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POLICY PAPER

**The Geopolitics and Economics of
Technology in the Indo-Pacific: Security,
Prosperity And Values**

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Abstract

The globalization of supply chains that accelerated after the end of the Cold War has decelerated in recent years due to factors such as natural disasters, human interventions, pandemics, and the rise of a China that aims for self-sufficiency. In the United States, the Obama, Trump, and Biden administrations have increasingly viewed China as America's main global competitor, and efforts have intensified to secure supply chain resiliency, security, and reliability with the cooperation of like-minded countries. The clearest example is in semiconductors, seen as key to America's national security, both militarily and economically. The competition between the United States and China is likely to escalate, but it is too early to gauge the extent to which the United States will be successful in gaining the full support of other countries in its efforts.

Keywords

National security; supply chains; U.S.-China competition; semiconductors

INTRODUCTION

Supply chains are networks of people, ideas, information, components, funds, organisations, activities and resources involved in delivering a product or service to a customer.

Globalisation of supply chains accelerated after the fall of the Berlin Wall in 1989 and the collapse of the Soviet Union in 1991, when geographical and political borders were thought to have lost their importance and both the production and distribution of products and services were seen as taking place in an increasingly 'borderless' world. This meant that companies were incentivised to move their production centres to low-cost regions, procure inputs just in time from the lowest-price suppliers and deliver the final product or service just in time to the end users. Cost and time efficiency became the basis of competition, and this was spurred by advances in technology – especially telecommunications and transport – which facilitated the movement of people, information, components, etc.

This 30-year trend started to decelerate in the 2010s. Four main factors were responsible for this. First, natural disasters, including earthquakes (e.g. the Great East Japan Earthquake of 2011), tsunamis, fires, floods (e.g. the floods in Thailand in 2011), showed that the just-in-time system of supply chain management was fragile and easily subject to disruption. Second, human interventions, including cyberattacks and wars (e.g. the Russian invasion of Ukraine in 2022) also exposed vulnerabilities and proved highly disruptive. Third, pandemics (e.g. the Covid-19 outbreak of 2019-2023) demonstrated the dangers of becoming entirely dependent on foreign suppliers for key medical equipment and pharmaceuticals. Finally, the rise of China and its self-proclaimed goal of self-sufficiency (e.g. 'Made in China 2025') has resulted in a fundamental questioning and reassessment, from the standpoint of national security, of the notion of borderless just-in-time supply chains that attach top priority to low-cost efficient production and delivery.

This paper examines supply chains in the context of national security and recent U.S.-China competition.

U.S. NATIONAL SECURITY POLICY

The Obama Administration's U.S. National Defense Strategy (2015) foresaw that "China's rise and Russia's aggression [would] significantly impact the future." This view continued in the Trump Administration's National Defense Strategy (2017): "China and Russia [are reasserting] their influence regionally and globally." The Biden Administration's Interim National Security Strategic Guidance (March 2021) spoke of "growing rivalry with China, Russia and other authoritarian states" (p. 9) and the need to "rebuild American supply chains for critical goods" (p. 6).

The Biden Administration's National Security Strategy, issued on 12 October 2022, states:

The PRC is the only competitor with both the intent to reshape the international order and, increasingly, the economic, diplomatic, military and technological power to do it. Beijing has ambitions to create an enhanced sphere of influence in the Indo-Pacific and to become the world's leading power. It is using its technological capacity and increasing influence over international institutions to create more permissive conditions for its own authoritarian model, and to mould global technology use and norms to privilege its interests and values.

The needs for "vendor diversity" and "resilient and secure supply chains" are mentioned throughout the document, with the most attention paid to the challenges posed by China.

On 24 February 2021, just over a month after assuming office, the Biden Administration issued its 'Executive Order on America's Supply Chains' (Executive Order 14017), which stated "The United States needs a resilient, diverse and secure supply chain to ensure our economic prosperity and national security." It also ordered a '100-Day Supply Chain Review.'

On 24 February 2022, the Biden Administration issued its 'Plan to Revitalise American Manufacturing and Secure Critical Supply Chains in 2022.' It ordered six supply chain reports to be prepared by the (1) Department of Energy, (2) Department of Transportation, (3) Department of Agriculture, (4) Department of Health and Human Services, (5) Department of Commerce and Department of Homeland Security and (6) Department of Defense.

