Istituto Affari Internazionali

Technological Competition: Can the EU Compete with China?

by Francesca Ghiretti

ABSTRACT

The debate on technological development and the unfolding fourth technological revolution tends to neglect the role of the EU, relegating it to follower status. The leadership positions are occupied by the US and China, who compete with one another for technological supremacy. Yet, despite lagging behind in some areas, the EU is better placed than is often assumed and still stands a chance of guaranteeing the delivery of a technological revolution that is not only environmentally but also socially sustainable. This is critical in proposing a model of technological development alternative to that of China, in particular, and especially in such sectors as artificial intelligence, supercomputing and digital skills.

European Union | China | Digital policy

keywords

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Technological Competition: Can the EU Compete with China?

by Francesca Ghiretti*

Introduction

In 2018, Kai-Fu Lee – President of Sinovation Ventures, and one of the most important and renown voices in the field of artificial intelligence (AI) – remarked that the European Union was not even competing for the bronze medal in the AI race.[1] While he was referring solely to AI, it is difficult not to broaden this damning assessment to most sectors of technological development. If one follows the current debate on the matter, the EU is neglected at best. The notable contenders are the United States and China. The objective of this paper is to see whether this established paradigm can be challenged. The content will show that in certain aspects the EU is still "in the running" and stands a chance, in the long-term, of building a sustainable technologisation.

Because of the highly technical and specific nature of the topics covered in this paper, a disclaimer is necessary. This paper wants to offer an overview; hence, it by no means covers all the aspects that must be accounted for when assessing the technological development of an international actor or its future chances of leading a technological revolution. In a similar fashion, it does not delve into technical specificities. This means that at times depth is sacrificed for the sake of the breadth of the argument. The objective, as previously stated, is to provide an overview of the situation.

In 2020, the European Commission launched the Digital Europe Programme, which is part of its new Multiannual Financial Framework (MFF) covering the years 2021–7. The 7.5 billion-euro programme intends to "accelerate the economic

[1] Carly Minsky, "One Former Google Exec Says There's No Hope for Europe's Artificial Intelligence Sector", in *Sifted*, 14 December 2018, https://sifted.eu/?p=728.

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recovery and shape the digital transformation of Europe's society and economy".[2] The Commission has identified five areas of priority: "supercomputing, artificial intelligence, cybersecurity, advanced digital skills, and ensuring a wide use of digital technologies across the economy and society". In March 2021, it launched the 2030 Digital Compass: "the European way for the Digital Decade", which builds on a previously adopted European Digital Strategy and sets targets for the EU's future digitalisation. Admittedly, its identification of key areas of action and setting of targets adopted by the EU very much resemble plans and programmes typical of China.[3]

Despite the fact that both the EU and China have adopted roadmaps and plans for digitalisation, their approaches differ far more than they concur. China is a unitary state with a high degree of control over its policies and their implementation. Although local governments and enterprises have their own room for manoeuvre, China's high degree of centralisation translates into an ability to invest heavily in research and development (R&D). The EU, by contrast, is a partly supranational regional organisation made up of 27 nation states. Even in areas in which the Union has been given competence, the approval and application of policies still lie with the 27 (who vote by qualified majority or unanimity) – so, despite the EU making plans in Brussels, the realisation of these plans, and therefore their success, is often in the hands of the member states.

In the case of digitalisation, for example, the Scandinavian countries, together with the Netherlands, are at the top of the ranking on the 2020 Digital Economy and Society Index.[4] By contrast, France, Germany and Spain are placed in the centre of the ranking; at the bottom of the list are Eastern European countries and Italy (which occupies the 25th slot out of 28). Countries such as Italy have an economic fabric mainly made up of small and medium-sized enterprises, often family-run, which can not only lead to lower levels of competitiveness and possible growth but can also have fewer incentives for digitalisation. In an attempt to foster much-needed EU-wide economic convergence by advancing a single market for services, in 2015 the Union launched the Digital Single Market Strategy – the main outcomes of which have been the 2020 Digital Service Act and the Digital Market Act. The insufficient degree of integration also involves the financial sector, in which the existing situation makes it difficult for the EU to attract venture capital (VC) and equity investments fundamental for the development of innovations. In 2018, EU investments in VC were worth 27 billion US dollars, and China's 108 billion US dollars.[5] This is why the capital-market union and the banking union are much

[2] European Commission, *The Digital Europe Programme*, 23 March 2021, https://europa.eu/!JW33qU.

