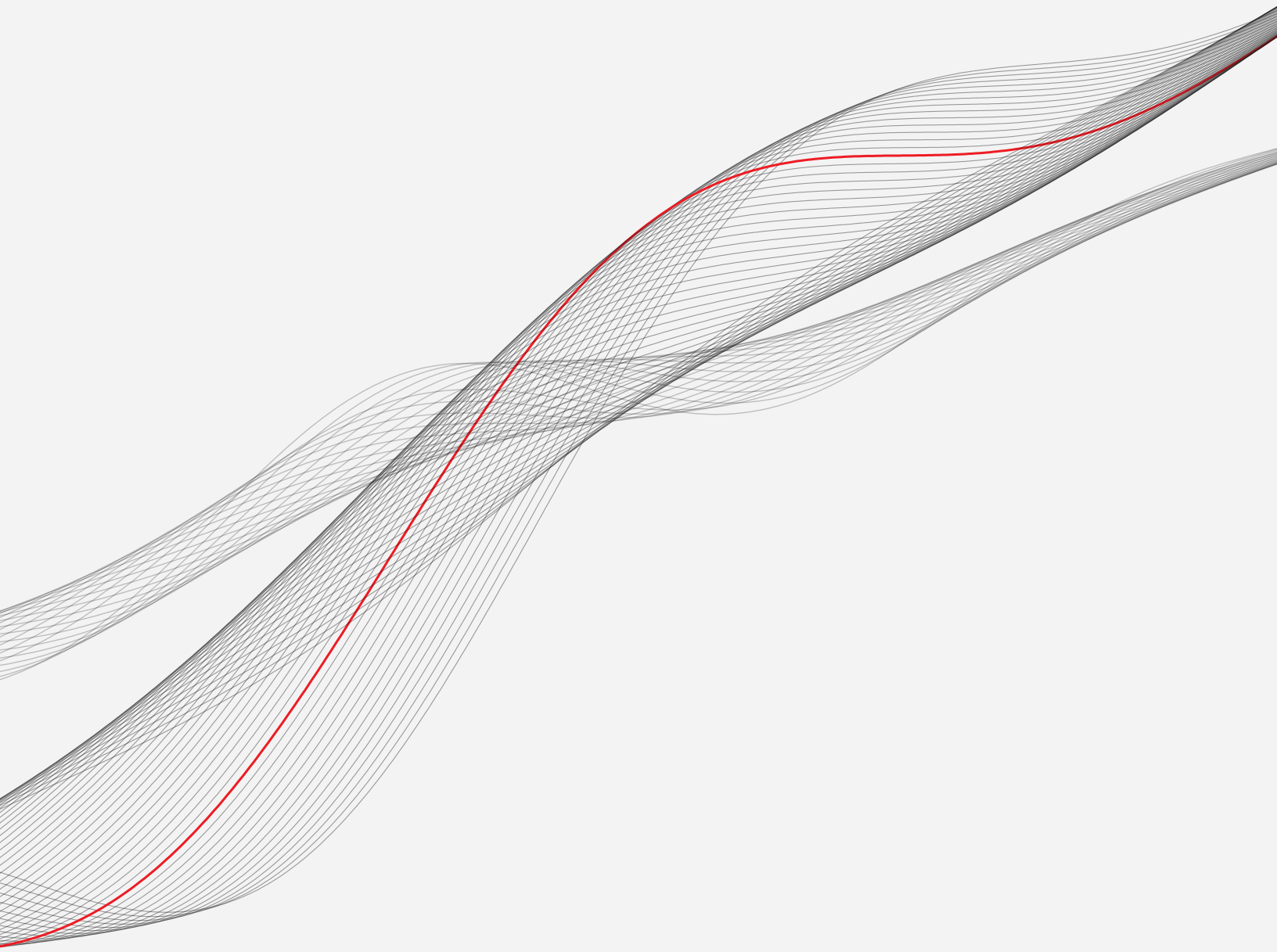


2 | Academic Research

Academic publications offer an early look at scientific progress, building the base for wider commercial application of quantum technologies. By analyzing publication metrics, we intend to spot emerging trends, track how knowledge spreads, and better understand how global quantum ecosystems are evolving. This chapter draws on research by ASPI[1] to present publication data across quantum computing and quantum communications.

Quantitative metrics give us a clearer view of national capabilities in quantum technologies. While total publication counts show overall activity, reflecting the scale of a country's research infrastructure and talent pool, they tell only part of the story. Combining publication volume with h-index[2] scores and citation data[3] balances sheer output with actual impact and influence. This dual perspective makes it easier to separate quantity from quality, giving a clearer picture of what each nation contributes to the quantum knowledge base.

