The knowledge economy is an essential pillar for increasing exports in Republic of Korea and Iraq: A comparative analysis for the period 2003- 2018

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Abstract:

Mankind has witnessed economic patterns and various and multiple types of knowledge, innovation, renewal and development since the beginnings of the industrial revolution in Europe and England in particular and the gradual transformation from the traditional style to the pattern of knowledge economy. This pattern has become a reality and the concept imposes itself strongly to make its way in a changing world accelerated by innovations and knowledge renewal in all countries including developing, as it is an organization for contemporary aspects of life and societies. We have no choice but to respond quickly to its requirements to achieve comprehensive development and raise economic growth rates by increasing the volume of merchandise exports and demanding the implementation of a strategy to replace exports. This research comes to find out the reality of this economy in Iraq by comparing it with a pioneering experience from one of the global experiences of one of the countries that has taken great steps towards growth that is the Republic of Korean experience to stand shocked against numbers, data and indicators that were produced by the study. Nevertheless, Iraq possesses many of the possibilities of economic, physical, natural and human constituents to raise the knowledge economy indicators in Iraq in order to make it moving towards the growth economically, cognitively and socially for the purpose of achieving the sustainable human development goals and getting rid of the rentier, economic and social phenomena such as poverty, deprivation, ignorance, unemployment, corruption and others.

Keywords: *knowledge Economy, Balance of Trade, Commercial Account, Republic of Korea, Iraq*

1. Introduction:

In order to build a robust economy based on sound scientific foundations and pillars enhanced with knowledge which has become the dominant feature in today's world, to keep pace with technological developments in the field of information and communication technology, brought by the scientific technological revolution. As, the knowledge is considered the

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main engine of economic competition as result of adding tremendous values of economic products by increasing productivity and demand for new technologies and ideas.

These products have actually kept pace with revolutionary changes in all markets and sectors, which facilitate and enhance the countries' ability to increase their commodity exports. In addition, the possession and acquisition of the means of knowledge in an oriented and correct form, and invest them more efficiently and effectively by integrating the skills and tools of technical knowledge, innovation and advanced technology making the concept of knowledge economy an important and prominent concept so as to increase and develop countries and achieve high growth rates by increasing the contribution of commodity exports and commodity in Gross Domestic Product (GDP).

In light of the economic, political and social transformations and developments that Iraq is experiencing towards achieving increased rates of knowledge economy and information and communication technology in the market economy environment and for the advancement of the economy and its modernization in accordance with cognitive economic visions based on stimulating human capital and activating individual initiatives towards creativity and innovation, this research came to show the progress of knowledge economy and its various indicators for increasing and growing the export structure and comparing it with international experiences such as Republic of Korea's experience in the field of knowledge economy that enhances export growth. Apart from this section, the research consists of three sections. The following section deals with the theoretical and cognitive framework of the knowledge economy in the countries compared. The next section is devoted to compare the knowledge economy indicators and GDP in Republic of Korea and Iraq and to test the hypotheses of the research. This is followed by the final section relating to the conclusion of the research to provide a forward-looking view of the reality of the knowledge economy in both Republic of Korea and Iraq.

2. General framework of the research:

This section discusses the importance, problem, objectives, hypothesis, methodology and structure of the research.

2.1. Importance of the research: It lies in studying and analyzing the reality of the knowledge economy in the countries compared (Republic of Korea and Iraq) and the export structure for the period (2003-2018) with the aim of determining the importance of the mutual relationship between the knowledge economy and exports.

2.2. Problem of the research: It is limited to studying and analyzing the relationship between knowledge economy and commodity exports in order to increase economic growth rates and using the comparative method in economic analysis in the countries of the comparison sample (Republic of Korea and Iraq).

2.3. Objective of the research: The research aims to identify the most important strengths and weaknesses of the knowledge economy indicators, their relationships and effect to increasing exports and vice versa in Republic of Korea and Iraq.

2.4. Hypothesis of the research: The research starts from the hypothesis that the knowledge economy and commodity exports are related to a reciprocal relationship in the world of digital economics directly or indirectly to increase the rates of economic growth and achieve economic equilibrium and stability and that the Iraqi economy does not possess the elements of comparison with the state of Republic of Korea because its experience is pioneering in this field.

The research relied on four null hypotheses: The first null hypothesis ($H0_1$) "There are no statistically significant correlations between the knowledge economy indicators and GDP in Republic of Korea". While, the alternative hypothesis (HA_1) states that "There are statistically significant correlations between the knowledge economy indicators and total GDP in Republic of Korea."

The second null hypothesis (H0$_2$) "There are no statistically significant correlations between the knowledge economy indicators and GDP in Iraq", and an alternative hypothesis (HA$_2$) states that "There are statistically significant correlations between the knowledge economy indicators and total GDP for Iraq.

The third main null hypothesis (H0$_3$): "There is no statistically significant effect of the knowledge economy indicators on total GDP in Republic of Korea", and the first alternative hypothesis (HA$_3$) which states "There is a statistically significant effect of the knowledge economy indicators on total GDP in Republic of Korea."

The fourth null hypothesis (H0$_4$) "There is no statistically significant effect of the indicators of knowledge economy on total GDP in Iraq". While, the fourth alternative hypothesis (HA$_4$) states that "There is a statistically significant effect of the knowledge economy indicators on total GDP in Iraq."

2.5. Methods of the research: The research adopted the methodology of inductive scientific research based on the economic theory and economic analysis according to the deductive approach that adopts quantitative analysis between the independent and dependent variables using the method of comparative economic analysis between Republic of Korea and Iraq for the studied period (2003-2018).

The research data have been collected from economic statistics published in the websites of Republic of Korea, the World Bank, Organization for Economic Co-operation and development, OECD, Iraqi Ministry of Planning and Central Bank of Iraq for the years 2008 to 2018. Also, Pearson correlation coefficient was used to determine the relationships between knowledge economy indicators on the one hand, and the relationships between GDP and exports in both countries.

