

China-India Brief

A publication of the Centre on Asia and Globalisation



Image Credit: Wikimedia Commons/ TurnOnTheNight

Guest Column

China and India in the Global Quantum ‘Race’

By Manoj Harjani

Quantum technologies have captured global attention in recent years across **three main application areas**—communication, computing, and sensing. Quantum communication offers the promise of secure information exchanges. Quantum computing seeks to outperform “classical” computers at certain tasks, while quantum sensing enables more precise measurement of time, gravity, and magnetic fields.


Lee Kuan Yew
School of Public Policy


CENTRE ON ASIA
AND GLOBALISATION

The *China-India Brief* is a monthly digest focusing on the relationship between Asia’s two biggest powers. The Brief provides readers with a key summary of current news articles, reports, analyses, commentaries, and journal articles published in English on the China-India relationship. It features a Guest Column weighing in on key current issues in China-India relations.

Centre on Asia and Globalisation

cag@nus.edu.sg

469A Bukit Timah Road, Tower Block 10,

Singapore 259770

<https://lkyspp.nus.edu.sg/cag>

cont'd p2

As a result of their **dual-use nature**, quantum technologies have become increasingly central to countries' efforts to build economic and military power while competing on the global stage. However, it would be misleading to assume that the same competitive dynamics observed for other disruptive dual-use technologies such as artificial intelligence (AI) and semiconductor chips apply neatly to quantum technologies.

This is because the three quantum application areas are at **different levels of maturity** in terms of commercialisation and operational military use. Quantum sensing is the most mature, followed by quantum communication, with quantum computing being the most nascent. In a similar vein, **concerns** about the sovereignty of disruptive technologies apply differently to quantum because there is no single, unified supply chain or technology stack.

Discussions of the global competition over quantum technologies often begin and end with the United States and China. This is understandable given the impact their rivalry has on the global economy and international security. However, in Asia, other rivalries also weigh on the region's economic and security environment, such as that between China and India.

Discussions of the global competition over quantum technologies often begin and end with the United States and China. This is understandable given the impact their rivalry has on the global economy and international security. However, in Asia,

other rivalries also weigh on the region's economic and security environment, such as that between China and India.

On the surface, China and India do not appear to be peer competitors in quantum technologies, given the gap between their economic and technological capabilities. Nevertheless, the competitive and sovereignty dynamics that govern other disruptive technologies do not map neatly onto quantum. A simple capability comparison therefore misses what matters: how the two countries are advancing their quantum ecosystems, and how those differences will shape the rivalry between them.

Attention is better directed at what will shape each country's quantum ecosystem, and at the areas where neither has fully disclosed their intentions, particularly regarding military applications.

The Limits of a Straight Comparison

While there is no objective framework to compare two countries' quantum ecosystems, the table below highlights several indicators that point towards a clear gulf in capabilities between China and India. These indicators should be considered with caution. For instance, the **widely cited** figure of \$15.3 billion for China's public-sector quantum investments remains unverified and is likely inflated. Patent data, similarly, indicates **quantity rather than quality**, which qualifies the dominance of China's filings.

Indicator	China	India	Remarks
<u>Public sector investment in quantum technologies</u>	\$15.3 billion	\$1.7 billion	Based on publicly announced commitments up to 2023.
<u>Nature Index ranking for share of research output in quantum physics</u>	1/77	11/77	Based on articles published in 145 journals tracked by the Nature Index from 1 June 2025 to 30 May 2026.
<u>Quantum technology patents (2014-2024)</u>	43,458	1,281	Based on data from relevant national patent offices.
<u>Number of universities in top 100 of QS World University 2026 ranking for physics and astronomy</u>	8 (Peking University [13]; Tsinghua University [14]; Shanghai Jiao Tong University [36]; University of Science and Technology of China [43]; Fudan University [47]; Nanjing University [65]; Zhejiang University [74]; University of Chinese Academy of Sciences [85])	1 (Indian Institute of Science, Bangalore [90])	Based on a composite of indicators that also measures employer reputation and international engagement alongside research-related metrics.
<u>Number of quantum clusters in ECIPE 2026 ranking</u>	6 (Hefei [8/45]; Shanghai [26/45]; Beijing [29/45]; Shenzhen-Hong Kong-Guangzhou [32/45]; Hangzhou [34/45]; Suzhou [44/45])	1 (Bangalore [32/45])	Based on a composite of indicators for market orientation, collaboration intensity, and ecosystem maturity.

