

## **The impact of technological innovation on the growth of exports in the United Arab Emirates**

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### **Abstract**

Technological innovation, which is based on research and development, is the main determinant that develops the competitiveness of economic institutions. Excellence and competitiveness come mainly through reducing production costs and raising the level of quality, whose main sources are technological innovation. From this point of view, the United Arab Emirates gave innovation It is of great importance, as many institutions concerned with innovation have been established, and several strategies have been developed that will create the appropriate climate for innovation, realizing that technological innovation is the main reason for access to international markets and thus promoting export growth, and the latter is what leads to economic growth.

The research used the analytical approach to reach the goal by analyzing the technological innovation indicators represented in spending on research and development, patents, and spending on education and their impact on the growth of UAE exports.

The research concluded that there is a positive relationship between technological innovation and the growth of exports, although this relationship may be misleading because a large part of the UAE exports are crude oil exports, but the positive relationship between the three technological innovation indicators and the growth of advanced technological exports indicates that there is an impact For technological innovation on export growth.

**Keywords:** Technological innovation, Competitiveness, Export growth

### **Introduction**

The progress of societies and economies has been linked to the use of scientific and technological research outputs, which came mainly through focusing on the technological factor within the production elements. .

The transformation of economic institutions towards innovation is due to the fact that these institutions have acquired large resources, techniques and technical and administrative expertise for research and development to deal with innovation as a distinct organized activity to reach what is completely new (radical innovation) or partially (improving innovation) in order to achieve the ability of competitive in the business environment.

Competitiveness, which is based mainly on the factor of innovation and modernization, has become an increasingly important reality in today's world, and competition has become institutions, bodies, and departments, and they have strategies and policies that report to senior officials and not only to

1017

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businessmen. Some countries even consider low economic competitiveness as one of the elements that It threatens the national economy of the state, and competitiveness is no longer limited to institutions to survive and grow, but rather has become an urgent need for the state that desires to sustain and raise living standards for its members and to participate in the achievements of scientific progress.

Research problem: Technological innovation is a major factor in transforming the economic structure of a country from the production of primary commodities to the production of manufactured goods with knowledge and technological content, and enhances its competitiveness. Access to international markets has become easy through multilateral agreements, but market access requires Producing high quality goods at reasonable prices that enable it to do so, and the only way is technological innovation, and the latter is the secret of distinguishing the United Arab Emirates, as it has taken the technological factor as a basis for progress and growth.

The importance of the research: The distinguished role of the UAE government through the establishment of institutions concerned with innovation, and the application of many strategies to promote innovation, played an important role in creating the appropriate climate for technological innovation, and the latter is the main factor in transforming the export structure in the United Arab Emirates from the export of raw materials, fish and pearls To produce manufactured goods and goods with advanced knowledge and technology content, which undoubtedly have a greater added value.

Research hypothesis: The research stems from the hypothesis that there is a positive relationship between technological innovation and export growth through its significant role in enhancing the competitiveness of enterprises.

Research objective: The research aims to study and analyze the relationship between technological innovation represented by spending on research and development, patents, and spending on education, and the growth of exports in the United Arab Emirates.

Research scope: The research is limited to analyzing the relationship between technological innovation and export growth in the United Arab Emirates during the period from 2011 to 2020.

Research Methodology: The research relied on the application of the deductive inductive analytical method to show the relationship between technological innovation and the promotion of export growth in the United Arab Emirates.

## **The first topic: What is technological innovation?**

### **Definition of innovation:**

There are several definitions that dealt with the concept and characteristics of innovation, as Joseph Schumpeter described it in his book “The Theory of Economic Development” in 1934 as the driving force for development (McCRAW: 2007, 4), while Peter Drucker believes that innovation is the abandonment of the old by the institution, emphasizing what he brought Schumpeter that innovation is creative demolition (Nicholas: 2003, 1023), that is, the process of transforming ideas into new goods and services. Joseph Schumpeter defines innovation as an activity that leads to a new production function, a new product, and divides this activity into several steps: (Ramadani, et al: 2013, 324-325). secondly. The importance of innovation:

Historically, technological innovation was a major driver for increasing the workforce, and advances in health technology led to a significant increase in life expectancy. In 1800 AD, the average lifespan was less than 40 years in most advanced economies, and by 2011 this average exceeded more than 75 years. year, by reducing the burden of chronic disease and disability, technological innovation has also contributed to an increasingly healthier, and thus more economically productive workforce (WIPO, 2015: 27), given that technology is the main source of economic growth. The United States, which is a distinguished field for valuing technology, has estimated about 80% of its productivity growth since

