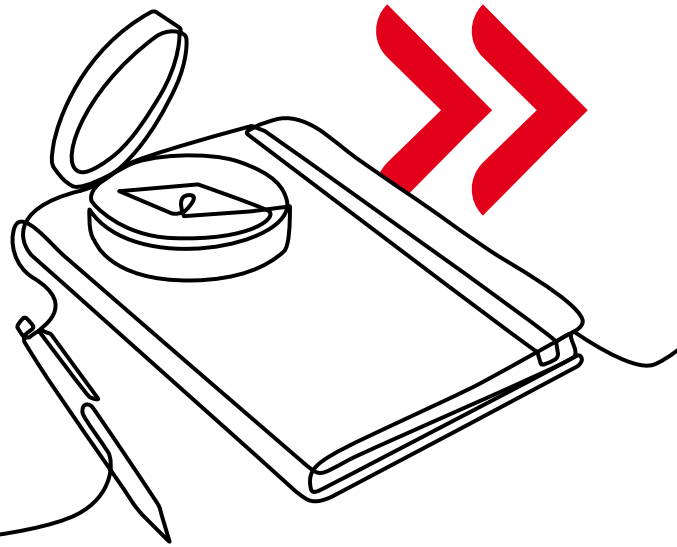


Letter from the Editor

China's long tech game



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Letter from the Editor is our biweekly weekend read, which looks at the big picture, one question at a time.

In recent years, both the Biden and Trump administrations have adopted protectionist measures to prevent China from accessing the most advanced chips. However, so far, they have, at best, slowed Beijing's march towards the tech frontier. There are probably two explanations for this. First, China has likely passed a technological threshold that makes coercive measures ineffective. Second, long-term planning to achieve some sort of tech self-reliance appears to be paying off. Paradoxically, trade restrictions are not just failing to stifle China's technological progress. They are, in response, spurring Chinese innovation.

Hello from The Investment Institute

For the last two decades, simply speaking, roles in the tech world were clearly assigned. The US was the great innovator, China the great imitator and Europe the great regulator.

These roles are changing, at least to some extent.

China is increasingly competing with the US as the world's leading innovator. According to White House AI czar David Sacks, "China is not years and years behind us in AI. Maybe they're three to six months. It's a very close race." A few months can make a huge difference in the world of tech. Just in 2024, then US Commerce Secretary Gina Raimondo said Chinese technology was "years behind".

The fourth plenum of the Communist Party's Central Committee, which came to a close this week, pledged to "substantially improve" China's capacity for technological self-reliance and innovation in the next five years.

At the same time, the US might uncomfortably find itself as falling into the role of imitator if China keeps developing competitive AI language models such as DeepSeek that require far less computing power than those developed by American tech giants such as Open AI, Google and X. Furthermore, decisions by the Trump administration to cut federal funding for elite universities and basic research, or to restrict H1 visas (used to hire top foreign talent) might undermine America's competitive advantage in tech.

The only certainty is Europe, which remains stuck in its regulatory role.

So, the question for today's *Letter* is: **How is China managing to move to the technological frontier despite US trade restrictions?**

China is playing the long tech game. While Washington is focused on tactics, Beijing is focused on strategy. It has prepared itself for almost a decade, working on economic self-reliance. While export restrictions might stifle less-developed economies like those of Cuba and Iran, they spur innovation in economies of China's size and complexity.

The fruits of long-term strategic thinking

The strategy of cutting off China from key technologies that both the Biden and Trump administrations have pursued rests on two interrelated assumptions. The first is that China is still primarily an imitator and cannot progress without access to foreign technologies. The second is that the Chinese economy is stuck in a sort of underdevelopment trap that makes it vulnerable to coercive policies.

Both assumptions are wrong.

- 1. Self-reliance:** For more than a decade, President Xi Jinping has tried to re-establish China's technological leadership and avoid another century of humiliation. Back in 2018, Xi argued that the Fourth Industrial Revolution would bring "earth-shaking changes" while offering an "important opportunity to promote leapfrog development," allowing China to "**catch up and surpass**" the US. Xi has devoted many speeches to discussing the kind of "great divergence" that accompanied past industrial revolutions and emphasizing the importance for China to be an early adopter of new technologies, leaping ahead of rival competitors.

In 2016, Xi argued that "historical experience shows that technological revolutions profoundly change the global development pattern". The "century of humiliation" (1839-1949) was caused by China's technological inferiority to Western powers. Once a global economic leader, China missed the scientific and industrial revolutions and fell behind Europe in the nineteenth century. "**The backward will be beaten**" is a common refrain within the Chinese Communist Party elite.

These bruising memories were behind Xi's promotion of "**regeneration through one's own efforts**" and "**whole-nation system**". This means going beyond "stealing" IP rights or forcing transfers of know-how from foreign companies. By taking a long-term perspective, these policy approaches put the Chinese economy on an innovation trajectory that America's coercive policies can hardly derail. Thanks to this strategic thinking, China has probably passed critical technological and scientific thresholds, which make it resilient to external pressure.