In addition, the research used the simple regression method to determine the effect of knowledge economy indicators on GDP and the latter's effect on exports in both countries. Analysis of variance (ANOVA) was also used to test the significance of simple regression related to the variables under study. Moreover, to the above, the research used the T-Test because it is considered one of the important tests for validating the hypothesis of the research. Finally, the research relied on analyzing the collected data on the 22th version of the Statistical Package for Social Science (SPSS).

3. Literature review: Knowledge economy, theoretical and cognitive framework:

This section discusses the main concepts of the research as follows:

3.1. Cognitive economics –definition and features:

Cognitive economics is globally considered a modern trend in the economic and social vision, because knowledge is a basic pillar, an active engine and an essential commodity for the production operations. Knowledge plays an active role in wealth creation after the labor and capital were the two primary production elements in wealth creation and conversion of raw materials into consumer and productive goods in the traditional economy. As intellectual capital and information availability are a foundation stone for this economy to transfer information to knowledge (Al-Khatib, and Zighan, 2009, 15).

There are many definitions that were popularly used at the end of the twentieth century for the knowledge economy as a result of the tremendous development in the knowledge and technological accumulation accompanied by two very important elements which are capital accumulation and the speed of scientific technological development embodied in the birth of the concept of information and communication technology (ICT), and among the most important definitions are:

Alvin Toffler defined knowledge economy as a new branch of economic sciences that focus on the capital and knowledge to develop the economy and the progress of society (Al-Attiyah, 2011, 40). Marc Uri Porak defined knowledge economy

as an economy that depends in its various economic sectors on the production and use of information rather than traditional sectors by employing raw materials and energy in the production process (Economic and Social Committee for Western Asia (ESCWA), (2011, 3). While, Peter Druker, defined it as the economy in which knowledge is the main component of the contemporary economic and social system and an important source of wealth in it. He was the first scholar to use the term knowledge economy in 1969 (Al-Attiyah, 2011, 40).

The basic features and key steps for the merger and transition to knowledge economy which must be available are the following:

a. Stability of macroeconomic policies at the micro levels (human capital, information and communication technology, and technical sciences) and macro (capital, currency stability, and exchange rate stability (Al-Hayali, (2010, 150).

b. Financing research and development to enhance the competitiveness of different economies and keep abreast of recent developments and introduce innovative products of high quality and value that contribute to raising economic growth rates to confirm that the highest value added of innovation is derived from scientific knowledge (Economic and Social Committee for Western Asia (ESCWA), 2011,12).

c. Development of the scientific and educational infrastructure for human capital, to be integrated into the knowledge economy through training and qualification in accordance with advanced scientific methods.

d. Developing infrastructure of information and communication technology so as to meet the basic needs, to the transition towards knowledge economy to draw economic development and investment policies and creating new institutions and markets were not present previously contributed to the increase of wealth (Rzaiq, 2009-2010, 143-144).

3.2. Knowledge economy indicators:

Many institutions and international organizations have developed indicators and criteria for the economy to make international comparisons in order to assess the performance of countries and their ability to compete and apply the concept of knowledge economy. These are as follows:

a- Research and development (R&D) indicator: This is considered one of the important indicators for the knowledge economy through the allocated expenditure for research and development, and the team that is used for business (R&D), which need long periods to collect data and analyze them to make international comparisons (Toltian, 2006, 21). These data include high-tech export for the industry as a whole, the number of scientists and engineers working in the field of R&D, the total workers in R&D for the population, the total expenditure on R&D in relation to the gross domestic product (GDP), the annual average of R&D, the private expenditure on R&D by businessmen per one individual.

b- Information and communications technology indictor: Recent years have witnessed a development and acceleration of inventions and discoveries especially in the field of information technology and communication of regeneration, speed and number contributed to human development in various countries manufacturing and using them in many economic sectors. This indicator consists of many sub-indicators, including the amount of investment in communications, public telephones per thousand persons, mobile phone per thousand persons, television and radio per thousand persons, fax machines per thousand persons, the cost of international call, periodicals and daily newspapers for each one thousand persons.

c- Education and training indicator : The human element contributes in the expansion of economic activity under knowledge economy as it offers modern and sophisticated technology that increases production and raises the economic growth rates. Importance of the human element is measured by two sources: the data relating to education and training (human capital) and the data related to performance efficiency (Toltian, 2006, 22).

d- Innovation, invention and creativity indicator: The enormous and rapid expansion of the scientific technological revolution has made the possibility of innovation, invention and creativity easy and fast accompanied by the possibility of converting information into knowledge to create new goods that were not previously innovated and markets did not even exist. This indicator contains (79) sub-indicators issued by many international organizations and universities such as the World Intellectual Property Organization (WIPO), Cornic University (CU) and the European Institute of Business Administration (INSEAD).This indicator is calculated as an average of two sub-indicators: the first is the innovation input indicator (institutions, human capital, infrastructure, market development, and business development). The second indicator is the innovation output (knowledge and technology outputs and innovative outputs).

e- Computer infrastructure indicator: It is an indicator for several sub-indicators, including the percentage of international participation in computers, the number of computers per thousand persons, the percentage of the international participation in the computer infrastructure per second, computer power per person, the number of the internet users per thousand persons, and the internet sites for every ten thousands persons (Ismail, 2004, 43).

The fourth group includes the rest of the world, which is marginalized from digital dealing.

3.3. Analyzing the knowledge economy indicators in Republic of Korea:

At the end of the seventies and early eighties of the twentieth century, began the economic renaissance in Republic of Korea depending on the reform of the education system and caring for vocational education and eliminating the illiteracy rate of %100 between the members of the people of Republic of Korea. Interest in the knowledge economy has begun based on the modern technology and become the university education coupled with the technical and technological training. The education outputs have been connected with the requirements of the Republic of Korean work market and the world markets, accompanied by economic openness and the employees' productivity, increase the high competitive ability in the world markets and interest in industries and services creativity.

