

A Comparative Analysis of

Quantum Industry

Financing in the U.S. and China

April, 2024

Declaration

01

The content and viewpoints presented in this report strive to be independent and objective. The information or opinions expressed herein do not constitute investment advice; therefore, please be cautious when referring to them.

02

The purpose of this report is to summarise and present the investment and financing events occurring in the global quantum industry until March 2024, as well as investment and financing analyses related to China and the U.S.. It relies primarily on publicly available data and information, as well as the compilation of publicly accessible data. Additionally, it combines the global economic development status at the time of publication to provide predictive descriptions of potential short-term impacts.

03

This report focuses on content related to investment and financing within the quantum industry that occurred between 1 January 2019 and 31 March 2024, based on local time reporting and first event publication. Reports with identical or highly similar content that span different years are not considered significant events that occurred in that year.

04

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This report involves dynamic data and presents the situation until the time of statistics; it does not represent future circumstances and does not constitute investment advice. Please use with caution.

Introduction

As a critical frontier in the future technological development, the field of quantum technology has garnered attention from over 30 countries and regions, leading to the development of quantum technology industries. With its revolutionary potential, quantum technology has increasingly attracted the interest of investors.

Both China and the United States are major participants in quantum technology, with their combined financing accounting for approximately two-thirds of global financing, exerting significant influence on the global development of the quantum field. Therefore, this report aims to conduct a comparative analysis of the investment and financing situations of the U.S. and China in the field of quantum technology, exploring their differences, and providing recommendations tailored to the financing status of Chinese quantum enterprises, with the aim of offering insights for relevant policy-making and market participants.

Firstly, we will provide an overview of the global quantum technology industry, including technological advancements, policy support, market prospects and financing demands, to lay the groundwork for subsequent comparative analysis.

Next, we will focus on the investment and financing performance of the U.S. and China in the field of quantum technology. Through comparisons based on total financing amounts, industry distribution, company financing situations, etc., we will delve into the similarities and differences between the two countries, as well as the potential reasons and influencing factors.

Through the in-depth research and analysis presented in this report, we aim to provide comprehensive data support and professional advice for investors, enterprises, and government departments in the field of quantum technology. Together, we can advance the development and application of global quantum technology, achieving a win-win situation for technological innovation and economic growth.

Content

| | |
|---|----|
| Introduction | 02 |
| Content | 03 |
| List of Figure | 04 |
| 1. Overview of Investment and Financing in the Quantum Technology | 06 |
| 1.1 The gap between quantum industry investment and financing and leading-edge technology sectors is significant. | 10 |
| 1.2 Quantum computing companies are currently more likely to receive favor from capital | 11 |
| 1.3 The financing situation of enterprises exhibits disparities, with a significant proportion ceasing at the Series A round | 13 |
| 2. Comparison analysis of social financing and fiscal expenditure between the U.S. and China | 17 |
| 2.1 Comparison of total social financing between the US and China: social capital funding fluctuates dramatically, with the gap between China and the US steadily increasing. | 17 |
| 2.2 Comparison of total government financial investment between the US and China: While China's government input is higher, the U.S. Leads in Quantum technology Innovation | 19 |
| 2.3 Summary of comparative analysis | 20 |
| 3. Comparative Analysis of Enterprise Financing Amounts and Stages | 22 |
| 3.1 China's financing in quantum computing is about one-tenth that of the U.S. | 22 |
| 3.2 Challenges in Chinese Enterprise social capital Financing and Weak Financing Sustainability | 25 |
| 3.3 The relatively complete capital market system in the U.S. ensures active social capital investment, leaving China behind | 26 |
| 4. Prospects for Future Trends | 28 |
| 4.1 China's Possible Actions | 29 |
| 4.2 Strategies in response to the U.S. embargo | 29 |

List of Figure

Figure: Annual changes in total investment and financing amount in the global quantum technology industry (2019-2023)

Figure: Annual number of investment and financing rounds in the global quantum technology industry (2019-2023)

Figure: Annual number of investment and financing rounds in the global quantum technology industry (2019-2023)

Figure: Proportion of investment and financing rounds in the global quantum technology industry (2019-2023)

Figure: Proportion of total investment and financing in global quantum computing, quantum communication & safe and quantum sensing & imaging (2019-2023)

Figure: Comparison of the total investment and financing amounts in the quantum technology industry with AI and renewable energy in 2022

Figure: Frequency of investment and financing rounds in global quantum computing, quantum communication & safe, and quantum sensing & imaging industries (2019-2023)

Figure: Total social capital financing for global quantum computing, quantum communication & safe, and quantum sensing & imaging (2019-2023)

Figure: Global Quantum Technology Industry Top Ten social capital Financing Events (Single Round Financing Amount, Descending Order)

Figure: Global Quantum Technology Industry Top Ten social capital Financing Events (Full Financing Amount, Descending Order)

Figure: Distribution frequency of time difference between the last social capital financing and the current time for global quantum startups

Figure: Current round of social capital financing for global quantum startups until today

Figure: Annual changes in social financing total between the U.S. and China quantum technology companies (2019-2023)

Figure: Comparison of U.S. and Chinese Government Investments in the Global Quantum Industry (2019-2023)

List of Figure

Figure: Proportion of the U.S. and Chinese government investment in the global quantum industry

Figure: Proportion of social capital Investments in Quantum Computing, Quantum Communications & Safe, and Quantum Sensing & Imaging in the U.S. and China (unit: million dollar)

Figure: Annual social capital financing total for quantum computing between the U.S. and China (2019-2023)

Figure: Annual social capital financing total for quantum communication between the U.S. and China (2019-2023)

Figure: Annual social capital financing total for quantum sensing & imaging between the U.S. and China (2019-2023)

Figure: Comparison of the annual frequency of social capital financing for quantum technology companies in the U.S. and China

Figure: Comparison of financing rounds for quantum technology companies in the U.S. and China

1. Overview of Investment and Financing in the Quantum Technology

The global quantum technology sector is confronted with an imminent necessity for financial support. As technological advancements persist and commercialization progresses, the demand for funding becomes progressively urgent.

The anticipated average growth rate of the global quantum technology market over the next five years is poised to surpass 30%, with the average annual growth rate projected to remain notably high over the subsequent decade. Nevertheless, in 2023, despite the overall substantial financing volume, a significant decrease was observed compared with 2022, amounting to only approximately 75% of the previous year. This signifies a transient downturn in global investment enthusiasm towards quantum technology, failing to maintain the momentum of preceding years.

 **Figure:** Annual changes in total investment and financing amount in the global quantum technology industry (2019-2023)

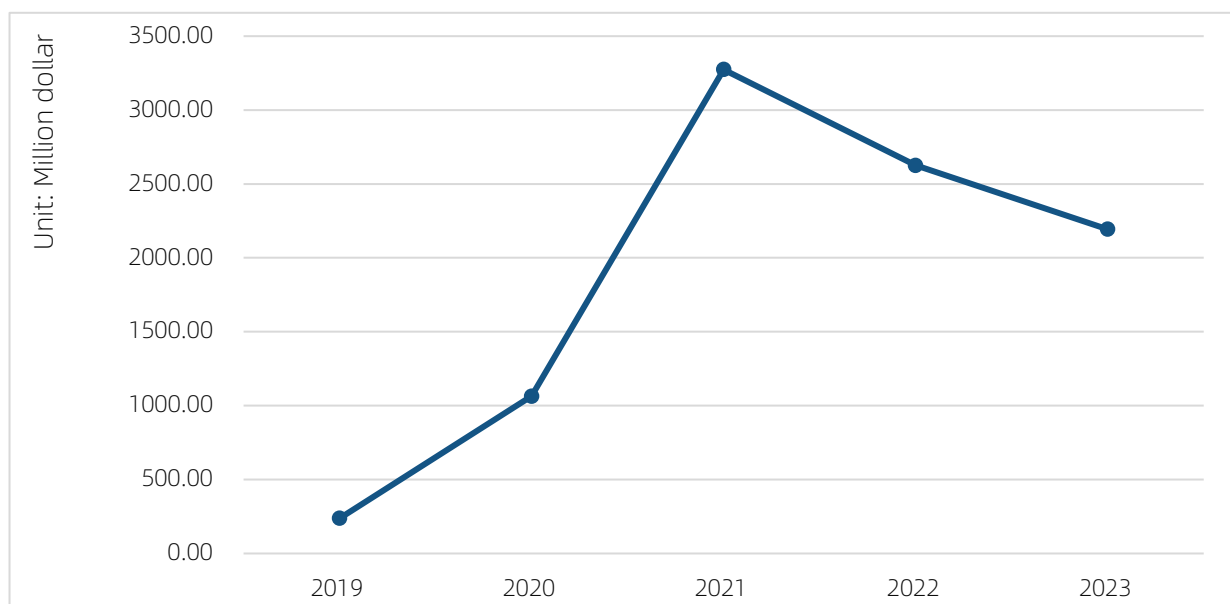
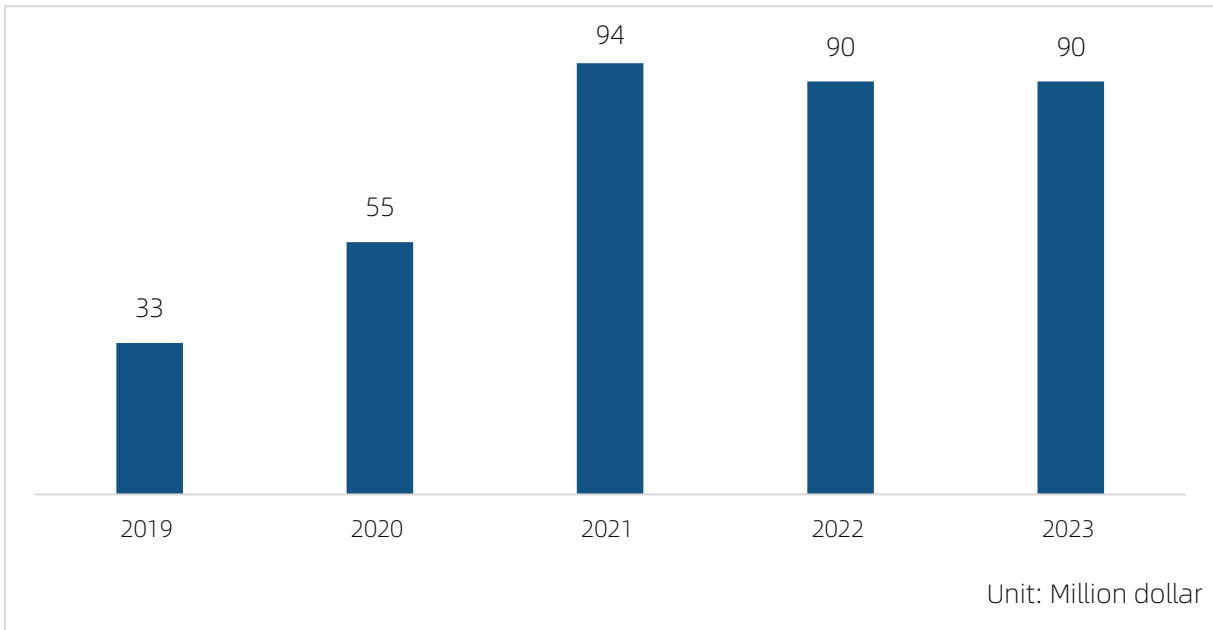
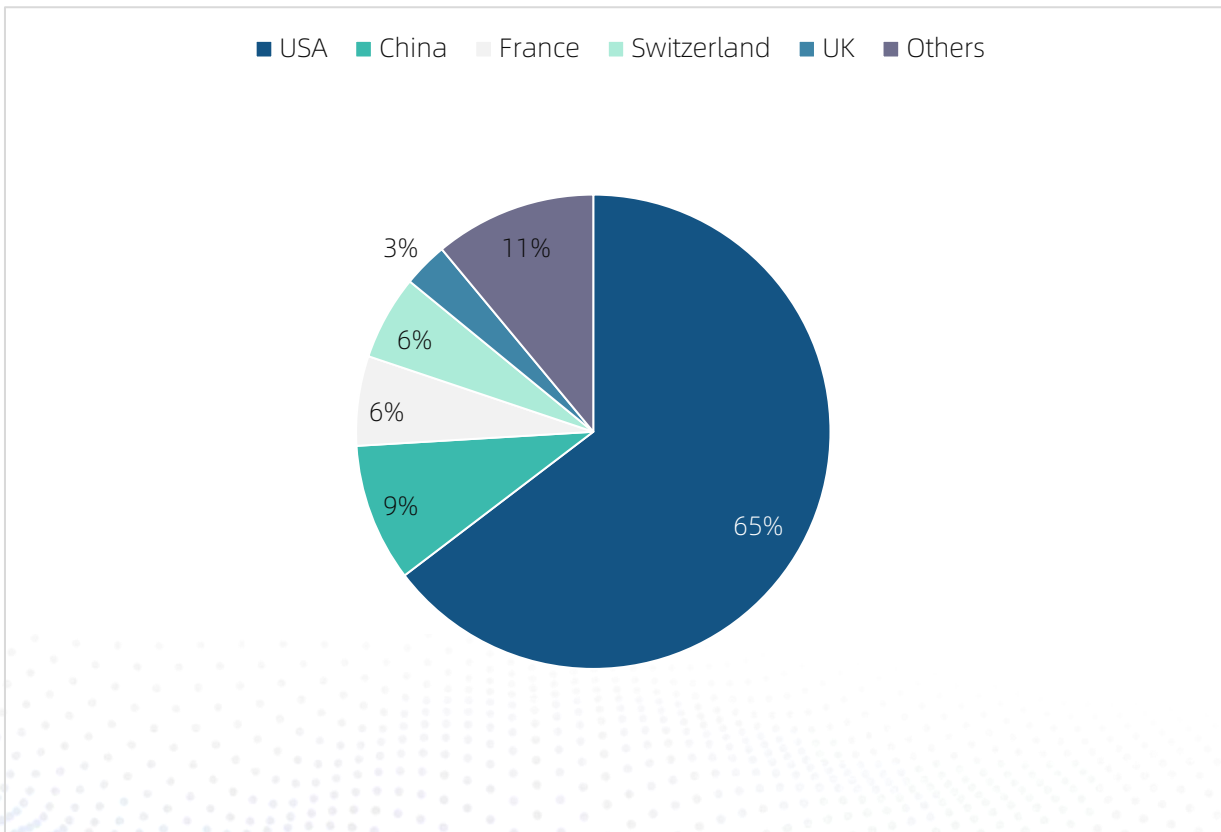


