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RESEARCH ARTICLE

Impact of Human Capital and Research Development, as one of the Global Innovation Indicators, on China's Exports Development

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ABSTRACT

The research is intended to know and measure the impact of human capital, as one of the global innovation indicators, on China's exports development, and it depends on both the descriptive approach and the analytical approach to study the concept, types and significance of innovation as well as development of both the innovation indicator and the human capital and research indicator, as one of innovation indicators in China. Statistical analysis tools such as correlation coefficient, coefficient of determination and regression coefficient were also used to measure the impact of human capital and research as an independent variable on China's exports as a dependent variable, and also to measure impact of the Chinese innovation indicator as an independent variable on China's exports as a dependent variable. The results show that a direct statistically correlation extends between human capital and research indicator and China's gross exports, as the Chinese government has paid a great attention to updating science and technology since 1970s, then China moved to implement the innovation-based economic development strategy. Thanks to the government's efforts in enhancing the domestic innovation models, China has become a model of developing the global innovation indicator, particularly the human capital and research indicator.

INTRODUCTION

Innovation is considered one of the most important sources of making fortune and pushing the economic development process through increasing competitiveness, improving productivity, improving services as well as improving the quality of making decisions. The Chinese government paid attention to updating science and technology in industry and agriculture sectors, then moved to implement the innovation-based economic development strategy, which required improving efficiency of the national innovation system. In order to study impact of human capital development, as one of the global innovation indicators, on China's exports development, it was depended on the descriptive approach as well as the analytical approach to study the concept, types and significance of innovation as well as development of both innovation indicator and the human capital and research indicator as one of innovation indicators in China. Statistical analysis tools, such as correlation coefficient, coefficient of determination and regression and variance coefficient, were also used to check the hypotheses of the study, which are measurement of impact of human capital and research as an independent variable on China's exports as a dependent variable, as well as measurement of impact of the Chinese innovation indicator as an independent variable on China's exports as a dependent variable. Significance of the study lies in getting to know the role of the Chinese government in developing the human capital and research indicator, as one of the most important global innovation indicators, and how China managed to advance the global innovation indicator in general and the human capital and research indicator in particular. The results show that a direct statistically correlation extends between human capital and research indicator and China's gross exports. Thanks to the government's efforts in enhancing the domestic innovation models,

China has become a model of developing the global innovation indicator, particularly the human capital and research indicator. The study is divided into introduction, theoretical framework, reference literatures, results and discussion, and recommendations.

LITERATURE REVIEW

Hypotheses of the study:

A statistically significant correlation extends between human capital and research indicator and gross exports.

A statistically significant correlation extends between global innovation key indicator and gross exports.

METHODOLOGY

in order to study impact of the development of human capital and research, as one of the global innovation indicators, on the development of China's exports, it was depended on both the descriptive approach and the analytical approach, so that we can get to know the concept, types and significance of innovation, in addition to studying human capital and research in China as well as the relation between human capital and research on one hand and all the innovation indicators and Chinese exports on the other hand. Data and information were collected from the International Bank and the World Intellectual Property Organization (WIPO) as well as revising scientific references. Statistical analysis tools, such as variance, correlation coefficient, linear regression, and coefficient of determination were also used to measure the impact of human capital and research as well as the impact of global innovation indicators on China's gross exports.

Concept of innovation:

Innovation is regarded a comprehensive term which includes a large number of innovation types. Innovation is not only technological, rather it is " social", "cultural", " institutional", " inclusive", " green", " ecological", " open", "user-paid" , " agile", " low-cost", " basic", "general", and " transformative" (Edwards-Schachter, & Wallace, 2017). Innovation means to provide "something new" that makes change, but innovation also refers to the "process" (way) in which a change takes place and sustains over time. Innovation includes both the revolutionary changes (the internet) and the small gradual changes (Dodgson, 2018). In light of what is mentioned above, innovation can be defined as generating creative ideas, implementing them successfully, and transforming them into goods and services. Innovation is the implementation of a new or significantly improved (goods or services), a process, a new marketing method or a new regulatory method in business practices.

