



## **THE US-CHINA TRADE WAR AND TECHNOLOGICAL RACE**

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*The so-called trade war between the US and China, which started as a tariff war, has soon become a technological conflict. In fact, next to growing tariffs from both sides, covering 66% of US imports from China and 58% of Chinese imports from the US, the conflict has witnessed the increasing use of other policy tools in order to slow down reciprocal trade flows. The US have resorted to an export control policy for their semiconductors, software and equipment for their production. Controls have been extended to all the products that China might utilize for the development of its own industry in that field.*

*Chinese retaliation has quickly materialized, especially through a new law on export control that obliges Chinese exporters to strictly comply with it and leaves a wide margin of manoeuvre to the Chinese authorities, when they want to prevent undesired exports. The ultimate reason of this technological conflict lies in the fact that the US technological predominance is being slowly eroded by Chinese advances in many technological fields, including artificial intelligence. The biggest American worries result from the activity of the Chinese firm Huawei, specialised in telecommunication infrastructure equipment, in particular concerning fifth generation (5G) technology. Trade war has not benefitted the two contending countries, which saw a decrease in their reciprocal trade and have undergone other negative, sometimes unintended, consequences, due to their insertion in the global value chains. Although other countries have derived short-term commercial advantages by substituting the reciprocal trade flows of the two superpowers, major global damages were caused by disruptions in the global value chains and by the wound to the international trade system centered upon the World Trade Organisation (WTO), insofar as both superpowers have behaved without respecting the WTO rules. Although many analysts point to a progressive decoupling between the American and the Chinese economies, the data so far do not support a general trend, but only a partial one, referred to the products involved in the export control policies. The fundamental pillars of their reciprocal economic dependency appear still in place. However, more recently, the policies adopted by the two governments, some international initiatives and their official declarations could foreshadow a process of partial technological delinking.*

*La cosiddetta guerra commerciale tra Stati Uniti e Cina, iniziata come guerra dei dazi, si è presto trasformata in conflitto tecnologico. Infatti, accanto a dazi doganali crescenti da una parte e dall'altra, che hanno finito per coprire il 66% delle importazioni americane dalla Cina e il 58% delle importazioni cinesi dagli USA, il conflitto ha visto l'uso crescente di altri strumenti per frenare le importazioni reciproche. Gli USA hanno fatto ricorso a una politica di controllo delle esportazioni di semiconduttori, software e attrezzature per la loro produzione. I controlli sono stati estesi a tutti i prodotti che la Cina potrebbe utilizzare per lo sviluppo della propria industria in quel campo. La ritorsione cinese non si è fatta attendere soprattutto a livello legislativo, con una nuova legge sul controllo delle esportazioni, che rende obbligatoria per gli esportatori cinesi una stretta compliance con tale legislazione e che dà ampio margine alle autorità di impedire esportazioni non desiderate. La ragione ultima di tale conflitto tecnologico risiede nel fatto che il predominio tecnologico degli USA viene progressivamente minato dai progressi cinesi in molti campi della tecnologia, ivi compresa l'intelligenza artificiale. Le preoccupazioni americane maggiori derivano dalle attività della società Huawei, specializzata nelle attrezzature per*

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*infrastrutture di tele comunicazione, in particolare relative alla tecnologia di quinta generazione (5G). La guerra commerciale non ha giovato ai due contendenti, che hanno visto diminuire le loro esportazioni reciproche e hanno subito altre conseguenze negative a volte inattese, dovute alla loro inserzione nelle catene globali del valore. Altri paesi hanno tratto vantaggi commerciali nel breve periodo, andando a sostituire i flussi reciproci delle due superpotenze. E soprattutto un grave danno è stato inferto al sistema commerciale internazionale incentrato sull'Organizzazione Mondiale del Commercio (OMC), nella misura in cui entrambi i contendenti hanno agito al di fuori delle regole dell'OMC. Si parla molto di progressivo scollegamento tra le due superpotenze, ma i dati per ora non mostrano un fenomeno generale in tal senso, se non riferito ai prodotti oggetto di controlli sulle esportazioni. Gli elementi fondamentali della dipendenza economica reciproca appaiono ancora presenti. Tuttavia, le politiche adottate dai due contendenti, alcune iniziative internazionali e le più recenti dichiarazioni ufficiali potrebbero preludere ad un futuro processo di parziale dissociazione tecnologica.*