Figure: Annual number of investment and financing rounds in the global quantum technology industry (2019-2023)




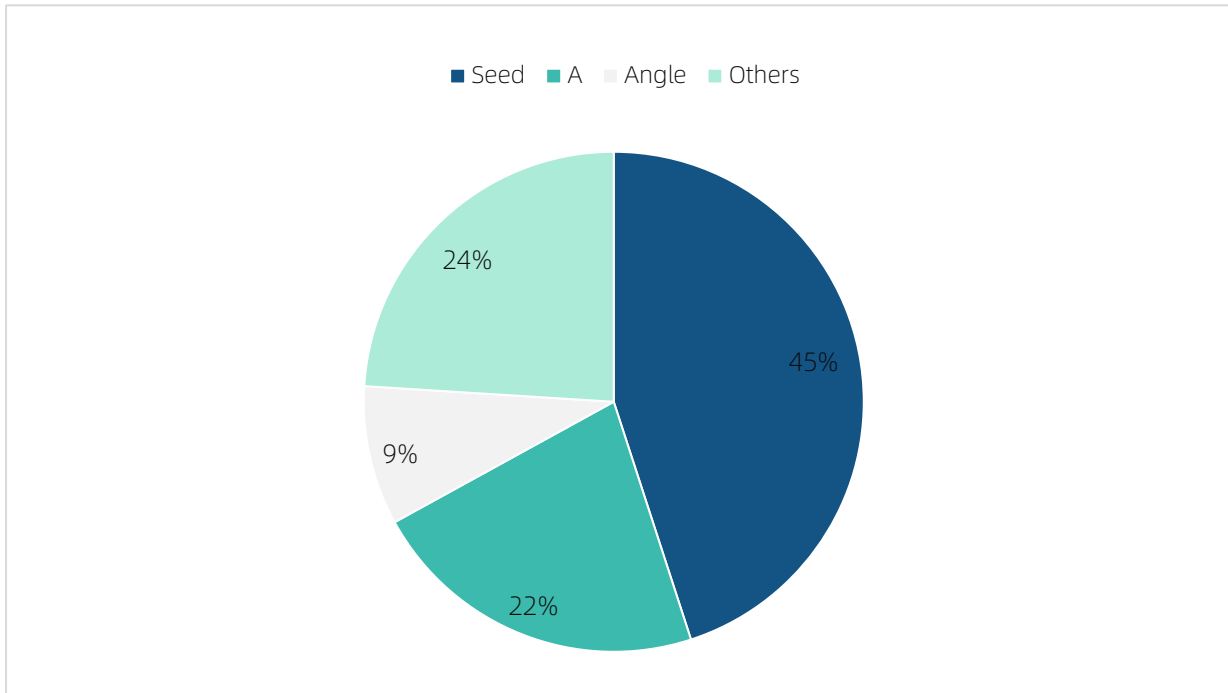
From the perspective of financing frequency, the differences between 2022 and 2023, as well as 2021, are not transparent; however, there is an overall declining trend in the total financing volume. This suggests that since 2021, the decrease in the average individual financing amount has led to a decline in the overall financing of the quantum industry.

Figure: Distribution of total global investment and financing by country and region (2019-2023)




From the perspective of geography, both the U.S. and China are main nations engaged in quantum technology, collectively constituting approximately two-thirds of the total global financing. Their substantial contributions have a significant influence on the global advancement of the quantum domain. Subsequently, France and Switzerland follow, comprising approximately 6% of the total financing. The United Kingdom occupies 3%, while other countries collectively represent approximately 11% of the total.

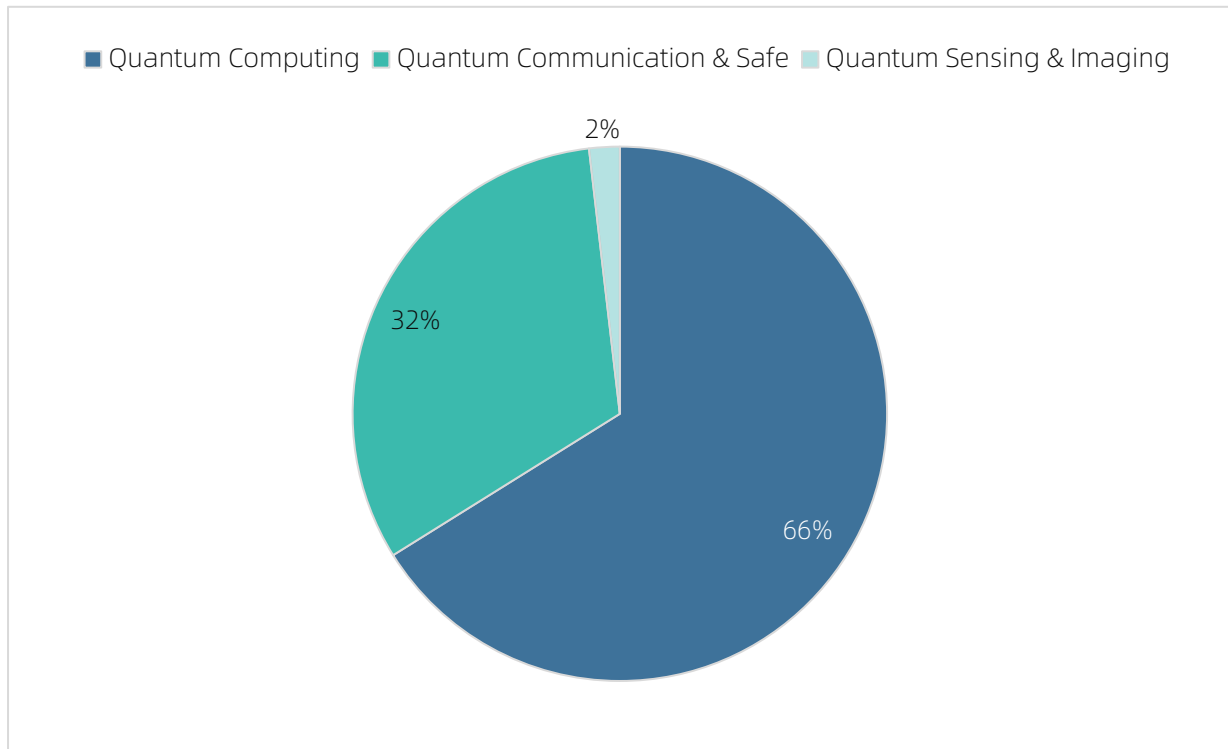
 **Figure:** Proportion of investment and financing rounds in the global quantum technology industry (2019–2023)



From the perspective of financing rounds, since 2018, there has been a surge of startups globally. According to statistics, among the 201 known enterprises that have investment and financing events, 124 were established after 2018. Consequently, early-stage investment and financing events have become frequent since 2020, with financing rounds mainly concentrated in Seed, Angel, and Series A.

In terms of technology sectors, the global quantum computing sector has received the highest amount of financing, accounting for approximately two-thirds of the total. Following that is quantum communication & safe, accounting for around 32%. Quantum sensing & imaging has the lowest total financing, comprising only about 2%.