[3] European Commission website: *Europe's Digital Decade. Digital Targets for 2030*, https://ec.europa.eu/info/node/159650.

[4] European Commission, *The Digital Economy and Society Index (DESI)*, last update 18 December 2020, https://ec.europa.eu/digital-single-market/en/node/77955.

[5] Sophia Matveeva, "Raising Venture Funding in Europe vs. the U.S.", in *Forbes*, 31 May 2019, https://www.forbes.com/sites/sophiamatveeva/2019/05/31/raising-venture-funding-in-europe-vs-the-us.

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needed priorities.[6]

Economically speaking, while the EU has been struggling since the global financial crisis and the euro crisis China has moved at astonishing speed from backward-economy status to the world's second-largest economy. Despite existing differences within its territory, the incredible economic development that China has seen over the past few years and the possibility of building urban realities and highly technological companies from scratch – also (like its R&D capacity) thanks to heavy state incentives – has given it an immense advantage over the rest of the world, not just the Old Continent. Furthermore, China's economy has been recovering quickly and well following the "hit" brought by the COVID-19 pandemic – recovery from which, for several reasons, the EU is yet to see and will struggle to quickly bring about.

Another critical factor distinguishing China from the EU is the nature of their respective political regimes. China is a single-party authoritarian state in which the Chinese Communist Party, while not immune to public dissatisfaction, has huge leeway to adopt and implement policies. The EU is a collection of democratic states under constant scrutiny from public opinion and inherently geared towards government turnover – and, consequently, discontinuity in policy priorities.

In the final analysis, centralised planning has allowed China to target investments towards entities and areas of interest that eventually led it to rapid and impressive technological development. China, alongside the US, holds the highest number of "unicorn" companies (i.e. privately held startups valued at more than 1 billion US dollars) – a good indicator of its incredible technological might.[7] The EU, by contrast, must develop technologically with limited economic capacities, persistent internal divisions and the need to pay attention to its existing socio-economic fabric. This makes competition with highly digitised actors such as China even more challenging.

1. Technologisation

Over the past couple of decades, China has made enormous progress in the technology sector, transitioning from a technologically underdeveloped country to a global technological leader. Key to its success has been the broadening of its population's access to the internet. To be sure, the internet in China is controlled and increasingly censored by the government, yet it still provides the platform

[6] Nicola Bilotta, *EU's Scramble for Digital Sovereignty. Why Being the Global Regulator Will Not Be Enough*, Brussels, Institute of European Democrats, December 2020, https://www.iedonline.eu/publications/2020/geopolitics-values/eus-scramble-for-digital-sovereignty.-why-being-the-global-regulator-will-not-be-enough-bilotta.

[7] Jianbin Gao and Yuqing Guo, *The New Chinese Unicorns. Seizing the Opportunity in China's Burgeoning Economy*, PwC, 2018, https://www.pwc.com/chinasunicorns.

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from which technology has increasingly encroached into people's everyday lives. In 2008, only 22.6 per cent of the Chinese population had internet access; in 2018, that proportion had more than doubled, reaching 59.6 per cent.[8] The EU, by contrast, started from a more advantageous position, with 53 per cent of its households having internet access in 2007. By 2019, the share of households with internet connection had reached 90 per cent. Both cases present relevant oscillations in the rural/urban divide. The internet-penetration rate in China's cities was 75.8 per cent in 2019, compared with just 39.8 per cent in its rural areas.[9] In the EU, household access to the internet is 92 per cent in cities and 86 per cent in rural areas.[10] Thus, a higher percentage of Europeans have access to the internet than Chinese, and the EU has a smaller gap in internet access between urban and rural areas. That said, China's society is arguably much more digitalised than European ones. Internet access is not everything; the frequency and intensity of the use of digital assets that individuals and enterprises make are as, if not more, relevant.