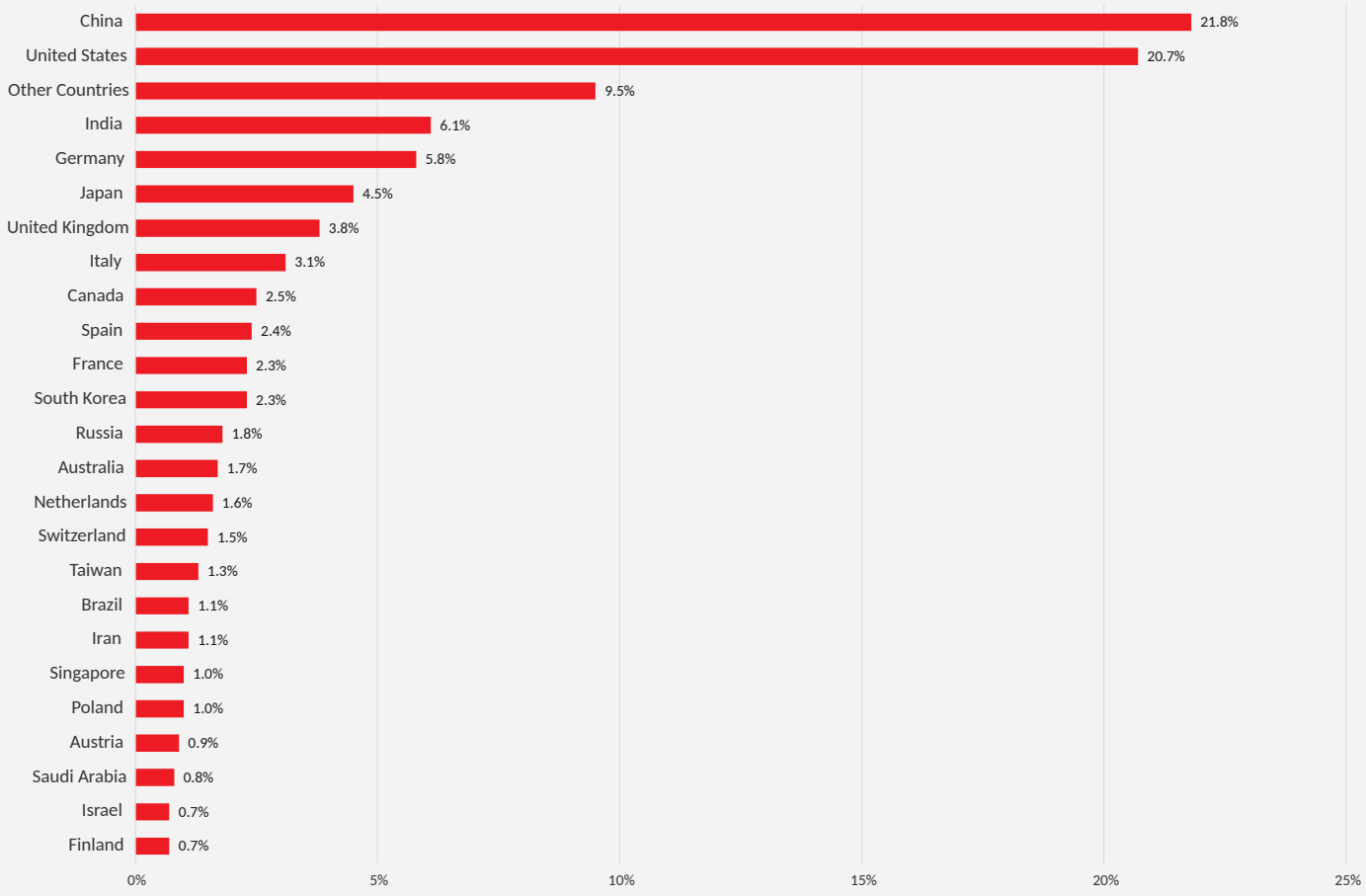
> The three-metric comparison reveals that publication volume alone does not predict research impact.

2.1 | Quantum computing

2.1.1 | Rankings by published research

Fig. 2.a | National share of quantum computing published research, 2021–2025

MIT Quantum Index Report



The global landscape of quantum computing publications over 2021–2025 reveals a highly concentrated distribution pattern, with China and the United States collectively accounting for 42.5% of all published research. China leads with 21.8% of publications, followed closely by the United States at 20.7%, signaling a close competition at the top.

India emerges as the leading individual contributor outside the top two, with 6.1% of global publications, followed by Germany at 5.8%. Together, the top five contributors (China, U.S., India, Germany and Japan at 4.5%) account for 58.9% of all quantum computing research, meaning just five countries generate nearly six in every ten papers published worldwide.

42.5%

China and the United States alone account for 42.5% of all quantum computing academic publications, nearly matching the combined output of every other country in the top 25.

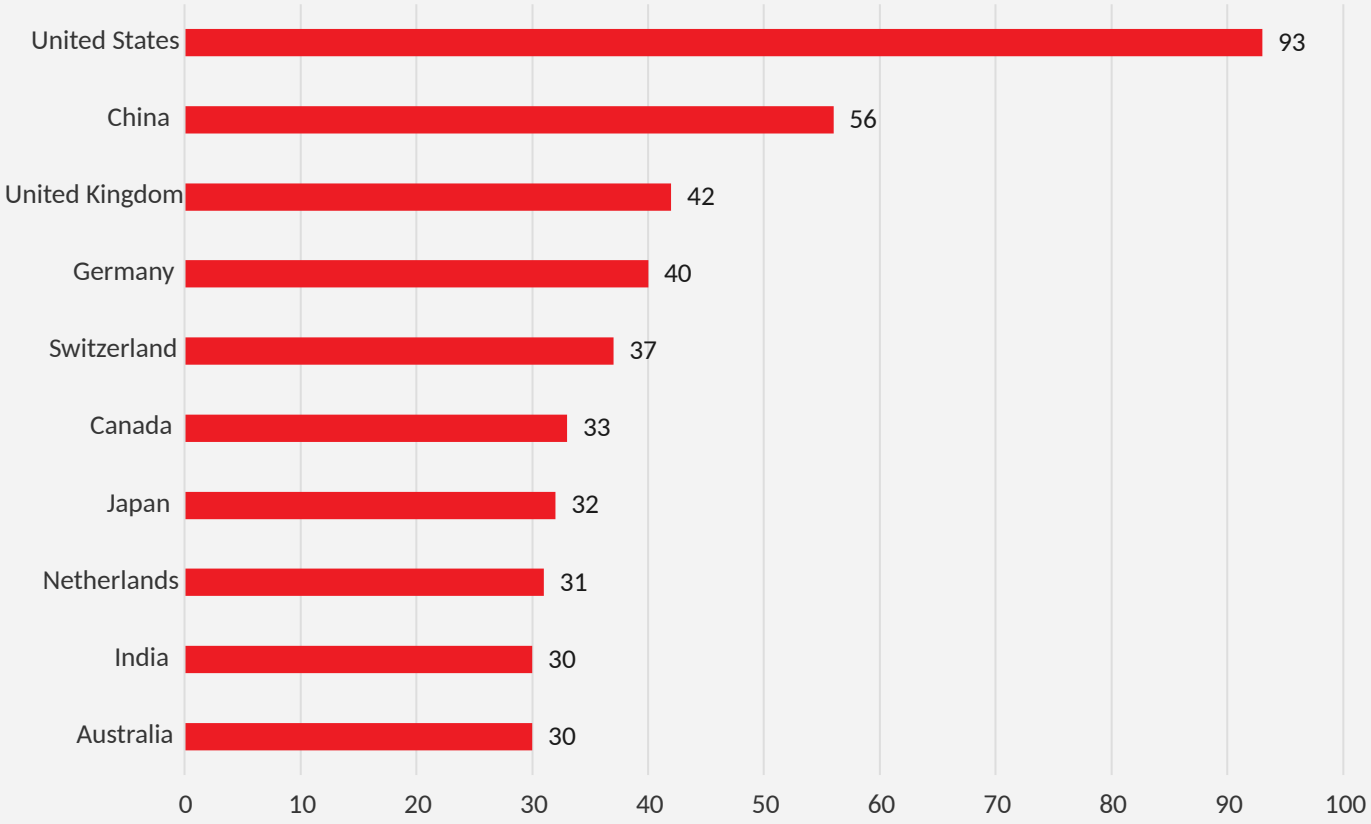
The middle tier shows diversity: Japan (4.5%), the United Kingdom (3.8%), and Italy (3.1%) form a distinct band of established research producers, together contributing 11.4% of global output. Just behind them, Canada (2.5%), Spain (2.4%), South Korea (2.3%), France (2.3%), and Russia (1.8%) make up a secondary cluster contributing a nearly identical 11.3% combined, indicating a competitive mid-tier.