 **Figure:** Proportion of total investment and financing in global quantum computing, quantum communication & safe and quantum sensing & imaging (2019-2023)

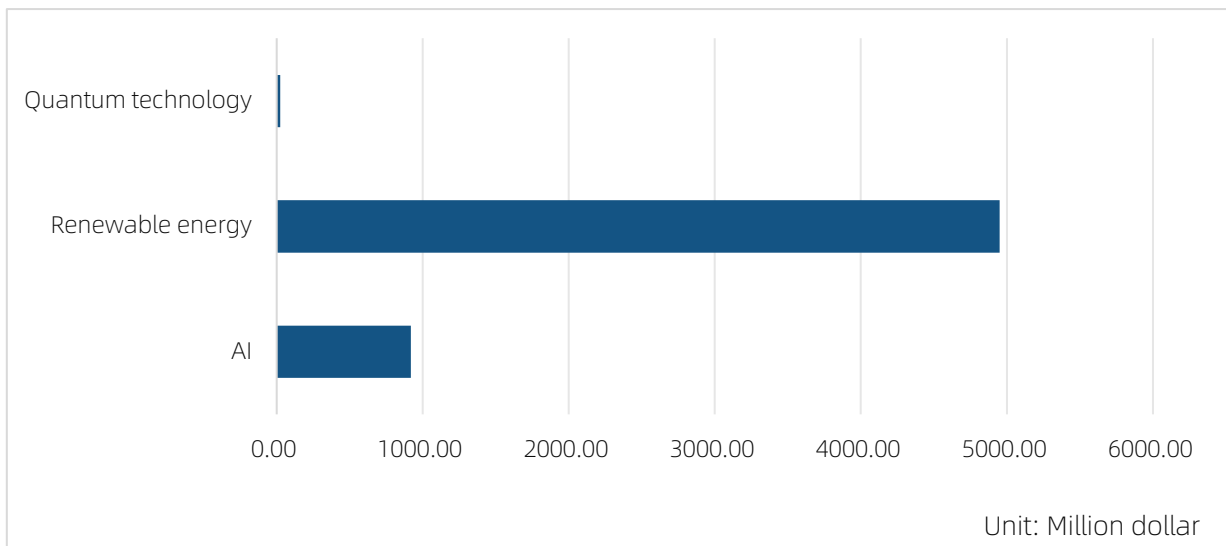


1.1 The gap between quantum industry investment and financing and leading-edge technology sectors is significant.

Until March 22, 2024, the total investment and financing amount in the global quantum industry amounted to \$11.359 billion. Compared with similar industries, the quantum industry still falls behind significantly in terms of total investment and financing. According to Statista, the authoritative data agency, in the year 2022, the total investment and financing amount in the artificial intelligence (AI) industry was approximately \$92 billion, while the total investment and financing amount in the renewable energy industry was \$495 billion. In contrast, the quantum industry only received \$2.625 billion in investment and financing.

Compared with the AI and renewable energy industries, the quantum industry is still in its early stages, primarily focused on research and development. Although the quantum industry has demonstrated some application capabilities and advantages in fields including electricity, such as the superior computing power provided by quantum computers compared with traditional computers, it still has some distance to go before reaching widespread commercial applications. Therefore, compared with the AI and renewable energy industries, which have already seen significant commercial utilization, the quantum industry has attracted relatively less attention, resulting in a smaller total investment and financing amount.


 **Figure:** Comparison of the total investment and financing amounts in the quantum technology industry with AI and renewable energy in 2022

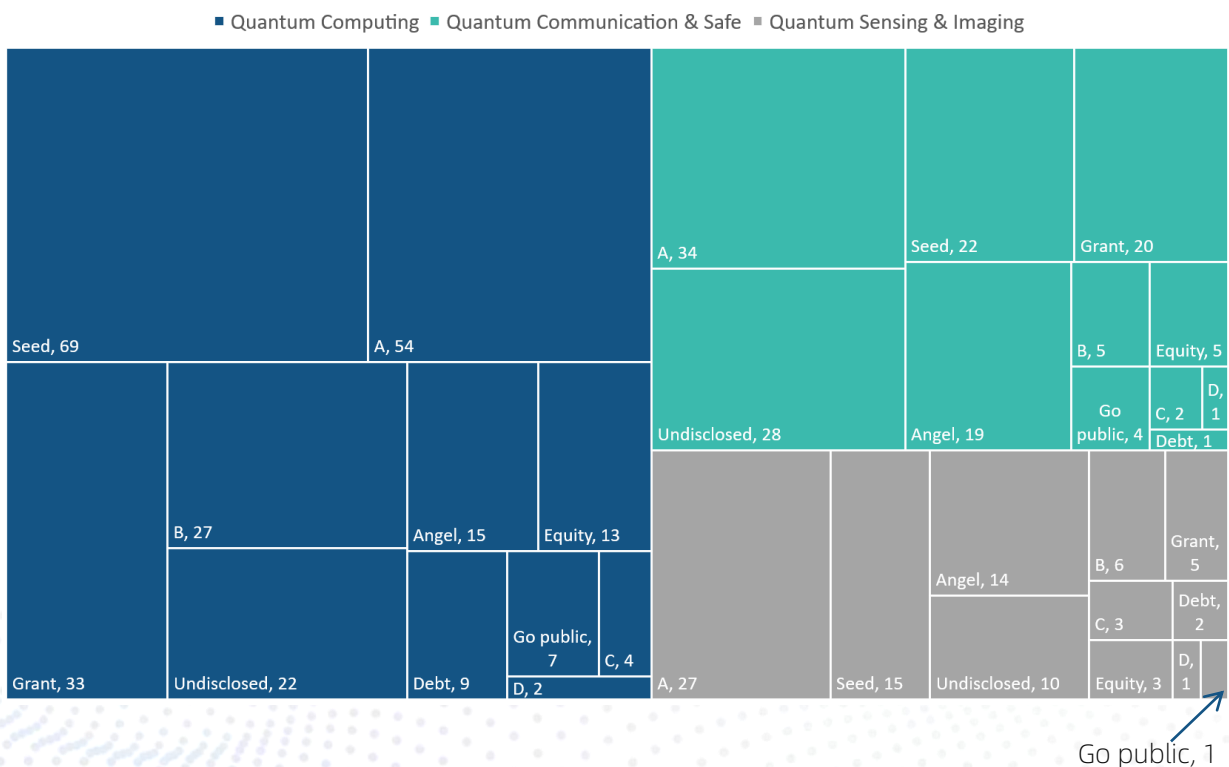


1.2 Quantum computing companies are currently more likely to receive favor from capital

Among the three principal sectors—quantum computing, quantum communication & safe, and quantum sensing & imaging, total investment and financing figures have all witnessed accelerated growth since 2020. Quantum computing retains a definitive lead in total investment and financing, followed by quantum communication and quantum sensing & imaging, which exhibit comparatively lower investment and financing volumes. Additionally, quantum computing maintains a clear advantage in the number of financing rounds, with listed companies predominantly concentrated within the quantum computing domain.


On one hand, owing to the earlier advancement and maturity of quantum computing technology alongside its broader application prospects, there exists a relatively higher participation of companies in the quantum computing sector. Among the 201 surveyed companies, a substantial 104 are actively involved in quantum computing, constituting over 50% of the total. On the other hand, significant quantum industry policies worldwide allocate ample funding and institutional incentives specifically to quantum computing within designated sub-sectors. Among 26 government policies about quantum released in 2022, nine are dedicated to specific sub-sectors, with six targeting quantum computing, two focusing on quantum communication, and one addressing quantum sensing & imaging. These policies directed at specific sub-sectors provide nearly \$300 million in funding support specifically for the quantum computing domain. Consequently, in terms of the policy framework, the quantum computing field has considerable advantages.

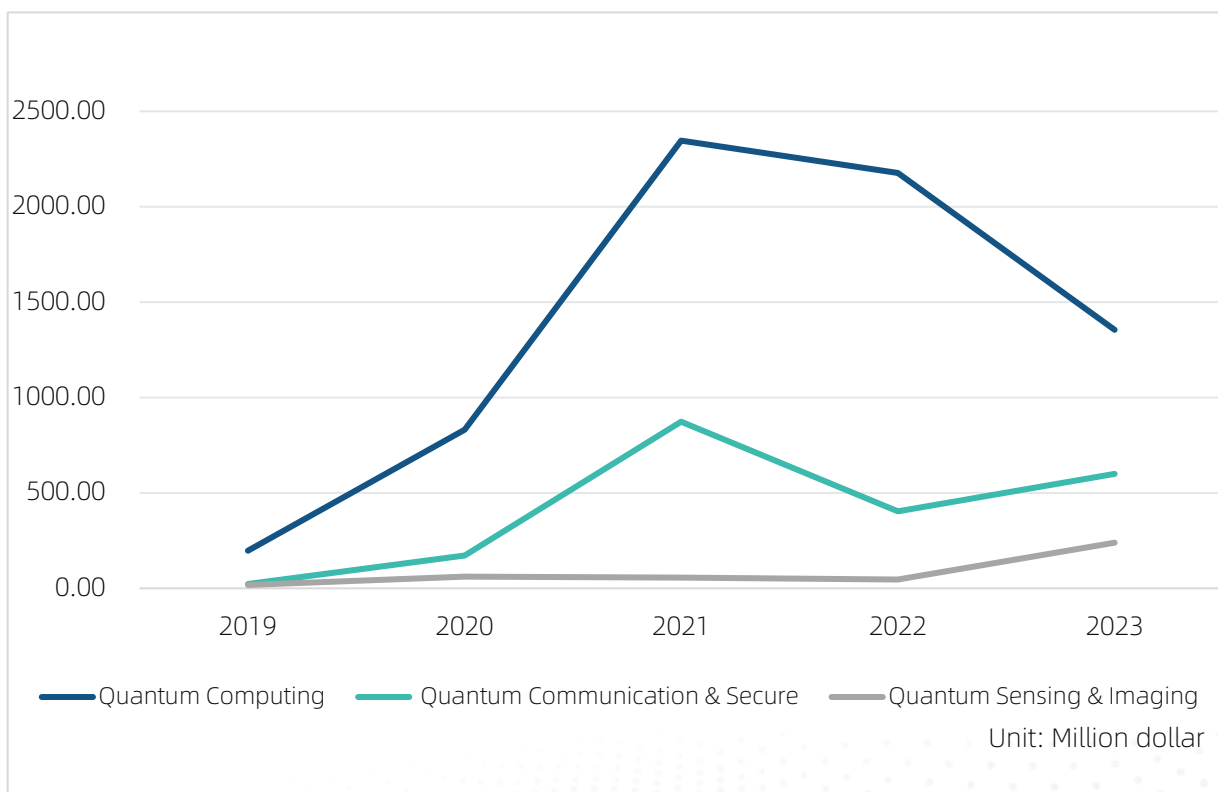
 **Figure:** Frequency of investment and financing rounds in global quantum computing, quantum communication & safe, and quantum sensing & imaging industries (2019-2023)

