RECONNECT CHINA

POLICY BRIEF 11

— June 2024 —

The Chinese AI Innovation Ecosystem: Spurring Innovation or Consolidating Monopolies?

Junhua Zhu & Mikael Mattlin

Executive summary:

Based on its 2017 development plan for Artificial Intelligence (AI), China aims to become the world's main AI innovation centre by 2030. To achieve this goal, China's strategy is to cultivate an open and sharing AI innovation ecosystem through construction of AI Open Innovation Platforms (OIPs) and AI Pilot Innovation Zones (PIZs), of which there are currently 23 and 18, respectively. PIZs can be deemed as the innovative environment and OIPs as the medium, which exist in a symbiotic relationship. OIPs focus on one specific key subfield of AI, and the construction is contracted out to a leading private enterprise or research institute in each subfield. In the benign scenario, AI start-ups and small and medium-sized enterprises (SMEs) gain access to quality data, algorithms, and computing power to train their AI services and products. Meanwhile, the PIZs share their successful experiences with other regions to replicate. Technology diffusion then enhances AI innovation capabilities and SMEs can bring more competition into their fields. However, as OIPs are mostly constructed by leading private AI enterprises and their standard-setting power is reinforced when all start-ups and SMEs in the same field use their software and hardware, they may abuse this dependency and become uncontrollable giants. In such an adverse scenario, selected subfield leaders can turn into consolidating monopolies, thus reducing competition. Moreover, China's internal "brain drain" towards major innovation hubs within the country might accelerate, resulting in even larger disparities among regional talent pools. Recent policies, such as the Personal Information Protection Law, and an AI-related 2022 revision to China's Antimonopoly Law aim to reduce these dangers.

Policy recommendations:

- Increase the EU's understanding of China's fast changing AI landscape by collecting regularly updated information on new developments in AI innovation in China, and funding related research through EU funding instruments.
- Deepen analysis of the role that the Chinese government plays in cultivating the AI innovation ecosystem.
- Ensure that European enterprises have the same chances to apply for the construction of a Chinese OIP, and equal access to the OIPs if carrying out business activities in China (maintaining a level playing field).
- Encourage Chinese policymakers to share their experiences on AI governance with EU policymakers.

BACKGROUND

China has ambitions to excel in the global AI race. According to the 2017 New Generation AI Development Plan, by 2025 China aims to achieve major breakthroughs in basic AI theories; reach the world's leading level in some AI technologies and applications; make AI the main driving force for industrial upgrading and economic transformation; and make positive progress in the construction of a smart society. By 2030, China aims to reach the world's leading level in overall AI theories, technologies and applications; become the world's main AI innovation centre; achieve significant results in the construction of a smart economy and society; and meanwhile lay an important foundation for leading as an innovative country and economic power (State Council, 2017).

To achieve these goals, China's strategy is to cultivate an open and sharing AI innovation ecosystem that is efficient and sustainable in generating economic and social benefits. That cultivation, in practise, is highly dependent on the construction of AI Open Innovation Platforms (OIPs) and AI Pilot Innovation Zones (PIZs). For European stakeholders, a better understanding of the rationales behind the proposed PIZs and OIPs therefore becomes the precondition of a more accurate evaluation of the Chinese AI landscape.

THE RATIONALE OF OIPS AND PIZS

As listed in Figure 1, there are hitherto 23 OIPs and 18 PIZs in total. According to the Ministry of Science and Technology (MOST), an OIP focuses on one specific key subfield of AI and the construction is contracted out to a leading private enterprise or research institute in that subfield. Via OIPs, all kinds of basic AI hardware and software developed by the leading enterprises can be opened and shared, including but not limited to data, toolkits, libraries, frameworks, and computing resources (Larsen, 2019). This way, the barriers for other SMEs to participate in AI innovation are, at least in theory, lowered, the diffusion of AI technological achievements are promoted, and AI is made a new infrastructure-like engine to drive the real economy and the development of social undertakings (MOST, 2019a).