1018

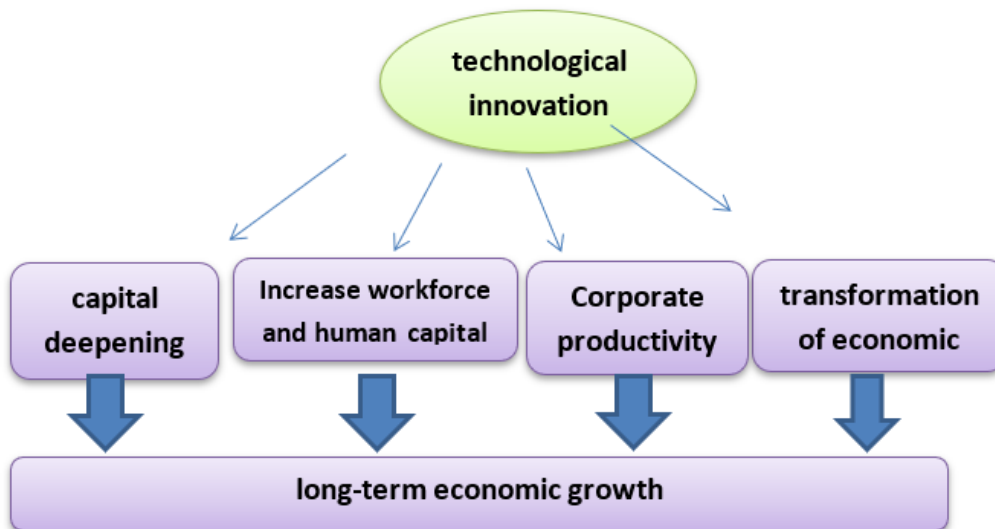
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the global crisis is caused by technological innovation, and there is no field today that does not have innovative outputs of various kinds. .

Schumpeter was the first to clear the way for the intellectual treatment of the subject from a scientific and academic point of view. He saw that innovation in general and technological innovation in particular bring about change through balance and imbalance, both of which are at the heart of economic mobility, and that his distinction between great innovation and simple innovation made him focus On the first, since it is in his view that it causes the real changes in the structure of organizations and economies, and both "Porter" and "Freeman" believe that performance of a technological type that is based on research, development and technological innovation, is the main determinant that develops the competitiveness of economic institutions. On performance, it has no meaning if it is not based on the renewal or improvement of products, systems and production methods, and therefore excellence and competitiveness come mainly through reducing production costs and raising the level of quality, whose main sources are research and development and technological innovation in particular, that these activities alone It can only bear fruit if there is an administration that performs its duty in terms of organization, marketing and other auxiliary activities (Ukel, 2011, 43-44).



**Scheme (1)** Stimulating innovation for economic growth through various channels

Source: World Intellectual Property Report, 2015: 27

## **The second topic: The reality of technological innovation in the United Arab Emirates**

At the beginning of the twentieth century, the United Arab Emirates was a group of emirates in the desert famous for one port in the city of Dubai, and in 1971 Sheikh Zayed Al Nahyan was able to unite those Emirates into one state under the name of the United Arab Emirates, and since the beginning of its establishment it is in the development Proudly, as it turned from a few isolated emirates into a powerful country, and the discovery of oil in the fifties of the last century contributed to a qualitative leap for the UAE economy, which was mostly reliant on fishing and pearling, and the UAE is considered today one of the most important economic centers in the Middle East, and the center of Global trade, and some Emirati companies have large investments in many countries of the world, as there has been a major qualitative leap in the field of education. The Emirates, to transform the UAE into a distinguished scientific edifice that advances education and provides its children with an education

comparable to that of developed countries. It has achieved unprecedented rates in the process of development, as the achievements that It has exceeded the time frame in which it was planned to take place, which is confirmed by growth rates, figures and international assessments when they monitor the extent of development at all levels (Al-Mutairi, 2019, 2).

The UAE government realizes that technological innovation is the decisive factor in transforming the developing countries into the ranks of the developed countries. From this point of view, the government set out to draw up a seven-year plan for 2014, aiming to make the UAE at the forefront of the most innovative countries in the world. This plan was called the National Strategy for innovation.

**First: The National Innovation Strategy:** This strategy aims to stimulate creativity in the seven fields that depend mainly on innovation in achieving its goals: (space, water, health, education, technology, transportation, and renewable energy), through the innovation pioneers represented by ( Innovative government, innovative companies and institutions, and innovative individuals), with the help of the innovation-supportive environment represented by (investment and incentives, supportive services, technological infrastructure, and the regulatory framework for innovation) (UAE Vision 2021, 2017, 11).

The strategy includes 30 national initiatives that include a set of new legislation, support for innovation incubators, building specialized national capacities, building global research partnerships, a set of private sector incentives, and changing the government work system towards more innovation. The strategy works through three parallel tracks. The track focuses The first is to establish an environment conducive to innovation, by providing an institutional environment and legislation supportive of innovation, expanding support for technological business incubators, focusing on research and development in the areas of innovation, and providing technological infrastructure that stimulates innovation in all sectors.

As for the second track, it focuses on developing government innovation by transforming innovation into institutional work and developing an integrated system of modern tools to help government agencies innovate, and directing all government agencies to reduce their expenses by 1% to be allocated to support innovation projects and launch educational and training programs in the field of innovation on state level.