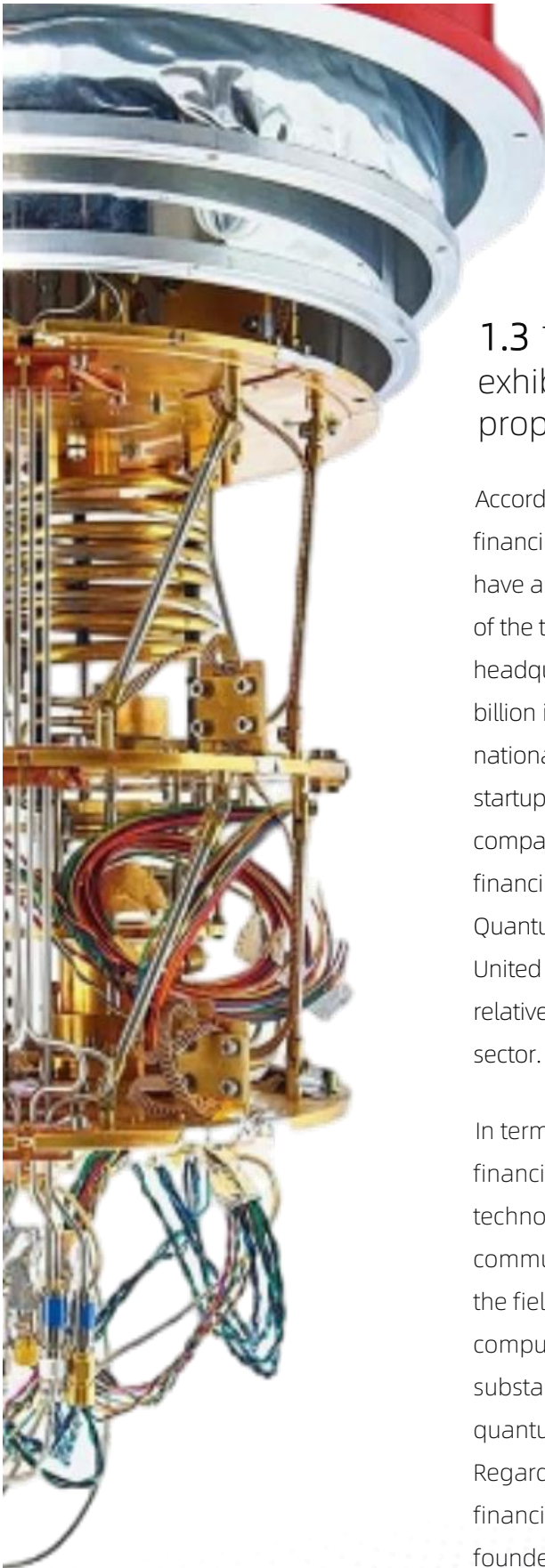


Despite the quantum computing industry's dominance in total investment and financing, the potential of the quantum communication and quantum sensing & imaging industries should not be underestimated. Quantum communication holds significant advantages in quantum key distribution and quantum cryptography, ensuring communication security. Quantum key distribution enables completely secure key exchange, impervious even to quantum computers, as any eavesdropping attempts are disrupted by the observation of quantum states. With the progression of quantum communication technology, establishing more intricate and expansive quantum communication networks becomes feasible. These networks can interconnect multiple communication nodes, facilitating functions such as quantum key distribution, quantum communication, and quantum computing, thus laying the groundwork for future quantum internet construction. Presently, quantum communication technology is applicable experimentally and practically over short distances, but long-distance quantum communication encounters challenges.

In the future, with continuous technological advancements, long-distance quantum communication is anticipated to become achievable, broadening the scope of quantum communication applications. In the realm of quantum sensing & imaging, quantum sensors exhibit superior accuracy and sensitivity compared with conventional sensors, with the potential to supplant existing products. However, technical hurdles and cost considerations currently confine most applications to the laboratory stage.

 **Figure:** Total social capital financing for global quantum computing, quantum communication & secure, and quantum sensing & imaging (2019-2023)





1.3 The financing situation of enterprises exhibits disparities, with a significant proportion ceasing at the Series A round

According to publicly available data, the top ten cumulative financing events in the global quantum technology sector have amassed \$5.8 billion, representing approximately half of the total financing in the sector. PsiQuantum, headquartered in the U.S., ranks top 1 in this list with \$1 billion in cumulative financing. From the perspective of the national distribution, among the top ten total financing for startups in the quantum technology sector, American companies occupy five positions, each company's total financing and investment surpassing \$500 million. QuantumCTek from China ranks eighth. Additionally, the United Kingdom, Canada, and Australia also demonstrate relatively high total financing in the quantum technology sector.

In terms of technological domains, all of the top ten financing events are concentrated within two primary technology directions: quantum computing and quantum communication and security, with no companies listed in the field of quantum sensing & imaging. Quantum computing emerges as the dominant focus, with substantial financing directed towards both photonic quantum computing and annealing quantum computing. Regarding company establishment time, the top ten financing events primarily occurred within companies founded in the past decade. The largest financing rounds within each company's total financing are predominantly concentrated around pre-IPO stages, encompassing Series C, Series D, SPAC, PIPE, and private placements.

 **Figure:** Global Quantum Technology Industry Top Ten social capital Financing Events (Single Round Financing Amount, Descending Order)

| Company | Country | Techonology Field | Financing Amount (Unit:One hundred million dollar) | Time |
|-----------------|-----------|---|---|---------|
| Sandbox AQ | USA | Quantum computing,Quantum security | 5.0 | 2023.02 |
| PsiQuantum | USA | Optical quantum computing | 4.5 | 2021.07 |
| Arqit Quantum | UK | Quantum Cloud Platform | 4.0 | 2021.05 |
| IONQ | USA | Ion trap quantum computing | 3.5 | 2021.03 |
| D-Wave | Canada | Annealing Quantum Computing | 3.4 | 2022.02 |
| Quantum CTek | China | quantum communication & safe, superconducting quantum computing | 2.9 | 2024.03 |
| Quantinuum | USA | Ion trap quantum computing | 2.7 | 2021.12 |
| Rigetti | USA | Superconducting Quantum Computing | 2.6 | 2022.03 |
| Qtict | China | quantum communication & safe network operation | 2.3 | 2021.04 |
| Silicon Quantum | Australia | Semiconductor Quantum Computing | 1.3 | 2022.06 |

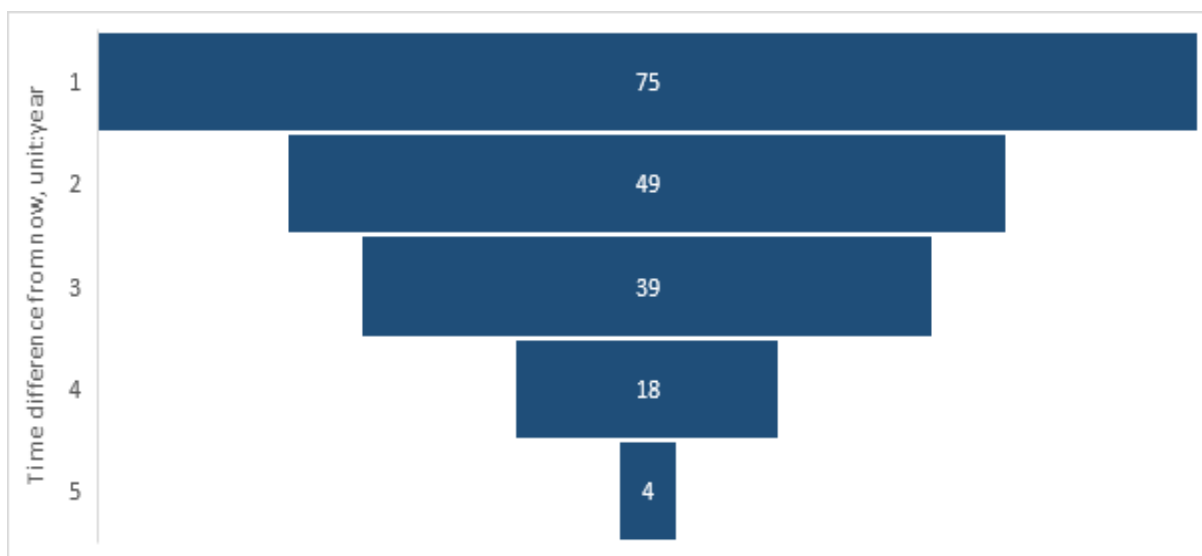
 **Figure:** Global Quantum Technology Industry Top Ten social capital Financing Events (Full Financing Amount, Descending Order)

| Company | Country | Techonology Field | Financing Amount (Unit:One hundred million dollar) | Establish time |
|-----------------|-----------|---|---|----------------|
| PsiQuantum | USA | Optical quantum computing | 10.0 | 2016 |
| D-Wave | Canada | Annealing Quantum Computing | 8.9 | 1999 |
| IONQ | USA | Ion trap quantum computing | 7.3 | 2015 |
| Sandbox AQ | USA | Quantum computing,Quantum security | 6.9 | 2022 |
| Quantinuum | USA | Ion trap quantum computing | 5.7 | 2021 |
| Rigetti | USA | Superconducting Quantum Computing | 5.6 | 2013 |
| Arqit Quantum | UK | Quantum Cloud Platform | 4.2 | 2017 |
| Quantum CTek | China | quantum communication & safe, superconducting quantum computing | 3.9 | 2009 |
| Xanadu | Canada | Optical quantum computing | 2.9 | 2016 |
| Silicon Quantum | Australia | Semiconductor Quantum Computing | 2.5 | 2017 |

According to publicly available data, the collective amount of the top ten single-round financing events in the global quantum technology sector has reached \$3.212 billion. Sandbox AQ, headquartered in the U.S., occupied the leading position with a single-round financing amount of \$500 million. This financing event has propelled the development of the quantum sub-market to some extent. Among the top ten events, the U.S. emerges as the most active country, with multiple companies receiving substantial financing. China also boasts two companies entering the top ten, indicating a gradual development in quantum technology. Moreover, countries such as the United Kingdom, Canada, and Australia have also secured significant financing within the quantum technology sector.