Types of innovation:

There are various types of innovation, the most important of them may be: technological innovations, service innovation, processes innovation, business model innovation, social innovation. Mentioned below a simplified explanation of each one of innovation types:

Technological innovations: They are the ones which require a radical change in the science or technology used in products, requiring new resources of research and development. Companies need to develop new markets and advanced marketing skills. The new technological waves, such as mobility, cloud computing, internet of things, artificial intelligence, augmented reality and big data contribute to achieving the "every-thing-is- smart" future, which benefits companies, consumers and the entire society (OECD, 2017). It is likely that the technological gaps existing among countries could increase in the future, as headquarters of the world biggest 2000 companies are centered in few economies, particularly the United States, Japan and China, and 70% of the total expenses spent on research and development are centered in the biggest 200 companies (OECD, 2017). Demand for innovation undoubtedly firmly relates to sustainable development (Pansera & Owen, 2018). The need for studying innovation exceeds western models, rather it extends to emerging economies like China and India (Chen et al, 2018).

Service innovation: Services are very important for economic growth given its role in labor and production. Production of services focus on solving problems through intangible processes that include individuals' skills and materials. Service innovation includes fields such as mobility, logistics, information, knowledge, foods, healthcare and education. Technological innovations, such as cloud

computing, banking services and self-service technologies, have historically developed to enhance those services. Services sector is regarded the basis of social innovations and often relates to technological innovations (Edwards-Schachter, & Wallace, 2017).

Products innovation: Products innovation is considered the most popular, as it is defined as a new or significantly-improved product in terms of its properties and uses. Innovators, either companies or consumers, are able to achieve their innovations themselves, and protecting such innovations as intellectual properties is important (Gault, 2018). Production innovation and processes innovation are mutually related, as one generates need for the other. Flexible manufacturing and innovating manufacturing processes are regarded new methods of innovation with limited-resources, particularly in the shade of rapid technological development (Halova& Sims, 2016).

Processes innovation: Production innovation creates need for processes innovation and vice versa. Processes innovation generates need for a product (Halova & Sims, 2016). (Reichstein & Salter, 2006) define processes innovation as " new elements introduced into production processes or services in the organization- input materials, specifications of tasks, work and information flow mechanisms, and the equipment used to produce a product or provide a service aiming to achieve lower costs and higher quality for the product". Marketing methods to increase regulatory productivity is regarded one of the processes innovation components.

Business model innovation: Business model innovation includes amending the existing model or setting up a new model that better meets clients' needs and improves work performance. Regulatory and marketing innovations play a critical role in achieving that uniqueness and excellence in business models. (Gault, 2018) defines regulatory innovation as implementation of new or significantly-mutated methods in business practices and regulating business and foreign relations. Platforms of cooperative and multiple-sectors innovation, such as digital social innovations, contribute to introducing new markets into developing countries and accessing the pyramid-base clients, and focus on developing the technological and social innovations for poor and deprived segments, aiming to maximize value and minimize costs while trending to sustainability through green and ecological business models (Dentchev et al, 2016).

Importance of innovation:

Innovation is regarded one of the most important sources of making fortune and pushing social and economic development process. Innovation is also regarded the most important means to increase competitiveness, particularly improving productivity of institutions, improving the services rendered to consumers and improving the quality of making decisions. Therefore, importance of innovation is attributed to the role it plays in developing the society. Importance of innovation varies in different sectors, the most important of them are (Dereli (2015):

Economic growth: Innovation contributes to improve efficiency of using economic resources, hence enhancing sustainable economic growth.

Creating job opportunities: Innovation leads to developing new products and services, thus providing new job opportunities in different economic sectors.

Improving life quality through innovating new and sophisticated products that contribute to raising the standard of living and welfare of society.

Solving problems: innovation contributes to finding innovative solutions for the challenges existing in different sectors, particularly economic, ecological and social challenges.

Concept of global innovation indicator:

Global innovation indicator is intended to measure economic performance in the field of innovation, and it helps assess the progress achieved annually in the field of innovation. Innovation indicator includes 130 countries, and there are seven global indicators as follows:

Institutions indicator: It includes political environment, regulatory environment and business environment.

Human capital and research indicator: It includes education, intermediate education, research and development.

Infrastructure indicator: It includes information technology and communications, public infrastructure and energy.

Markets development indicator: It includes credit, investment, commerce, diversification and market size.

Business development indicator: It includes knowledge works, innovation links and knowledge absorption.

Knowledge outputs indicator: It includes creating knowledge, knowledge effect and knowledge dissemination.

Creative outputs indicator: It includes intangible assets, creative goods and services and online creativity.