1.1 The digitalisation of SMEs

The EU's greater internet access should, in theory, translate into a wider digitalisation of EU firms than of Chinese ones. However, this is not the case. In fact, the EU and China have similarly low levels of digitalisation of small and medium-sized enterprises (SMEs).

In China, SMEs account for 90 per cent of jobs and 70 per cent of gross domestic product (GDP),[11] which makes them critical to the country's economic performance. Large companies, including state-owned enterprises (SOEs), might be crucial for doing business abroad but at home SMEs are of the essence, which is why they are an important element of the new dual-circulation economy launched by President Xi Jinping. Nonetheless, only a small portion of Chinese SMEs use digital services or basic elements such as online sales.[12]

The situation in the EU is similar. SMEs represent about 99 per cent of its businesses; they employ about 100 million people and account for more than 50 per cent of the

[8] China Internet Network Information Center (CNNIC), *The 43rd China Statistical Report on Internet Development*, November 2019, p. 43, http://cnnic.com.cn/IDR/ReportDownloads. As of June 2020, the percentage was 67 per cent. See CNNIC, *The 46th China Statistical Report on Internet Development*, December 2020, p. 13, http://cnnic.com.cn/IDR/ReportDownloads.

[9] As of June 2020, the percentage was 76.4 in cities and 52.3 in rural areas. See CNNIC, *The 46th China Statistical Report on Internet Development*, cit., p. 15.

[10] Eurostat, *Digital Economy and Society Statistics - Households and Individuals*, Data extracted in September 2020, https://ec.europa.eu/eurostat/statistics-explained/index.php/Digital_economy_and_society_statistics_-_households_and_individuals#Internet_access.

[11] UN Development Programme (UNDP), *Enhancing SME Resilience with Digitalization*, 6 August 2020, https://www.cn.undp.org/content/china/en/home/presscenter/pressreleases/2020/enhance-MSMEs-with-digitalization.html.

[12] Xican Xi, Xu Hu and Tao Xu, "Are China's SMEs Lagging Behind the Digital Transition? Evidence from a Survey", in *Fudan-Ping An SME Financing Report Series*, November 2020, https://group.pingan.com/media/perspectives/2020-11-10.

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Union's GDP[13] – and thus compose the basis of the EU's economy and wellbeing. Yet, according to data published by the European Commission, only one-fifth of European companies are highly digitalised and 90 per cent of its SMEs lag behind in the digitalisation process. The EU is fully aware of the importance of SMEs, for which it has established the activation of Digital Innovation Hubs designed to help companies to digitalise (for instance, through access to experts who have the task of informing and training them).[14] There are widespread concerns, however, that without incentives from the state most SMEs will not make the necessary investment to increase their level of digitalisation. However, if in this regard the EU and China are not that different from one another – and, in fact, face similar challenges – the same cannot be said for cashless payments, the daily use of apps and the development of "smart cities".

1.2 Cashless payments and "smart cities"

Despite the similarities in the levels of digitalisation of SMEs China displays a wider use of technologies in people's daily life, with Chinese people being more at ease with and accustomed to technologies than Europeans are.[15] One way to gauge the difference is by looking at two elements: cashless payments and "smart cities".

Cashless payments – and, in particular, mobile payments – are now the norm in China. WeChat, an app which to a certain degree shows characteristics similar to an operative system, and Alipay are widely used to make payments. Unlike the EU, China has skipped the phase of payments that relies on cards and leapt forward to the use of mobile payments. This is not an unusual development in a country that never developed the habit of using cards and where lax regulation allowed the flourishing of private enterprises developing cashless forms of payments. The latter have become diffused to the point of making the use of cash difficult.[16] In the EU, an increasing number of banks are adopting the option of paying via an app, and tools like Apple Wallet are becoming more common; however, the use of cash remains widespread. If we look, for example, at the Eurozone, in 2019 cash was used three times more often than other means of payment: 73 per cent of daily purchases were made using cash, 24 per cent using cards and only 3 per cent via other means such as mobile payments.[17]

[13] European Commission website: *Entrepreneurship and Small and Medium-sized Enterprises (SMEs)*, https://europa.eu/!Yp88BY.