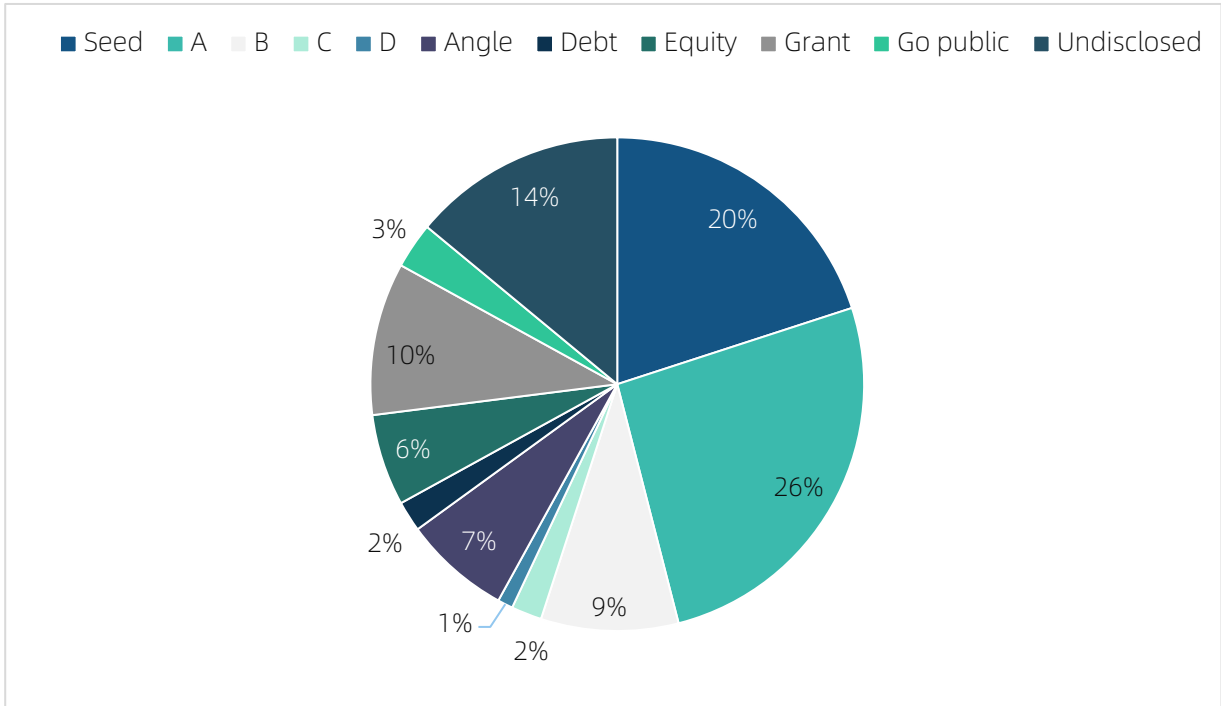
In terms of technological fields, quantum computing predominates the top ten financing events in the global quantum technology sector. Companies specializing in photonic quantum computing, ion trap quantum computing, and superconducting quantum computing have all received substantial financing. Significantly, no companies are listed in the quantum sensing & imaging sub-sector. In terms of financing stages, these financings mainly occur around pre-IPO stages, including Series C, Series D, SPAC, PIPE, and private placements.

 **Figure:** Distribution frequency of time difference between the last social capital financing and the current time for global quantum startups



From the view of the timeline, the most recent financing events of global quantum enterprises are primarily concentrated in the past year. Among the 201 surveyed companies, 124 had their latest financing concentrated in the past year to two years. Regarding financing rounds, the latest financing of global quantum enterprises predominantly focuses on initial rounds such as Seed and Series A. This trend is mainly attributable to the fact that the majority of quantum enterprises globally are startups established within the last five years.


 **Figure:** Current round of social capital financing for global quantum startups until today

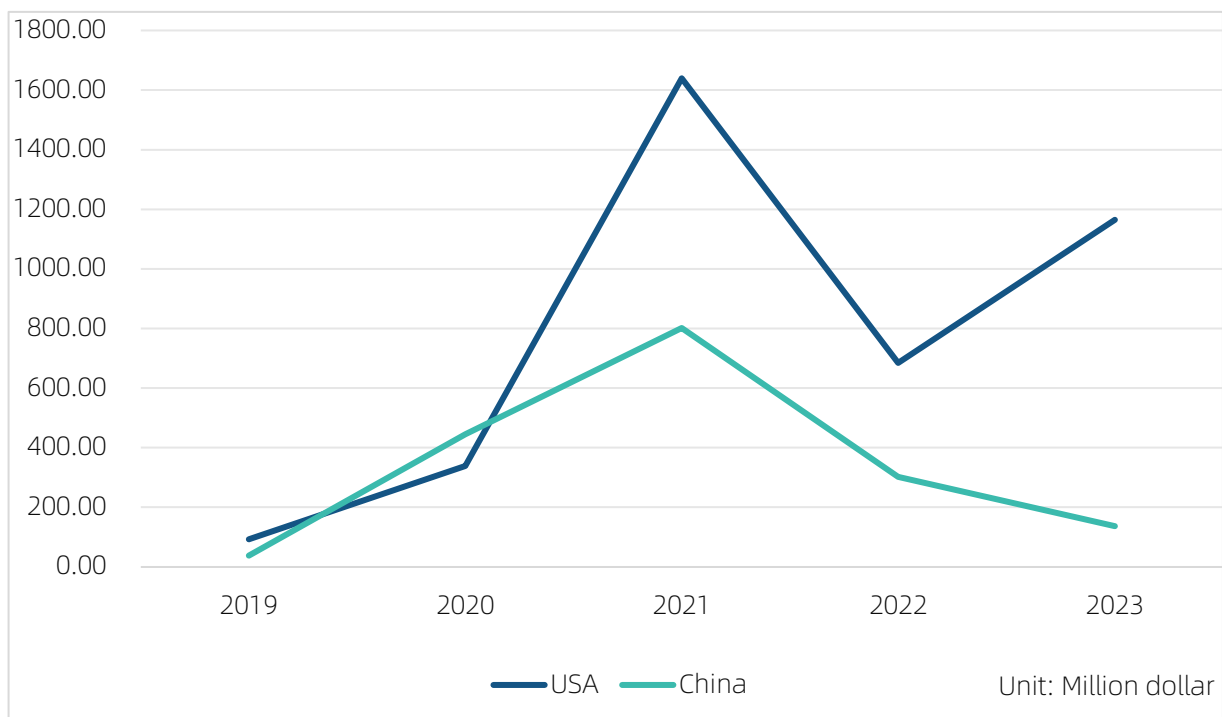


2. Comparison analysis of social financing and fiscal expenditure between the U.S. and China

2.1 Comparison of total social financing between the US and China: social capital funding fluctuates dramatically, with the gap between China and the US steadily increasing

Before 2020, China's quantum industry had a comparable total social financing amount to that of the U.S., occasionally maintaining a slight lead in some years. Post-2020, both countries augmented their investments in the quantum industry, resulting in significant growth in total investment and financing compared with previous years. However, the increase in social financing for the quantum industry in the U.S. surpassed that of China, exhibiting a relatively stable growth trend. Consequently, the difference in financing between the two countries has progressively widened. In 2021, the difference in social financing between the quantum industries of the U.S. and China stood at approximately \$800 million. By 2022, this difference narrowed to around \$400 million but subsequently expanded to over \$1 billion in 2023.

 **Figure:** Annual changes in social financing total between the U.S. and China quantum technology companies (2019-2023)



Quantum industry has been a stronghold of American innovation and investment. China has indeed made strides in quantum technology, but it is still a fact that the US maintains a clear lead in this field. The US has consistently exceeded China in quantum investment and financing, with the difference only widening over the years.

One main advantage of the US is its early start in quantum technology development, with many of its companies established before 2018, while half of China's quantum enterprises were founded after 2019. This early start has allowed US companies to complete more funding rounds, leading to higher total financing compared with their Chinese counterparts.

Moreover, the US has advantages in scientific research and innovation, publishing significantly more quantum-related papers and holding a leading position in high-cited papers in quantum computing and communication & safe. American research is highly globalized, with adequate international collaboration, enabling it a diverse and stable scientific output.

In terms of enterprise innovation, the US boasts a strong lineup of both established companies like IBM, HP, and AT&T, as well as emerging startups like MagiQ and D-Wave Systems. These companies cover a wide range of quantum subfields and have a strong grasp of core technologies.

The US also benefits from a more stable and paradigm-breaking approach to technical innovation compared with China's more fast-paced and imitation-focused strategy. This has led to a more solid foundation for US quantum technology development.

Furthermore, the US has a more diversified and less internationally influenced social capital situation compared with China. With the US government's support for innovation and the implementation of regulations like FIRRMA, American quantum companies face fewer obstacles in funding compared with their Chinese counterparts.

2.2 Comparison of total government financial investment between the US and China: While China's government input is higher, the U.S. Leads in Quantum technology Innovation

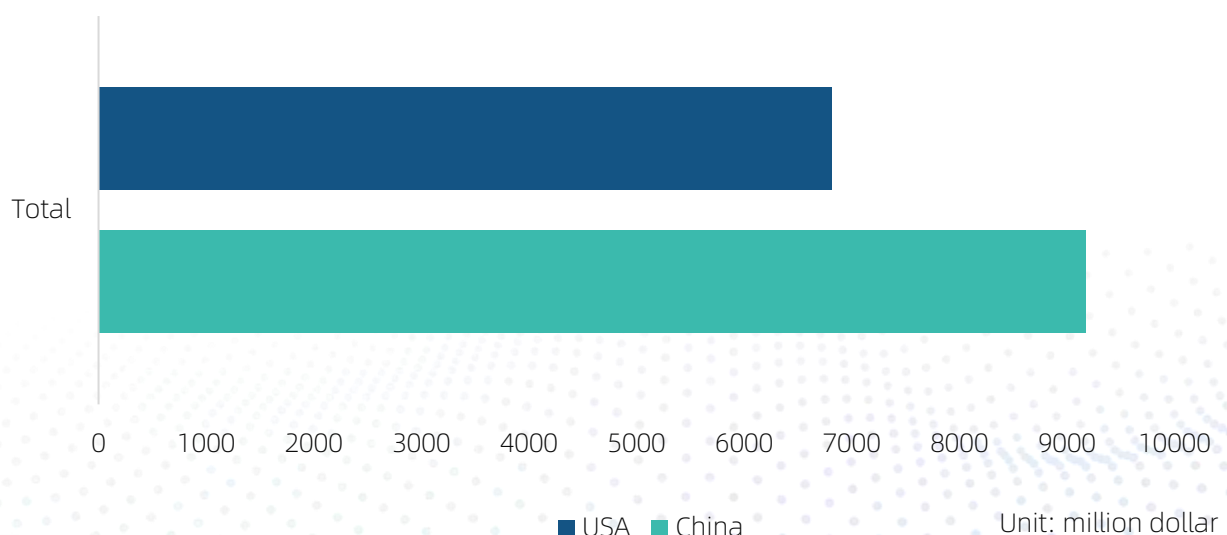
The global surge in funding for quantum technology between 2019 and 2023 underscores the recognition of its strategic importance worldwide. While various countries have stepped up their investments, it's clear that the U.S. remains at the forefront of quantum innovation and funding.

Despite China's substantial government investments, which exceed those of the US by nearly \$2.4 billion, the U.S. maintains its leadership position in critical areas such as superconducting quantum computing, ion trap quantum computing, post-quantum cryptography (PQC), and atomic clocks. This demonstrates the efficiency of the US approach to quantum research and development, which emphasizes both public and private sector collaboration and leverages a powerful ecosystem of academy, industry, and government support.