At the lower end, a long tail of smaller but active research nations rounds out the picture: Australia (1.7%), the Netherlands (1.6%), Switzerland (1.5%), and Taiwan (1.3%) form a modest fifth tier (6.1% combined), while Iran, Brazil, Poland, Singapore, Austria, Saudi Arabia, Finland, and Israel, each contributing between 0.7% and 1.1%, collectively add another 7.3%. Notably, this tail includes a geographically diverse mix spanning the Middle East (Iran, Israel, Saudi Arabia), Latin America (Brazil), and Europe (Poland, Finland, Austria), suggesting quantum computing research, while still top-heavy, is becoming a genuinely global pursuit rather than one confined to a handful of traditional research powers.

2.1.2 | Rankings by H-index

Fig. 2.b | National quantum computing published research ranked by H-index, 2021–2025

MIT Quantum Index Report



93

U.S. quantum computing research quality is ranked highest in the world, with an h-index of 93 that leaves every other country well behind. China ranks second with an h-index of 56, meaning even though China rivals the U.S. in publication volume, its research impact trails by a much wider margin. The United Kingdom follows in third place with an h-index of 42.

This top three forms a clear leading group, with all other countries falling to 40 or below. Germany (40), Switzerland (37) and Canada (33) round out the upper-middle tier, followed closely by Japan at 32. The Netherlands (31) and a tie between Australia and India (30 each) complete the top ten, showing a tight cluster of countries within just a few points of one another at the lower end of the ranking.

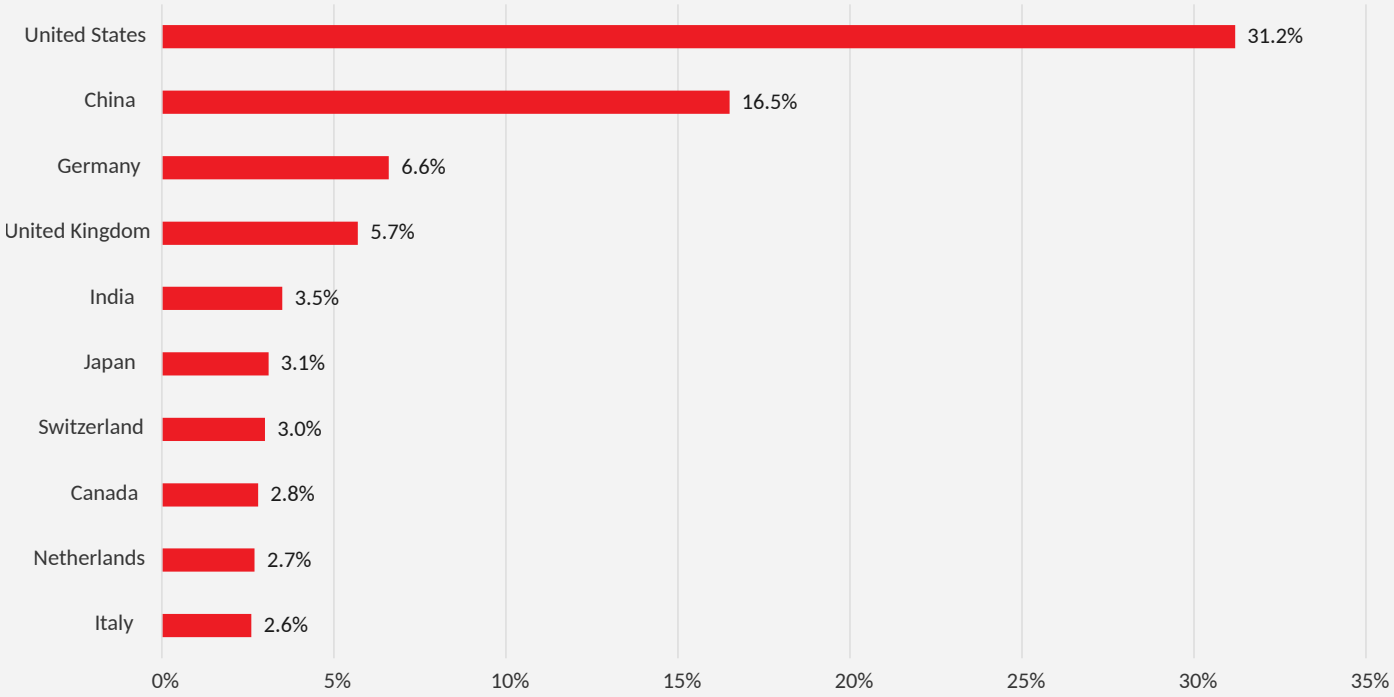
Comparing this ranking to publication volume, the U.S. produces slightly fewer papers than China in raw output terms, yet its h-index is 66% higher, pointing to research that is cited and built upon far more consistently. Similarly, the UK and Germany, mid-tier producers by publication share, punch well above their weight on impact, ranking third and fourth globally despite trailing India in sheer volume of published research.

The h-index rankings reveal a quality gap that does not mirror the quantity rankings: the U.S.'s commanding lead (93) is nearly double China's (56) and more than double the UK's (42), suggesting that research influence in quantum computing is even more concentrated at the top than publication output alone would indicate.

2.1.3 | Rankings by most highly cited papers

Fig. 2.c | National share of top 10% most highly cited quantum computing publications, 2021–2025

MIT Quantum Index Report



> Among the top 10% of the most highly cited papers in quantum computing, the United States holds the largest share by a wide margin, with 31.2% of all highly cited publications.

China follows in second place with 16.5%, just over half the U.S. share, reinforcing the pattern seen in the h-index rankings, where China's research volume is not matched by an equivalent share of high-impact output.

Germany ranks third with 6.6%, followed by the United Kingdom at 5.7%, together forming a clear second tier well behind the two leaders but still notably ahead of the rest of the field. India comes in fifth with 3.5%, edging out Japan (3.1%) and Switzerland (3.0%) in a closely clustered group.