The third track focuses on pushing the private sector towards more innovation, by motivating companies to establish innovation and scientific research centers, encouraging and supporting national companies to develop innovative products, and attracting international companies leading in the field of innovation in all sectors of national priority. As for the fourth track of the national strategy For innovation, it focuses on building individuals with high innovation skills, through building national talents and capabilities in the field of innovation, with a focus on science, technology, mathematics and engineering, developing educational materials in schools and universities for innovation, and consolidating a culture of encouraging innovation and entrepreneurship that respects and rewards the feet of innovation. Risk taking through cooperation between the government and the private sector (Hussain, 2016, 3).

The state's investments in innovation are estimated at \$3.78 billion annually, half of which is allocated to research and development. The National Innovation Strategy includes 16 indicators to measure the development in the implementation of the strategy, such as the percentage of innovative ideas in government agencies, and the proportion of government agencies that have succeeded in allocating 1% of their budget to support innovation. In addition to indicators related to the private sector, such as the index of companies' spending on research and development, the percentage of knowledge workers out of the total number of workers in the country, it also includes the global innovation index,

the number of patents, the index of the availability of scientists and engineers in the country, and other indicators (Ministry of Cabinet Affairs, 2015, 12)

**Second: Digital Transformation in the United Arab Emirates:** The UAE has launched a number of strategies for digital transformation and to keep pace with the developments of the Fourth Industrial Revolution. These strategies are:

- 1- Emirates Artificial Intelligence Strategy (2017-2031): This strategy aims to rely on artificial intelligence in services at a rate of 100% by 2031. The strategy targets a number of vital sectors, including: transportation, health, space, renewable energy, education, water, and the environment. and the traffic sector.
- 2- The Emirates Strategy for Digital Transactions (Blockchain) (2018-2021): This strategy aims to adapt and employ advanced technology, so that 50% of government transactions are transferred to the Blockchain platform, and the implementation of this strategy has saved about \$3 billion.
- 3- The National Cyber Security Strategy: This strategy aims to create a safe environment for individuals and companies and to support cyber security standards through different mechanisms and axes, and it includes an integrated system for cyber security based on five main axes: cyber security laws, an integrated and vital environment for cyber security, infrastructure protection program Vital Information Infrastructure, National Cyber Incident Response Plan, and Partnerships.
- 4- Digital transformation in the field of economy: The UAE government has adopted many initiatives for digital transformation in the field of economy, which has resulted in many positive results, including: a smart service that allows new investors to establish and start their business within only 15 minutes, an official portal for all open data in the country is published Data from all government and private agencies, 45% of the population have a credit card, 21.3% have a financial account on smart phones, 83% of the population buy goods and services from the Internet, 65.7% use smart applications for shopping (Telecom Regulatory Authority and Digital Government, 2020, 12 - 15th).

Those strategies and efforts made by the UAE have yielded positive results at the level of international and Arab indicators. Among these indicators are:

- A- First place globally in the public-private partnership index
- B - First place in the world in the government's purchase of advanced technology products.
- C- First place in the Arab world and 16 globally in the ease of doing business index.
- D- First place in the Arab world and (11) globally in the Digital Competitiveness Index.
- C- First in the Arab world and 34th globally according to the Global Innovation Index.
- H- First in the Arab world and (14) globally, according to the agricultural services index.
- G- Second place globally in the Entrepreneurship Index.
- D- Third place globally in the foreign investment and technology transfer index.
- Y- First place in the Arab world and (9) globally in the Global Competitiveness Index (Federal Center for Statistics and Competitiveness, 2020).

### **The third topic: Indicators of technological innovation in the United Arab Emirates:**

**First - Expenditure on Research and Development:** In 2021, the UAE launched the Research and Development Governance Policy, which led to the establishment of the Emirates Research and Development Council, as well as the National Guide to Measure Research and Development Expenditure in the Government Sector, in addition to the establishment of the Advanced Technology

