UNESCO: China Accounts for over 40% of Global Research Spending Increase

By Cao Cong

China's R&D expenditure has reached new heights, accounting for more than 40 percent of the global increase in research spending.

That's according to the recently released United Nations Educational, Scientific and Cultural Organization(UNESCO) Science Report: The Race Against Time for Smarter Development.

The Science Report is an essential UNESCO publication that aims to monitor global trends in scientific governance and shows the development paths that countries are pursuing.

The report contains the following key points:

China accounted for more than 40 percent of the increase in global research spending in 2018

China's R&D expenditure has reached new heights, accounting for more than 40 percent of the global increase in research spending in 2018.

Between 2014 and 2018, global spending on research soared 19.2 percent, outpacing global GDP growth (14.8 percent). More than 30 countries increased their research spending, with 44 percent of the increase coming from China.

G20 countries account for 93 percent of global research spending. Among them, China's global R&D investment increased from 21.2 percent in 2014 to 24.5 percent in 2018.

The global average R&D intensity, which is the ratio of gross expenditure on R&D to GDP, increased from 1.73 percent in 2014 to 1.79 percent in 2018, but 80 percent of countries still have less than 1 percent R&D intensity.

In 1996, China's R&D intensity was 0.56 percent; in 2018, it reached 2.19 percent, and increased to 2.4 percent in 2020.

China's R&D intensity is expected to rise to 2.8 percent by 2030.

Scientific development achievements are laudable

In recent years, China has developed a number of strategies to reduce its dependence on core foreign technology in certain industries, thus overcoming the "middle-income trap."

Today, China has the highest number of international patent applications. With 31.7 percent of global applications, China exceeds 21.7 percent of the US, 20 percent of Japan, and 13.9 percent of the EU.

China has made achievements in areas such as space technology, supercomputing, and cutting-edge strategic technologies, while the country has prioritized research on artificial intelligence and brain science for the coming years. In addition, China's manufacturing technology is increasingly sophisticated, and efforts to enhance its own innovation capabilities have paid off. Local giant Huawei is a global leader in 5G technology.

China has also made great strides in fin-tech such as mobile payments, blockchain, cryptocurrencies, digital currencies, and other areas.

The prospect of green development and transformation is promising

In 2018, China's GDP per capita reached $15,243 in purchasing power parity (PPP) terms, which means it has achieved the first of its nine priority goals for sustainable development, namely, eradicating poverty and hunger.

China has proposed to be carbon neutral by 2060. To achieve its 20 percent non-fossil energy consumption goal by 2030, China is developing nuclear, hydroelectric, wind, and solar power. In addition, China has introduced "the ban on using plastic bags" to eliminate plastic bags by 2022 and reduce the use of non-biodegradable disposable plastic tableware in catering take-out in cities above the prefecture-level by 30 percent by 2025.

Compared to 2005, China's carbon dioxide emissions per unit of GDP, or carbon intensity, fell by 46 percent in 2018, meeting the 2020 target of a 40 percent to 45 percent reduction in carbon intensity.

China also encourages companies to work with partner countries of the Belt and Road Initiative. In 2017, a series of guidelines were adopted to achieve this "green" initiative.