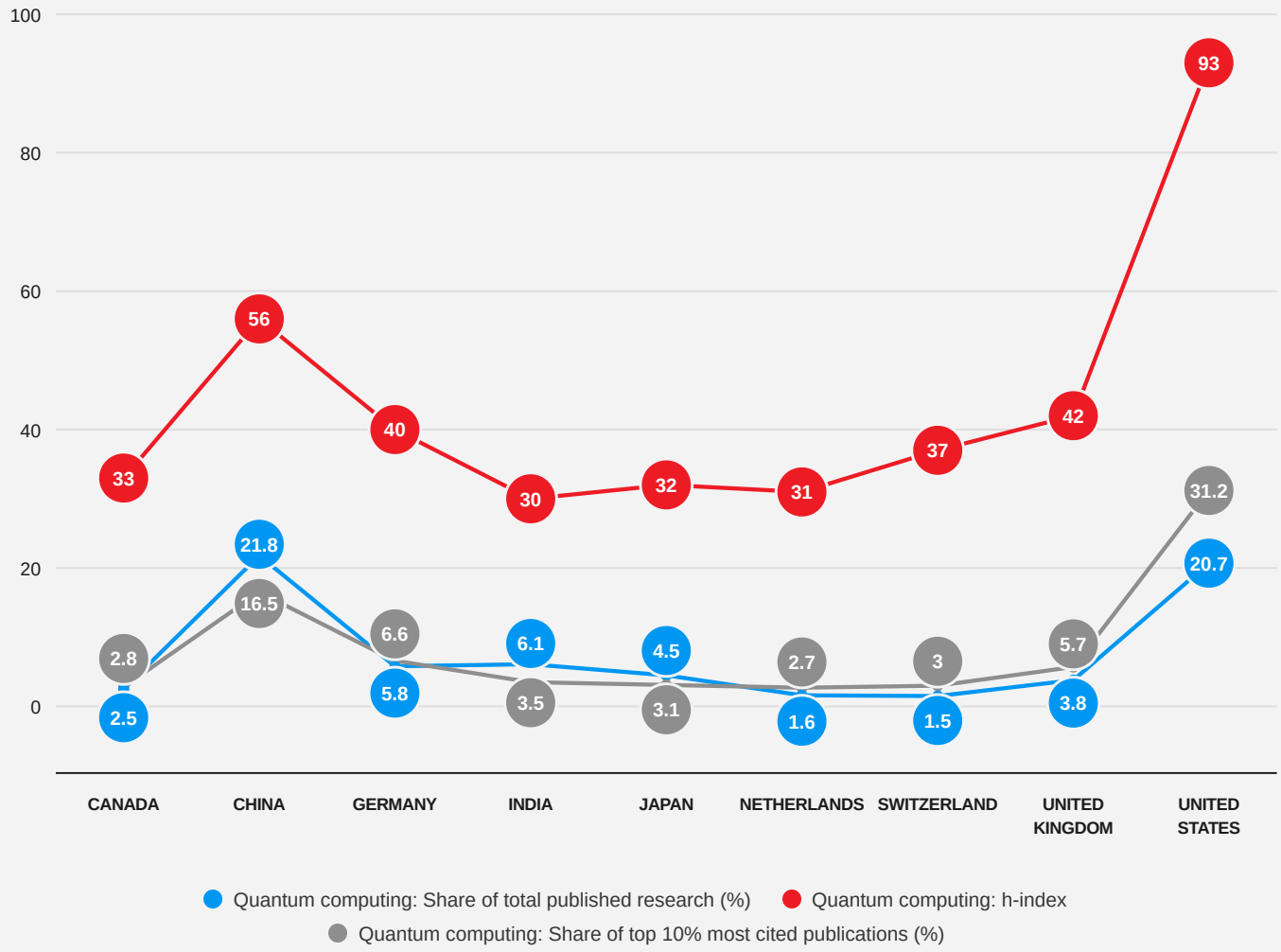
The remainder of the top ten, Canada (2.8%), the Netherlands (2.7%) and Italy (2.6%), cluster within just 0.2 percentage points of one another, indicating that beyond the top four countries, the ability to produce highly cited research becomes far more evenly distributed among a broader set of nations.

> The U.S. and China alone are responsible for 47.7% of the most highly cited publications, meaning the two leading nations produce nearly half of the world's most influential quantum computing research, a concentration even sharper than their already-dominant 42.5% share of total publications by volume.

2.1.4 | Quantum computing rankings overall

Fig. 2.d | Quantum computing research rankings overall, 2021–2025

MIT Quantum Index Report



The three metrics together show a fuller picture of global quantum computing research and reveal that volume, quality and impact do not always move together.

The United States demonstrates remarkable consistency in leadership despite not leading in raw output. It ranks second in total publications (20.7%, just behind China), but takes the top position decisively in both the h-index (93) and highly cited publications (31.2%).

This pattern suggests the U.S. research system converts a slightly smaller volume of output into disproportionately higher quality and influence.

China presents the inverse case. It leads narrowly in total publications (21.8%), yet its performance drops sharply in the quality metrics, second in h-index (56, a 37-point gap from the U.S.) and second in highly cited papers. Germany and the United Kingdom emerge as the strongest “quality relative to volume” performers outside the top two. Both countries consistently outperform their publication share in the impact metrics, suggesting efficient, high-quality research systems.

India tells a different story, ranking higher in volume but lower in impact. Switzerland and the Netherlands stand out as small but disproportionately influential contributors. Both nations produce a small fraction of global output but consistently rank among the more cited and influential research bases, which could be interpreted as a sign of concentrated, high-caliber research programs rather than broad output. Japan and Canada occupy a more balanced middle ground, with rankings that stay relatively proportional across all three metrics.