[14] European Commission, *Digital Innovation Hubs (DIHs) in Europe*, last update 25 January 2021, https://ec.europa.eu/digital-single-market/en/node/84619.

[15] Zhou Mo, "Small Enterprises Stepping Up Digital Transformation Efforts", in *China Daily E-paper*, 18 September 2020, http://epaper.chinadaily.com.cn/a/202009/18/WS5f640134a31099a23435071d.html.

[16] Aaron Klein, "China Digital Payments Revolution", in *Brookings Global China Reports*, April 2020, https://brook.gs/2KgRp9T.

[17] European Central Bank (ECB), *Study on the Payment Attitudes of Consumers in the Euro Area (SPACE)*, Frankfurt am Main, ECB, December 2020, https://www.ecb.europa.eu/pub/pdf/other/ecb.spacereport202012~bb2038bbb6.en.pdf?05ce2c97d994fbcf1c93213ca04347dd.

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The difference does not lie just in cashless payments. In China, and especially in the big cities, apps are used for a number of tasks; in the EU this is simply not the case. Underlying these diverging trends is a quite different attitude to smart cities. According to the EU, these are places "where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of [the city's] inhabitants and business".[18] The EU, with its limited urban space and desire to protect historical heritage, has been designing the creation of smart cities from existing cities via projects mostly focusing on "green" technologies. The goal is to innovate, investing in a green future without creating excessive disruption in the lives of EU citizens.[19]

China has applied a completely different approach. It has torn down the old to rebuild the new or, thanks to the availability of land, it has simply built new smart cities. More than 500 of them are being developed around the country, although some have warned that their relative isolation and high costs risk turning them into "ghost", rather than "smart", cities.[20] Even if this outcome is avoided, attention should be paid to the widening gap between those who can and those who cannot afford to live in a smart city. In China, with city life becoming increasingly prohibitive, the construction of "cathedrals in the desert" that pay no attention to affordability looks like it is only set to exacerbate existing socio-economic gaps.

The EU's plans for smart cities seem safer in this regard as, at least on paper, they give priority to issues of accessibility; environmental standards; and, as mentioned above, the preservation (and upgrading) of existing urban areas.[21] The Union is also more concerned with its citizens' privacy, which can be challenged by new technologies. Thus, while the EU has moved towards greater protection of data and privacy, China has promoted the development and dissemination of technologies that increase control over citizens – a trend that will continue and be strengthened in smart cities.

Nonetheless, the fact remains that China's urban society is more digitalised than that of the EU, and that it has digitalised more quickly. It is often argued that one of the keys to China's technological and economic success is its ability to plan. However, the EU too has been devising a series of multi-annual plans. The Digital Europe Programme is the Union's blueprint for digitalisation and technologisation, and the areas of priority identified by the EU do not differ from those of China: supercomputing, artificial intelligence, digital skills, 5G technology, and data and regulations.

[18] European Commission website: *Smart Cities*, https://ec.europa.eu/info/node/49912.

[19] Ibid.; Smart Cities Market Place website: *About*, https://smart-cities-marketplace.ec.europa.eu/node/2911.

[20] Umberto Bacchi, "'I Know Your Favourite Drink': Chinese Smart City to Put AI in Charge", in *World Economic Forum Articles*, 9 December 2020, https://www.weforum.org/agenda/2020/12/china-ai-technology-city; Simone Pieranni, *Red Mirror. Il nostro futuro si scrive in Cina*, Roma/Bari, Laterza, 2020.

[21] European Commission website: *Smart Cities*, cit.; Smart Cities Market Place website: *About*, cit.