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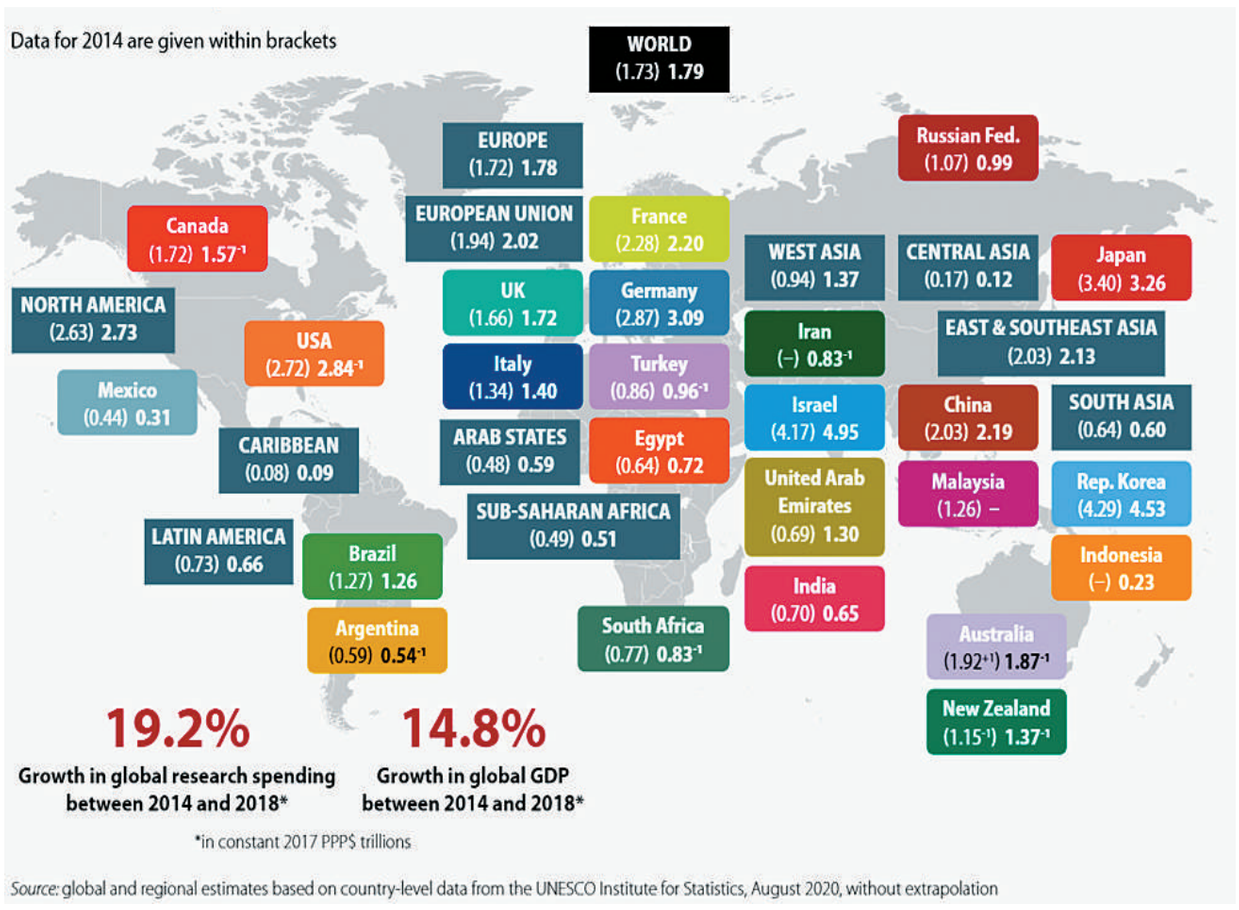

The figure shows the investment in research as a share of GDP by region and selected country, 2014 and 2018 (%) (PHOTO: UNESCO)

Time to Get Even - the Value of Research Diversity

By Jonathan Adams

"Diversity" has long been a watchword in fields such as economics and ecology, and in recent years has gained prominence in the conversation around increased racial, ethnic and cultural representation across the public and commercial sectors.

Diversity also pertains to research – not only to researchers, but also to the balance of subject fields embraced by universities, research institutions and nations as a whole.

Our latest Global Research Report from the ISI at Clarivate, examines this latter aspect, indexing levels of subject diversity over the last 40 years, in selected samples representing institutions as well as nations. To demonstrate the relevance of subject diversity, we also investigate its role in the global research community during the COVID-19 pandemic.

Seeking balance

The authors of the latest Global Research Report turned to the Web of Science(WOS) and its collection of indexed journals spanning more than a century, with curated, consistent treatment of publications representing a constant set of 250 subject areas as reference material? Our analysis focused on research indexed from 1981 to 2018.