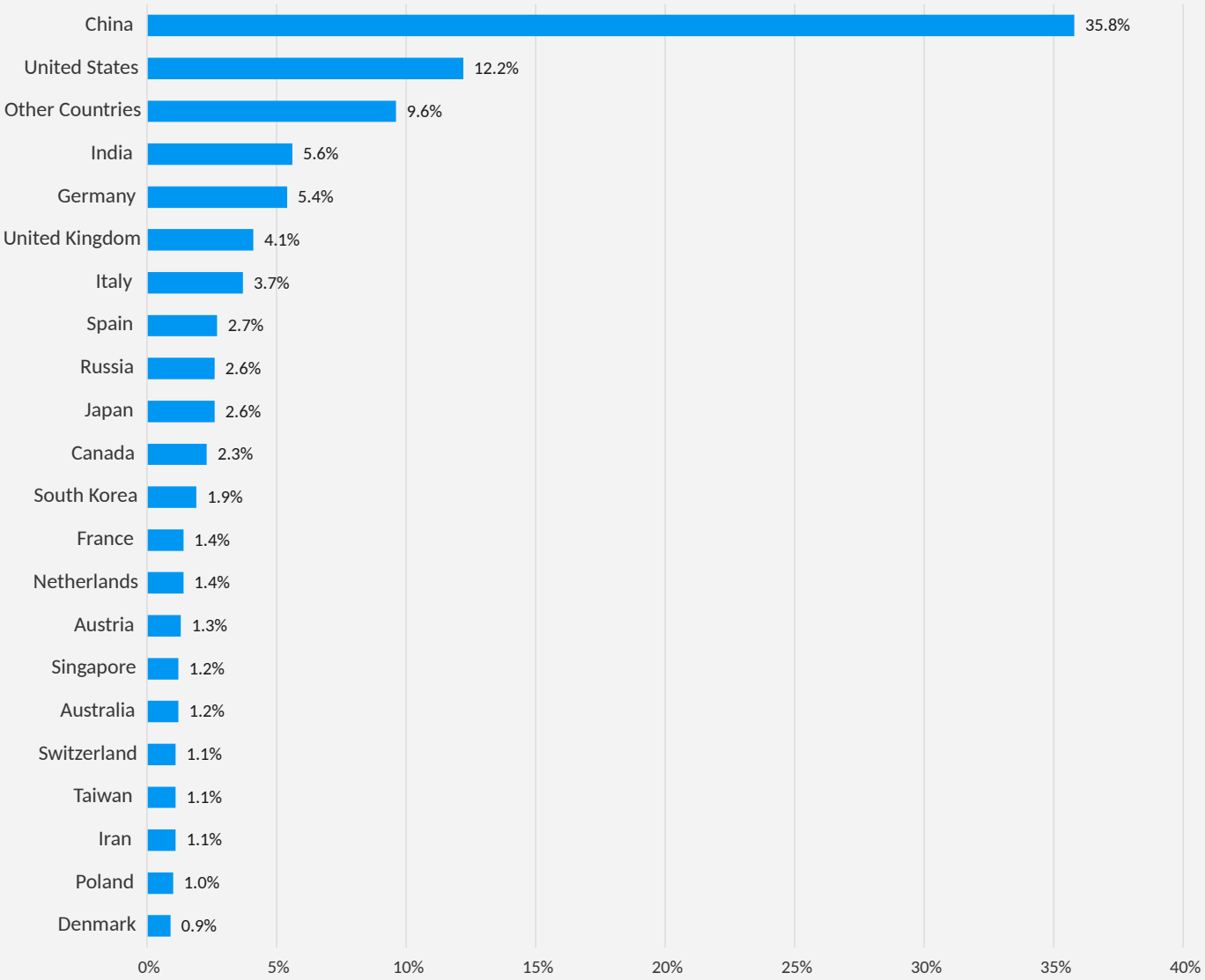
> The three-metric comparison reveals that publication volume and research impact are not always aligned. The U.S. leads decisively on quality and impact despite a marginally smaller publication share than China, while China and India lead on volume but rank lower on influence, and a group of smaller, high-efficiency research nations (Germany, the UK, Switzerland, the Netherlands) consistently convert modest output into outsized global impact.

2.2 | Quantum communications

2.2.1 | Rankings by published research

Fig. 2.e | National share of quantum communications published research, 2021–2025

MIT Quantum Index Report



35.8%

China leads quantum communications research to a degree far above its already-strong position in quantum computing, holding 35.8% of global publications, nearly three times the share of the United States, which ranks a distant second at 12.2%.

India (5.6%) and Germany (5.4%) form a closely matched third and fourth, together contributing 11%. Combined, the top four countries, China, the U.S., India, and Germany, account for 59% of all quantum communications publications, underscoring the concentration in this research domain.

A secondary tier follows with the United Kingdom (4.1%) and Italy (3.7%), together adding 7.8%, followed by Spain (2.7%), Japan (2.6%), and Russia (2.6%), a closely clustered trio contributing 7.9% combined. Canada (2.3%) and South Korea (1.9%) round out the upper-middle tier, each still producing a meaningful share of global research despite trailing the leaders significantly.

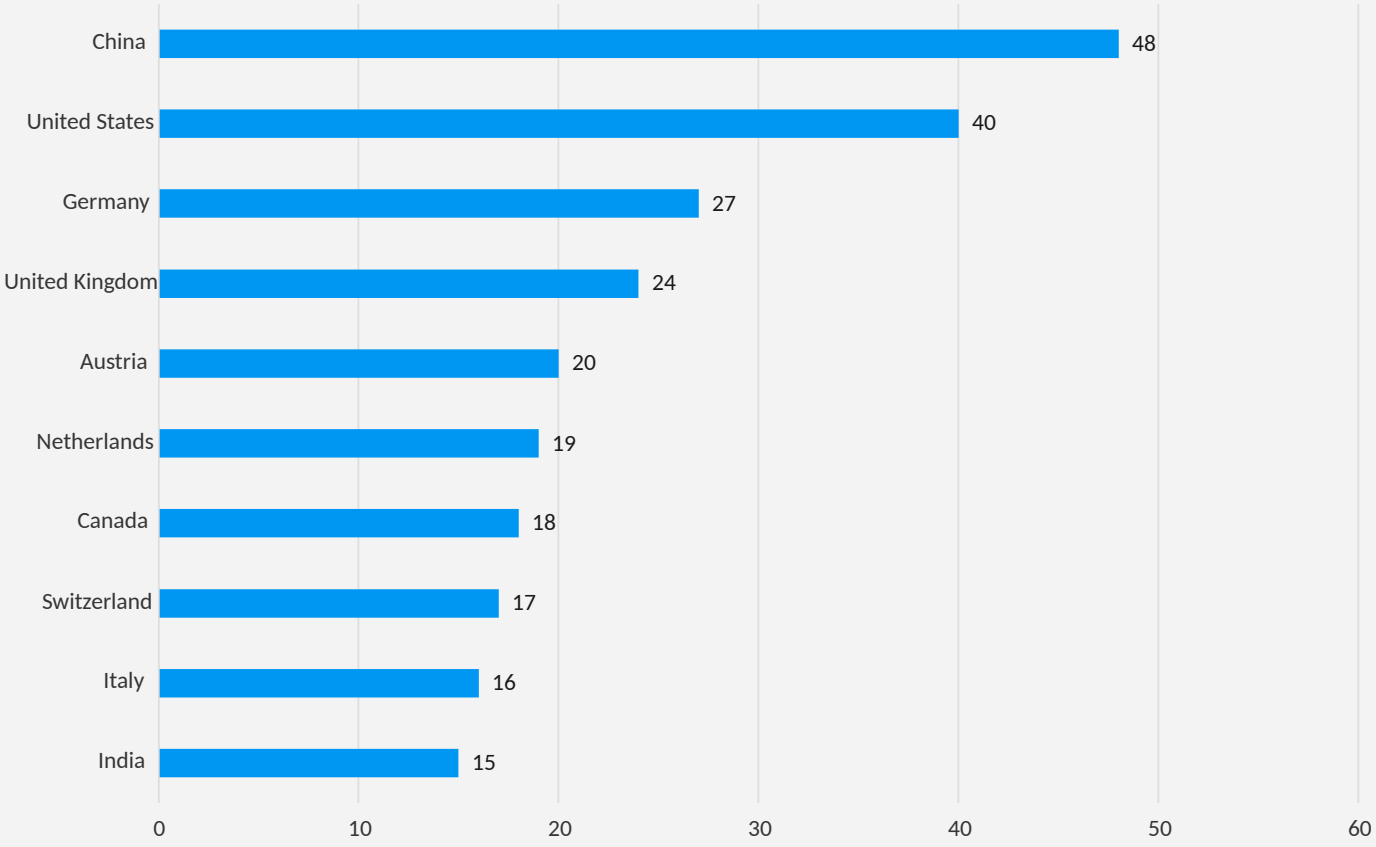
The lower tier reveals a long list of contributors: the Netherlands and France tie at 1.4%, Austria, Australia and Singapore sit near 1.2–1.3%; and Iran, Taiwan, and Switzerland all cluster tightly around 1.1%, followed by Poland (1.0%) and Denmark (0.9%) ranking at the end.