Republic of Korea has been developing export industries by adopting the oriented economy strategy towards the export in order to develop its economy. In the year 2012 Republic of Korea was the sixth largest exporter and the seventh largest importer of the world. In order to know the reality of the indicators of knowledge economy in Republic of Korea, Table (1) reviews the most important of these indicators with the values of the (GDP) for the period (2003-2018) ranging from (680.5 to 1410) billion dollars, up and down during the period under study. Republic of Korea globally occupies the eleventh rank within the Group of Twenty (G20) of the largest economies in the world, superior thereby to each of Russia and Spain, which makes Republic of Korea within the G20. The economy of Republic of Korea has suffered from the crisis of liquidity and adopted a rescue package provided by the International Monetary Fund (IMF) included the restructuring and modernizing the economy of the country together with policies that contributed to the development of the state at the national level for information technology industries.

Among the most important indicators of the knowledge economy in Republic of Korea was the expenditure on education indicator, whose value percentages ranged from (3.9%) to (4.98%) during the research period of (2003-2016). In fact, there are many reasons that made Republic of Korea interested in spending on education at all its levels. The primary education stages were given an early attention because education was the driving force of economic growth in Republic of Korea during the past three decades and the educational system was characterized by freebies, comprehensive and quality to achieve the goals of overall development.

On the other hand, the percentages of expenditure on R&D indicator to the GDP for the period under study increased from (2.4%) in 2003 to about (5.5%) in 2016. The main reason and motive of this increase was the transformation of various

industries to develop the R&D areas to reach the competitiveness of their commodity and cognitive exports. In fact, investment in the R&D has witnessed a qualitative leap even after the financial crisis. Republic of Korea was considered the sixth country in the world in terms of the expenditure on the R&D. Among the indicators closely related to the previous indicator was the number of scientists and researchers in the field of R&D. As this indicator witnessed a large length of studied period from (3,787) scholars for every thousand persons in 2003 to about (8,688) scholars for every thousand persons in

Table (1): Knowledge economy indicators in Republic of Korea for the period (2003 - 2018)

Year	Gross Domestic Product (GDP)	Expenditure on education % of GDP	Expenditure on R&D % of GDP	Scientists and researchers	Research and journals	Patents	Trademarks
2003	680.5	4.13	2.351	3787	21802	118,649	110611
2004	764.9	4.12	2.532	3887	26740	140115	113320
2005	898.1	3.9	2.626	4329	30926	160921	123064
2006	1010	3.97	2.830	4760	36030	166189	130738
2007	1120	3.95	3,000	5320	40200	172469	141289
2008	1000	4.46	3.123	5679	43095	170632	137461
2009	901.9	4.67	3.293	5913	44684	163523	134211
2010	1090	4.53	3.465	6349	49539	170101	129486
2011	1200	4.62	3.743	6904	53821	178924	133645
2012	1220	4.62	4.025	7525	56897	188915	142625
2013	1310	4.77	4.148	7624	58844	204589	158677
2014	1410	4.68	4.291	8140	62096	210292	160644

2015		4.9	5.342				
	1380			8318	65448	213694	170325
2016	1270	4.98	5.543	8688	68800	222564	166175

Sources : OECD, Main Science and Technology, World Bank, Accounts Data Files and Republic of Korea, Education-expenditure.

2016. This continuous increase indicates a positive case for the knowledge economy in Republic of Korea, surpassing many developed countries to go a long way in knowledge and digital areas and the establishment of many specialized universities and institutes to open up abroad and the development of human capital in it. Among the indicators that are linked to the R&D indicator are the members of scientific research and journals that have witnessed growth in their numbers for the period studied from (21,802) scientific journals and research in 2003 increased to about (53,821) scientific journals and research in 2011 increased to about (68,800) journals and research in 2016. This is a result of increased expenditure on the R&D and interest in research and scientific sobriety in order to achieve scientific and cognitive progress in light of the digital economy and undermine the digital gab globally as shown in the table.

As for the patents indicator, it also witnessed a noticeable increase during the research period, where it increased from (118,649) patents in 2003 to (170,632) patents in 2008.The increase in this indicator continued to reach (222,564) in 2016. While, the number of trademarks registered a noticeable increase during the research period, as it increased from (110,611) trademarks in 2003 to (166,175) trademarks in 2016. This clearly indicates the interest of the Republic of Korean leaders in increasing the expenditure on R&D in order to increase the number of patents and trademarks because they represent a reflection and an important indicator in the development of knowledge, technical and scientific economy for the Republic of Korea's economy, as shown in Table (1) above.

3.3. Analyzing the knowledge economy indicators and the difficulty of measurement in Iraq:

The figures and data related to the knowledge economy displayed in the Table (2) below show that the expenditure on R&D indicator as a percentage of GDP gave very low percentages that did not exceed (0.22%) in 2016 for the period under consideration, while it was (0.0018) in 2003 with very little increase for the following years. This clearly indicated that the decision-makers did not give the necessary attention and adequate support to increase expenditure on R&D which was one of the important indicators in the field of knowledge economy. While, the number of researchers working in the field of R&D for every million people, it did not exceed (486) people in 2011. It decreased to (65) people in 2015 and this was also a serious indicator of the low indicators of the digital economy in Iraq. Whereas, expenditure on education indicator recorded volatile figures during the period under consideration ranging between (2.17% - 5.72%) up and down clearly showed the extent of lack of interest and indifference to the expenditure on education indicator after the change of the governmental regime and the occupation of Iraq to confirm that the change was not only an occupation and a violation of the rights and prohibitions of a people deprived of the most basic elements of life such as its right to education and the acquisition of knowledge. This was clearly reflected on the number of scientists and researchers in the fields of scientific research that decreased from (486) to (65) as a result of the campaign of assassinations, killing and displacement against them, the escape of many of them and the

Table (2): Knowledge economy indicators in Iraq for the period (2003-2018)