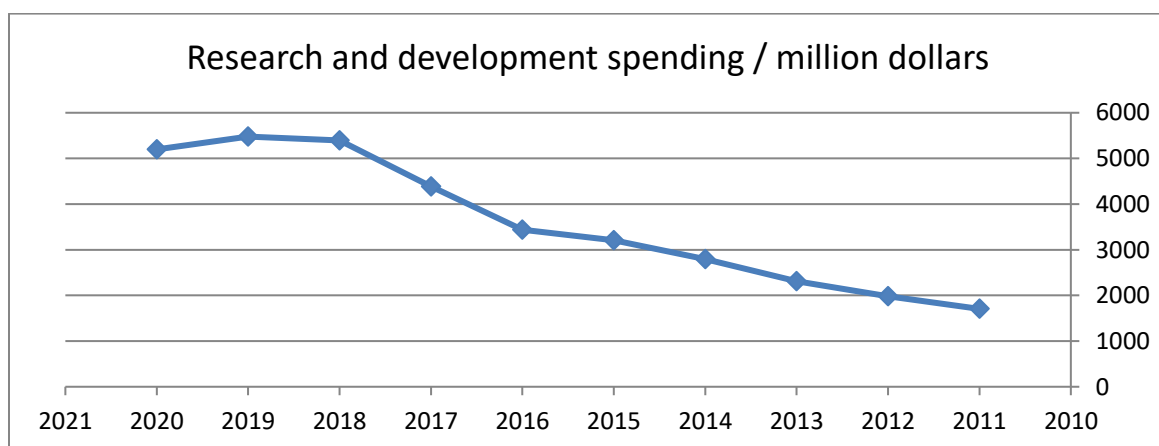
Research Center, in recent years. The picture seemed brighter in the UAE, where spending on research and development doubled to exceed 1% of GDP, occupying the 24th rank globally in terms of percentage (UNESCO, 2021).

It appears from Table (1) that there is a continuous growth in spending on research and development in the UAE, as it amounted to about 1705 million dollars in 2011, at a rate of 0.48% of the gross domestic product, then it rose to 1979 million dollars in 2012 with a positive growth rate of 13.8 %, and constituted 0.52% of the GDP. Expenditure on research and development continued to increase to achieve the highest growth rate in 2017 with a rate of 21.5% from 2016, and the growth rate of spending on research and development increased by a large percentage also in 2018 to reach 18.75% over the year 2017, then rose in 2019 to reach its highest value of \$5478 million, at a rate of 1.3% of the GDP, and then decreased relatively in 2020 to \$5201 million, but its percentage of GDP rose to 1.44% as a result of the latter's decline.

**Table (1)** Expenditure on research and development in the United Arab Emirates

the year	Research and development spending / million dollars	Gross Domestic Product / Million Dollars	Spending on research and development as % of GDP	Expenditure on research and development growth
2011	1705	350666	0.486	-
2012	1979	374590	0.528	13.845
2013	2314	390107	0.593	14,477
2014	2796	403137	0.694	17,239
2015	3205	358134	0.895	12,761
2016	3440	357045	0.963	6.8314
2017	4385	385605	1.137	21,551
2018	5397	422215	1.278	18.751
2019	5478	417215	1.313	1.4786
2020	5201	358868	1.449	-5.326

Source: Ministry of Economy, Annual Economic Report for the years 2012 to 2021, United Arab Emirates



**Figure 1** Evolution of expenditure on research and development in the United Arab Emirates.

Source: Prepared by the researcher based on Table (1).

It appears from Figure (1) that there is a continuous increase in spending on research and development, especially after 2014, as a result of the implementation of the national innovation strategy, according to which the government allocated large sums to spending on research and development. As for the decline in 2020, the reason is due to the outbreak of a pandemic Corona and the closure measures that reflected on most economic and social activities alike.

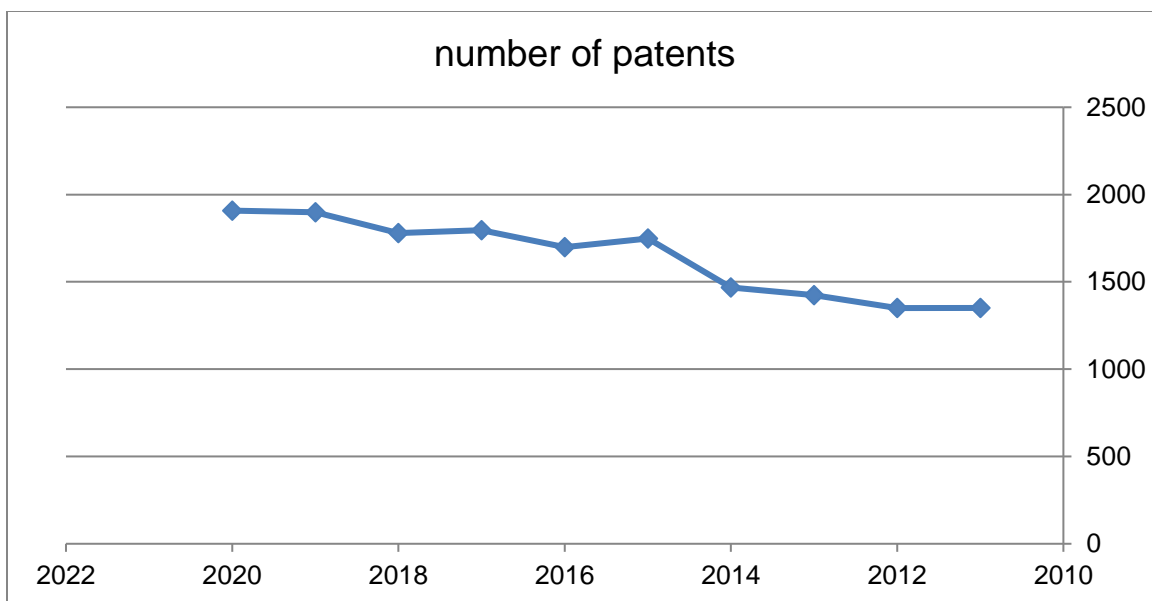
**Second - Patents:** The Ministry has placed the UAE economy among its priorities to develop the intellectual property system and protect the rights of inventors, which represents one of the main pillars of enhancing the innovation environment and building a knowledge economy, because of its importance in combating fraud and counterfeiting, preserving the rights of institutions, companies and individuals, encouraging invention owners and providing the climate It is appropriate to transform creative ideas into innovative applications and solutions that contribute to economic growth and upgrading the country's competitiveness (Ministry of Economy, 2018, 27), and the number of patents granted in the UAE has increased, as shown in Table (2).