Comparing this to the quantum computing landscape, China's quantum communications share (35.8%) is 64% higher than its quantum computing share (21.8%), while the U.S. shows the opposite pattern, with its quantum communications share (12.2%) roughly 41% lower than its quantum computing share (20.7%). This divergence suggests quantum communications is a field where Chinese research investment and output have scaled far more aggressively than in quantum computing, while the U.S. maintains a comparatively smaller presence, though still securing second place in both domains.

2.2.2 | Rankings by H-index

Fig. 2.f | National quantum communications published research ranked by H-index, 2021–2025

MIT Quantum Index Report



> China leads quantum communications research quality with an h-index of 48, followed by the United States at 40, a gap of 8 points that, while notable, is far narrower than the near-threefold lead China holds in publication volume. This suggests that while China's dominance in communications is most pronounced in sheer output, its research impact edge over the U.S. is comparatively modest.

Germany ranks a clear third with an h-index of 27, followed by the United Kingdom at 24, together forming a distinct second tier well behind the two leaders. Austria (20) and the Netherlands (19) follow each other closely, while Canada (18) and Switzerland (17) rank just below them.

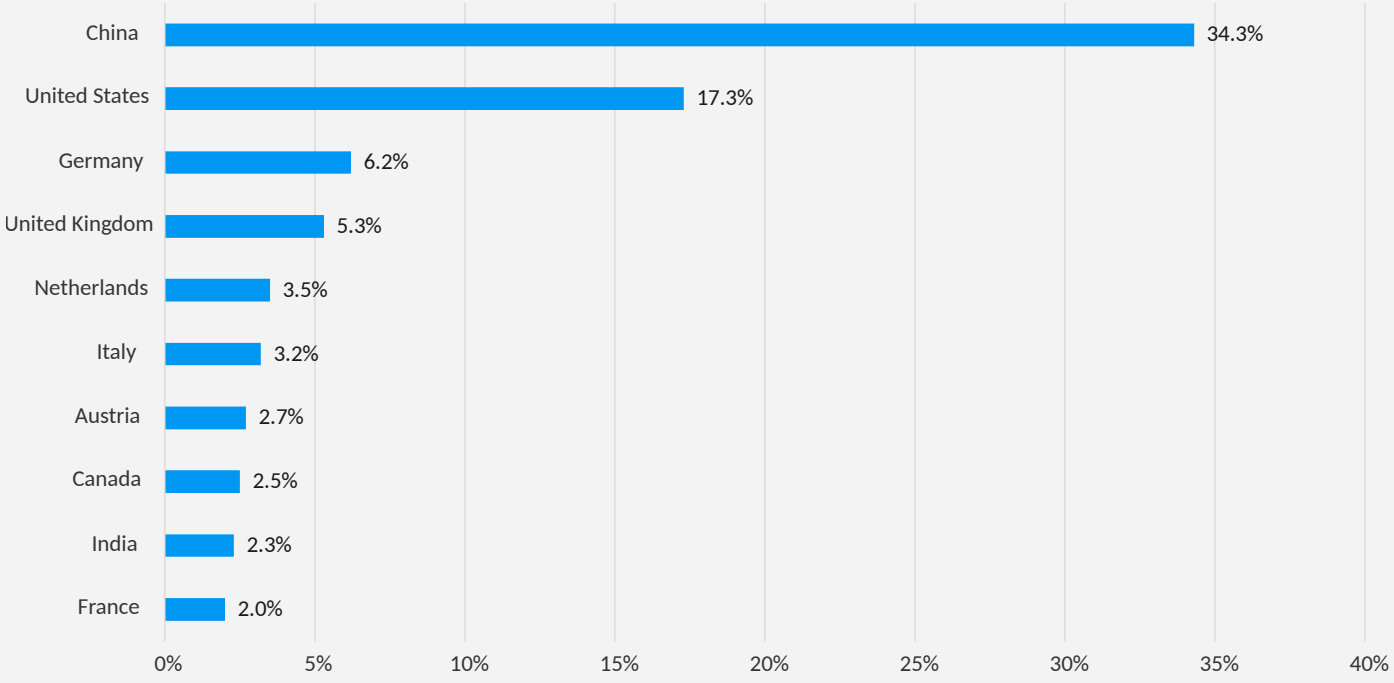
Italy (16) and India (15) round out the top ten, closing out a ranking where the gap between third and tenth place spans just 12 points, compared with the 8-point gap between the top two alone, indicating a relatively compressed and competitive mid-to-lower tier.

In comparison to quantum computing rankings where the U.S. held a commanding h-index lead (93 vs. China's 56), in communications, China actually overtakes the U.S. on research quality (48 vs. 40), not just volume. China's leadership in quantum communications reflects genuinely higher-impact research in this specific subfield, unlike quantum computing where its volume lead was not matched by citation influence.

2.2.3 | Rankings by most highly cited papers

Fig. 2.g | National share of top 10% most highly cited quantum communications publications, 2021–2025

MIT Quantum Index Report



Among the top 10% of the most highly cited papers in quantum communications, China holds a commanding lead with 34.3% of all highly cited publications, nearly double the share of the United States, which ranks second at 17.3%.