Year	GDP Million dinars	Expenditure of education % of GDP	Spending on R&D % of GDP	Scientists and researcher	Research and journal	Patents	Trademarks
2003	29585788.6	---	0.0018	-	118	17	-
2004	53235358.7	3.23	0.0027	-	91	14	491
2005	73533598.6	2.19	0.002 5	-	141	0	-
2006	95587954.8	2.17	0.0022	-	244	14	-
2007	111455813.4	2.22	0.0022	423	241	16	-
2008	157026062	3.35	0.003 4	439	319	29	994
2009	131275592.6	5.72	0.0049	462	408	29	-
2010	159607123.6	4.19	0.004 3	478	607	14	934
2011	211309950	3.65	0.0038	486	793	57	988
2012	245186418.5	3.74	0.0046	-	945	136	---
2013	2202586808	3.88	0.005	-	947	240	---
2014	98100347.5	3.73	0.097	93	866	369	---
2003	57201849.5	4.66	0.178	65	897	50	---
2004	48452584.1	4.70	0.223	-	1227	0	---

Sources: The World bank, National Accounts Data Files, Central Bank of Iraq, Directorate of Statistics and Research, Ministry of Planning, Central Organization for Standardization and Quality Control and Ministry of Planning, Central Statistics Organization.

emigration of minds to evacuate universities, institutes and R&D centers from scientific competencies. The scientific journals and research indicator's numbers varied from time to time, as they ranged between (91- 1,227) during the studied period. This also was not a positive or healthy sign of the reality of the knowledge economy in Iraq compared to the developed and developing countries in the world alike. In addition, the patent indicator's numbers were low, which cannot be compared with the different countries of the world, as it ranged (14) to (369) for the years of the research. This indicated that Iraq was not an innovative country with little invention and development through its patents produced annually. Moreover, this indicated that Iraq throughout the study period was unable to develop indicators of knowledge economy and raise the level of information technology and communications to constitute the most dangerous stage in modern history of Iraq despite spending hundreds and thousands billions of dollars to develop its technological and digital infrastructure and the formation of a new ministry called Ministry of Science and Technology.

3.4. The reality of foreign trade in Republic of Korea and Iraq:

This section deals with the reality of foreign trade in Republic of Korea and Iraq.

3.4.1. Analyzing exports in Republic of Korea:

Republic of Korea ranked ahead in the global economy in many industrial and service areas, as it came second in the shipbuilding industry globally, and fourth in the artificial textile industry. At the export level, Republic of Korea ranked

ninth in the world, and became the third producer of semiconductors, and the sixth producer of cars, the eighth producer of digital devices, and the ninth producer of steel and petrochemicals. The importance that Republic of Korea occupies globally in the field of high-tech industries can be clarified in Table (3) below.

Table (3) shows that commodity exports in Republic of Korea have increased at high rates for the period under study (2003-2018), after it was (194,911.9) million dollars in 2003 to about (432,803.5) million dollars in 2008, with almost twice as a result of the economic policies pursued by Republic of Korea, especially the policy of replacing commodity exports. However, there was a slight decrease that led to a reduction in their values   to (363,931.1) million dollars in the following year due to the exposure of the global economy to the crisis of 2008 and

the collapse of the global economy that started its first spark from the United States of America for what was called a mortgage crisis and high interest rates that were accompanied by drop in

crude oil prices to extend to the rest of the major industrial countries and then spread to developing countries. Nevertheless, the Republic of Korean economy recovered sooner to

Table (3): Republic of Korean commercial account and high-tech exports for the Period (2003-2016)

Years	Exports (million dollars)	Imports (million dollars)	Trading account (million dollars)	High-tech exports	High-tech exports %
2003	194911.9	172773.8	22138.1	57.46	30.5
2004	256053.9	216880.7	39173.2	76.12	32.1
2005	285261.9	252769.5	32492.4	83.91	32.5
2006	329110.9	304596.4	24514.2	93.35	32.9
2007	382803.0	350 360.7	32436.3	101.03	29.8
2008	432909.5	421163.5	11746.0	100.91	35.1
2009	363931.1	315875.5	48055.6	92.86	32.1
2010	463834.1	415902.4	47932.4	121.48	35.1
2011	587213.1	559196.7	28016.4	122.02	32.1
2012	603664.9	555075.5	48589.4	121. 31	22.1
2013	618393.4	538134.3	80259.1	130.46	26.6
2014	613396.5	527251.5	86145.0	133.45	24.1
2015	543082.5	422807.5	12027.5	126.54	26.0
2016	511926.2	395464.4	116461.8	145.67	29.5
2017	580310.2	466717.3	113592.9	16668.	396.
2018	626266.6	516179.7	110086.9	19380.	44.9

Sources: World Bank National Accounts Data Files and OECD National Accounts data files.

increase its export values to (463,834.8) million dollars in 2010 and continued to grow until it reached (626,266.6) million dollars in 2018. On the other hand, the Republic of Korean commodity import values faced many fluctuations during the period under discussion, as they increased from (172,773.8) million dollars in 2003 to (421,163.5) million dollars in 2008, as was the case of exports, and for the same previous reasons and repercussions of the global financial crisis in 2008. However, the commodity reports returned to increase in the following years until it reached (555,911.7) in 2012 and

continued to decrease in the following years to reach the value of (395,464.4) million dollars. Then, it returned to the increase in its value   until it reached (516,179.7) million dollars in 2018.

Through the above data, the calculation of the Republic of Korean trade account can be reached for the studied period (2003 -2018), as its value varied as a result of the changes facing commodity exports and imports due to the policies pursued by Republic of Korea in its industrial structure and the transformation of many traditional industries into high-precision industries with advanced technology that exceeded in some years the amount of half of its contribution to the commodity export structure illustrated in Table (3). In fact, the percentage of the exports of High-technology industries amounted to approximately (45%) in 2018 of the commodity export values, after it was not exceeding (35%) for previous years, not to mention the exports of cognitive services.