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2. Supercomputing

Supercomputers have elevated computational capabilities and are thus able to process exceedingly high numbers of data. The European Commission considers supercomputing to be a fundamental element not only for the economic recovery of the EU but also for its green revolution. The Union in 2018 launched an effort to develop and build "world-class supercomputing and data infrastructure".[22] In 2019–20, a budget of 1 billion euro was dedicated to supercomputing; with it, the EU acquired eight supercomputers and supporting R&D in the field. Once operative, three of these machines will be in the world's top five supercomputers, and the other five will be in the world's top 50.[23]

For the period 2021–33, the EU has planned a budget of 8 billion euro to meet five objectives:

1. expand and deploy supercomputers and data infrastructure in the EU;
2. make these resources available to the whole EU;
3. scale-up supercomputing technology to make it the basis for big data analysis, AI, cloud technologies and cybersecurity;
4. provide secure cloud services; and
5. develop and deploy quantum-computing infrastructures to solve complex issues.[24]

Supercomputing is one of the areas in which the EU might still be able to compete with the US and China. In 2020, before the Union started the process of deploying its new eight supercomputers, two of the world's top six supercomputers were in China, another three were in the US and one was in Japan.[25]

The EU is most certainly not the only actor to have plans for the development and use of supercomputers (see Figure 1). China's 15-year Medium- to Long-Term Plan for the Development of Science and Technology, its Internet Plus action plan and its five-year S&T Development Plan (13th Five-year Plan on Science, Technology, and Innovation) all place supercomputing at the centre of cloud computing and big data analytics. The country's 14th Five-Year Plan, published in March 2021, envisions the construction of ten E-class supercomputing centres, meaning centres with the most powerful supercomputers currently available in terms of computing capacity.

[22] European Commission, *EuroHPC: The European High Performance Computing Joint Undertaking*, September 2020, https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=54437.
[23] Ibid.
[24] Ibid.
[25] Top 500, *The List, November 2020*, https://www.top500.org/lists/top500/2020/11.

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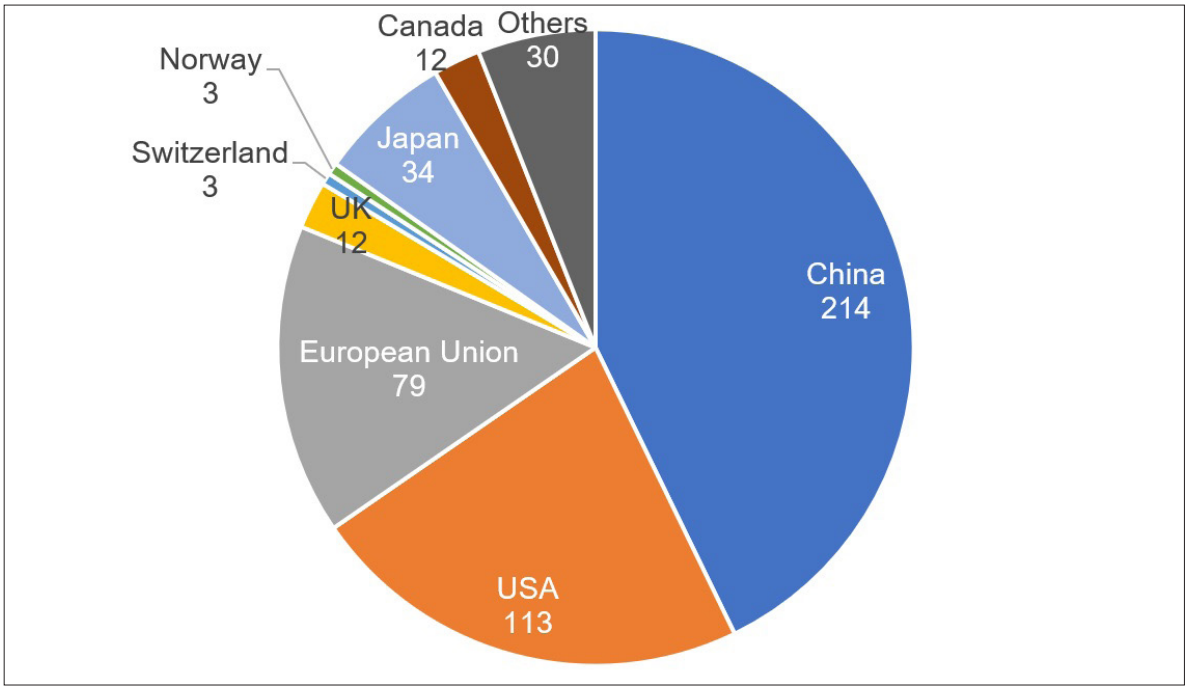
Figure 1 | How many supercomputers are there in 2020?