This report relies primarily on the alternate terms "balance" and "evenness" in referring to a diverse research portfolio reflecting many disciplines. This contrasts with programs that lean more toward specialization in comparatively fewer disciplines.

To control the large differences in paper output between different subject areas, along with other complexities in such a large, multiyear sample of publications, we normalized the data against the WOS Core Collection as a sound global reference baseline for uniform comparison. We also used the Gini coefficient – initially developed in economics to convey income disparity – as a gauge to track the evenness in subject-matter output over the decades.

A closer look at samples

In examining selected nations, the report charts the diversity of subject fields for Canada, France, Germany, Italy, Japan, the UK and the US, as well as Brazil, Russia, India, Mainland China and South Korea.

Our findings include the observation that Germany and the US have tended to display a more even balance of subject concentration over recent decades. Meanwhile, Chinese Mainland and South Korea, for example, have moved from an initial footing of greater specialization toward increased balance.

At the institutional level, the report examines subject diversity as displayed by selected universities in the UK and Australia. Results suggest that Australian universities have cultivated greater diversity, while some large UK institutions have retained a lower balance of specialty areas.

Looking ahead

Creating a custom database based on COVID-related keywords, we parsed some 67,000 reports published during 2020 and 2021. The aim was to learn which countries responded with research of particular relevance to confronting the pandemic.

The results showed that countries with evenly balanced research portfolios – especially the US, Germany and the UK – produced papers in the most comprehensive range of topics pertinent to COVID-19. South Korea and Chinese Mainland are technology specialists with less diverse portfolios, which impacted the range of research they published in response to this crisis.

With this finding, the report demonstrates that analysis of subject diversity goes beyond typical citation analysis, which generally looks backward at performance.

Instead, learning lessons from a balanced research portfolio can guide institutions and nations alike in steering their future efforts – for normal planning and management, as well as preparation against unforeseen circumstances.

The author is Chief Scientist, Institute for Scientific Information at Clarivate.

Taikonaut's Dine on Microwave Oven Meals in Space

By YU Haoyuan

A microwave oven is an indispensable item of kitchenware in most homes, but astronauts have never used this cooking tool in space. Early astronauts ate space food from toothpaste tube-like containers, squeezed straight into their mouths, to prevent food from floating around the cabin due to lack of gravity. Times have changed and taikonauts(Chinese astronauts) now enjoy a variety of more than 120 kinds of space food, with a long shelf life, ensuring they are well-fed with three hot meals a day.

The Shenzhou-12 manned spacecraft successfully sent three taikonauts to the Tianhe core module on June 17. The three taikonauts used an aerospace microwave to cook their meals for the first time, creating history for space dining.

The aerospace microwave oven, which aims to provide healthy food for astronauts in the space station's core module, was developed by Chinese technology company Galanz over ten years.

As requested, the aerospace microwave oven needs to withstand high-frequency turbulence during the rocket lift-off, and work for ten years continuously in space, heating quickly and evenly.

The key to the success of the project lies primarily in the efficiency of the magnetron and the restructuring of the aerospace microwave oven. The Galanz research team focused its R&D on strengthening special magnetron control technology.

With the help of components and parts integration innovations, the research team has developed the aerospace microwave oven to reach an energy efficiency of super level I, can cook a staple meal for three taikonauts in 7 minutes.

In order to reduce the volume and weight of the microwave oven, and meet the reliability requirements of space operations, the researchers have not only creatively adapted fasteners, integral molding and other innovative features to reduce the size of the microwave oven, but also used frequency conversion microwave power instead of the traditional high-voltage transformer, greatly reducing weight of the product.

The aerospace microwave oven is a microcosm of China's world-leading aerospace technology. With the introduction of this technology, China has become the first nation to provide astronauts healthy and delicious hot meals in space by using a microwave oven.

With the help of the aerospace microwave oven, taikonaut can well-fed with three hot meals a day. (PHOTO: VCG)

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Meanwhile in Luopu County, Xinjiang, poverty alleviation funds of more than 60 million RMB have been used to build the largest pigeon breeding base in Hotan area, employing 193 poor people and lifting 7,900 impoverished households out of poverty with income increase of more than 1,000 RMB per capita.