3.4.2. Analysis of exports in Iraq:

Table (4) clearly shows the trade account of the Iraqi economy for the period (2003-2018). The Iraqi commodity exports, mostly depending on oil exports, amounted to nearly (93%) and gradually increased after the occupation of Iraq. In fact, these commodity exports have increased from (9,711.1) million dollars in 2003 to (63,726.0) million dollars in 2008. However, they have been fluctuating up and down even for subsequent years to reach their highest level in 2012 at the values of approximately (94,209) million dollars. Then they returned to volatility in the following years to reach about (86,360) in 2018 due to the existence of the double crises in the 2014 war of the Islamic State for Iraq and Syria (ISIS) and the drop in oil prices. Owing to these circumstances the Iraqi economy has entered into a severe recession that needed monetary and financial policies to get rid of staggering and degradation caused by the declining revenues other than oil.

As for the Iraqi commodity imports, they witnessed a clear fluctuation at the beginning of the studied period between (2003-2007) amounting to (9,933.5 – 23,532) million dollars up and down characterized by random import and open borders accompanied with the entry of the worst products and from bad origins. In addition, the subsequent years witnessed an increase in the value of commodity imports reaching (59,349.4) in 2013. However, the commodity imports decreased in the subsequent years, and with different values, as shown in table (4).

The Iraqi trade balance can be reached after subtracting imports from exports to see whether the trade balance at the beginning of the period was with negative values (deficit) due to the increase of imports and the country's openness to the outside as well as the country's entry in a new stage represented by the occupation, the absence of a clear policy and economic approach and the multiplicity of governing parties under an excuse of democratic pluralism, low oil revenues and

other revenues such as taxes, fees, fines, etc. Nevertheless, the trade balance transformed into

Table (4): Commodity exports in Iraq for the period (2003-2018)

Year	Exports	Imports	Trade balance
2003	9711.1	9933.5	-222.4
2004	17810 .0	21302.3	-3492.3
2005	23697.4	0. 23532	165.4
2006	30529.4	22008.8	8520.6
2007	0. 39587	19555.9	20031.1
2008	0. 63726	35011.6	28714.4

2009	39430.4	41511.5	-2081.1
2010	51763.6	43915.3	7848.3
2011	680.5 79	47802.9	31877.6
2012	94208.6	59005.9	35202.7
2013	89767.9	59349.4	30418.5
2014	83980.9	53176.6	30804.3
2015	43441.5	39045.1	4396.4
2016	8472.3	6684.2	1788.1
2017	0. 57559	0. 37866	19693
2018	0. 86360	0. 45736	40624

Source: Central Bank of Iraq, General Directorate of Statistics and Research, annual bulletins for the years 2003 to 2018.

positive values   (surplus) for the years (2005-2008). Then, they returned to record a negative value of (-2,081) million dollars for the year (2009). Notwithstanding, they continued with positive values   for the following years and achieved a surplus ranging from (1,788.1) million dollars to (40,624) million dollars, up and down for the period (2010-2018) as shown in Table (4).

The truth that could not be denied was the absence of any of the high-technology commodity exports because Iraq was a consuming not a producing country whose economy was characterized by unilateralism and reliance on only one resource which is the oil resource and its contribution to the GDP reached about (%50) and the total exports were about (99%) in 2016.

3.5. Knowledge economy and exports (comparative analysis) and a forward-looking vision of the Iraqi economy:

The previous data and statistics for knowledge economy indicators and the export structure of the two compared countries enabled us to conduct a comparative analysis of the Republic of Korean and Iraqi experiences due to the similarity of conditions, demographic and regional factors. Nevertheless, Iraq has superiority in having many of the economic fundamentals and potentials through which it can succeed in its experience if it was prepared and planned correctly by those who make decisions and have authority to raise export rates and develop indicators for the knowledge economy by simulating global experiences such as the Republic of Korean experience.

3.5.1. The relationship of knowledge economy with exports in the Republic of Korea experience:

The Republic of Korean experience in developing the knowledge economy indicators for increasing export rates, improving the structure of foreign trade and enhancing its trade account, was characterized by the following factors:

a-The Republic of Korean experience focused on developing the industrial sector for various industries successfully by setting export substitution strategies and relying on a monopolistic conglomerate that aims to raise economic growth rates and achieve economic development goals .

b-The Republic of Korean economy was relying on the mixed economy approach, especially export-oriented industries, and raising the degree of international competition for its commodity products in accordance with international standards.

c- The experience focused on   setting plans to support talented people and researchers, empowering women economically, creating incentives for scholars and researchers, finding ways to attract knowledge investment and giving tax reduction to leading technological projects.

d- Increasing governmental expenditure rates on R&D indicators, spending on education and establishing many research and development centers, universities and institutes specialized in various sciences and applied fields.

e- Enacting and legislating many laws and issuing resolutions that aimed to encouraging scientists, thinkers and creators to increase inventions, discoveries and patents, protecting intellectual property, developing the information and communications technology sector to attract foreign investment and create an appropriate investment environment and to encourage national exports for the local product abroad.

f- Giving a great interest in the exports of high-technology industries that have reached high contribution rates, constituting about (45%) of all the Republic of Korean exports, such as space products, computers, medical and therapeutic equipment, scientific tools, electrical machines, and others.