Source: Top 500, *List Statistics: Countries*, https://www.top500.org/statistics/list.

3. Artificial intelligence (AI)

In AI, the US and China hold the primacy – although the two excel in different areas. For example, the US has an advantage in the production of patents, R&D and in language-processing AI.[26] China, for its part, is more advanced in the application of AI as well as in the amount of investments that go into its R&D. Nonetheless, there are other areas in which competition between the two is still open – including the number of highly skilled experts and the application of AI to the military. Interestingly, despite China being the top provider of AI researchers, the US remains the top destination of researchers – including those from China – in the field (two thirds of whom select the US as their country of choice for work).[27]

What, then, is left for the EU? The Union generates a good share of skilled people in the sector; however, they often move abroad – again, mostly to the US – in order to continue studying and to work. Eighteen per cent of the world's top researchers in the field of AI come from Europe, a proportion that increases to 22 per cent if the UK is included, but only 10 per cent of them – 14 per cent in the case of the UK –

[26] Mercator Institute for China Studies (MERICS), *Web Seminar: China as an AI Superpower? Quantifying China's AI Progress against the US and Europe* [video], 1 July 2020, https://merics.org/en/node/758.

[27] MacroPolo website: *The Global AI Talent Tracker*, https://macropolo.org/?p=14195.

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work in Europe.[28] The US offers a more fertile environment for R&D as well as for applications, easing the possibility of a rewarding career both in terms of fame and money. The issue of the impossibility of scaling in the EU is more or less consistent throughout the technology sector. One of the problems, albeit not the only one, is that existing competition rules prevent the formation of so-called champions within the EU while allowing extra-EU large firms not only to operate in the Union but also to acquire its enterprises. The result is that highly innovative EU SMEs or startups are acquired by foreign, often American and Chinese, giants.

In 2018, the EU launched a Coordinated Plan on AI in an effort to create a greater degree of coordination, attract more private investments and complement national investments with 1.5 billion euro by 2020, which is 70 per cent more than in the previous period (2014–17).[29] The initial review of the Coordinated Plan on AI is expected in the first quarter of 2021. In the new budget for 2021–7, the EU will invest 2.2 billion euro in AI – to be complemented by funds coming from the 95 billion-euro Horizon Europe programme, of which about 20 per cent will go into R&D of the digital agenda.[30]

China has set itself the objective of becoming an AI superpower by 2030. In 2017, it adopted a strategy on AI that foresaw the investment of tens of billions in development as well as the application of AI. The objective set for 2020 was for the country's core AI industries to exceed 23 billion US dollars and related industries 150 billion. By 2025, China's core AI industries are to exceed 60 billion US dollars in value; its related industries, 760 billion – by 2030, they are expected to exceed, respectively, 150 billion and 1.5 trillion US dollars.[31]

4. Digital skills

The EU has decided to dedicate 600 million euro of the Digital Europe Programme to the development of digital skills, targeting three actions:

1. Offer 160 new master programmes aimed at training 80,000 digital specialists.
2. Offer short-term specialised training in advanced digital technologies for about

[28] MacroPolo website: *The State of European AI Talent*, https://macropolo.org/?p=14225.

[29] European Commission, *Member States and Commission to Work Together to Boost Artificial Intelligence "Made in Europe"*, 7 December 2018, https://ec.europa.eu/commission/presscorner/detail/en/IP_18_6689.