S&T Empower Poverty Eradication

Over 66 million RMB has been invested in the national key R&D programs of "high-quality and high-yield major cash crops and the improvement of quality and efficiency of sci-tech innovation by industries," "blue granary sci-tech innovation," "key technology R&D for food safety," and other key special projects to make aquaculture, fungus and rare edible mushrooms industries larger and stronger.

The poverty alleviation work through science and technology has made significant achievements. The sci-tech departments of all levels in China have established 1,290 innovation and entrepreneurship platforms in poverty-stricken areas, formed 77,000 sci-tech assistance pairs, selected 289,800 sci-tech commissioners, invested more than 20 billion RMB, implemented 37,600 projects, and promoted the application of more than 50,000 new advanced and practical forms of technology.

Since the 18th National Congress of the Communist Party of China (NCCPC), the MOST has firmly grasped the poverty alleviation strategy: targeted poverty alleviation, shown the will to fight against poverty should be put ahead of poverty alleviation, and understood that knowledge and skills needed should be provided at the same time.

Sci-tech departments of all levels in China have implemented 37,600 sci-tech projects at all levels in poverty-stricken areas, including national key R&D programs and special projects for the central-guided local science and technology development, leading the rapid development of poverty alleviation industries.

The application of more than 50,000 advanced practical technologies such as "integrated rice-fishing cultivation technology" and "smash-ridging technology," have been promoted, which injected strong momentum into the high-quality development of industries in poor areas.

Poverty alleviation through science and technology is an important part of the national poverty alleviation and development strategy. The sci-tech poverty alleviation action is one of the top ten poverty alleviation actions determined by the State Council's Leading Group of Poverty Alleviation and Development in 2016.

China saw the number of impoverished rural residents decline from nearly 770 million in late 1978 to 5.51 million by the end of 2019 based on the poverty standard of the respective year, as shown by data from China's National Bureau of Statistics. And the poverty headcount ratio dropped to 0.6 percent from 97.5 percent during the period, with regional overall poverty being basically eradicated. On the road to poverty alleviation, China eventually bridged the huge number gap between 97.5 percent and 0.6 percent with decades of unremitting efforts.

A Great Contribution to the World

In 2000, 189 countries signed the United Nations Millennium Declaration. To halve the number of people living in extreme poverty by 2015 is the first of the "Eight Millennium Goals," and China is the first developing country to make it happen. On September 15, 2015, the United Nations adopted the 2030 Agenda for Sustainable Development, and eradicating extreme poverty is once again on top of that list. By lifting almost 100 million people out of extreme poverty within eight years, China has achieved the goal ten years in advance.

United Nations Secretary-General António Guterres said that China has offered a satisfactory answer to the world in terms of eliminating poverty and China's experience can offer beneficial insights to other developing countries. Beate Trankmann, UNDP Resident Representative in China, said that China's success in eradicating poverty over the last 40 years has been historic. These feats have contributed greatly towards the achievement of Sustainable Development Goal 1, not poverty.

Ronnie Lins, who is the director of the China-Brazil Center for Research and Business, noted that China's poverty reduction is carried out using goals, plans and deeds, which deserves to be learned by all developing countries.

As a country with great responsibility, China has been contributing to global poverty eradication by offering help to more than 120 countries for the achievement of the Millennium Development Goals. Since 2016, the Ministry of Commerce of China has been conducting an annual "Seminar on Poverty Reduction for Officials," providing insights regarding poverty alleviation to officials from developing countries. In May 2019, the Belt and Road Initiative Poverty Reduction International Cooperation Forum was hosted in China, further strengthening the cooperation between China and countries and regions along the "Silk Road" in poverty alleviation communication. In June 2019, the World Bank issued a report, stating that 40 million people could be lifted out of poverty if what the Belt and Road Initiative proposes is to be fully implemented.