DEEPTECH CHINA MONITOR
by Bettina B. Scheibe

China's Quantum Ecosystem Through a European Venture Lens

A Strategic Note for Deep-Tech Ecosystem Builders and Policymakers

---

The Three Structural Differences Between China and Europe

Understanding the differences between China's and Europe's quantum ecosystems requires looking beyond funding levels or research output.

The key distinction lies in how innovation systems are structured to move technologies from scientific discovery to industrial deployment.

China has developed an ecosystem designed to accelerate the commercialization of deep technologies, while Europe's system remains strongly centered around academic institutions.

Three structural differences illustrate this contrast.

---

1. Innovation Structure

	China	**Europe**
Innovation architecture	Commercialization pipeline	Institution-centered ecosystems
Cluster organization	Stages of technology development	Universities and research institutions

China's innovation clusters are structured around stages of technology commercialization.

Research, engineering development, and industrial deployment frequently occur in different but connected ecosystems.

Europe's ecosystems, by contrast, are often centered around individual universities or cities, where research, startups, and early funding coexist but are less connected to industrial deployment environments.

2. Engineering Capacity

	China	Europe
Engineering teams	Large multidisciplinary teams early in development	Small academic teams dominate early stages
Development approach	Parallel experimentation across applications	Sequential research → prototype → commercialization

Chinese deep-tech ventures frequently deploy large engineering teams during laboratory stages, enabling technologies to be tested across multiple industrial applications simultaneously.

European projects often remain research-driven for longer, which slows the transition from laboratory prototypes to deployable products.

---

3. Industrial Deployment

	China	Europe
Pilot environments	National pilot programs and state-linked infrastructure	Fragmented industrial test environments
Early customers	State enterprises, telecom networks, infrastructure operators	Limited demand-side policy instruments

China benefits from large industrial actors that can act as early deployment partners for emerging technologies.

Europe often funds research infrastructure but provides fewer coordinated industrial pilot environments, making it more difficult for startups to validate technologies at scale.

Strategic Implication

Europe’s challenge is not scientific capability.

The challenge lies in connecting research excellence to industrial deployment environments.

Strengthening the commercialization pipeline — particularly between TRL 3 and TRL 7 — will be essential if Europe wants to translate its scientific leadership in quantum technologies into globally competitive companie

Executive Summary

Quantum technology provides a clear lens through which to understand structural differences between innovation ecosystems.

- China and Europe both possess strong scientific capabilities in quantum technologies. However, their innovation systems differ significantly in how quickly research breakthroughs translate into scalable companies and deployable technologies.

- China's system is designed to move technologies efficiently through commercialization stages, linking universities, national laboratories, venture funds, and industrial deployment programs into a continuous pipeline.

- Europe, by contrast, excels at generating research breakthroughs and university spin-outs but often struggles during the transition from laboratory prototype to industrial deployment.

- The core structural difference can be summarized as follows:

→ *China organizes its innovation clusters around the stages of technology commercialization, while Europe organizes them around institutions.*

As a result, China frequently progresses technologies through the commercialization pipeline faster, while European innovation often stalls between laboratory prototype and industrial application.

---

1. Quantum Technologies as a Strategic Industry

Quantum technologies encompass several rapidly emerging domains.

Technology area	Example applications
Quantum communication	ultra-secure communication networks
Quantum computing	optimization, cryptography, materials discovery
Quantum sensing	navigation, geological exploration, medical diagnostics
Quantum software	algorithms and quantum cloud platforms

These technologies differ significantly in maturity and commercialization readiness.

Quantum communication systems are approaching deployment in certain cases, while quantum computing and sensing remain in earlier development stages.

Understanding how different ecosystems support the transition from research to commercialization is therefore critical.

2. The Global Quantum Landscape

Quantum innovation has accelerated significantly over the past decade.

Patent activity provides one indicator of global investment.

Region	Share of global quantum patents
China	~46%
United States	~23%
European Union	~6%

China's rapid increase in patent filings reflects large national investments in quantum research and engineering capabilities.

At the same time, Europe hosts a substantial share of global quantum startups thanks to its strong university research base.

This apparent contradiction highlights an important distinction.

Europe excels at scientific discovery and startup formation, while China increasingly excels at technology scaling and deployment.

---

3. Startup Creation vs Commercialization

Europe produces a large number of quantum startups due to its strong academic institutions and spin-out programs.

However, relatively few of these companies evolve into globally competitive scale-ups.

The difference becomes clearer when comparing innovation stages.

Innovation stage	Europe	China
Scientific discovery	very strong	strong
University spin-outs	many	moderate
Engineering scale-up	limited	increasing rapidly
Industrial deployment	fragmented	coordinated pilots

In simple terms:

Europe creates many deep-tech startups. China scales technologies faster.

4. China's Quantum Clusters

China's quantum ecosystem is geographically concentrated in several specialized clusters.

These clusters reflect deliberate national investments in strategic technologies.

Hefei

Hefei has become China's most important quantum technology hub.

Key institutions and companies include:

- University of Science and Technology of China (USTC)
- Origin Quantum
- QuantumCTek
- CIQTEK

The city hosts several national laboratories focused on quantum computing and quantum communication.

Hefei therefore functions as a science and early commercialization hub.

Beijing

Beijing's ecosystem focuses strongly on:

- quantum algorithms
- quantum information theory
- national laboratory research

Key institutions include:

- Tsinghua University
- Chinese Academy of Sciences
- Baidu Quantum research teams

Shanghai

Shanghai has developed strong capabilities in quantum hardware engineering and device development.