Figure 1. All the OIPs and PIZs

	2017	2018	2019	2020	2021	2022
OIPs	**Baidu** (autonomous driving) **Alibaba** (smart city) **Tencent** (medical imaging) **iFlyTek** (smart audio)	**SenseTime** (smart vision)	**Yitu** (vision computing) **Mining Lamp** (smart marketing) **Huawei** (soft/hardware) **Ping'An** (smart finance) **Hikvision** (video perception) **JD** (smart supply chain) **Megvii** (image perception) **360** (Cybersecurity) **TAL** (smart education) **Xiaomi** (smart home)			**China Mobile** (smart network) **AIROHIT** (smart farming) **CloudWalk** (audio-visual interaction) **AISpeech** (linguistic computing) **CloudMinds** (cloud robotics) **Midea** (smart life) **DJI** (smart unmanned systems) **NIII** (smart manufacturing)
PIZs			**Beijing** **Shanghai** **Tianjin** **Shenzhen** **Hangzhou** **Hefei** **Deqing County**	**Chongqing** **Chengdu** **Xi'an** **Jinan** **Guangzhou** **Wuhan**	**Suzhou** **Changsha** **Zhengzhou** **Shenyang** **Harbin**	

Source: Own Graphic

The OIP selection process starts with the application made by a private enterprise or research institute, in which a subfield must be chosen and a long list of supporting materials must be provided (including the background, objectives, and the status of the construction of the proposed OIP). Later, MOST will organise field experts to review the application, assessing the rationality of the application direction, the capabilities of the applicant, the feasibility of the construction plan, and the expected effect. The whole process resembles an ordinary job application, in which the government as the employer hires the best private enterprises as the 'national AI team'. The enterprises, however, do not necessarily receive regular financial returns. Rather, what they mainly pursue is the endorsement from the government, with which they can be granted access to critical innovation resources (such as public space for testing autonomous vehicles and medical records for the training of medical imaging AI), and eventually become the dominant player in that subfield.

On the other hand, a PIZ is a locality that experiments on AI innovation boldly in all policy, technology, and societal aspects. Through the construction of PIZs, those localities facilitate the agglomeration of policy, finance, and technological resources, deepen the integration of AI with local economic and social development, generate new replicable and scalable models of AI innovation, and eventually are supposed to lift AI innovation capabilities across the country (MOST, 2019b). To become qualified, any applicant locality must have abundant technological education resources, a relatively good industrial foundation, solid infrastructure, and firm policy and financial support from the local government. After passing MOST's review, qualified localities get further policy support from the central government to construct the PIZs. Besides, the central government will also guide various resources to gather in the PIZs and promote cooperation and linkages among different PIZs.

PIZs can be deemed as the innovative environment and OIPs as the medium, which are in a symbiotic relationship with each other. One key objective of PIZs is to foster private AI enterprises that are capable enough to serve as OIPs. Conversely, OIPs also add more credibility to their home localities'

Figure 2. Locations of OIPs and PIZs

Source: Own Graphic

application to be selected as PIZs. It is then not surprising that both OIPs and PIZs are more likely to land in more economically developed regions that have highly ranked universities (in particular the ones with AI majors), large-scale AI enterprises, and even stock exchanges. As shown in Figure 2, almost all OIPs (22/23) are headquartered in the three major economic regions, namely the Beijing-Tianjin-Hebei Region, the Yangtze River Delta Region, and the Pearl River Delta Region (the only OIP that is not in these regions is AIROHIT, located in Harbin). In addition, half of the PIZs (9/18) are in these three regions. This configuration might be a natural result because these three regions have the most abundant talent and other innovation resources. Alternatively, this could also be a result of strategic planning by the central government selecting the Eastern coast regions as the 'leading goose' to experiment first. Either way, no success is guaranteed. In principle, technological innovation requires three basic helixes of stakeholders – government, industry, and academia – to cooperate in harmony (Etzkowitz & Leydesdorff, 2000). Depending on the interactions among the helixes, conflicts and collisions might occur.

Two Scenarios

As the national AI team members provide open access to AI software or hardware for AI training via OIPs, the benign scenario is that AI start-ups and SMEs from all over the country get quality data, algorithms, and computing power for the training of their AI services and products. Meanwhile, the PIZs share their successful experiences for other regions to replicate. Technology diffusion then kicks off and the general AI innovation capability in the country is improved. More importantly, once enabled, SMEs can theoretically bring more competition to the leading private enterprises or research institutes in their AI subfields.