- 2. Critical development threshold:** China can count on a nationwide innovation ecosystem that links national labs, universities and high-tech science parks. It is hard to assess confidently and exhaustively how far ahead China is in the tech race, but there is one often-cited ranking that really captures it. According to ASPI's Critical Technology Tracker, which measures tech leadership based on high-impact research, the US led in 60 of 64 technologies between 2003 and 2007, while China led in 3. In the most recent five years (2019-2023), the US led in 7 of the 64 technologies, while **China led in 57**.

Looking at specific cases, in 2024, China accounted for about 80% of global battery manufacturing capacity, it controlled around twice as much manufacturing capacity of 50-180nm semiconductors as the next largest producer, and it produced 70% of the world's electric vehicles (EVs).

The case of EVs is informative in this sense. **EV technology** was introduced as a priority science research project in China's Five-Year Plan back in 2001, when Beijing realized that it would never be able to compete with traditional automakers. In 2010, China was still unable to produce its own car batteries. Despite initially generous subsidies, only the most competitive Chinese EV automakers have remained in the market. In 2019, there were more than 500; now the number has dropped to about 100.

This means that the Chinese government is not keeping uncompetitive producers on life support and it creates a highly-competitive environment. Interestingly, in 2011, **Elon Musk**, the founder of Tesla, made fun of the cars produced by BYD. But last year, he said: "If there are not trade barriers established, they will pretty much demolish most other car companies in the world".

The limits of US coercion

Given this background, US trade restrictions are failing to stifle China's technological progress. To make things worse, they are spurring innovation within the country, compounding its own achievements.

For example, in response to trade restrictions targeting AI-related technologies since 2018, China identified **its technological chokepoints** and began directing more focused investment toward resolving them. It did not just stockpile goods before export bans entered into force or gain access to them through smugglers. China has prioritized domestic sourcing of raw materials (e.g., silicon wafers and rare earths) and equipment, integrating supply chains under state-backed conglomerates. It has also pursued vertical corporate integration – controlling multiple stages of the AI and semiconductor supply chain within its borders or through domestic firms – to reduce reliance on foreign technologies.

Think about how **Nvidia** is losing its leverage over Beijing. Last April, the Trump administration banned the company from selling **H20 processors** to China without a special license. Then, last summer, Nvidia managed to get the licenses to sell H20 chips to China, while agreeing to pay to the US government a 15% commission on those sales. But in September, the Chinese government banned its major tech firms from buying Nvidia's H20 chips due to security issues, urging them to use domestic alternatives.

H20 chips were no longer vital for China because SMIC and Huawei had developed their own advanced chips. At the same time, Chinese companies such as DeepSeek optimized AI models to run on lower-quality hardware, reducing computational needs. Chinese researchers are also advancing carbon nanotube chips, which offer potential for higher performance and lower power consumption than silicon at smaller scales.

This is a completely different approach to that adopted by the Soviet Union during the **Cold War**. Back then, Moscow conducted extensive reverse engineering of Western microchips to try to close the technology gap with the US. By the time the Russians mastered the technology, it was already outdated, and they were perennially behind. China is not limiting itself to reverse engineering but is innovating in the purest way.

Moreover, constraints induced by US trade barriers are forcing China to take its own technological path. While training foundational models (GPT-4, for example) requires massive computational resources and is the priority of American tech companies, Beijing has started to specialize in AI applications such as models for facial recognition and autonomous driving that are focused on inference and can run on less-advanced chips. China is surging ahead in **"embodied AI"**, with robots being augmented by smaller-scale Chinese AI applications that do not require the immense and costly digital infrastructure and physical infrastructure that powerful Western chatbots need.

Only time will tell whether focusing on the development of large language models (LLM) really pays off from a productivity perspective, or if focusing on more applied uses of AI is more rewarding. After all, there is a non-negligible risk of commodification for LLMs, while AI applications might have a more immediate impact on the economy.

Europe, stuck in its regulatory role?

The tech world is in flux and, as shown by China's rise, the roles are not set in stone. **China's model is certainly far from perfect.** Its industrial policies are a source of market distortions and wasted resources. Also, the Chinese economy might have reduced its reliance on foreign technologies but it still relies heavily on external demand, leaving its growth strategy quite vulnerable to international shocks. But it is undeniable that long-term planning has allowed the country to get onto a promising innovation trajectory.

Europe has the opportunity to rethink its own role along the lines of what I have discussed in past *Letters*. Its regulatory power is a source of influence, but only if it translates into the creation of smart rules that others are willing to follow and that would make the continent more appealing for investment. At the same time, while it is unlikely to aspire to the role of innovator in the foreseeable future, it should also resist the temptation of becoming an imitator – reproducing technologies developed in China and the US for the sake of self-reliance.

A more appropriate role might be that of the **great adopter** – that is, adopting, at scale, technologies developed by others. Like China is doing with AI, Europe should set its own technological trajectory, which might differ from that experienced by the Chinese and the American economies. After all, a lot of money is currently powering the AI hype in the US. It cannot be ruled out that much of today's investment in Artificial General Intelligence (AGI), for example, will be rewarding.

Europe is not condemned to being number three in the tech race and does not have to deal with FOMO (the fear of missing out) in the LLM race. It needs to clearly assess its strengths and weaknesses. If the European economy is powered by AI applications, it might enjoy a substantial productivity boost, while avoiding falling behind China and the US and risk entering its own "century of humiliation".

Enjoy your weekend!

Edo

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