The so-called trade war between the US and China has started as a tariff war. The latter has proceeded in various stages since June 2018, when it was launched by the Trump administration, culminating in the truce of the Phase One Agreement in February 2020. Tariffs rapidly escalated: US average tariffs on Chinese exports, from a low of 3% to a high of 19%, while Chinese average tariffs in retaliation increased from 8% to 21.%. Despite the phase one agreement and the new US administration, tariffs between the two countries have remained rather stable and high. As a result, by the end of 2022 US tariffs covered 66% of imports from China, while China's retaliatory tariffs covered 58% of imports from the US.

### ***US trade policy***

US trade policy tools have fallen into three main categories: 1) renewed use of safeguard protection, on products like solar panels and washing machines; 2) national security tariffs on steel and aluminum; 3) tariffs and other remedies to address China's potential misuse of American intellectual property, forced technology transfer, and cybertheft.

The policy tool number 3), in particular "other remedies", applied to the semiconductor industry, seems to be at the core of the present US trade policy vis-à-vis China. The main reason: America is falling behind in chip manufacturing, production being more and more concentrated in East Asia, in particular in Taiwan. On the other side, China is seeking self-sufficiency. China imports over \$300bn-worth of chips a year because it lacks the manufacturing capability to meet its own needs. Chips have featured in government plans since the 1950s: large subsidies were offered by the government, while top universities have amplified their chip programmes.

In order to impede this development, the trade tool chosen by the US administrations has been an export control policy affecting American sales of semiconductors, software, and manufacturing equipment. The major worry has involved the Chinese company Huawei, whose main business is telecommunications infrastructure equipment, providing hardware for many countries' 5G (fifth generation wireless technology) networks and leading the race to develop 5G.

Already in May 2019 restrictions applied to Huawei's access to items produced in the United States. American companies could not sell goods or services to Huawei without a license. In August of the same year almost 70 Huawei affiliates around the world were added to the list, while Huawei

designations were expanded to include its fabless semiconductor subsidiary, HiSilicon, plus 46 new designations, pushing the total number of Huawei entities designated to over 100. In May 2020 further restrictions applied to Huawei's acquisition of American software and technology used in semiconductor manufacturing from foreign companies. In August, the same licensing restrictions were implemented in the case of semiconductors developed outside the US that use American software or technology as chips manufactured within the United States itself. Finally in December, US sales limitations were applied to another firm, the Semiconductor Manufacturing International Corporation (SMIC), a major Chinese semiconductor producer.

The Biden administration not only continued this kind of policy, but it even reinforced it. In August 2022, President Biden signed the CHIPS and Science Act into law, which included billions of dollars of tax credits to foster semiconductor manufacturing in the United States. Shortly afterwards, additional export limits were placed on semiconductor EDA (electronic design automation) software from U.S. companies like Cadence and Synopsys and on advanced chips linked to artificial intelligence and advanced computing from Nvidia and Advanced Micro Devices. In October, new controls were applied on advanced computing and semiconductor manufacturing exports to China. License will be needed to export certain chips to China to be used in advanced AI calculations and supercomputing. The US also blocked foreign-made chips that are manufactured with American technology from being sold to China. Further controls were being placed on items China could use to develop its own manufacturing-equipment industry. By the end of the same month, the US Commerce Department added seven Chinese space, aerospace, and related technology entities to the Entity List. With this action, the Commerce Department has around 600 Chinese entities on the Entity List – more than 110 of which have been added under the Biden administration.

### ***China's retaliation on export controls***

After the US ban of public sector procurements of Huawei, in December 2019, in a tit-for-tat move, the Chinese government instructed public organisations and state offices to replace all non-Chinese computer equipment within three years. Some estimates suggest that as many as 30 million separate items of computer equipment might need to be replaced. The numbers may even be larger, due to the complex connections between the public and private sectors in China.