3.5.2. Knowledge economy and exports in Iraq:

In fact, the Iraqi experience in the field of knowledge economy is still in its early stages and almost not counted among international standards when calculating indicators and standards for the knowledge economy, due to the following causes and factors:

a-The significant and obvious deterioration of the main sectors of the economy, such as the industrial and agricultural sector, were the backbone of the national economy during the studied period after the occupation of Iraq in 2003. The Iraqi experience encountered the abolition of many government institutions and ministries such as industry and military manufacturing, the dissolution of the armed forces, marginalization of the industry, the deterioration of the agricultural sector and the failure to provide adequate protection for the national product by adopting the open door policy and the random import of cheap and poor quality goods to turn Iraq into a consuming not a producing country.

b- After Iraq was run by the previous political regime according to the holistic approach, central planning and the state's interference in economic life, it became managed after changing the governing regime in an unclear manner that was blurred and ambiguous in its economic approach and policy during the studied period (2003-2018).

c- Low rates of government expenditure on education and R&D compared to spending on education and R&D in Republic of Korea. Also, most of this expenditure was through private spending at a rate of approximately (80%) of the total spending and most of it was in the agricultural, military and service areas. Moreover, the rest of the indicators of knowledge economy were almost negligible and their rates were very low.

d- Expansion in the scope of the service sector, especially non-productive governmental activities that were characterized by sagging most of the time. In addition, the dependence of the Iraqi economy on oil as the rentier resource in all its exports and approval of its budgets, which constituted about (95%) of the total exports and about (70%) of the GDP (Salman, 2006, 1). Furthermore, there was a decrease in the contribution of other sectors in supplying the public budget with financial resources so that the national economy was directed towards import rather than export, along with the growth and increase in government expenditure on armaments and fighting terrorism.

e- A decrease in the number of scientists and researchers after the occupation, as a result of killing and displacing many of them due to the deteriorating security situations and political instability. This was accompanied by an increase in the

numbers of research centers and scientific journals in the disciplines that were mostly the science of energy, environment, and agriculture and that most of the ideas, innovations doomed to neglect and lack of application.

f- There were no high-technology commodity exports in Iraq, accompanied by deterioration in the centers of innovation and creativity, talent discovery and development of human capabilities. Thus, Iraq has lost many qualifications and indicators that contribute to enhancing the effectiveness of the knowledge economy to raise economic growth rates through exports and diversify the structure of foreign trade.

3 .5.3. Role of the knowledge economy in increasing the volume of Iraqi exports (an outlook view):

Most developed countries and some developing countries have paid great attention to the concept of knowledge economy and its role in raising economic growth rates by increasing the volume of various commodity exports. These have also had interest in the human component and considered human capital as a basic pillar for the formation of this economy by increasing rates of expenditure on education and R&D centers. Human capital is considered an inexhaustible source unlike other traditional natural resources. But its development requires scientific and knowledge incubators to develop the human skills and capabilities for the sustainability and success of the work of the human element. In fact, this is what Iraq needs today to develop the knowledge economy and raise its growth rates in a way that keeps pace with the global knowledge development. However, there were many constraints, obstacles and challenges that faced this trend, which were directly and substantially reflected on the results and activities of R&D, as shown in the previous tables of knowledge economy indicators in Iraq despite the presence of many universities and institutes and scientific research centers, but it did not live up to advanced levels because they suffered from keeping up with the enormous and rapid progress globally with the lack of allocations, equipment and poor scientific libraries, printing presses and advanced research centers. If we compare the expenditure in Republic of Korea on the R&D which was up to about 5.5% of GDP with the size of spending in Iraq, we found it did not exceed (0.05%) of the GDP for the year 2016. The reason behind this was that the GDP in Iraq depended heavily on oil exports and it was affected by world events and fluctuations in crude oil prices accompanied by deterioration in the security and political situation and the confrontation of terrorism and the rampant of corruption in Iraq.

It is worth noting that most research centers were governmental centers and the research centers for private activity were absent. In addition, most applied research were ignored and placed in archive for reference when needed. This led to the emigration and flight of human minds, including scholars, thinkers and researchers, and the assassination and killing of a number of them in the stage of violent and sectarian conflict. In other words, the infrastructure of information and communication technology was not to the required level and thus it significantly and clearly affected the contribution of the knowledge economy in raising the economic growth rates in Iraq accompanied by a deterioration in the quality of legislation, enactment of laws, the imposition of law, combating corruption, deterioration of political stability and the absence of intellectual property protection. As innovations, patents number and the development of scientific research methods are considered among the effective tools and basic pillars for measuring the development of countries and the progress of nations. Instead of the education and illiteracy gap, the digital gab and computer literacy have today become the standard as an important indicator of information technology and digital access to any country. In order to improve the concept of knowledge economy and enhance its indicators in Iraq, the following measures must be taken:

a- Developing and improving the information technology and communication infrastructure through the activation of communication networks, knowledge and digital channels, the establishment of research centers and applied digital

scientific experiments according to the digital connectivity indicator (network readiness) and interest in this infrastructure through focusing on individuals and the private sector in assisting the government to apply knowledge economy indicators according to the criteria of micro and macroeconomic governance.

b- Developing the work of universities, specialized and applied institutes and linking them to the labor market to determine the needs of society from skilled manpower and applying scientific, human and practical research in all areas of life.

c- Obtaining the maximum benefit from the experience and knowledge of experts, specialists, scientists and researchers in various fields, providing the appropriate scientific and research climate to conduct their experiments, applying their research in various specialties and giving the private sector an importance in supporting the public sector because of its physical and human capabilities to advance the reality of the knowledge economy in Iraq.

d- Working to provide political, economic and security stability and resolving political and partisan differences in forming successive governments in light of the democratic experience and the new regime of governance and the application of laws and instructions away from the narrow partyism and abhorrent sectarianism to provide a clean and transparent work environment in which the spirit of justice prevails, enforcement of law, state prestige and government effectiveness is applied to fight many of social and economic phenomena such as fighting poverty, deprivation, unemployment and corruption to contribute to strengthening the role of the knowledge economy in Iraq.

f- Working in a serious and explicit way to simulate the economic experiences and policies and development pursued by the developing countries towards growth, such as the Republic of Korea, and to benefit from the experience and lessons it approached due to the great similarity between the economic, political and international conditions that it passed with the reality of the Iraqi economy, which is superior due to many of the constituents and potentials it possesses such as natural and human resources to achieve the goals of the Iraqi experience and to successfully develop, diversify the structure of exports and foreign trade, get rid of the domination of the rentier oil resources and diversify economic resources and national income sources to disengage the link with the world economy. By doing so, the country can get rid of the fluctuations in world prices for crude oil that create a commodity production system and productive flexibility contributes to raising the economic growth rates and achieve the goals of economic development in Iraq.