Innovation development in China:

Since 1970s, the Chinese government has paid attention to upgrading science and technology particularly in industry and agriculture sectors, which formed the basis of reform and openness, then China proceeded to implement the innovation-based economic development strategy in 2006, which required improving efficiency of the national innovation system, setting up the basic structure needed for innovation, and implementing a group of procedures to reform the financial and banking system. As it was expanding the scope of market mechanisms and stimulating innovation at the micro level, China did not neglect the macroeconomic levers needed for achieving the strategic targets, so China took the initiative to set up high-tech zones, technology parks, clusters of creativity, and funds to support creative enterprises. Science and production were also integrated in the process of major companies formation, and industrial companies became a key link in the Chinese economic system, and China ranked first worldwide in terms of the number of patent applications filed with national patent agencies (Babenko et al, 2020).

One of the most important companies that focus on research, development and innovation is Huawei Technology in the electronic industries field, and which ranks third in the smart phones market after Apple and Samsung. Baidu, Ali Baba and Tencent are regarded among the most important companies which have set up platforms to provide services on mobile phones, contributing to developing digital economic systems as well as the " Super Apps" paid via mobile phones and which allow a person to be excluded from payment process, contributing to offering innovative services such as motorbikes sharing systems, automatic restaurants, automatic car parks, in addition to the Chinese innovations in the industrial production field, which depend on developing supply chains, such as drugs industry, communications and information technology as well as medical and industrial equipment (Babenko et al, 2020).

The turning point was in 2006 when China officially released the medium and long-term plan for science and technology development (2006-2020), a milestone in China's economic transformation. This strategy is intended to globally make China a flagship country in innovation field through developing its innovative economy. The essence of this strategy in particular is to boost the local innovation models which include the following three sides: introducing technology through digestion and absorption, integrating innovation and promoting original innovation. (Chen et al, 2018).

Implementing the medium and long-term plan for science and technology development strives to ensure that China's prosperity will be shared in the future by the whole population through comprehensive development (Liu et al, 2017).

Table 1: The relation between human capital and research on one hand and all the innovation indicators as well as China's exports during the period (2011-2022) on the other hand.

Data ____ Year	Spending percentage on education from GDP	Spending percentage on research and	GDP in trillion US$	Human capital and	Rank of human capital and	Global innovation indicator in China	Rank of global innovation	China's gross exports

		development from GDP		research indicator	research indicator		indicator in China	(trillion US$)
2011	%3.80	%1.78	7.55	39.9	56	46.4	33	2.01
2012	%4.30	%1.91	8.53	31.4	84	45.4	34	2.18
2013	%4.10	%2.00	9.57	40.6	36	44.7	35	2.35
2014	%4.10	%2.02	10.48	43.4	32	46.6	29	2.46
2015	%4.20	%2.06	11.06	43.1	31	47.5	29	2.36
2016	%4.20	%2.10	11.23	48.1	29	50.6	25	2.20
2017	%4.10	%2.12	12.31	49.2	25	52.5	22	2.42
2018	%4.00	%2.14	13.89	47.8	23	53.9	17	2.66
2019	%4.10	%2.24	14.28	47.6	25	54.6	14	2.63
2020	%4.20	%2.41	14.69	49.4	21	55.7	14	2.73
2021	%4.00	%2.43	17.82	50.6	21	57.5	12	3.55
2022	%4.00	%2.54	17.88	53.1	20	56.6	11	3.71

Source: https://www.wipo.int https://data.albankaldawli.org/

The relation between human capital and research indicator on one hand and global innovation indicator and China's exports on the other hand witnessed a significant development during the period (2011-2022). The human capital and research indicator includes three sub indicators: education, intermediate education, and research and development. In order to study this indicator, focus will be on expending on education, expending on research and development in China during the period (2011-2022), as the International Bank data refer to rise of spending percentage on education as well as the spending percentage on research and development from gross domestic product (GDP) during the same period, and table No.1 shows development of the relation among these indicators.

Table No.1 shows that spending percentage on education from GDP increased from 3.8% to 4.2% during the period (2010-2011) and decreased to 4.0% during the years 2021-2022, as China managed to enroll children to primary and intermediate schools and taught them basic knowledge and skills of mathematics and language. They were also trained to be disciplined and productive, thus China could offer sufficient numbers of low-waged and low-skilled labor that contributed to pushing manufacturing sector in the 1980s and early twenty-first century (Li, et, la, 2017).