However, apart some counter-sanctions on a few American citizens and entities using a new anti-foreign sanctions law, China's actions have been characterized prevalingly by the enactment of new legislation. Starting from 2017, the Chinese Ministry of Commerce (MOFCOM) and China's Standing Committee of the National People's Congress (NPC) published various revised versions of the drafts of the Export Control Law of the People's Republic of China. China's Export Control Law is the first comprehensive export control legislation that will regulate the export of sensitive materials and technologies from China to overseas, obliging both Chinese exporters and foreign customers to scrupulously comply to Beijing's export control policy or be liable to penalties. More recently, China's State Council released a white paper on China's export control regime, laying out China's policy objectives, saying that "China maintains a holistic approach to national security, which means coordinating development and security, opening up and security, traditional security and non-traditional security, and China's own security and the security of others."

One should finally note that the import and export of technologies is covered by a separate set of regulations, i.e., the Regulations for the Administration of the Import and Export of Technology, that require licences for the export of, amongst others, artificial intelligence interactive interface technologies; speech synthesis and evaluation technologies; scanning and photo recognition technologies; cryptographic security technologies; information countermeasure and defence technologies; laser technologies; and space and aerospace-related technologies.

In May 2019 the Ministry of Commerce announced that China would introduce an “unreliable entity list” characterized by the following factors: (a) whether such entities have implemented a blockade, cut-off of supplies, or other discriminating measures targeting Chinese entities; (b) whether such entities’ conducts are based on non-commercial purpose and violate market rules and the spirit of contract; (c) whether such entities’ conducts have caused substantial damage to Chinese companies or relevant industries; (d) whether such entities’ conducts pose a threat or potential threat to national security.

Although, unlike its US counterpart, China’s Ministry of Commerce has not yet published a list of US entities that would be the target of retaliation, the implementation of China’s Export Control Law may provide China with ample ammunitions to counter US export control measures targeting China. Among others, it formally introduces trade concepts such as embargoes and “blacklists,”; it allows national export control authorities to conduct an assessment of countries and regions where controlled items are exported, identify the level of risks, and take corresponding control measures; it makes it possible for national export control authorities to ban the export of certain items or to certain countries or regions or to certain persons (both individuals and entities), in order to “safeguard national security”; finally the law assert extraterritoriality, which means that China’s new export control regime, if and when the extraterritoriality is enacted, will impact businesses within and outside China that deal with Chinese controlled items.

All these features provide a legal framework and ample discretion for China to impose export control measures whenever it wants. Together with licences, controls and the like, they make the compliance to the China’s new export control regime a very time consuming, cumbersome and uncertain process for the firms involved.

### ***Winners and losers in the trade war***

*In the short term:* Winners in the US: domestic steel and aluminium producers, other protected industries and the US government (through the tariff revenues). But these gains are more than compensated by losses of millions of consumers plus the losses of producers who suffer from the price increase of their inputs. Winners in the rest of the world through export re-direction and supply-switching: some advanced countries (EU, Canada, Australia), Mexico and Argentina in Latin America; Vietnam, Malaysia, South Korea, Taiwan, Singapore, India, Pakistan and Thailand in Asia. Losers: these gains are more than compensated in the US by losses of millions of consumers plus the losses of producers who suffer from the price increase of their inputs. China appears to be a big loser altogether, apart from the tariff revenues accruing to the government. So, of the two contenders, neither side has really won on a net basis, from the trade point of view.

### *The costs for China*

In the short run, China's total exports to the US went down. The decline was particularly sharp in all the groups of products on which tariffs were imposed, concerning, inter alia, many intermediate products, auto parts, machinery, rubber and plastics. Moreover, China's retaliatory tariffs on US goods ended up hurting Chinese importers of those goods.

However, China seems to have succeeded in re-directing a substantial volume of exports away from the US towards other destinations. The largest amount was destined to the EU. Among the emerging countries, Vietnam and Malaysia come way in front of the others, followed by Taiwan and Mexico.

Some Chinese-headquartered firm may have moved, through a subsidiary, to other locations, like Vietnam, in order to avoid tariffs. In this sense there could have been a loss of Chinese employment at the assembly line. But, if the product continues to use the same amount of intermediate inputs from Chinese suppliers, the loss will be limited. US tariffs may not be the only cause: some labour-intensive production was likely relocating anyway, because China was losing competitiveness in those industries.

In the longer term, the US export control policy could substantially impair China's domestic chip industry – at least until it is able to produce these components on its own.