3.6. Analyzing and Testing Hypotheses:

As we mentioned earlier, the research relied on four null hypotheses. The first and second null hypotheses focused on correlations between the knowledge economy indicators in Republic of Korea and Iraq for the period (2003 - 2018). On the other hand, the third and fourth hypotheses focused on the effect of GDP on exports in Republic of Korea and Iraq. The four hypotheses were tested and analyzed in the following two sub-sections.

3.6.1. Correlations between the knowledge economy indicators in Republic of Korea and Iraq:

The first and second null hypotheses were tested using the Pearson correlation coefficient. Pearson's correlation coefficient (r) is the measure of the extent of association between two sets of variables which is applicable of the collected data. The values of person's measure range from +1 and -1. The value +1 indicates a perfect positive association between the variables, while the value -1 indicates a perfect negative association between the variables, i.e., the variables tend to either increase or decrease perfectly in the same direction. The value zero indicates that the two variables are not associated, i.e., are independent of each other.

The results of the statistical analysis regarding the first null hypothesis (H0$_1$) test related to the correlations between the knowledge economy indicators in Republic of Korea are as follows:

The relationships between the pairs of variables representing the data shown in Table (1) are summarized in table (5) below. The table shows that there are strong positive correlations between the pairs of variables significant at $p < 0.01$. The implication of these correlations is that as the GDP increased all other variables contained in the table strongly increased.

Table (5): Pearson's correlation coefficients for knowledge economy indicators in Republic of Korea for the period (2003 - 2018)

	1	2	3	4	5	6	7
1. Gross Domestic Product (GDP)	1.00	.974**	.925**	.925**	.933**	.948**	.915**
2. Expenditure on education		1.00	.969**	.981**	.980**	.955**	.933**
3. Expenditure on R&D			1.00	.965**	.961**	.953**	.950**
4. Scientists and researchers				1.00	.995**	.942**	.917**
5. Research and journals					1.00	.955**	.920**
6. Patents						1.00	.964**
7. Trademarks							1.00

**. Correlation is significant at the 0.01 level.

These results clearly indicated that there were statistically significant positive correlations between the pairs of variables related to the knowledge economy indicators and total GDP in Republic of Korea. These results led to reject the first null hypothesis (H0$_1$) and accept the alternative hypothesis (HA$_1$).

The results of the statistical analysis regarding the second null hypothesis (H0$_2$) test related to the correlations between the knowledge economy indicators in Iraq are as follows:

The relationships between the pairs of variables representing the data shown in Table (2) are summarized in table (6) below. The table shows five positive associations between some of the variables significant at $p < 0.01$ and $p < 0.05$. Expenditure on education had a positive strong association (.811**) with both expenditure on R&D and research and journals (.772**) and a moderate association with patents (.568*) · Also, expenditure on R&D had a positive moderate association with research and journals (.664**). Moreover, scientists and researchers had a positive moderate association with trademarks (.629*). The implication of these associations is that as each variable increased the other variable also increased, but with different degrees ranging from moderate to strong.

Table (6): Pearson's correlation coefficients for knowledge economy indicators in Iraq for the period (2003 - 2018)

	1	2	3	4	5	6	7
1. Gross Domestic Product (GDP)	1.00	.469	.239	-.169-	.321	.469	-.138-
2. Expenditure on education		1.00	.811**	-.386-	.772**	.568*	-.328-
3. Expenditure on R&D			1.00	-.346-	.664**	.032	-.251-
4. Scientists and researchers				1.00	-.115-	-.217-	.629*
5. Research and journals					1.00	.475	-.013-
6. Patents						1.00	-.271-
7. Trademarks							1.00

**. Correlation is significant at the 0.01 level.

*. Correlation is significant at the 0.05 level.

These results indicated that there were a number of statistically significant correlations between the pairs of variables related to the knowledge economy indicators and total GDP in Iraq. These results led not to completely reject the second null hypothesis (H0$_2$).

3.6.2. Analyzing the effect of GDP on exports in Republic of Korea and Iraq:

The third and fourth hypotheses related to the effect of GDP on exports in Republic of Korea and Iraq are examined in this section. The simple regression method was used to test these two null hypotheses. The regression functions were calculated for the independent variables and their effect on the dependent variables as follows:

Table (7) shows the results of testing the third null hypothesis (H0$_3$) that focused on the effect of the independent variable GDP on the dependent variable exports in Republic of Korea for the years 2003-2018. The results of the simple regression analysis for the collected data of Republic of Korea are as follows:

1- The coefficient of determination measuring the degree of relationship between the variables of the regression model, GDP and exports for the research period, amounted to (0.93), which was positively strong. As for the square of the coefficient of determination, which measures the extent of the influence of the independent variable, the GDP on the dependent variable exports, its value reached (0.86), which was also positively strong. This result indicated that the explanatory ability of the independent variable on exports was high, indicating a clear effect of GDP on exports in Republic of Korea. The remaining percentage (0.07) was due to other factors beyond the scope of the research.

2- Also, the value of the beta coefficients that constituted the simple regression equation for predicting the expected effect of the independent variable on the dependent variable was (-199,711,645) and (588,805), respectively. Since the GDP factor was positive, this means that when GDP increases, exports tend to increase. This result was statistically significant at the level of (0,000).

Table (7): Results of the simple regression analysis for the independent research variable, the GDP and the dependent variable exports in Republic of Korea, based on the data collected for the years 2003-2018.

Coefficient of determination (R)	0. 93		
Square coefficient of determination (R Square)	0. 86		
F Test value	Level of significance		
71.879	0.000		
Regression	Beta Coefficients	(t) Test	Level of significance
Constant	-199,711.645	2.588	0.024
GDP	588.805	8,478	0.000

3- As for the value of the t-test for the constant factor, it reached (-2.588). This value was statistically significant at the calculated level of significance (0.024), which was less than the selected level of significance (0.05). This means that the value of the constant parameter amounted (-199,711.645) when the value of the independent variable was zero. The value of the t-test coefficient of the independent variable amounted to (8.478), which was statistically significant at the calculated level of significance (0.000) that was less than the selected level of significance (0.05).