In addition to the competition in the private market, SMEs can participate in the government's open competition, namely *jiebang guashuai*. The method, functioning as a science and technology reward mechanism, is a research fund system to be redeemed by research achievements. It is a non-cyclical scientific research funding arrangement organised by the government to collect scientific and technological innovation achievements from the whole society. In other words, the government calls for innovative solutions to certain urgent scientific obstacles (e.g., 'bottleneck' technologies like high-end semiconductor manufacturing) via this open competition to mobilise the intellectual potential of all enterprises. In 2021, for instance, the Ministry of Industry and Information Technology (MIIT) announced 18 tasks of open competition in AI innovation, including AI chips for high-performance cloud computing, AI chips for high performance edge end/terminal computing, intelligent sensors, terminal AI inference frameworks, AI development platforms, and so on (MIIT, 2021). In 2022, both the tasks and the competition organisers became more decentralised. The tasks became more domain-specific, such as AI innovation in medical devices, and more local governments started to organise

Figure 3. Two Scenarios

	The Benign Scenario	The Adverse Scenario
The national AI team	in control	out of control
Start-ups and SMEs	significantly enabled	not significantly enabled
Competition	yes	no
The Eastern coastal regions	demonstration effect on	demonstration effect off
Other regions	resources flow in	resources flow out
Regional disparities	smaller	larger

Source: Own Graphic

open competition at the provincial or city level. That is, the enabled private sector can address the technological needs of the public sector as well, helping the government to achieve its political and social goals.

However, this approach is not without risk. An adverse scenario materialises when the leaders become monopolies. As OIPs are mostly constructed by the leading private AI enterprises and their standard-setting power is reinforced when all other start-ups and SMEs in the same field use their software/hardware, it is not unlikely that they abuse the dependency and become uncontrollable giants. The expected competition brought by other SMEs might never arrive because they are never enabled to the degree to which they can resist being merged or acquired. The government is also captured in a dilemma whereby regulating the private tech giants would potentially stifle innovation and harm the economy. Moreover, the internal brain drain towards the Eastern coastal region from the rest of the country might even be accelerated by the success of PIZs in, for instance, Beijing and Shanghai, resulting in even larger regional disparities within the talent pool. This way, the PIZs in other regions are less likely to be successful. In this scenerio, the plan to diffuse AI technology nationwide will fail. Precisely as shown in China's experiences of constructing special economic zones, the successful story of Shenzhen has so far not been replicated by any other selected zones. To avoid all these risks would require further, thoughtful policymaking in OIP and PIZ governance.

Another different type of potential risk relates to how closely the government is involved in OIPs that operate in AI fields that provide tools for tighter social control and surveillance, such as video and image processing, and autonomous driving.

The Current Governance Policy

There exists in the Chinese innovation ecosystem an 'asymmetric triple helix model', in which the government possesses more power at the top of the hierarchy (Arenal et al., 2020). The government wields this power either at an early stage of innovation to boost research and development as 'the catalysing state (Dai et al., 2024)', or at a later stage in a 'delayed government-led triple helix model' to keep the private enterprises from turning into uncontrollable monopolies that may potentially harm workers' rights, the market order, and the environment (Cai & Liu, 2015). Following the logic of this delayed government-led model, the 'start-up debts paying' metaphor effectively summarises the evolving dynamics in the holistic AI ecosystem in China. During the initial stage of rapid growth and experimentation, China as an innovative start-up environment was not regulating, but instead fostering the private sector. While this lead to rapid growth of the AI corporate sector, over time, a wide range of social "debts" have accumulated. This is evident not only in the lack of technical standards related to data security, cybersecurity, privacy, and transparency but also, as regulatory issues such as algorithmic discrimination, anti-trust, copyright, and the fight against fake news (Xu, 2021).

Currently, there are many policies and efforts designed to "pay off" those accumulated debts and to prevent the adverse scenario from materialising. One prominent example is that almost all the newly approved PIZs are outside the aforementioned three major economic zones. The policy on the construction of PIZs even specifically added the Southwest Chengdu-Chongqing Region as another key economic zone to balance the regional disparities in innovation capabilities. This would potentially alleviate the internal brain drain and sustain the talent in non-Eastern coastal regions. Regulatory efforts have also been made, for example, in the 2022 revision of China's Antimonopoly Law, in which Article 9 specifically states that "business operators shall not use data, algorithms, technology, capital advantages and platform rules to engage in prohibited monopoly acts" (The National People's Congress, 2022). The Personal Information Protection Law, and the Provisions on Administration of Algorithmic Recommendation in the Internet Information Services are also unprecedented moves to tighten the control over private platforms, ensuring data and algorithm are not misused by enterprises. It is important to note that this does not denote the end of the cooperative relationship between the government and the private sector, given how essential it is to construct the Chinese AI innovation ecosystem and level up China's AI capabilities in the international sphere.