### *US losses due to China's retaliatory tariffs*

As China imposed retaliatory tariffs, the US total exports to China declined. The sectors most affected were agricultural commodities and products, chemicals, motor vehicles, various types of machinery, paper waste and cotton. Moreover, Chinese tariffs on US manufacturing exports made it harder for many American companies to maintain their access to the Chinese market. There were also a few cases of hollowing out the US manufacturing base. In July 2018, China retaliated with a 25% tariff on US autos, while it simultaneously lowered its auto tariff on imports from the rest of the world. US exports to China fell by more than a third. Tesla accelerated construction of a new plant in Shanghai, arguing that the uncertain trade picture, made it no longer competitive to manufacture electric vehicles destined for China in the United States. For similar reasons, BMW shifted some production destined for China out of South Carolina.

### **Some unintended consequences: economic costs to the United States of its own tariffs**

Trade wars have redistributive effects at the level of firms: they protect specific import-competing industries, but other related downstream sectors will lose due to the higher costs associated. Tariffs on inputs like steel, aluminium, or the hundreds of “parts”, enter the US goods manufacturing process, frequently through cross-border supply chains and are then exported by the US to third markets. Raising the prices of intermediate inputs raises the costs to downstream US industries and makes American firms less competitive both in the North American and global markets. These price hikes are then passed onto consumers or eat into profits.

Costs on consumers: higher prices, lower volume, reduced access to foreign varieties. All these costs outweigh the limited gains to local producers who face less import competition.

### ***Possible negative implications of the US export control policy***

- 1) Companies now face pressure to avoid setting up semiconductor, software, or toolmaking facilities in the United States. Even firms currently manufacturing in the United States may explore moving production and activities offshore to escape US export controls.
- 2) Substitutes from the world's other major equipment providers are currently available from other countries that are not subject to controls.
- 3) Major foreign consumers of US-made semiconductors may look elsewhere in the future, concerned that their supplies will get cut off, even if they make products that do not pose a national security risk.
- 4) The policy requires a new US bureaucracy, creating concerns over preferential treatments, non-transparency and discrimination.
- 5) The policy cuts off an important revenue source for American chipmakers, software designers, and toolmakers jeopardizes the research and development (R&D) that supports thousands of American jobs. Less R&D also means less American innovation.
- 6) The policy forces the industry to demand tens of billions of dollars of new federal subsidies as compensation.
- 7) The policy gives China an incentive to develop its own alternatives faster.
- 8) China is likely to retaliate with its own export controls.

### ***On the whole several WTO rules and practices have been undermined***

The United States had established a long-term strategy of writing new trading rules through megaregional agreements like the proposed Trans-Pacific Partnership, to address many of the limitations of current trade agreements. The Trump administration withdrew the United States from the TPP agreement, kept and even expanded only the first part of the previous US trade policy strategy, i.e. tariffs, completely abandoning bilateral, plurilateral, and multilateral forms of engagement with China on trade and refusing to appoint new members to the WTO's Appellate Body. The Biden administration has kept the level of tariffs established under the previous administration and has hardened the export policy control. In words, it wants to return to the WTO and to multilateral negotiations. It lifted the tariffs on allied countries, but did not contribute so far to nominate the missing member of the Appellate Body and has not signed into the Pacific Partnership agreement.

On the other hand, China retaliated outside the WTO rules, while declaring to formally abide by the WTO trade rules and betraying them in practice. As a consequence, the two largest partners of the trading system are no longer respecting the WTO rules.

### ***The struggle for technological leadership***

The struggle for technological leadership seems to be at the core of the present confrontation. Since the early days of the Cold War, the United States has led the world in technology. Until the beginning of this century, its balance in goods with advanced technology used to be positive, but started to be increasingly negative ever since.

On the other side, over the past two decades, China has evolved from a country that largely imitates technology to one that now also improves and even pioneers it. This is the result of the state's deliberate, long-term focus. China has invested massively in R&D. If current trends continue, China is expected to overtake the US in such spending by 2025.

In recent years China has undertaken impressive investments in robotics, artificial intelligence, microelectronics, green energy. Central to China's drive has been a strategy of "military-civil fusion," a coordinated effort to ensure cooperation between the private sector and the defence industry. Support might come in the form of research grants, shared data, government-backed loans, or training programs. The government is creating whole new cities dedicated solely to innovation.