Table No.1 also shows that China's spending on research and development increased from US$ 139.7 billion, around 1.83% of GDP, in 2011, to US$ 456 billion, around 2.55% of GDP, in 2022 (NBS, 2023), indicating the huge increase of China's spending on research and development, as it increased by 226% during the period (2011-2022), which confirms keenness of the Chinese government on depending on research, development and innovation to push the economic development process. The successful economic reforms formed the basis to move from the poor countries group into middle-income countries group, rather, China is striving to proceed into the economically-advanced high-income countries. Worth noting is that China has topped the list of pioneering countries in attracting direct foreign investment, and this is attributed to the continuous flow of workers into labor market, injecting huge investments in the infrastructure, and increasing industrial capacities, in addition to low-waged labor, thus low-cost of production and increase of production, which contributed to transforming small firms into large companies that have a competitive advantage in international markets. These companies gained experience and knowledge in emerging markets, witnessed a gradual development and switched from technology-imitating companies into creative and innovative ones.

Table No.1 also shows increase of the value of human capital and research indicator from 39.9 in 2011 (WIPO, 2011) to 53.1 in 2022, the highest value of that indicator during the same period and with which China ranked 20th worldwide, indicating the great attention paid by China to develop human capital and research indicator, which includes education index at the 7th place globally, a very globally advanced rank, high education index at the 92nd place globally, a very low rank, in addition to research and development index at the 70th place globally (WIPO, 2022), a very low rank comparing to global innovation indicators. The table also shows development of global innovation indicators: value of the global innovation indicator in China increased from 46.4 in 2011 (WIPO, 2011) to 56.6 in 2022 (WIPO, 2022), an increase by 22% during the period (2011-2022). China also proceeded in the global innovation indicator from the 92nd place in 2011 (2011, WIPO) to the 11th place in 2022 (WIPO, 2022), as China advanced about 18 places during the same period, indicating the great attention paid by China to develop innovation indicators and compete the developed industrial countries.

However, the increase of applications for patents by the Chinese citizens is a clear evidence on development of human capital during recent years, as China took the initiative to set up high-tech zones, funds to support creative enterprises, technology parks and clusters of creativity,. Science and production were also integrated in the process of major companies formation, industrial companies became a key link in the Chinese economic system, and China ranked first worldwide in terms of the number of patent applications filed with national patents agencies (Babenko et al, 2020).

The table also shows the steady increase in the ration of spending on research and development from GDP from 1.7% to 2.54% during the period (2010-2022), indicating how the Chinese government is keen on paying attention to spending on research and development and switching into knowledge-based economy. China occupies varying ranks in the human capital indicator as China ranks 7th globally in the education index, a very globally advanced rank, 92nd globally in high education index, a very low rank, in addition to research and development index at the 70th place globally (WIPO, 2022), a very low rank comparing to global innovation indicators.

Previous studies:

A study conducted by (Pertichino, 2023) addressed the phenomenon of the sophisticated technological clusters in Israel as well as dynamics of globalization and innovation. The study concluded that Israel has paid attention to innovation ecosystem since the 1970s, then focused on disseminating research and development in business sector since early 1990s. Israel's success is attributed to paying national attention to innovation, implementation of a long-term strategies that focus on high technology, entrepreneurship, human capital and government aids to stimulate economic progress. Israel's experience is regarded a model of developing technology clusters to enhance economic progress through innovation and technology.

A study conducted by (Gurler, 2021) concluded that the countries which invest in research and development and have a large number of researchers get a bigger number of patents, which enhances high-tech exports, and that direct foreign investment contributes to enhancing research, development and increasing innovation, which leads to recording more patents and increasing high-tech exports. In the Organization of Economic Cooperation and Development (OECD) countries the relation between high-tech exports and patents is stronger than it is in emerging countries, however, the relation between spending on research and development and high-tech exports in emerging countries is stronger than it is in OECD countries.

A study conducted by (Sharma et al, 2021) and addressed foreign competitiveness and domestic innovation: proofs from American patents. The study concluded that over long-term, diversifying exports, technological innovation and capital formation contributed to expand the scope of renewable energy consumption in the BRICS countries, as expansion in the exports of new products led to reducing renewable energy consumption, however, exports of traditional products increased using renewable energy solutions over long-term. Moreover, the growing technological innovation helped enhance using clean energy solutions.

A study conducted by (Wu et al, 2021) and addressed detangling the impacts of business groups in the relation between innovation and export. The study concluded that China has become a big rival in innovation world through increasing spending on research and development (as a measure of innovation inputs) and doubling patents in the domestic market (as a measure of innovation outputs). These achievements contradict the prevailing belief that China's international competitiveness basically depends on low-wage labor and the high levels of investment in the physical capital, as innovation dramatically affects companies exports performance, indicating that companies need to implement strategies to support innovation and benefit from innovative outputs to improve export performance.