Germany follows in third place with 6.2%, ahead of the United Kingdom at 5.3%, together forming a clear second tier well behind the two leaders but still ahead of the rest of the field. The Netherlands (3.5%) and Italy (3.2%) come next, closely matched, followed by Austria (2.7%) and Canada (2.5%).

India (2.3%) and France (2.0%) round out the top ten, with the gap between third and tenth place spanning just 4.2 points, a relatively compressed field once past the two dominant leaders.

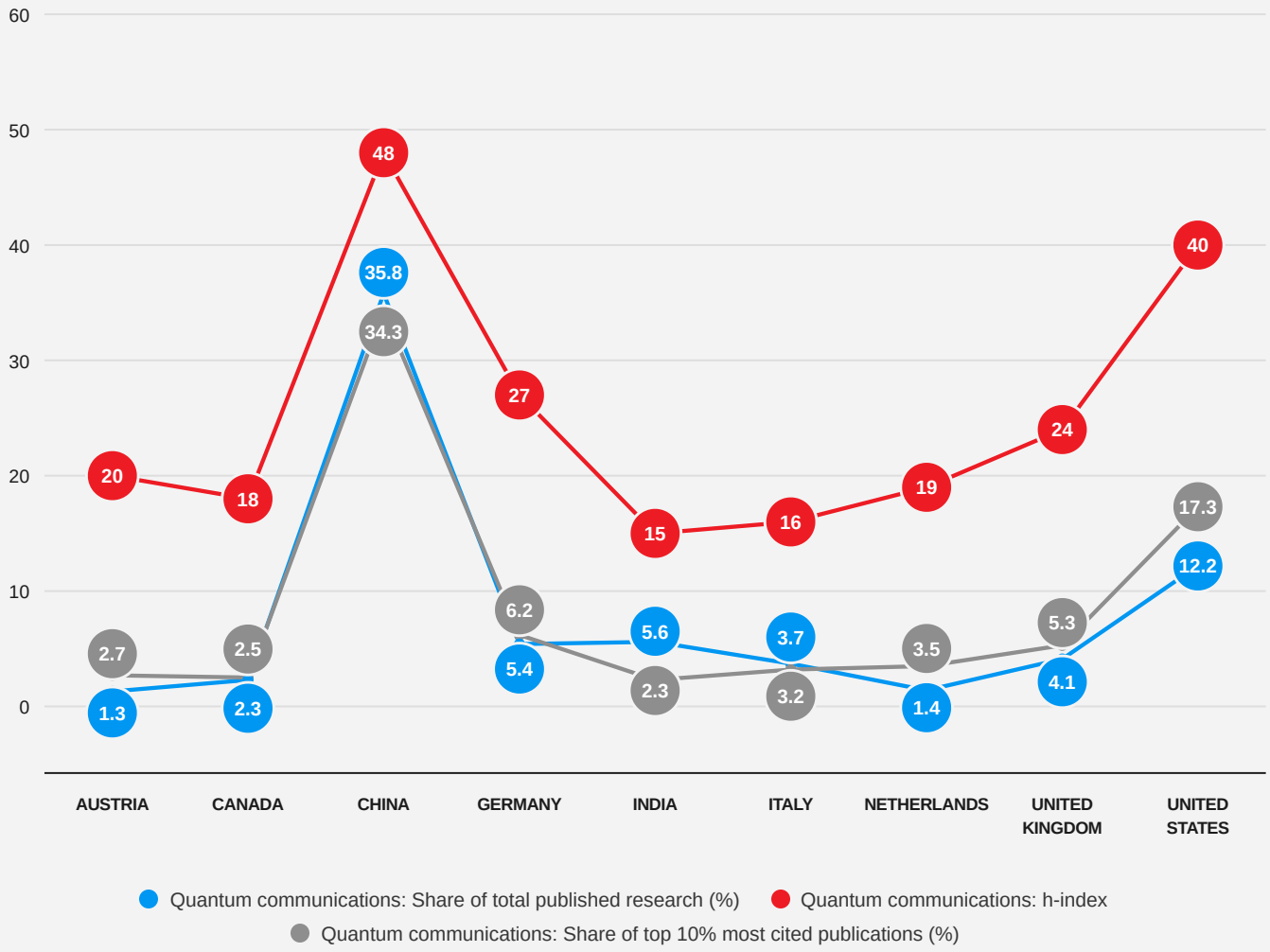
Combined, the top ten countries account for 79.3% of all top-10%-cited papers in quantum communications, with China and the U.S. alone responsible for 51.6% of that total, signifying that just two countries produce more than half of the world's most influential quantum communications research.

China's dominance is consistent across all three metrics in this field: it leads in publication volume (35.8%), h-index (48), and now highly cited papers (34.3%), with each share landing in a similar range of around one-third of the global total. This is a notable contrast to quantum computing, where the U.S.'s citation-impact lead (31.2%) was proportionally much larger than its publication share (20.7%); in communications, China's citation-impact share (34.3%) tracks almost identically with its publication share (35.8%), suggesting its research influence in this subfield scales directly with its research volume.

2.2.4 | Quantum communications rankings overall

Fig. 2.h | Quantum communications research rankings overview, 2021–2025

MIT Quantum Index Report



China dominates the quantum communications field across all three metrics, with 35.8% of total publications, significantly outpacing the next closest contributor, the United States, at 12.2% of global output. This nearly threefold gap in publication volume is reinforced by China's quality metrics, where it achieves an h-index of 48 and accounts for 34.3% of the top 10% most-cited works.

The United States holds a firm second place across the board, with 12.2% of publications, an h-index of 40, and 17.3% of highly cited papers. Notably, the U.S. converts its smaller publication share into a citation-impact share (17.3%) that is proportionally larger, roughly 1.4 times its output share, echoing the “small volume, outsized impact” pattern seen in quantum computing, though far less pronounced here given China’s significant lead in this field.

Germany emerges as the clear third-place research power in quantum communications. The United Kingdom follows a similarly stable pattern, placing fourth or fifth across all three metrics.

India presents a divergence: it ranks third in total publications (5.6%), ahead of Germany, yet falls to tenth in h-index (15) and ninth in highly cited papers (2.3%). This high-volume, low-impact pattern is even more pronounced in communications than it was in quantum computing.