[30] European Commission, *The 2021-2027 Multiannual Financial Framework: Digital Shines Through in the EU's Long-Term Budget*, last update 20 January 2021, https://ec.europa.eu/digital-single-market/en/node/94425.

[31] China's Government, *Xinyidai rengong zhineng fazhan guihua de tongzhi* (Notice of the State Council on Issuing the Development Plan for the New Generation of Artificial Intelligence), 8 July 2017, http://www.gov.cn/zhengce/content/2017-07/20/content_5211996.htm. An unofficial translation is available in the New America website: https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017.

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150,000 job seekers and employed people, especially in SMEs.
3. Create 35,000 job placements wherein advanced digital technologies are developed or used.[32]

Thus, the focus is on the training of both a new workforce and the existing one[33] in an attempt to minimise the possible negative impacts of technologies on society, to foster reform and to advance R&D. The target included in the Digital Compass is to see 80 per cent of the population attain basic digital skills by 2030.

The EU is currently in a good place in terms of graduates in the field of Science and Technology (S&T). Data from 2018 show that in the EU-27 there were 19.6 graduates in S&T for every 1,000 people aged 20–29[34] – up from 18.7 in 2016 (although the dataset includes a wide spectrum of S&T disciplines: natural science, mathematics and statistics, information and communications technologies [ICT], engineering, manufacturing and construction).

While these data show a mild increase through the years, the growth is not remotely as impressive as that occurring in China, which, once again, should come as no surprise since it is in line with the country's impressive development in other areas. It is difficult to find recent reliable data when it comes to China. However, several sources view it as either the first or the second country (after India) for graduates in Science, Technology, Engineering and Maths (STEM). According to the World Economic Forum, in 2016, China graduated 4.7 million STEM students.[35] The number has probably increased since then, thus widening the gap with the EU. To these we should add a small yet growing number of Chinese students who graduate or obtain PhDs in other countries, mostly at US top universities, and then go back to work in China.[36]

5. 5G technology

The fifth-generation technology standard for broadband cellular networks, known as 5G, and future-generation networks (6G, etc.) are instrumental for the support

[32] European Commission, *Digital Skills & Jobs*, 9 March 2021, https://europa.eu/!vv93WG.

[33] European Commission website: *Erasmus+*, https://europa.eu/!DR46Yh; *Horizon Europe*, https://ec.europa.eu/info/horizon-europe_en; and *European Globalisation Adjustment Fund (EGF)*, https://europa.eu/!Rw98Wk.

[34] Eurostat, *R&D Personnel*, Data extracted in November 2020, https://ec.europa.eu/eurostat/statistics-explained/index.php/R_%26_D_personnel#Science_and_technology_graduates.

[35] Katherine Stapleton, "China Now Produces Twice as Many Graduates a Year as the US", in *World Economic Forum Articles*, 13 April 2017, April 2017, https://www.weforum.org/agenda/2017/04/higher-education-in-china-has-boomed-in-the-last-decade.

[36] MacroPolo website: *The Global AI Talent Tracker*, cit.; Matt Sheehan, *The Transpacific Experiment. How China and California Collaborate and Compete for Our Future*, Berkeley, Counterpoint Press, 2019; Kai-Fu Lee, *AI Super-Powers. China, Silicon Valley and the New World Order*, New York, Houghton Mifflin Harcourt, 2018.

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and functioning of faster and better-performing communication technologies. A large part of the debate about 5G has been infused with political and geopolitical themes, due to US (and increasingly EU) concerns that the Chinese Government would obtain access to sensitive data thanks to the use of Chinese 5G, developed by Huawei, in Western telecom networks.

Until 2019, Huawei was set to develop most of the EU's 5G networks. The story of the company is impressive and symbolic of China's wider technological development. Founded in 1987, like most Chinese enterprises it began its global outreach in the 2000s. But it was not until the mid-2010s that it became a successful global provider of 4G technologies.[37] The subsequent 5G development would have been the crowning achievement of a relentless upward path but a series of technical, and mostly geopolitical, variables got in the way. Today, Huawei is being increasingly excluded from a number of EU markets.