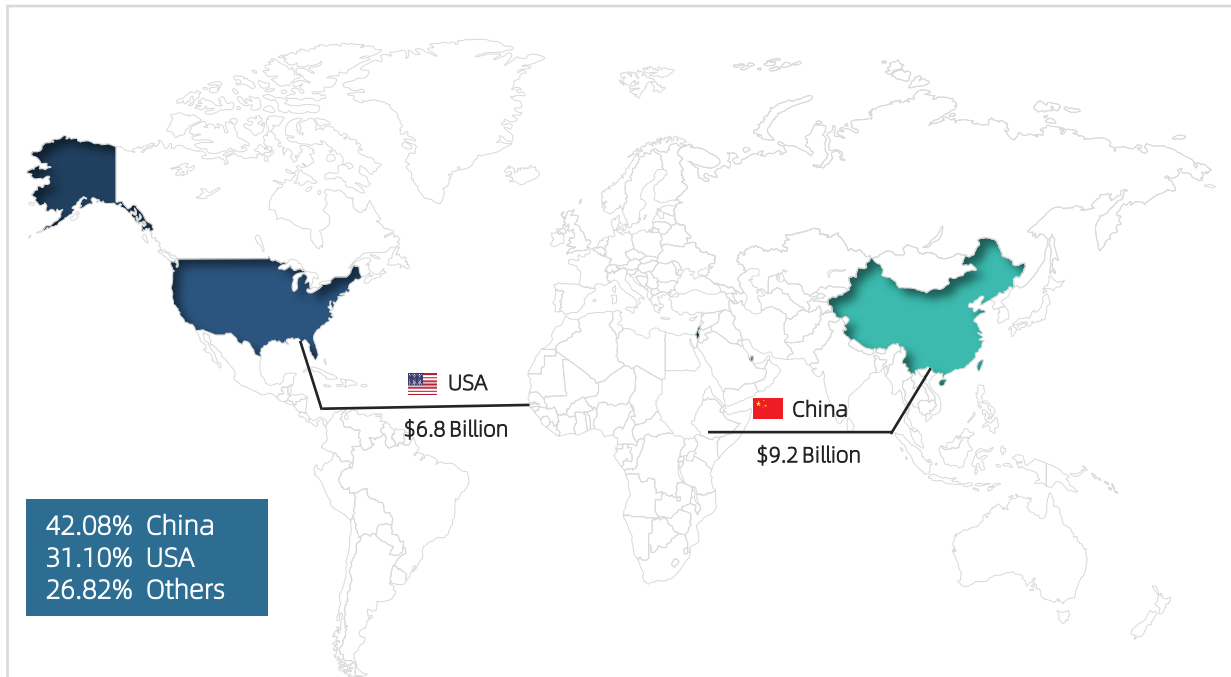
In terms of organizational structure and strategic planning, the US stands out with its comprehensive approach to implementing quantum initiatives. The National Quantum Initiative Act (NQIA) of 2018 paved the way for significant investments and coordinated efforts across various agencies. Programs like the Quantum Leap Challenge Institutes (QLCI) under the National Science Foundation (NSF) and legislative actions such as the National Defense Authorization Act (NDAA) and the CHIPS & Science Act further solidify US commitment to advancing quantum technologies.

While other countries like the UK, Australia, and the Netherlands have also announced ambitious quantum strategies and funding initiatives, they still look to the U.S. as a leader and collaborator in driving quantum innovation forward. The US not only excels in research and development but also in fostering a vibrant startup ecosystem and facilitating technology transfer from academia to industry.

 **Figure:** Comparison of American and Chinese Government Investments in the Global Quantum Industry (2019-2023)



 **Figure:** Proportion of the U.S. and Chinese government investment in the global quantum industry



2.3 Summary of comparative analysis

Powerful social capital drives the U.S. quantum industry leadership

In the U.S., social capital investment in the quantum industry has been powerful, with a total investment of approximately \$380 billion in quantum computing alone. This demonstrates the confidence of private investors in the U.S. quantum sector.

Chinese social capital investment in quantum technology has been relatively lower, with only around 3% of the risk capital attracted by Chinese quantum enterprises compared with their US counterparts. This indicates a relative lack of enthusiasm or confidence among Chinese private investors in the quantum industry.

China's Quantum Investment situation: Limited social capital Confidence

The U.S. government has taken an active approach to support the quantum industry through policies like the National Quantum Initiative Act. This legislation has provided substantial funding, totaling \$1.275 billion from 2019 to 2023, for the development of quantum technologies.

While China has also made significant government investments in quantum technology, exceeding those of the US by nearly \$2.4 billion, the impact of these investments on technology advancement is not obvious. The U.S. maintains a clear lead in critical quantum technologies such as superconducting and ion trap quantum computing, indicating that government investment does not necessarily translate to technological superiority.

US Quantum Industry has a Robust Capital Market and Diverse Exit Opportunities

In the realm of quantum technology, the United States stands as a beacon of innovation and investment, boasting a mature capital market that offers a myriad of exit opportunities for both investors and companies alike. Within this flourishing landscape, numerous quantum technology firms have successfully navigated the complexities of the stock exchanges, providing a lucrative avenue for investors to capitalize on their ventures while simultaneously empowering companies to procure additional capital for expansion and development. This thriving ecosystem, characterized by the presence of multiple listed companies, underscores the robustness of the US quantum industry and the strength of its exit pathways.

In stark contrast, the Chinese quantum industry languishes with a solitary listed company, presenting a stark limitation in exit opportunities and grappling with formidable hurdles in fundraising through public markets. This glaring asymmetry underscores the pivotal role of a supportive regulatory environment and a mature capital market in fostering industry growth and prosperity. While the United States offers investors a diverse array of exit options, ranging from initial public offerings (IPOs) to strategic acquisitions, the Chinese market struggles to provide comparable avenues for investors to realize their investments.

US Government Funding and Innovation Outpace Chinese Efforts

The powerful social capital investment in the U.S. quantum industry has contributed to its global leadership, especially in critical areas like superconducting and ion trap quantum computing.

While China's government investment in quantum technology is substantial, the country's relative lag in key quantum technologies suggests that social capital investment and private sector innovation may play a more significant role in driving technological advancement in the quantum industry.

US Policy and Investment Climate Supports Quantum Innovation Advantage

The U.S. has a more diversified and less internationally influenced social capital situation compared with China, which faces challenges in attracting international capital due to government regulations and economic conditions.

The U.S. government policies have created a supportive environment for social capital investment in the quantum industry, leading to a more stable and conducive ecosystem for innovation compared with China.


3. Comparative Analysis of Enterprise Financing Amounts and Stages

3.1 China's financing in quantum computing is about one-tenth that of the U.S.

While China may show competitiveness in areas like quantum sensing & imaging, the difference in quantum computing financing is substantial and highlights The U.S.'s superiority in this critical field. Looking at the figures provided, it's evident that the U.S. consistently outpaces China in quantum computing financing across multiple years.

In 2019, the U.S. invested \$92.80 billion compared with China's \$30 billion. This trend continues in subsequent years, with the U.S. maintaining a substantial lead, reaching \$554.86 billion in 2023, while China only reached \$51.60 billion, or one-tenth that of the U.S..

This significant difference displays the U.S.'s dominance in quantum computing innovation and investment, positioning it as a global leader in this crucial aspect of quantum technology. The U.S. powerful ecosystem of social capital, research institutes, and government support fosters a beneficial environment for quantum computing advancements, further solidifying its superiority in the global quantum industry.

 **Figure:** Proportion of social capital Investments in Quantum Computing, Quantum Communications & Safe and Quantum Sensing & Imaging in the U.S. and China (unit: million dollar)