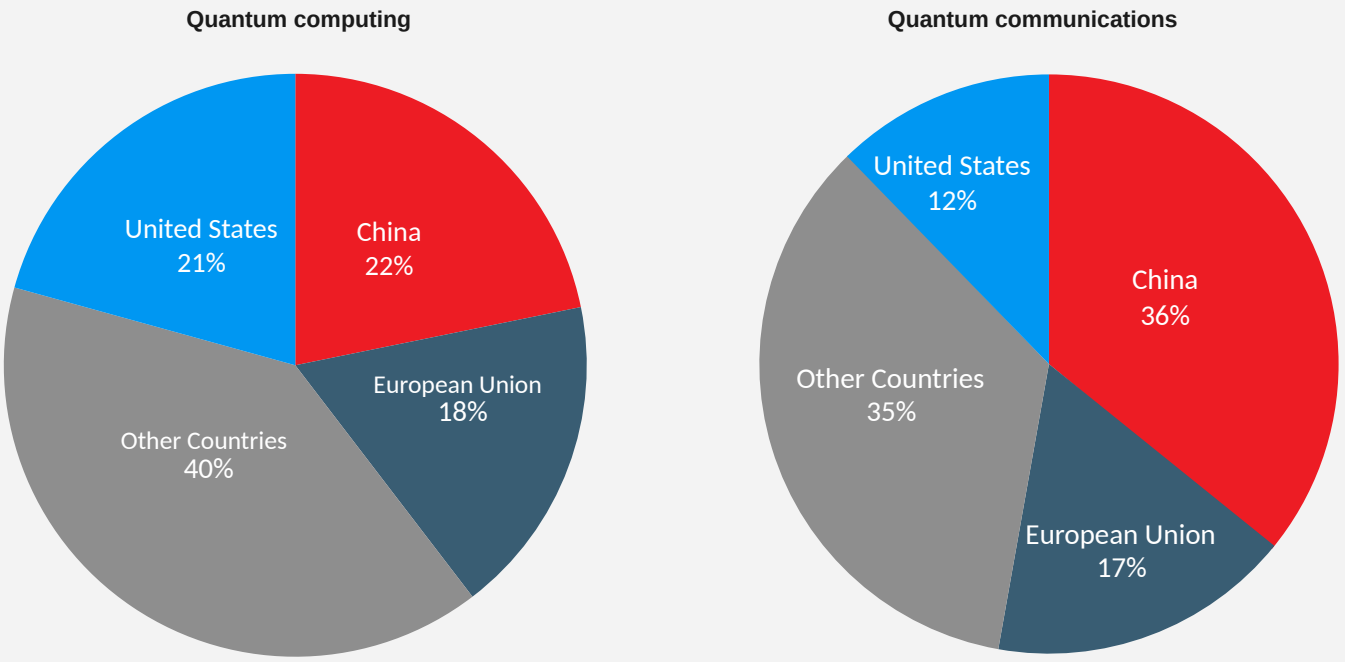
Austria ranks in a lower tier in publications (1.3%) but climbs to fifth in h-index (20) and seventh in highly cited papers (2.7%), while the Netherlands shows an almost identical trajectory (1.4% publications, sixth in h-index at 19, fifth in highly cited papers at 3.5%). Both nations exemplify concentrated, high-efficiency research programs rather than broad-based output.

> Quantum communications is a field defined by China’s leadership across volume, quality, and impact alike, a more uniform and commanding leadership position than seen in quantum computing, where the U.S. retained the edge on research quality despite trailing in output. The U.S. remains the clear second place power, Germany and the UK provide steady mid-tier consistency, and countries like Austria and the Netherlands demonstrate that impact and volume don’t always move together, even within a field as concentrated as this one.

2.3 | Quantum computing vs. quantum communications research

Fig. 2.i | National share of published research, 2021–2025

MIT Quantum Index Report



The regional comparison reveals a divergence in strategic focus between the world's two research superpowers: China's 14-point overweighting toward quantum communications contrasts with the U.S.'s 8.5-point overweighting toward quantum computing, while the European Union stands out as the most balanced major player, maintaining an almost identical share of global output across both quantum subfields.

China demonstrates clear strategic emphasis in quantum communications, holding 35.8% of publications compared to 21.8% in quantum computing, a difference of 14 percentage points. This gap might suggest a deliberate national focus on quantum communications, an area often tied to secure networking and satellite-based encryption infrastructure, where China has invested heavily and publicly for over a decade.

The United States shows the inverse pattern. It leads the “other” major players in quantum computing with 20.7% of publications, but drops to a distant second in quantum communications at just 12.2%, a difference of 8.5 percentage points in the opposite direction. This reversal might suggest that the U.S. research base is more heavily weighted toward computing hardware and algorithms than toward communications infrastructure, pointing to a divergent set of national priorities compared to China.[4]

The European Union maintains a remarkably stable position across both fields, holding 17.8% of quantum computing publications and 17.0% of quantum communications publications, a gap of just 0.8 percentage points. This consistency might suggest the EU’s quantum research strategy is broad-based rather than concentrated in one subfield, reflecting a more evenly distributed investment across quantum technologies as a whole.

2.4 | Future research

Looking ahead, we aim to expand our analysis by diving into specific subfields of quantum computing and quantum communications. By tracking how research output and quality differ across these specialized areas, we can better map the relationship between theoretical breakthroughs and practical applications. This granular focus would help uncover emerging trends and innovation opportunities that broader, field-level data often hides. We invite the quantum research community to contribute data and insights to future editions of this report.

You can reach us at contact@qir.mit.edu

Footnotes

[1] Wong-Leung, J., Robin, S., & Cohen, L. (2025). ASPI's Critical Technology Tracker: 2025 updates and 10 new technologies; Gaida, J., Wong-Leung, J., & Robin, S. (2023). Critical technology tracker. Who Is Leading the Critical Technology Race. A Project by the Australian Strategic Policy Institute. Critical Technology Tracker, Australian Strategic Policy Institute (ASPI), (Accessed May 2026), https://techtracker.aspi.org.au.

[2] Ibid, h-index (Hirsch index) is an established performance metric used for analyzing the impact of scholarly output. It's a combined measure of quantity and impact. To calculate h-index, a set of papers (e.g. all those on quantum computing from a particular country over a certain time period) has an h-index of N if the relevant authors have published N papers that have N or more citations each. The h-index is based on Times Cited data from the Web of Science database.
It does not include citations from non-indexed resources.

[3] The top 10% of the most highly cited papers were analyzed to generate insights into which countries are publishing the greatest share of high-quality, innovative and high-impact research. Credit for each publication was divided among authors and their affiliations and not assigned only to the first author (for example, if there were two authors, they would each be assigned half the allocation). Fractional allocation of credit was used for all metrics.

[4] 'Vying for Quantum Supremacy: U.S.-China Competition in Quantum Technologies' (US-China Economic and Security Review Commission 2025).