4- Finally, the result of the ANOVA test shown in Table (7) indicated the statistically significant analysis of the simple regression, as the value of the (F) test was (71.879) which was statistically significant at the calculated level of significance (0.000) which was less than the selected level of significance (0.05). This result indicated the rejection of the null hypothesis (H0$_3$) that there is no effect of the independent variable GDP on the dependent variable exports and acceptance of the alternative hypothesis (HA$_3$) that there is an effect of the independent variable GDP on the dependent variable exports in Republic of Korea.

Consequently, the results reached through the test analysis led to reject the third null hypothesis and accept the alternative hypothesis. The reason for this result was due to the strengths of the knowledge economy indicators as well as the economy in Republic of Korea.

Table (8) shows the results of testing the fourth null hypothesis (H0$_4$) that focused on the effect of the independent variable GDP on the dependent variable exports in Iraq for the years 2003-2018. The results of the simple regression analysis for the collected data of Iraq are as follows:

1- The coefficient of determination measuring the degree of relationship between the variables of the regression model, GDP and exports for the research period, amounted to (0.49), which was approximately moderately strong. As for the square of the coefficient of determination, which measures the extent of the influence of the independent variable, the GDP on the dependent variable exports, its value reached (0.24), which was weak. This result indicated that the explanatory ability of the independent variable on exports is weak, indicating that there was no clear effect of the GDP on exports in Iraq. The remaining percentage (0.51) was due to other factors beyond the scope of the research.

2- Also, the value of the beta coefficients that constituted the simple regression equation for predicting the expected effect of the independent variable on the dependent variable was (41,547.483) and (0.017) respectively. Since the GDP factor

was positive, this means that when GDP increases, exports tend to increase, but to a weak extent. However, this result was not statistically significant at the level of (0.05).

3- As for the value of the t-test for the constant factor, it reached (5.182). This value was statistically significant at the calculated level of significance (0.000), which was less than the selected level of significance (0.05). This means that the value of the constant parameter amounted to (5.182) when the value of the independent variable was zero. In addition, the value of the t-test coefficient of the independent variable was (1.923), which was not statistically significant at the calculated level of significance (0.079) that was more than the selected level of significance (0.05).

Table (8): Results of the simple regression analysis for the independent research variable, the GDP and the dependent variable exports in Iraq, based on the data collected for the years 2003-2018.

Coefficient of determination (R)	0. 49		
Square coefficient of determination (R Square)	0. 24		
F Test value	Level of significance		
3.699	0. 079		
Regression	Beta Coefficients	(t) Test	Level of significance
Constant	41, 547 . 483	5. 182	0.000
GDP	2 . 652E-5	1.923	0.079

4- Finally, the result of the ANOVA test in Table (8) indicated the statistically insignificant analysis of simple regression, as the value of the (F) test amounted to (3.699). This value was not statistically significant at the calculated level of significance (0. 079) that was more than the selected level of significance (0.05). Consequently, the result indicated the acceptance of the null hypothesis (H0$_4$) that there was no effect of the independent variable GDP on the dependent variable exports and rejection of the alternative hypothesis (HA$_4$) that there was an effect of the independent variable GDP on the dependent variable exports in Iraq.

To summarize, the test analysis indicated that there was a statistically significant strong effect of GDP on exports in Republic of Korea and on the contrary there was not a significant effect of the same variables in Iraq. The reason behind these results were that the knowledge economy indicators and GDP in Republic of Korea were stronger than those in Iraq due to the weak knowledge economy indicators and economy in Iraq.

4. Conclusions:

The research reached many conclusions regarding the comparison between the economies of Iraq and Republic of Korea. The most important of these are conclusions are:

1 - The Korean experience in the field of knowledge economy was pioneering with distinction as it achieved great and increasing growth in most indicators of the knowledge economy, especially the research and development indicator and its focus on industrial activity in the field of light and heavy industries.

2- The economic policies pursued by Republic of Korea and its adoption of the mixed economic approach proven successful in order to increase its competitive position internationally, especially in the field of complex industries, as well as interest in the youth sectors, empowering women and caring for the talented and creative people.

3-Increasing spending on research and development, education and training directly contributed to increasing investment rates in the field of human capital, protecting intellectual freedom, and caring for scientists, thinkers and creators.

4-The collapse of the infrastructure of the knowledge economy in Iraq represented by information and communication technology and digital delivery, that could not match regional and global counterparts, in addition to the low rates of non-oil commodity exports of goods and services in Iraq.

5-Low rates of spending on research, development and education in Iraq compared to global spending rates despite the financial surpluses provided by the rentier resource and the absence of other funding sources to be subject to internal and external shocks because the Iraqi economy is a distribution and consumer economy and not a producer as is the case in the Korean economy.

6- The structure of exports in Iraq depends on oil exports, at a rate of (93%). The economic structure of exports from other sectors, such as the agricultural and industrial sectors, is required to be diversified in order to increase the rate of non-oil commodity exports to get rid of unilateralism of the rentier economy in Iraq.

7- In connection with the Republic of Korean situation, the research found that there were statistically significant positive correlations between the pairs of variables related to the knowledge economy indicators and total GDP in Republic of Korea. Also, the test analysis indicated that there was a statistically significant effect of the GDP on exports due to the strengths of the knowledge economy indicators as well as the economy in Republic of Korea.

8- Concerning the Iraqi situation, the research found that there was a number of statistically significant correlations between the pairs of variables related to the knowledge economy indicators and total GDP. Also, the test analysis indicated that there was not a statistically significant effect of the GDP on exports because the knowledge economy indicators as well as the economy were weak in Iraq.

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