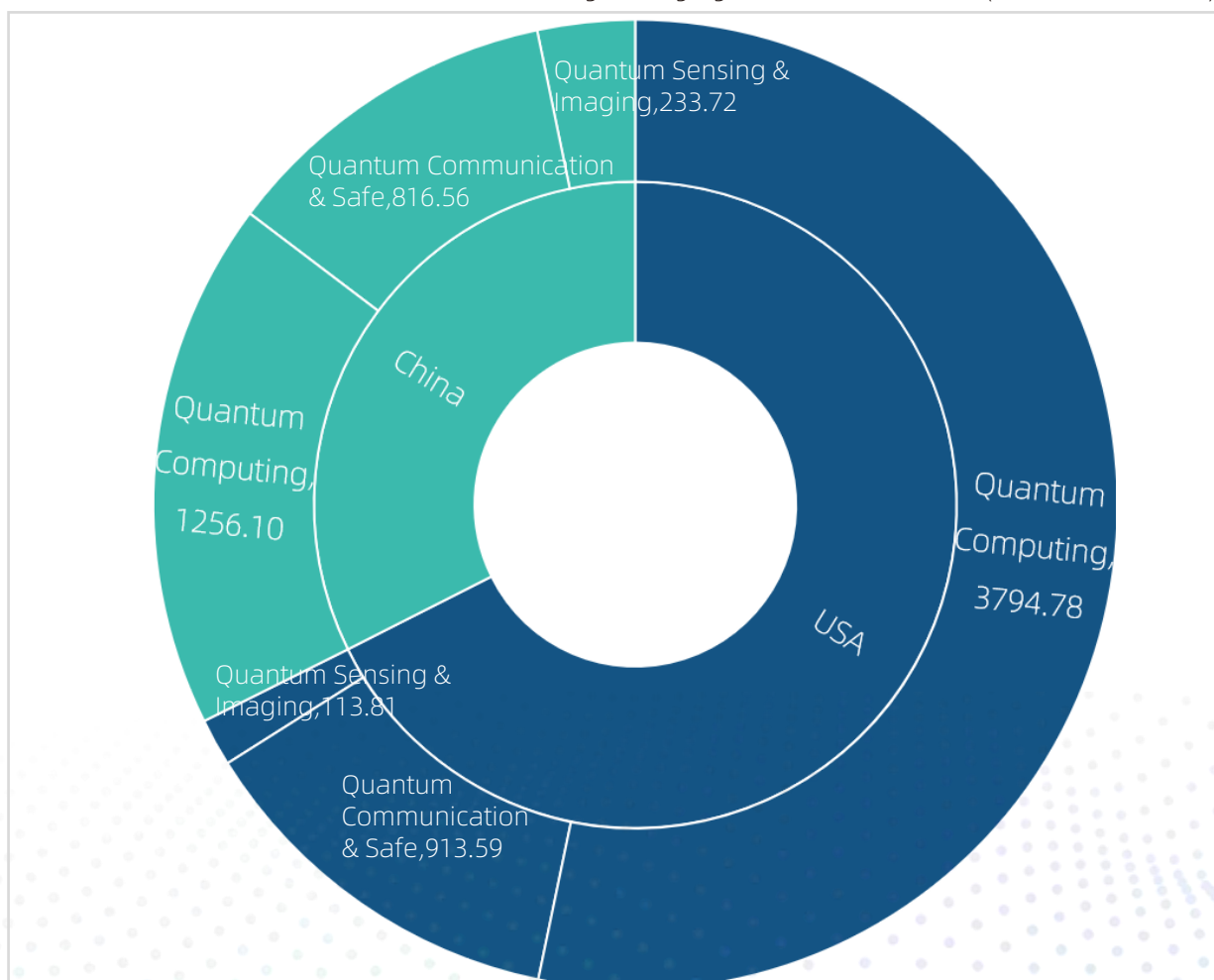
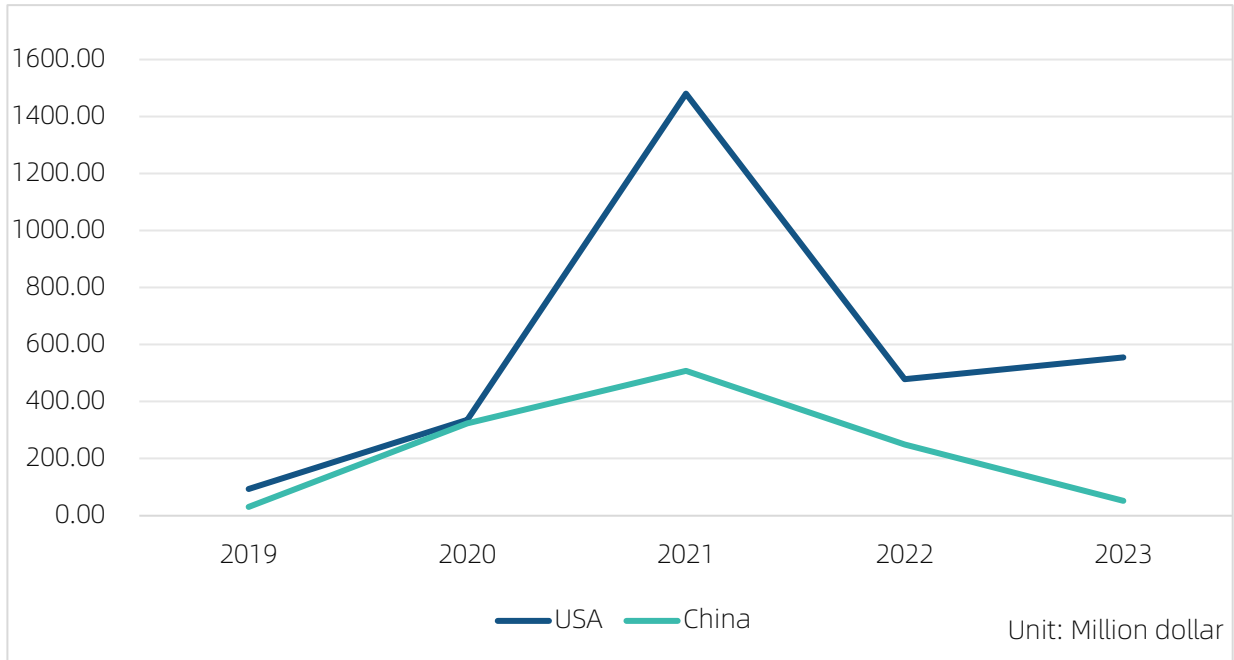
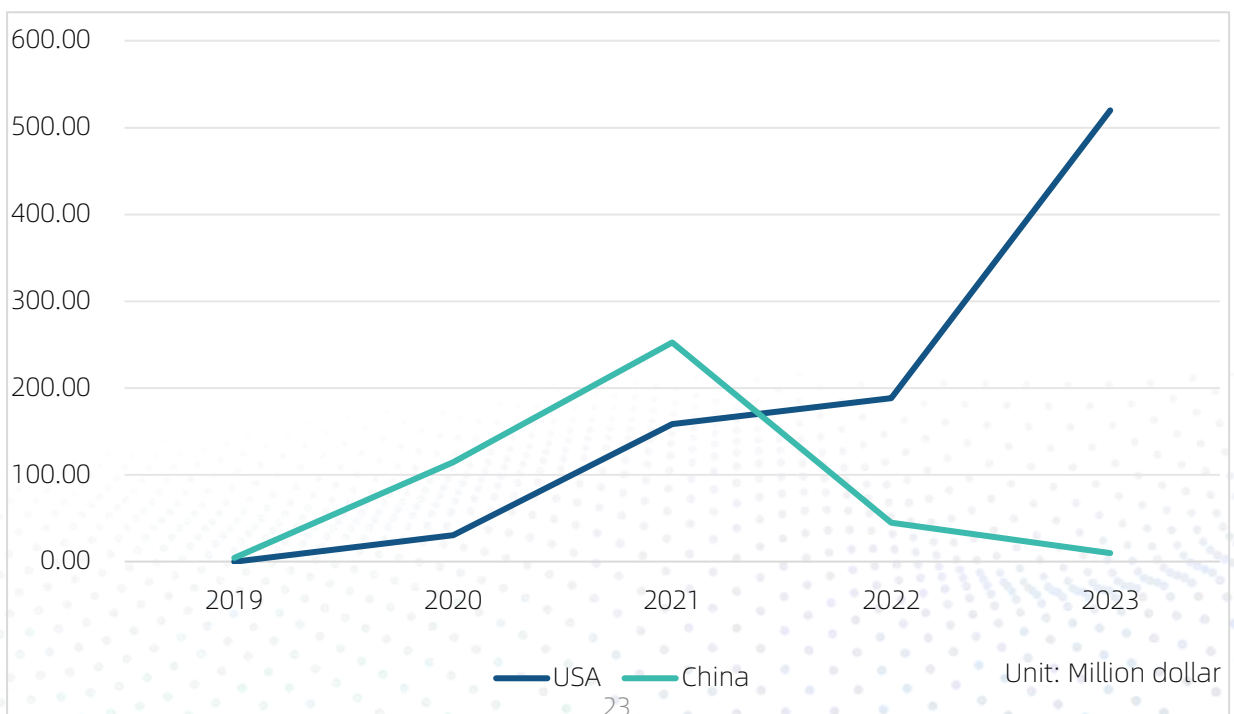


Figure: Annual social capital financing total for quantum computing between the U.S. and China (2019-2023)



It's evident that the U.S. consistently outperforms China in quantum communication & safe financing from 2019 to 2023. Despite the lower absolute value of social financing in this sector compared with quantum computing, the U.S. maintains its leadership position. For instance, in 2019, while China invested \$4.50 billion in quantum communication & safe, the U.S. did not record any investment. However, in subsequent years, the U.S. rapidly closed the difference and surpassed China. By 2023, the U.S. reached an impressive \$520 billion in financing, far surpassing China's \$9.75 billion.


Figure: Annual social capital financing total for quantum communication & safe between the U.S. and China (2019-2023)

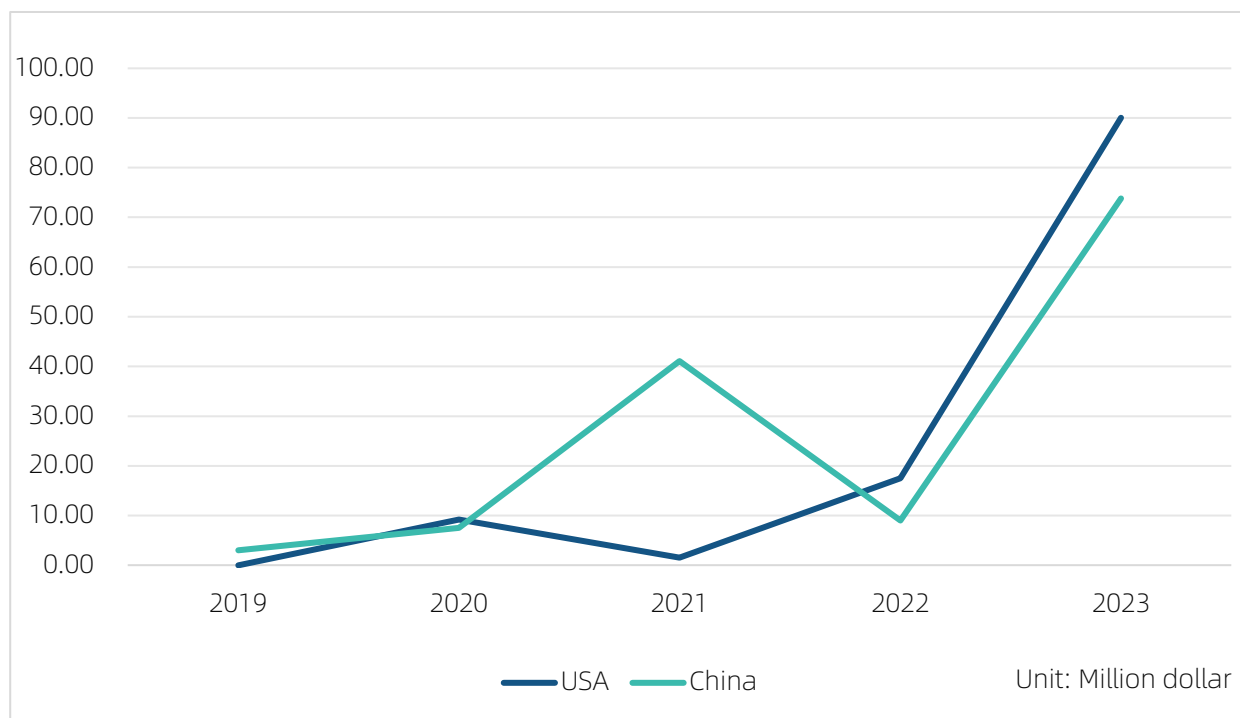


While the absolute value of social financing in quantum sensing & imaging may be the lowest among the various quantum sectors, it's important to consider the overall impact and the U.S. comparative performance in this area.

Although the total financing in quantum sensing & imaging may not significantly affect the overall quantum social financing situation, it's noteworthy that the U.S. and China have relatively similar levels of investment, with China holding a slight lead in recent years.