**Table (2)** Evolution of the number of patents in the United Arab Emirates

the year	number of patents	Population / million people	Number of patents per million people	Patent growth rate
2011	1351	8.947	151	-
2012	1350	9.142	147.7	-0.07
2013	1423	9.198	154.7	5.13
2014	1467	9.214	159.2	2.999
2015	1749	9.263	188.8	16.12
2016	1699	9.361	181.5	-2.94
2017	1796	9.487	189.3	5.401
2018	1780	9.631	184.8	-0.9
2019	1898	9.771	194.2	6.217
2020	1908	9.89	192.9	0.524

Source: Ministry of Economy, Annual Economic Report for the years 2012 to 2021, United Arab Emirates.

It appears from Table (2) that there is an increase in the number of patents, as the number of patents granted in 2011 reached 1,351 patents and almost the same in 2012, at a rate of 151 patents per million people, and increased in 2013 to 1,423 patents at a growth rate 5.13% from 2012, and continued to increase to reach 1749 patents in 2015, with a positive growth rate of 16.12% from 2014, then decreased relatively in 2016 to reach 1699 patents, after which it continued to increase to reach 1908 patents in 2020, with a rate of 192.9 per million people, and a growth rate of 0.5% compared to 2019.



**Figure (2)** Number of patents granted in the United Arab Emirates

Source: Prepared by the researcher based on the data in Table (2).

It appears from Figure (2) that there is a clear development in the number of patents granted in the United Arab Emirates, especially after 2015, and this is due to the strategies adopted by the Emirates in encouraging innovation.

Third - Spending on Education: The state is responsible for spending on public education in all its stages, and Law No. 11 of 1972 indicates that education is free at all levels, and the state is committed to providing the buildings and human and material resources necessary to achieve the goals of education (Al-Ahmadi, 2018, 455) The higher education sector in the UAE is witnessing significant growth, as eight Emirati universities have recently been included among the top 3% of universities in the world, according to the QS World Rankings 2020, in addition to two universities being ranked among the top fifty universities in Asia, according to the university rankings. Asian 2019, issued by Times Higher Education Magazine 2019, (Abdullah, 2020, 2), and it appears from Table (3) that spending on education has increased remarkably with a relative decline in some years, reaching 5654 million dollars in 2011 and then It decreased to 4847 million dollars in 2012, with a negative growth rate of 16.6%, and then recorded an increase in 2013 to reach 5593 million dollars, with a growth rate of 13.3 percent and 1.4 percent of GDP.

Then it recorded a rise in 2014, reaching \$6145 million, with a growth rate of 8.9% and 1.52% of the GDP. Then it varied between rise and fall in small percentages in subsequent years, reaching its highest level during the year 2020, when spending on education reached 6458. million dollars, or 1.79% of the GDP. The average spending on education during the studied period amounted to 5975 million dollars, or 1.57% of the GDP.

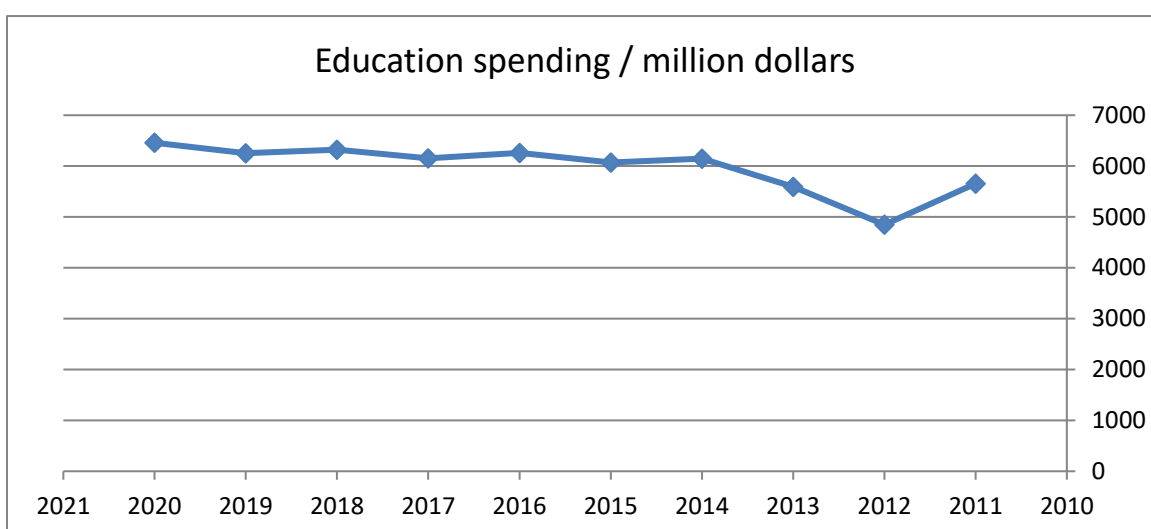
**Table (3)** Expenditure on education in the United Arab Emirates

