**Madagascar**	**-0.823322**	**-0.820193**	**-1.49269**	**-1.47536**	**-1.45882**
122	**Guinea**		**-2.17828**	**-1.22835**	**-1.44215**	**-1.51688**
123	**Bangladesh**	**-1.17559**		**-1.76105**	**-1.77822**	**-1.71442**
124	**Nigeria**	**-1.73702**	**-1.72001**	**-1.60088**	**-1.73247**	**-1.90268**
125	**Papua New Guinea**				**-1.75799**	**-2.00821**
126	**Togo**	**-0.671987**	**-0.462205**			
127	**Namibia**	**-0.328879**	**0.381863**			
128	**Botswana**	**-0.574288**	**-0.790862**			
129	**Belgium**	**0.951062**	**0.90581**			

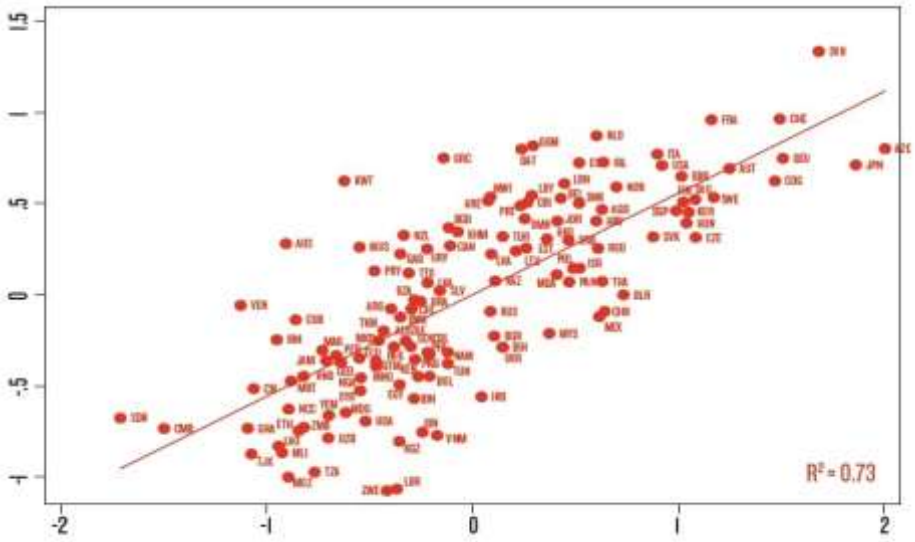
Source: **https://atlas.media.mit.edu/en/rankings/country/neci/**

Fig (1): The relationship between the index of economic complexity and the per capita income of GDP



Source: Hausman, Hidalgo et al, 2011, page 28

Fig (2): The relationship between the index of economic complexity and the per capita income of GDP after taking into account income from natural resources



Source: Hausman, Hidalgo et al, 2011, page 28

Analyzing:

The theory of economic complexity changes the traditional concept of economic growth by relying on productive knowledge as an indicator for predicting future growth. This productive knowledge depends on the diversity and quantity of knowledge that exists in society to produce different products.

To determine the economic complexity of any country, this theory measures the diversity and development of the country's various exports. By diversity, we mean the diversity of productive knowledge owned by the state through the number of products it produces and exports. Scarcity reflects the complexity of these exports because of their scarcity on the world market, Thus, the more diversified and scarce a country's exports become, the more complex its economy will be.

From the above it is clear that to study the complexity of the economy of a country, it must be located in the product space to determine the current productive knowledge and study all the possibilities of industrial development by studying the added value of all products that will lead development trends to access production and export, and then examine the compatibility of knowledge Productivity needed for the production and export of these products and the current production capacity, in order to know the ease of access to the production and export of these products.

We must also study all opportunities to expand the country's exports towards new and diversified value-added products should be examined by identifying all products that the country does not export in its industrial sectors, and classifying them to identify the most advanced and easiest to reach, which will enable investment in production and export increase. The diversification and development of exports, thus increasing the complexity of the economy in order to accelerate the process of economic growth.

The database provided by such a study is intended to help decision makers to formulate an industrial policy aimed at manufacturing and exporting products that will further complicate the country's economy and prosperity.

Conclusion:

To measure the amount of productive knowledge in the community, the principle of economic complexity has been created, which is based on the fact that the more productive knowledge exists in society, the more products it can produce, and the process of comparing the diversity of the country's products and their development, the researchers have access to An equation through which to measure the productive knowledge that exists in each country.

According to the theory of economic complexity, the index of economic complexity is commensurate with the evolution of the product basket of goods to any country, and there is a direct correlation between the index of economic complexity and GDP.

The expected economic growth of the next 10 years for all countries of the world will be predicted by the productive knowledge of these countries through the expected growth index.

The path to make a complex economy is a long one, which normally requires the structuring of industries to embrace new economic activities that increase economic complexity.

Bibliographie

1. Hausmann, Hidalgo et al. «The Atlas of economic complexity, Cambridge, center for international development, Harvard university.» 2011. *atlasmedia.* 13 01 2017. <https://atlasmedia.mit.edu/static/pdf/atlasofeconomiccomplexity_part_I.pdf>.
2. MIT. *Atlas media*. s.d. 2017. < https://Atlas.media.mit.edu/en/rankings/country/neci/EconomicComplexityRankings>.
3. OEC. *Atlas media*. 2010. 18 01 2017. < https://atlas.media.mit.edu/en/ >.
4. Pietronero, Masud Cader. «Economic complexity was presented in a conference dedicated to OECD in Paris.» 04 2017. *World Bank.* 01 05 2017. <http://www.lucianopiertmero.it/wp-content/uploads/2017/04/EC4U.pdf>.
5. Upadhyay, Sanjay. «Farewell Lecture on Life Provides Lessons on Expanding Prosperity.» 19 06 2019. *Linked in.* 05 01 2021.
6. وزارة الثقافة, .« فضاء المنتجات الأردني -الجزء الأول-.» كانون الثاني 2017. *منتدى الاستراتيجيات الأردني*. 01 05 2017. <http://www.jsf.org/sites/default/files/PCA1_0.pdf >.
7. Hidalgo, C., B. Klinger, A. Barabasi and R. Hausmann 2007. "The Product Space Conditions the Development of Nations." Science vol 317.
8. Kaufmann, Daniel. 2003. "Sustained Macroeconomics Reforms, Tepid Growth: A Governance Puzzle in Bolivia?" In In Search of Prosperity: Analytical Narratives on Economic Growth, edited by Dani Rodrik, Princeton University Press.
9. Rodrik, Dani. 2006. "Industrial Development: Stylized Facts and Policies."
10. Hausmann, Ricardo and Baily Klinger. 2006. "The Structure of the Product Space and the Evolution of Comparative Advantage." Center for International Development Working Paper no. 146, (April).
11. Sanjay Upadhyay. 2019. "Farwell lecture on life provides lessons on expanding prosperity". Web site: https://www.linkedin.com/pulse/farewell-lecture-life-provides-lessons-expanding-sanjay-upadhyay?trk=portfolio_article-card_title .
12. Web site: https://atlas.media.mit.edu/en/rankings/country/neci/