POLICY RECOMMENDATIONS

1. **Increase the EU's understanding of China's fast changing AI landscape by collecting regularly updated information on new developments in AI innovation in China, and funding related research through EU funding instruments**. Before 2019, almost no one envisioned that the regulation on AI in China would be tightened. Since then, the landscape has drastically changed. There is a great need to keep abreast of developments in a fast-changing innovation landscape.

2. **Deepen analysis of the role that the Chinese government plays in cultivating the AI innovation ecosystem.** For example, apart from providing critical innovation resources, the government might take other measures such as tariffs, subsidies, and quotas to protect the growth of the 'national AI team' member enterprises. Tracking those potential measures and understanding how they might help the Chinese enterprises to compete against European enterprises is then essential for AI policymaking in the EU.

3. **Ensure that European enterprises have the same chances to apply for the construction of a Chinese OIP, and equal access to the OIPs if carrying out business activities in China.** If such a level playing field can be maintained, European enterprises should be encouraged to become critical players in AI fields in China, and provided with help for fully utilising the OIPs. If not, diplomatic, and perhaps even legal, recourse should be considered.

4. **Encourage Chinese policymakers to share their experiences on AI governance with EU policymakers.** From a global governance perspective, China is undergoing a bold experiment in reigning in AI, which potentially could serve as a model worth following, or a cautionary tale. This can be facilitated by either inviting Chinese policymakers to Europe or organising *ad hoc* European expert groups to visit China.

ENDNOTES

Arenal, A., and others. (2020). 'Innovation Ecosystems Theory Revisited: The Case of Artificial Intelligence in China'. *Telecommunications Policy*, 44(6), p.101960.

Cai, Y., & Liu, C. (2015). 'The Roles of Universities in Fostering Knowledge-intensive Clusters in Chinese Regional Innovation Systems'. *Science & Public Policy*, 42(1), p.15–29.

Dai, S., and others. (2024). 'Innovation Network Formation and the Catalysing State: A Study of Two Innovative Industry Clusters in China'. *Journal of Contemporary China*, 33(147), p.373-391.

Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and "mode 2" to a triple helix of university. *Research Policy, 29*(2), p.109.

Larsen, B. (2019). 'Drafting China's National AI Team for Governance'. *DigiChina*. https://digichina.stanford.edu/work/drafting-chinas-national-ai-team-for-governance/

State Council of China. (2017). New Generation Artificial Intelligent Development Plan. https://www.gov.cn/zhengce/content/2017-07/20/content_5211996.htm See full English translation by DigiChina from https://digichina.stanford.edu/work/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/

The Ministry of Science and Technology. (2019a). Guidelines for the Construction of a New Generation of Artificial Intelligence Open Innovation Platform.

https://www.most.gov.cn/xxgk/xinxifenlei/fdzdgknr/fgzc/gfxwj/gfxwj2019/201908/t20190801_148109.html

The Ministry of Science and Technology. (2019b). Guidelines for the Construction of a New Generation of National Artificial Intelligence Pilot Innovation Zone. https://www.gov.cn/xinwen/2019-09/06/content_5427767.htm

The Ministry of Industry and Information Technology. (2021). Notice on Organising the Open Competition for Artificial Intelligence Industry Innovation in 2021. https://www.miit.gov.cn/jgsj/kjs/gzdt/art/2021/art_d68e868fd1ad4dba8051005e661dac73.html

The National People's Congress. (2022). Anti-monopoly Law of the People's Republic of China. https://flk.npc.gov.cn/detail2.html?ZmY4MDgxODE4MjM0Y2NiNTAxODI5ZjQ2YzZhYzJhNWE%3D

Xu, K. (2021). 'Removing China's "Start-up debt"'. *Interconnected*. https://interconnected.blog/removing-china-startup-debt/

Funded by the European Union