the year	Education spending / million dollars	Gross Domestic Product/Million Dollars	Spending on education as % of GDP	Spending on education growth
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2011	5654.04	350666	1.6124	-
2012	4847.89	374590	1.2942	-16.6
2013	5593.55	390107	1.4338	13.3
2014	6145.29	403137	1.5244	8.98
2015	6069.68	358134	1.6948	-1.25
2016	6261.35	357045	1.7537	3.06
2017	6150.01	385605	1.5949	-1.81
2018	6324.86	422215	1.498	2.76
2019	6251.32	417215	1.4983	-1.18
2020	6458.49	358868	1.17997	3.21

Source: Ministry of Economy, Annual Economic Report for the years 2012 to 2021, United Arab Emirates.



**Figure (3)** The evolution of spending on education in the United Arab Emirates

The source was prepared by the researcher based on the data in Table (3).

The fourth topic: the growth of exports in the United Arab Emirates

First: The development of UAE exports: During the past decade, the United Arab Emirates made major investments to develop and expand its capacity in the infrastructure of the transport and storage sectors, in order to achieve the strategic objective of linking air and sea ports to achieve high efficiency for the transfer of goods and services to and from the Emirates, through the establishment of new projects (Dubai Logistics City), and Maktoum International Airport.

**Table (4)** The development of exports in the United Arab Emirates

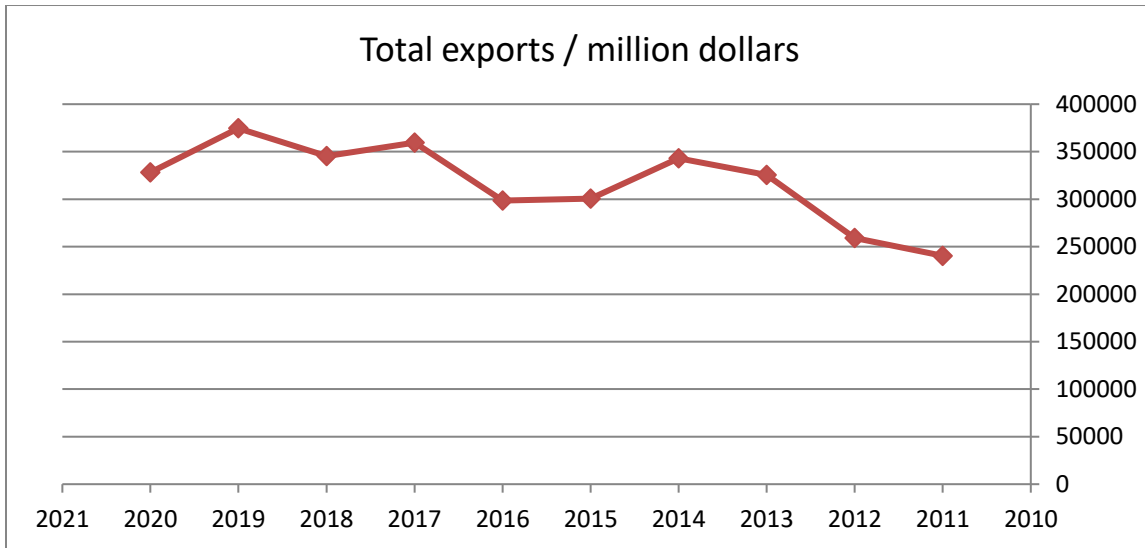
the year	Total exports / million dollars	High Tech Exports/ Million Dollars	Gross Domestic Product/Million Dollars	Exports % of GDP	High tech exports % of GDP	export growth	The growth of advanced technology exports
2011	240384	428	350666	68.551	0.1221	-	-
2012	259182	493	374590	69.191	0.1316	7.2528	13.185

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2013	325376	401	390107	83.407	0.11028	20,344	-22.94
2014	343063	1465	403137	85,098	0.3634	5.1556	.72,628
2015	300476	903	358134	83.9	0.2521	-14.17	-62.24
2016	298625	484	357045	83.638	0.1356	-0.62	-86.57
2017	359544	501	385605	93.242	0.1299	16,943	3.3932
2018	345500	676	422215	81.83	0.1601	-4.065	25,888
2019	374561	637	417215	89.776	0.1527	7.7587	-6.122
2020	328043	1155	358868	91.41	0.3218	-14.18	44.848

Source: Arab Monetary Fund data and World Bank data.