Several institutes of the Chinese Academy of Sciences are located here.

Greater Bay Area (Shenzhen)

The Greater Bay Area cluster is centered around Shenzhen, one of China's most important technology ecosystems.

For readers less familiar with China's technology landscape, Shenzhen became the country's leading consumer internet and B2C SaaS hub during the rise of the Chinese internet economy.

Major companies headquartered in Shenzhen include:

Company	Sector
Tencent	internet platforms
Huawei	telecommunications infrastructure
DJI	robotics and drones
BYD	electric vehicles and batteries
Ping An	fintech platforms

Several of these companies are increasingly involved in quantum-related research, particularly in communication security and infrastructure.

Shenzhen therefore plays a critical role in industrial deployment and engineering integration, complementing research clusters located in Hefei and Beijing.

---

5. CIQTEK: A Case Study in Accelerated Commercialization

CIQTEK provides an illustrative example of how China accelerates the transition from laboratory research to industrial technology.

I first researched the company in 2023, when analyzing different deep-tech sectors in China in order to understand what constitutes China's unique competitive edge in deep technology development.

One key difference emerged.

Chinese deep-tech projects often deploy **large multidisciplinary engineering teams** while technologies are still in laboratory stages.

Instead of sequential development: *Research → Prototype → Market*

Chinese teams frequently test multiple industrial applications **simultaneously**.

Example domains explored in parallel include:

- semiconductor inspection
- materials science instrumentation
- advanced measurement systems

→ *This approach allows companies to identify viable markets earlier while continuing technical development.*

→ *As a result, the transition from laboratory prototype to deployable product can occur significantly faster.*

Why European Deep-Tech Funding Often Struggles

Europe has made substantial investments in research and innovation programs such as:

- Horizon Europe
- the European Innovation Council
- national research grants

These instruments are highly successful at supporting scientific discovery and early prototypes.

However, several structural challenges remain for deep-technology sectors such as:

- quantum technologies
- nuclear fusion
- space systems
- advanced semiconductors

These sectors share common characteristics:

Characteristic	**Impact**
Long research cycles	technologies may require 10–20 years to mature
High capital intensity	large engineering teams and infrastructure
Scientific uncertainty	applications often emerge gradually
Multiple parallel use cases	technologies must be tested across industries

Traditional venture capital alone rarely supports these development timelines.

Structural Challenges in Europe

Three structural challenges frequently appear.

A) Funding stops too early

Many European programs end after:

- research
- prototype development
- startup creation

However, deep-tech commercialization requires years of engineering development and industrial testing.

B) Venture capital enters cautiously

European venture investors often wait until technologies approach market readiness.

This can delay the development of:

- engineering teams
- manufacturing capabilities
- pilot deployments

C) Limited industrial test environments

Deep-tech sectors require specialized infrastructure.

Examples include:

Sector	**Infrastructure**
Quantum	cryogenic systems, photonic labs
Fusion	experimental reactors
Space	launch facilities and satellite testing

Europe often funds research infrastructure but less frequently supports industrial deployment environments.

Deep-Tech Funding Timeline (Typical)

One way to visualize ecosystem differences is through the typical path of a deep-tech startup.

China	Europe
University research	University research
↓	↓
National research grants	Research grants
↓	↓
Large engineering teams (Lab)	Spin-out
↓	↓
Government-guided funds	Seed funding (VC)
↓	↓
Industrial pilot programs	Funding gap
↓	↓
Series A / scaling capital	Delayed Series A

This structural difference explains why Chinese deep-tech startups often reach industrial pilots earlier.

China vs Europe Quantum Commercialization

The commercialization process also differs geographically.

China	Europe
Science hubs (Hefei / Beijing)	**Science hubs** (Oxford / Zurich / Munich)
↓	↓
Engineering hubs (Shanghai / Shenzhen)	**Startups** (Paris / Berlin / Amsterdam)
↓	↓
Industrial deployment (State enterprises / telecom networks)	**Fragmented industrial pilots**

China deliberately separates:

- science clusters
- engineering clusters
- industrial deployment environments

Europe often attempts to perform all stages within the same ecosystems.

This leads to the central insight:

→ China organizes its innovation clusters around the stages of technology commercialization, while Europe organizes them around institutions.

The European Deep-Tech Pipeline

Rather than attempting to replicate Silicon Valley in a single location, Europe could benefit from connecting specialized innovation hubs.

A potential structure could look like this:

Science hubs (Munich/Zurich/Oxford)	→	**Engineering hubs** (Eindhoven/Dresden)	→	**Industrial scaling hubs** (Stuttgart / Turin)	→	**Global markets**

Each stage requires different capabilities.

Stage	Capability
Science	discovery
Engineering	prototyping
Industrial	manufacturing
Scaling	global commercialization

Implications for Europe

Europe remains one of the strongest regions in the world for scientific research and deep-tech entrepreneurship.

The challenge is not discovery.

The challenge is commercialization speed.

Quantum technology illustrates this broader structural difference between innovation systems.

China's advantage lies not primarily in scientific discovery but in how efficiently technologies move through the commercialization pipeline.

The strategic implication for Europe is clear:

Final conclusion

The future of European deep tech may not depend on creating one Silicon Valley, but on connecting several specialized innovation clusters into a coherent ***commercialization pipeline.***