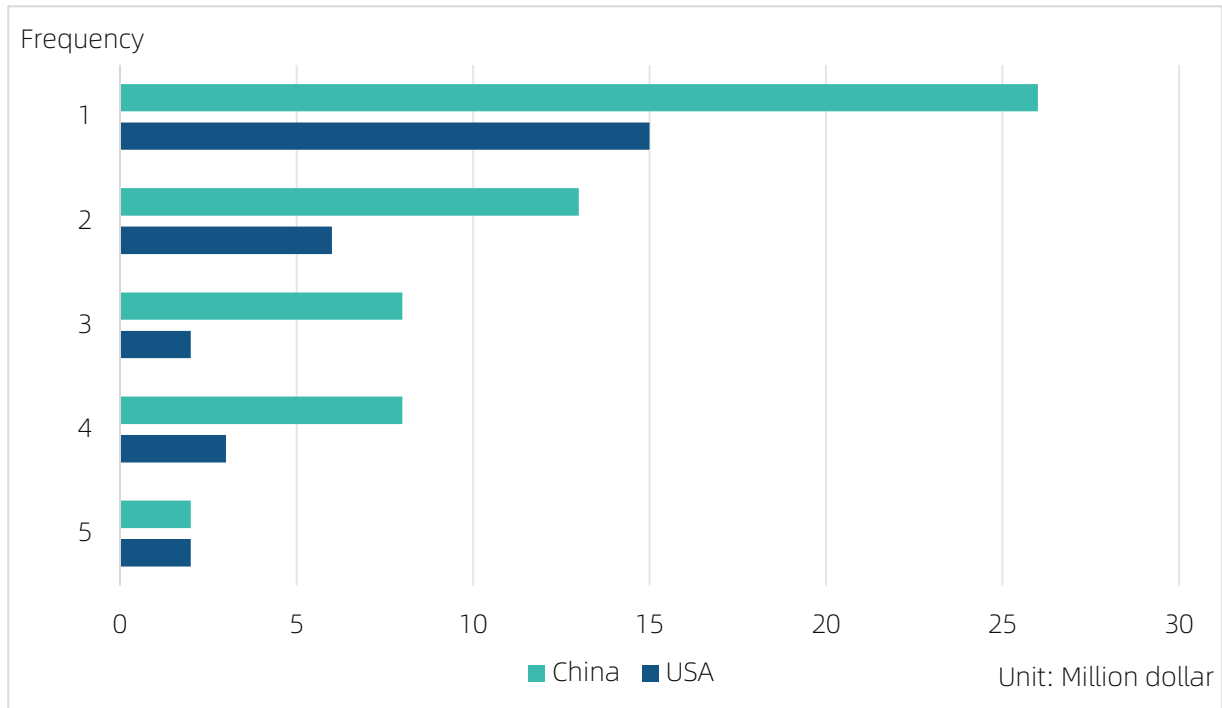
However, according to the provided data, it's evident that the U.S. has been steadily increasing its investment in quantum sensing & imaging over the years. For instance, in 2019, both countries had minimal investment, with the U.S. recording \$0 and China \$3 billion. However, by 2023, the U.S. significantly increased its investment to \$90 billion, surpassing China's \$73.82 billion.

 **Figure:** Annual social capital financing total for quantum sensing & imaging between the U.S. and China (2019-2023)



3.2 Challenges in Chinese Enterprise social capital Financing and Weak Financing Sustainability

Figure: Comparison of the annual frequency of social capital financing for quantum technology companies in the U.S. and China



The establishing time of quantum enterprise in China compared with the U.S. indicates a delayed start for Chinese companies. Among the number of financing rounds, only 13 out of 60 companies surveyed in China have completed three or more rounds of financing, compared with the U.S., where a larger proportion of companies have completed multiple rounds, indicating a more powerful financing environment.

Among Chinese quantum enterprises, QuantumCTeK stands out with nine rounds of financing, followed closely by CAS Quantum Network with seven rounds. However, when considering the time since the last financing round, about two-thirds of Chinese quantum startups have gone over a year without financing, compared with only a quarter in the U.S.. This indicates a potentially less stable funding environment for Chinese quantum startups.

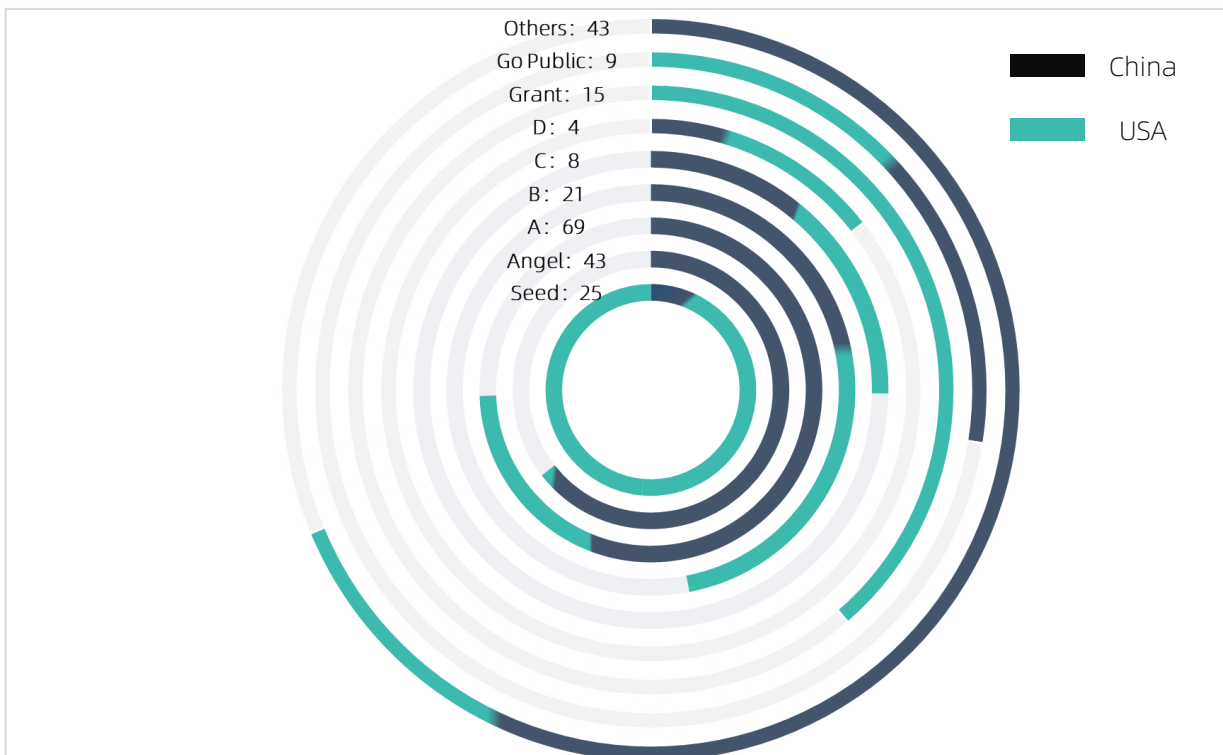
This funding situation has led to over half of Chinese quantum startups not acquiring any funding, and about two-thirds of them going nearly over a year without funding. Additionally, only about one-tenth of Chinese quantum startups have successfully secured Series B funding or later rounds. In terms of single-round funding amounts, Chinese quantum companies receive approximately one-fifth of the funding compared with their U.S. counterparts.

3.3 The relatively complete capital market system in the U.S. ensures active social capital investment, leaving China behind

The relatively complete capital market system in the U.S. ensures active social capital investment, giving the country a significant advantage over China. Among the top ten cumulative financing events in the global quantum technology field, US-based PsiQuantum leads with a total financing of \$1 billion. Looking at the distribution by country, U.S. companies occupy five of the top ten spots in total financing for quantum technology startups.

Among the global quantum technology field's top ten single-round financing events, the U.S. is the most active country, with multiple companies receiving substantial funding. Among them, US-based Sandbox AQ ranks first with a single-round financing amount of \$500 million. Additionally, among the nine listed companies surveyed, U.S. enterprises account for the largest proportion, with three companies: Rigetti, IONQ, and Quantum Computing Inc. (QCI). Until March 22, 2024, Rigetti Computing has a market value of \$258 million, with an average stock price of \$1.63. IONQ has a market value of \$1.96 billion, with an average stock price of \$9.39. Quantum Computing Inc. has a market value of \$80.35 million, with an average stock price of \$1.07.

 **Figure:** Comparison of financing rounds for quantum technology companies in the U.S. and China



The U.S. capital market is relatively complete, offering a variety of ways for enterprises to raise funds, creating a more loose market environment for financing. From the perspective of financing methods, U.S. companies not only rely on common financing methods but also use debt financing and other methods to raise capital. Moreover, relevant government departments in the U.S. provide considerable support for the development of the quantum industry. For example, the Department of Energy (DOE) has participated in the investment of multiple enterprises. Currently, four companies have completed multiple rounds of financing through government grants.

In contrast, China faces significant challenges in social capital funding for its quantum enterprises, especially in the current context of decoupling from the U.S. in investment and social capital. As the U.S. imposes restrictions on investments in sensitive technologies like quantum, Chinese companies may find it increasingly difficult to access U.S. capital markets, further widening the difference between the two countries in the quantum technology sector.

Looking at investors, U.S. companies have a diverse range of investor sources, including domestic private investment institutions like Honeywell and JP Morgan Chase, U.S. government departments such as the DOE and the National Science Foundation, as well as foreign institutes such as investors from Republic of Korea, China, and the UK, who have also participated in the investment and financing of U.S. quantum enterprises. Source Photonics, for example, received a \$90 million investment from Chinese companies Wantong Development and Haomei New Material in its Series D financing in 2023.

4. Prospects for Future Trends

4.1 China's Possible Actions

Increased Funding Support

China has been significantly increasing its funding support for the quantum industry, investing approximately \$92 billion from 2019 to 2023, compared with the U.S.'s \$50 billion. This trend is expected to continue, with China likely to further increase its funding in the next five years.

Dual-Cycle Strategy

To counter US restrictions on Chinese investments, China is likely to adopt a dual-cycle strategy. This strategy involves balancing the "internal cycle" and the "external cycle" by attracting long-term capital sources from countries along the Belt and Road Initiative and other regions to replace US capital.

Technological Innovation

China will continue to focus on technological innovation in quantum information science, with more universities establishing quantum laboratories. The number of quantum computing technology invention patents in China has grown significantly, indicating a narrowing difference with the US in technology development.

4.2 Strategies in response to the U.S. embargo

Legislative Measures

The U.S. has enacted a series of legislative measures to curb Chinese investment in critical technologies, including quantum. The Foreign Investment Risk Review Modernization Act (FIRRMA) of 2018 expanded the authority of the Committee on Foreign Investment in the U.S. (CFIUS) to review and block foreign investments in U.S. companies, especially those with ties to China. This has made it more challenging for Chinese entities to invest in U.S. quantum companies, limiting their access to U.S. technology and markets.

Export Controls

The U.S. has implemented stricter export controls on technologies relevant to quantum, preventing the transfer of sensitive technologies to China. The Commerce Department's Bureau of Industry and Security (BIS) has placed restrictions on the export of items that could be used for quantum computing, communication, or cryptography, effectively limiting China's access to key technologies.

Intellectual Property Protection

The U.S. has strengthened intellectual property protection measures to safeguard its quantum technology innovations. This includes stricter enforcement of patent laws and regulations, making it harder for Chinese entities to replicate or utilize US-developed quantum technologies without proper authorization.

Research and Development Focus

The U.S. government has prioritized funding and support for quantum research and development, fostering an environment conducive to technological advancement. Programs like the National Quantum Initiative (NQI) provide funding and resources for quantum research, giving U.S. companies a competitive edge in innovation.

Investment Screening

The U.S. has increased scrutiny of foreign investments, particularly those from China, in U.S. quantum companies. CFIUS reviews investments for national security risks and can block or require divestment of investments that pose such risks, further limiting Chinese access to US technology and intellectual property.

International Partnerships

The U.S. has sought to strengthen international partnerships in quantum research and development, particularly with allies in Europe and Asia. These partnerships not only enhance collaboration but also create a unified front against Chinese technological expansion in the quantum sector.

Public Awareness Campaigns

The U.S. government has launched public awareness campaigns highlighting the risks associated with Chinese investment in critical technologies like quantum. These campaigns aim to educate the public and policymakers about the importance of protecting US technology and intellectual property from foreign threats.

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