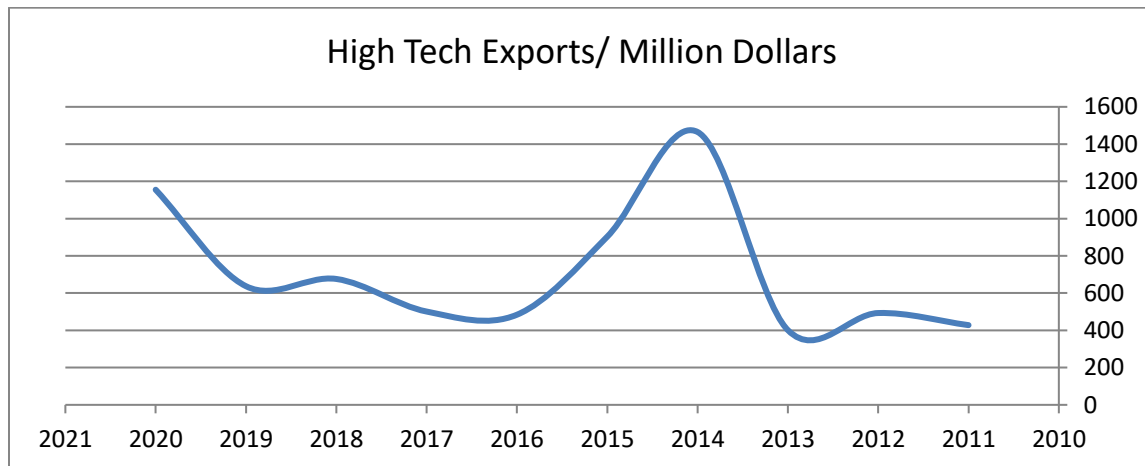
In addition to the expansion of existing projects such as (Dubai Cargo Village), Jebel Ali Port, and the development of free zones, as these investments have ensured the provision of absorptive capacity to carry out trade exchange operations with the outside world (import, export, and re-export), (Ministry of Economy, 2015, 15), and the UAE's exports have grown significantly in the last decade, and it appears from Table (4) that there is a significant increase in the volume of UAE exports after 2011, as it reached 325 billion dollars in 2013, with a growth rate of 20% over 2012, It accounted for 83% of the GDP, then rose in 2014 to reach \$343 billion, with a growth rate of 5%, and 85% of the GDP, and declined in 2015 to \$300 billion, with a negative growth rate of 14%, and decreased more In 2016, it reached its lowest level at \$298 billion, at 83% of GDP. The reason for the decline in the value of exports is due to the drop in oil prices at that time, because oil exports constitute a large part of total exports.



**Figure (4)** The development of exports in the United Arab Emirates  
The source was prepared by the researcher based on the data in Table (4).

After the rise in oil prices after 2016, UAE exports returned to rise to reach \$359 billion in 2017, with a growth rate of 16% over 2016, and a rate of 93% of GDP, and decreased relatively in 2018, to return to the rise in 2019, reaching its highest value during the study period, amounting to \$374 billion, with a growth rate of 7% and forming 89% of the GDP, and declining in 2020 to \$328 billion, however it was 91% of the GDP, due to The last drop due to the Corona pandemic.

As for the advanced technological exports, they varied between rise and decline during the studied period, as they amounted to 428 million dollars in 2011, or 0.12% of the GDP, and in 2012 they grew by 7% to reach 493 million dollars, then decreased to 401 million dollars in 2014, with a negative growth rate of 22%, and achieved a significant leap in 2014, reaching 1.465 billion dollars, with a growth rate of 72% over 2013, and it constituted 0.36% of the gross domestic product, with the latter rising to 403 billion dollars.



**Figure (5)** The development of advanced technological exports in the United Arab Emirates

Source: Prepared by the researcher based on table (4).

It is clear from Figure (5) that advanced technology exports declined significantly after 2014, reaching 903 and 484 million dollars in 2015 and 2016 respectively, with a negative growth rate of 86% in 2016, and then began to rise gradually after 2017, as It amounted to \$501 million, and rose to \$676 million in 2018, with a growth rate of 25%, and decreased relatively in 2019 to \$637 million, and then made a leap in 2020, reaching \$1.155 billion, with a growth rate of 44% over 2019. And at a rate of 0.32% of GDP. It should be noted that the average value of advanced technological exports during the studied period amounted to 714 million dollars, or 0.18% of GDP, which is a good percentage for this type of exports in the oil countries.