A study conducted by (Chalioti, et al, 2020) and addressed innovation, patents and commerce: analysis at the firm level. The study concluded that as competition intensifies among exporters of non-innovative products, innovative companies have a greater export advantage comparing to their non-innovative rivals, as innovative companies compete over the market share against several non-innovative rivals. Worth noting is that patents grant a monopoly of an invention for a limited period (usually 20 years from date of filing the application) in exchange for full disclosure of the invention, so companies strive to protect their innovations through patents.

A study conducted by (Autor et al, 2020) and addressed foreign competition and domestic innovation: proofs from American patents. The study concluded that the growing competition by Chinese imports negatively affects innovation at the firm and technology level. This effect is clearly manifested in both the outputs (patents) and inputs (research and development expenses). This negative effect also applies to producing patents in the private sector, however, results confirm that response to innovation by the American companies, that are more vulnerable to China's growing competition, was clearly and significantly negative.

A study conducted by (Durmaz & Yildiz, 2020) and addressed impact of innovation in high-tech exports process: analysis of BRICS countries. The study concluded that a strong positive relation exists between patents and exports of high-tech products. Therefore, innovation is regarded an important factor to enhance exporting these products in the BRICS countries. The study asserts the necessity to focus on innovation activities to create a high added value, and that technological transformation, the labor market that has a high stock of human capital, and political and economic stability are the key factors of the economic growth rates that some countries have experienced recently. In order to achieve a sustainable economic growth and narrow the gap with developed countries, countries need to increase their exports of high-tech products through enhancing research and development activities.

A study conducted by (Babenko et al, 2020) which addressed developing innovations in China under globalization circumstances. The study concluded that implementing a comprehensive innovation strategy requires improving efficiency of national innovation system, setting the infrastructure needed for innovation and implementing a group of procedures to reform the financial and banking system. The study found that national innovation system in China has become an important factor in developing economy, science and technology, which enabled the country to become one of the major economist countries in the world. As it was expanding market mechanisms and stimulating innovation at the micro level, the Chines government did not neglect the macroeconomic levers needed for achieving the strategic goals. China took the initiative to set high- tech zones, technology parks, innovation clusters and funds to support innovative enterprises. Science and production were also integrated into the major companies formation process which organizationally and economically combined strong production and the scientific potentials for a specific industry. Major industrial companies have become a key link in the Chinese economic system, and China ranked first worldwide over the patent applications filed with national patent agencies. Today, the patent applications filed with patent office in the People's Republic of China are more than the ones filed with patent organizations in the United States and Japan together.

A study conducted by (Bayraktutan & Bıdırd, 2018) and addressed innovation and high-tech exports in developed and developing countries. The study concluded that developing countries should implement long-term, stable and strategic science and technology policies instead of short-term and unstable approaches in order to improve technological development indicators, as performance of technological development has a basic importance in developing foreign trade. The study also asserts the importance of setting policies and mechanisms intended to dedicate more funds from national income for research and development, in addition to setting regulations for training highly-qualified labor (human capital development) needed for research and development sector. Intellectual properties should be also protected to encourage the innovative activities, and implement the incentives policies to attract direct foreign investment and research and development institutions. The share of private sector in research and development activities should be increased through coordination and information exchange between the public and private sectors.

RESULTS AND DISCUSSION

First hypothesis: A statistically significant correlation exists between human capital and research indicator as an independent variable and gross exports as a dependent variable.

Table 2: Imple linear regression coefficient between human capital& research and China's gross exports, averages and variance of human capital& research and gross exports during the period (2011-2022).

Simple linear regression between human capital& research and China's gross exports during the period (2011- 2022)

Data	Correlation coefficient	Determination coefficient R Square	Value F	Regression coefficient B	Significance level
Human capital& research and China's gross exports	0.69	0.47	8.89	0.06	0.014
Averages and variance of human capital& research and China's gross exports during the period (2011- 2022)					
Data			**Average**	**Standard deviation**	**Variance**
Human capital& research and China's gross exports			45.35	5.98	2.45

Table No.2 shows the relation between human capital& research indicator and China's gross exports. Results of statistical analysis showed that a direct statistically significant correlation exists between human capital& research indicator and China's gross exports, as correlation coefficient amounted (0.69) and the determination coefficient amounted (0.47) respectively. The value (F) which amounted (8.89) with a significance level (0.014), and it is a function at the significance level (0.05), confirms existence of a direct correlation, which means that each increase in the human capital& research leads to an increase in China's gross exports. Table No.2 also shows that human capital and China's gross exports average is 45.35 with standard deviance 5.98 and variance amount 2.45, thus, standard deviance is little as it is less than third of the average, indicating that data is less distracted and that data is tightly clustered around the average.