This plan focused on four key sectors: (1) semiconductors, (2) batteries, (3) critical materials and (4) pharmaceuticals. The following new initiatives were stipulated: (1) an Export-Import Bank Domestic Manufacturing Initiative, (2) New Buy America Provisions, (3) Critical Minerals and Clean Energy, and (4) others, including in the Departments of Agriculture, Labor and Health and Human Services. Notably, the plan declared the establishment of a Supply Chain Disruptions Task Force (SCDTF).

A major element in this plan was institutionalisation of supply chain resilience throughout the U.S. federal government:

Supply chain resilience must become a lasting focus for businesses and governments alike. In addition to the SCDTF, which has broken down silos and coordinated collaboration between agencies to respond to supply chain disruptions, the Administration has begun to formally institutionalise supply chain resilience throughout the Federal government.

Regarding China, the Biden Administration's Asia policy includes the Quadrilateral Security Dialogue ('The Quad'), which issued an initiative on supply chains after the Quad Leaders' Summit on 24 September 2021:

Launch a Semiconductor Supply Chain Initiative: Quad partners will launch a joint initiative to map capacity, identify vulnerabilities and bolster supply-chain security for semiconductors and their vital components. This initiative will help ensure Quad partners support a diverse and competitive market that produces the secure critical technologies essential for digital economies globally.

The 'Indo-Pacific Strategy of the United States' announced on 11 February 2022 also explicitly refers to the centrality of supply chains: "We will work with our partners to advance resilient and secure supply chains that are diverse, open and predictable." (p. 11).

An 'Indo-Pacific Economic Framework for Prosperity' (IPEF) announced on 23 May 2022 involves a total of 14 countries including the United States: Australia, Brunei, Fiji, India, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand and Vietnam. The four pillars of IPEF are: (1) fair and resilient trade; (2) supply chain resilience; (3) infrastructure, clean energy and decarbonisation; and (4) tax and anti-corruption. On supply chains, it states "The prosperity of everyday Americans is linked to the Indo-Pacific ... this requires investments to ... rebuild supply chains."

As shown above, since at least the Obama Administration (2009-2017) the U.S. government has seen China as America's most serious long-term rival and competitor, and the issue of supply chains has been a central concern in America's national security. However, it was only in 2021, with the advent of the Biden Administration, that the U.S. government took a proactive and systematic approach to promoting supply chain resilience and security.

THE CHIPS AND SCIENCE ACT OF 2022

The initiatives launched by the Biden Administration described above have been complemented by legislation in the U.S. Congress. On 9 August 2022, President Biden signed into law the bipartisan CHIPS and Science Act (officially called the Creating Helpful Incentives to Produce Semiconductors for America Act), which provides \$52.7 billion for U.S. semiconductor research, development, manufacturing and workforce development, including \$39 billion in manufacturing incentives and \$13.2 billion in R&D and workforce development. Also included is a 25 percent investment tax credit to incentivise semiconductor manufacturing in the United States. These investments and tax credits have the aim of revitalising American semiconductor manufacturing and strengthening the global semiconductor supply chain. The Act has been described as “the biggest U.S. foray into industrial policy in 50 years.”

The centrality of supply chains is indicated by the fact that the term appears in (1) the title of the Fact Sheet issued by the White House on 9 August 2022: “CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains and Counter China”; (2) the first paragraph: “[T]he Administration has implemented an industrial strategy to revitalise domestic manufacturing, create good-paying American jobs, strengthen American supply chains and accelerate the industries of the future”; and (3) the second paragraph: “[The Act] will strengthen American manufacturing, supply chains and national security, and invest in research and development, science and technology, and the workforce of the future to keep the United States the leader in the industries of tomorrow ...” [emphasis added].

In addition to taking measures to strengthen American semiconductor manufacturing, on 7 October 2022 the Biden Administration announced sweeping export controls aimed at impeding China’s semiconductor development. The U.S. Commerce Department barred American companies from shipping certain grades of advanced chip equipment to any Chinese client without a licence. The ban also applies to shipments of American-made electronics parts or other items that China could use to produce its own chipmaking tools and equipment.

The Commerce Department also tightened the Foreign Direct Product Rule to restrict China’s ability to obtain or build the cutting-edge chips used in supercomputers and artificial intelligence applications. These restrictions also apply to non-Chinese chipmakers, including South Korea’s Samsung and Taiwan’s TSMC (Taiwan Semiconductor Manufacturing Co.), which rely on American manufacturing technologies.