Second: Analysis of the relationship between innovation indicators and export growth in the United Arab Emirates:

The nature of the relationship between technological innovation can be reached through its indicators (expenditure on research and development, patents, spending on education), and the growth of exports through the two indicators (total exports, and advanced technological exports), as follows:

1- The relationship of technological innovation indicators with total exports: Figure (1) shows that there is a continuous increase in spending on research and development, coinciding with the increase in total exports. Figure (4), with the exception of 2015 and 2016, there is an increase in research and development accompanied by a decrease in Total exports, and this is due to the drop in oil prices, since oil constitutes a large part of UAE exports, as well as for patents. It appears from Figure (2) that patents for invention are constantly increasing accompanied by an increase in total exports, except for the years 2016 and 2017 for the same reason above. As for spending on education, Figure (3) shows that the shape of the curve tends to increase, accompanied by an increase in total exports as well, so it can be said that there is a positive relationship between technological innovation represented by (expenditure on research and development, patents, and spending on education) and the growth of

exports Represented by (total exports), the degree and strength of this relationship varies according to the nature of each of the three indicators, however, this relationship may be misleading, because the indicator of total exports includes various goods and services, including crude oil, and some These goods may be devoid of knowledge content (such as raw materials, live animals, fish, and pearls) and represent the bulk of the UAE's merchandise exports.

2- The relationship of technological innovation indicators with advanced technological exports: Referring to the graphs of technological innovation indicators (Figure 26, 27, 28) it seems that the curves' shapes tend to increase, as for advanced technological exports, it is clear from Figure (30) that the shape of the curve tends to increase. Significantly in 2014, and then declines in 2015 and 2016, and then returns to rise, but in general there is an increase in the volume of advanced technological exports during the studied period. As for the cases of decline that occurred, they may be attributed to the economic cycles experienced by the economies of countries, especially in In 2015 and 2016, however, there is a positive relationship between technological innovation represented by (expenditure on research and development, patents, spending on education) and export growth represented by (advanced technological exports). The increase in technological innovation indicators led to an increase in the growth of technological exports. developed in the United Arab Emirates.

## Conclusions

The research reached many conclusions, the most important of which are:

1. The implementation of the National Innovation Strategy and the Digital Transformation Strategy led to an improvement in the UAE's ranking in global development indicators, especially the Global Innovation Index, which ranked first in the Arab world, in addition to the Global Competitiveness Index and many other important indicators.
2. The research found that the UAE government's interest in education, especially through increased spending on education, led to the inclusion of eight Emirati universities among the top 3% of universities in the world, according to the QS World Rankings 2020, in addition to two universities being ranked among the top fifty universities. In Asia, according to the 2019 Asian Universities Ranking, Times Higher Education 2019
3. The research concluded that the continuous increase in spending on research and development coincided with the increase in total exports, except for the years 2015 and 2016. There is an increase in research and development accompanied by a decrease in total exports, and this is due to the decline in oil prices, since oil constitutes a large part Of the UAE exports, as well as patents, it is a continuous increase accompanied by an increase in total exports except for the years 2016 and 2017 for the same reason above. As for spending on education, the shape of the curve tends to increase, accompanied by an increase in total exports as well, so it can be said that there is a positive relationship Between technological innovation represented by (spending on research and development, patents, and spending on education) and export growth represented by (total exports), the degree and strength of this relationship varies according to the nature of each of the three indicators, however, this relationship may be misleading, because The index of total exports includes a variety of goods and services, including crude oil, and some of these commodities may be devoid of knowledge content (such as raw materials, live animals, fish, and pearls), and they represent the largest part. of the UAE's merchandise exports.
4. There is a positive relationship between technological innovation represented by (expenditure on research and development, patents, spending on education) and export growth represented by (advanced technological exports). The increase in technological innovation indicators led to

1028

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an increase in the growth of advanced technological exports in the United Arab Emirates during the studied period.

## Recommendations

1. We recommend the UAE government to invest its comparative advantage in the field of oil, by establishing oil refineries with high technological capabilities, and exporting it in the form of oil derivatives and engine oils instead of exporting oil in its crude form, because refining involves a greater added value.
2. We recommend developing countries, including Iraq, to follow the example of the United Arab Emirates with regard to the application of innovation strategies, and the establishment of institutions concerned with technological innovation, such as the Mohammed bin Rashid Al Maktoum Knowledge Foundation, because of its importance in transforming the economic structure from a rentier economy to an economy based on science and technology.
3. We recommend industrial companies in developing countries, including Iraq, to increase their spending on research and development, as it is the most important factor in converting comparative advantages into competitiveness. The problem of developing countries lies in the narrowness of the market, and in order to access global markets, this requires the production of high-quality goods and suitable prices to be able to compete. From competition, this can only be achieved through technological innovation.
4. Developing countries should give utmost importance to global development indicators, especially the Global Innovation Index and the Global Competitiveness Index, and take into account their sub-indicators and work in their light in a systematic manner in order to provide an appropriate climate for innovation.

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