Interestingly, the main beneficiaries of Huawei's exclusion are not American but European companies – namely, Finland's Nokia and Sweden's Ericsson, which are just behind Chinese companies in the development of 5G networks. The two were huge ICT enterprises at the end of the 20th century and the beginning of the 21st. Without Huawei's setback they would have hardly had a chance to play a relevant role in the development of 5G networks in the EU, as the Chinese company's technology arrived first and, most importantly, was cheaper. Yet while the EU is still mainly concerned with 5G, China is already thinking about 6G – exposing yet another weakness of the Union: short-sightedness. The EU needs to think about the future and identify where technological development is heading. Otherwise, it risks playing a never-ending game of catch-up.

6. Data and regulation

One last element to be considered concerns data. It is often said that data are the "oil of the future". If so, China has a rosy future as it has the potential to harvest the largest amount of data. This is the result, once again, of a larger population but also of fewer privacy regulations and high levels of technologisation. The EU can improve its position by leveraging quality rather than quantity. This means identifying ways of gathering sector-specific or need-specific data. However, admittedly, this will not supplant the advantage that China holds in numbers.

Ultimately, China aspires to set global standards for technologies. In this sector, however, the EU has a better chance of competing thanks to its solid background as rule-maker and rule-setter. A main case in point is the General Data Protection Regulation (GDPR), which is often mentioned as proof of the Union's ability to force other countries to abide by its own rules. The true power of GDPR, however,

[37] Huawei, *The Early Years*, 6 May 2020, https://www.huawei.eu/story/early-years.

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lies in the strength of the EU as a single market and companies wanting to have access to that market. Such strength can be leveraged with tech regulations too, but the EU needs to maintain a strong single market and also to harmonise it in terms of technological regulations. In this regard, important steps have already been taken with the introduction of the Digital Service Act and the Digital Market Act.[38] The undeniable risk, however, is a multipolar scenario in which actors like the US, the EU and China adopt different rules and economic actors have to adapt accordingly.

Some takeaways

This paper has shown the strengths and weaknesses of both China's and the EU's approach to technology development. A centralised system allows the Chinese Communist Party not only to plan centrally and see its plans through – increasingly so under the centralisation of power enacted by Xi Jinping – but also to invest heavily and strategically in areas of priority. The availability of venture capital and global technological champions place it in an even more favourable position.

The EU is weaker than China in most of the areas mentioned above. Internal divisions – whether formal or informal – and much slower economic growth rates make it difficult for it to invest heavily and, most importantly, strategically. Much-needed venture capital and equity investments are limited. And very strict competition law, coupled with the possibility of extra-EU giant tech acquiring small EU enterprises within the Union, makes it almost impossible for European enterprises to scale up. Yet, thanks to its attention to the socio-economic impact of new technologies and an even distribution of these, the EU has an advantage in the long term by making technologies sustainable both for the planet and European society.

In conclusion, the action over which the EU has the greatest degree of control and ability to bring about necessary change is the acceleration of the reform of its competition and industrial rules – as well as the creation of a capital-market union and banking union, and a digital single market. These measures would allow: a) the attraction of venture capital and equity investments; and b) the scaling up of enterprises and, eventually, the creation of European champions. Such a change will help to create an environment more fertile than hitherto for innovation and the application of this innovation within the single market, allowing the EU to be better positioned to compete globally. In other regards, much is left to member states. Truthfully, the Union might never be able to compete with the scale and success of China's technological development across the spectrum, so it should

[38] European Commission, *The Digital Services Act Package*, last update 3 March 2021, https://ec.europa.eu/digital-single-market/en/node/94375; and *Digital Markets Act: Ensuring Fair and Open Digital Markets*, 15 December 2020, https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_2349.

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find where to invest next and carve out its niche. The EU appears already well placed to guarantee a technological revolution that places citizens at its core, and thus has the potential to be less disruptive than expected. Addressing these issues now, instead of when they present themselves, might slow down the digitalisation of the EU, but it will grant it better resilience to technological disruptions in the long term.

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