A direct comparison based on the indicators above ignores not only the complexity within quantum technologies across its application areas, but also India's record of achieving global standing through indigenous development, despite numerous economic and political constraints.

India's experience in fields such as **space** and **nuclear technologies** should prompt a rethink of any analysis seeking to declare China the outright winner in quantum at this stage.

Trajectories for China and India's Quantum Ecosystems

Indeed, the notion of a “race” between China and India obscures the more important question: what will drive each country's quantum ecosystem over the coming decade.

Both Beijing and New Delhi have made quantum technologies a high-level policy priority. China's 15th Five-Year Plan (2026-2030) named quantum technologies a “**future industry**” expected to drive economic growth. India's **National Quantum Mission** (NQM), running from 2023/24 to 2030/31, set specific objectives, from developing domestic quantum computers to implementing quantum-secured communication infrastructure.

High-level policy attention is being complemented by broader mechanisms to sustain innovation. China, for instance, launched a **National Venture Capital Guidance Fund** in late 2025 to encourage patient capital and region-specific investments in priority technologies. India similarly set up a **Research, Development, and Innovation Fund** to draw in private sector participation in specific strategic technologies. In both cases, such public investment, aimed at sustaining innovation more broadly, can be expected to reach the quantum ecosystem.

At the same time, policy prioritisation does not guarantee a mature quantum ecosystem. For China, much will depend on how provincial and local administrations implement the 15th Five-Year Plan on the

ground. As the semiconductor chip experience has shown, competition between and within provinces can lead to **duplicative efforts and even fraud**. For India, prioritising quantum will mean little unless it addresses **fundamental weaknesses** in the national research and innovation base, without which the NQM will struggle to achieve its goals.

Another key determinant shaping the two quantum ecosystems will be the commercialisation and growth of private sector investment. In China, **exits** from quantum research by Alibaba in late 2023 and Baidu in early 2024 prompted concern about the sector's future. Since 2024, however, China's quantum startups have attracted **multiple funding rounds**, suggesting renewed momentum for commercialisation.

Data from the **Entangled Future** database as of October 2026 shows that China has a larger overall number of quantum commercial entities at forty-six compared to twenty-six for India. However, it is difficult to draw neat lines to define such entities, and they can evolve over time in terms of their focus and business model. Additionally, databases are limited in their fidelity and completeness by access to data sources, which can vary considerably by country.

Nevertheless, both China and India remain heavily reliant on public investment to drive their quantum ecosystems. China's National Venture Capital Guidance Fund and India's Research, Development, and Innovation Fund are steps in the right direction, but

both remain state-led. This partly reflects how nascent quantum technologies still are, which makes private sector investment over the next three to five years a key indicator to watch. Data from Tracxn **points** to a significant gap: \$1.01 billion in China against \$30 million in India.

Uncertainty Ahead in the Military Domain

A major uncertainty for how China and India will advance their quantum ecosystems centres around the military domain. In the absence of a published policy document or strategy, individual reports can be pieced together to indicate how the People's Liberation Army intends to operationalise quantum technologies. Two recent trials illustrate this: a **miniaturised prototype device** for quantum-enabled communication in late 2025 and a **drone-mounted atomic magnetometer** for submarine detection in April 2025.

Unlike China, India has provided some information about how it views quantum technologies in the military domain, through its Military Quantum Mission Policy Framework **announced** in early 2026. While the full document is not public, available information **points** to progress concentrated in quantum communication applications. For example, the Indian Army and Navy have **procured** quantum-enabled communication systems, and the Defence Research and Development Organisation **completed** a trial of one in July 2026.

With only a **nascent conversation** globally on responsible use of quantum technologies in the military domain, there are few—if any—restrictions for countries like China and India that are competing for a strategic advantage. Nevertheless, technological advances in quantum do not immediately translate to operationalised military capabilities. The friction and lag between what is discovered in the lab and what is eventually used on the battlefield will likely remain an important constraint, until multilateral dialogue matures enough to address the implications of quantum technologies for international peace and security.

Conclusion

For now, quantum technologies are less likely to become a key determinant shaping competition and the overall bilateral relationship between China and India. This is partly due to greater potential economic and strategic gain in other dual-use disruptive technologies such as AI and chips, as well as the perceived gap in quantum capabilities and technological advancement. Nevertheless, both countries are competing on quantum within the larger global landscape and with an eye on military capabilities. It is in this area that the potential for quantum to tip the balance should be monitored closely.

Manoj Harjani is an Associate at the Asia-Pacific Institute for Law and Security.