Second hypothesis: A statistically significant correlation extends between global innovation indicator in China and China's gross exports during the period (2011-2022).

Table 3: Shows simple linear regression between global innovation indicator, China's gross exports, averages and variance of the global innovation indicator, and China's gross exports during the period (2011-2022).

Simple linear regression between global innovation indicator and China's gross exports during the period (2011-2022)					
Data	**Correlation coefficient**	**Determination coefficient R Square**	**Value F**	**Regression coefficient B**	**Significance level**
Global innovation indicator and China's gross exports	0.78	0.62	16.13	0.087	0.002
Averages and variance of global innovation indicator and China's gross exports during the period (2011-2022)					
Data			**Average**	**Standard deviation**	**Variance**
Global innovation indicator and China's gross exports			51	4.70	2.17

Table No.3 shows the relation between the global innovation indicator and China's gross exports. Results of statistical analysis showed that a direct statistically significant correlation exists between the global innovation indicator and China's gross exports, as correlation coefficient amounted (0.78) and the determination coefficient amounted (0.62) respectively. The value (F) which amounted (16.13) with a significance level (0.002), and it is a function as it is less than the significance level (0.05), confirms existence of a direct correlation, which means that each increase in the global innovation indicator in China leads to an increase in China's gross exports. Table No.3 also shows that global innovation indicator and China's gross exports average is 51 with standard deviance 4.70 and variance amount 2.17, thus, standard deviance is little as it is less than third of the average, indicating that data is less distracted and that data is tightly clustered around the average.

Results of the statistical analysis match with (López-Bazo & Motellón, 2018) study which indicates that innovation contributes to increasing productivity of companies in the future and getting products that are more attractive, thus, making it easy for companies to face export additional costs, achieve high levels of productivity and increase competitiveness. As benefits of innovation allow companies in some regions to cover export costs, the policies intended to stimulate innovation are likely to be effective in enhancing exports through increasing the number of exporting companies in Spain. The results also match with (Dumaz & Yildiz, 2020) study which indicates that a significant positive relation extends between the number of patents in countries and exporting high-tech products, therefore, innovation is regarded an important factor to boost exporting high-tech products of BRICS countries, and that innovation activities should be paid a great attention to create

a high added value in these countries. The results also match with (Bottega & Romero, 2021) study which asserts that technological competitiveness has a greater impact on high-tech exports comparing to low-tech exports. It also asserts the importance of switching towards producing high-tech products to achieve a higher growth in exports. Results of the statistical analysis of the global innovation indicator and China's gross exports match with (Wu et al, 2021) study which indicates that innovation dramatically affects companies exports performance, therefore, companies need to get strategically involved in innovation and benefit from innovative outputs to improve exporting performance, as innovation is considered a means to develop the Chinese companies, and it is the key driver of exports development.

CONCLUSION

China has paid a great attention to macroeconomic levers required to achieve the strategic goals of the innovation-based economic development as it took the initiative to set up high-tech zones, technology parks, innovation clusters and funds to support the innovative projects. China has ranked first worldwide in terms of the number of patent applications filed with national patent agencies, and it proceeded in the global innovation indicator from the 29th place to the 11th place during the period (2011-2022). The growing demand for patents by the Chinese citizens is regarded a clear evidence on development of human capital and research. China has also witnessed a steady increase in expending on research and development from GDP, indicating China's interest in developing innovation indicators and competing the exports of developed industrial countries. Results show that a direct statistically significant correlation extends between human capital& research and China's gross exports, and that standard deviation is little as it is less than third of the average, indicating that data is less distracted and is tightly clustered around the average. Results also show that a strong direct statistically significant correlation extends between global innovation indicator in China and China's gross exports, and that standard deviation is little as it is less than third of the average, indicating that data is less distracted and is tightly clustered around the average. In the future, researches can be done on impact of development of expending on education in exports development, expending on research and development and its impact on exports development, and impact of innovation on improving productivity and exports competitiveness.

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