The competitive threat from China encompasses semiconductor manufacturing, 5G technologies and synthetic biology, as well as AI and machine-learning. China's global R&D expenditure has increased enormously in recent years. Today, spending on domestic R&D is the second-highest figure in the world, behind the United States, but some forecasts say that it will surpass it in the coming years. Chinese R&D expenditures as a share of GDP amount to 2.2%, still lower than the US (3%), but on the increase, having just surpassed the EU27 (2.1%). Chinese researchers are publishing more scientific papers in the field of AI than American ones do. China's 'Thousand Talents Program' targets high-level scientists and other experts from overseas, including foreign scientists. It offers significant financial support to relocate to China for conducting research in high-tech industries and technologies of the future. The program supports "national champion" firms (including Huawei, Baidu, Alibaba, Tencent, iFlytek, and SenseTime) to lead development of AI technologies at home, advance state-directed priorities that feed military and security programs under the rubric of military-civil fusion, and capture markets abroad. Moreover it funds massive digital infrastructure projects across several continents and it is trying to set global technical standards for AI development.

True, China: is not technology leader in the main economic sectors, while being runner up in more than half of them; does not appear among the 10 most innovative economies in the world; lags far behind as far as robot density in the manufacturing industry is concerned; depends on imports of some core technologies. More than half of purchases of foreign R&D comes from only three countries — United States, Japan, and Germany - and finally China does not lead in the "creation" stage, that produces the breakthroughs in core technology or invention of new paradigms for user interaction.

Nevertheless, the chairman of a special US commission on artificial intelligence recently warned the Congress that the United States is only one to two years ahead of China in developing artificial intelligence. For the near future, the US is likely to remain the world leader in AI, but trends are concerning.

### ***Decoupling: the evidence so far***

If we look at trade data, some decoupling has taken place. In 2017, before the onset of the trade war, China represented roughly 22% of global US goods imports. In 2021 it was down to 18%. At the product level, as expected, the trade war has had the largest impact on imports from China of products hit with the highest US tariffs, mostly intermediates, largely related to the technological sphere. But many other imports, where no or very low US tariffs were applied, like laptops and computer monitors, phones, video game consoles and toys gained market shares. On the other side, US exports to China

slightly increased from 8.4% to 8.6% of total US exports to the world, in the respective years, largely pulled by American goods not affected by Chinese retaliatory tariffs.

Data provided by the General Customs Administration of China show that in 2017 the US constituted 19% of China's global goods exports. In 2021 it was down to 17%. On the import side, in 2017 the US represented 8% of China's imports from world, going down to 7% in 2021. Finally, even if some delinking is taking place with the US, China remains still one of the main hubs of global value chains.

Although trade presents contrasting evidence on decoupling between the two superpowers, the main ingredients of the historical "economic embrace" between them are still there: masses of Chinese cheap consumer goods are still flooding the US market (as an example, 74% of US imports of phones are still sourced from China) representing an enormous benefit for American consumers. At the same time they continue to fuel China's export-led growth, providing it with millions of jobs; US FDI in China, after decreasing in 2019, have continued the upward trend. Chinese FDI decreased slightly in 2018 and 2020, but resumed in 2021. There is some anecdotal evidence on reshoring and nearshoring, but it does not appear to be a tide for the moment. Finally, China is still the second world holder of US debt behind Japan.

Even if a clear decoupling does not appear in the trade data, some future technological delinking of the two superpowers might be suggested by the new directions taken by their policy.

As for China, the two key components of domestic development strategy (the so-called double circulation) seem to be the expansion of the internal market and technological self-sufficiency. This might imply a reorganisation of the global value chains. At an international level, the Regional Comprehensive Economic Partnership (RCEP), the world's largest trade agreement, constitutes China's first mega trade agreement and creates for the first time preferential trade flows amongst the three largest Asian economies (China, Japan, and the Republic of Korea). RCEP might signal a push toward diversifying trade away from the United States in favour of intra-Asian commerce.

The US strategic approach implies challenging China's state-led, non-market approach to the economy and trade, which includes China's industrial policies. It also bolsters supply chain resiliency to mend disruptions and major vulnerabilities and tries to prevent Chinese companies from not only having access to the latest high-performance chips and technology, but from having the ability to manufacture comparable technology itself. Finally, it includes launching the Indo-Pacific Economic Framework (IPEF) - aimed at "expanding US economic leadership" – and therefore curbing Chinese influence – in the region.

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