According to the Commerce Department, the number of Chinese entities on the U.S. export ‘blacklist’ grew from 11 in 2018 to 42 in 2019, and to 108 in 2020. In 2019, Huawei, China’s largest telecommunications firm, was added to the list and in 2020 SMIC (Semiconductor Manufacturing International Corp.), China’s top semiconductor manufacturer, was also added.

In addition to the U.S. government’s domestic initiatives, the Biden Administration has engaged in discussions with allies – most notably South Korea, Taiwan, Japan and the European Union – to coordinate policies and to encourage ‘friendshoring’ – relocating supply chains to countries or regions where the risk of disruption by political chaos is low. As U.S. Secretary of the Treasury Janet Yellen said in April 2022,

We cannot allow countries to use their market position in key raw materials, technologies or products to have the power to disrupt our economy or exercise unwanted geopolitical leverage. ... Let’s build on and deepen economic integration and the efficiencies it brings, on terms that work better for American workers. And let’s do it with the countries we know we can count on.”

Some recent examples include TSMC's investments of \$100 billion in Taiwan and the United States and of \$7 billion in Japan; Intel's investments of \$90 billion in Europe (Germany, Ireland, Italy, Poland and Spain) and of \$7 billion in Southeast Asia (Malaysia and Vietnam), and of \$16 billion in Israel; Samsung's investment of \$200 billion in the United States; and Micron's investment of \$150 billion in Japan.

ISSUES

As the developments described above indicate, both the Biden Administration and the U.S. Congress have elevated China to being top priority in U.S. national security policy, in terms of both military security and economic/technological security. Strengthening the security of supply chains is a key element in this effort, and semiconductors are the most prominent example of a product that has broad military and economic importance.

Even limiting the issue to semiconductors, this effort to secure supply chains faces several challenges. First, it requires effective communication and close coordination among (1) U.S. federal government agencies, (2) U.S. local governments, (3) U.S. corporations, (4) like-minded foreign governments and (5) like-minded foreign corporations. This process can be complex and time-consuming, and should ideally be implemented by government officials with extensive business experience and business executives with government experience. This is rarely the case.

Second, the sheer complexity, scale and scope of the semiconductor production process presents challenges in securing the supply chain. Some of the bottlenecks that have slowed down the semiconductor supply chain are: (1) precision ball screws; (2) optical systems; (3) valves for handling gas used in equipment; (4) wafer handling and transmission robots; (5) ultra-high purity gas cylinder valves; (6) sensors; (7) controller modules; (8) cylinders; (9) lithography for chip manufacturing; (10) lithography for chip substrates; (11) chemical mechanical polishing; (12) chemical vapor deposition; (13) physical vapor deposition; (14) etching; (15) metrology, measurement and wafer inspection; (16) wafer wet chemical cleaning; (17) wafer grinding and polishing; (18) laser drilling; (19) testing; and (20) automated material handling systems.

The Boston Consulting Group estimates that even an aim of 70 to 80 percent self-reliance in semiconductor production is "extremely tough. ... It could be extremely challenging for any country or region to get all the fronts covered." And TSMC founder Morris Chang declared:

If you want to re-establish a complete semiconductor supply chain in the United States, you will not find it a possible task. ... Even after you spend hundreds of billions of dollars, you will find that it will be very high cost, much higher cost than what you currently have.

Finally, despite a concerted attempt to deny China key components in the semiconductor supply chain, there are indications that Chinese companies have been extremely resourceful in gaining access to semiconductors, components, chip manufacturing equipment and electronic design automation software that are supposedly off-limits to them. Therefore, although it may be difficult, as Morris Chang says, for any single country to establish a totally hermetic but efficient semiconductor supply chain, it may also be difficult to completely deny key parts of the supply chain given the porous nature of the global semiconductor production process and the slippery nature of the citizenship and nationality of individuals and corporations. That is, even if friendly governments agree with the United States government to restrict the export of sensitive technology to China, there is no guarantee that all companies in the world with access to that technology will comply, or that there will not be loopholes to circumvent the restrictions. Two industries in the semiconductor supply chain that merit close scrutiny are semiconductor equipment makers (e.g. ASML, Applied Materials, Lam Research, Nikon, Canon) and electronic design automation software firms (e.g. Cadence Design Systems, Synopsys, Xilinx).

PROSPECTS

The U.S. midterm elections of 8 November 2022 resulted in the Republican Party gaining a slight majority in the House of Representatives. Kevin McCarthy, the Republican Congressman from California who is most likely to be Speaker of the House, has announced that if selected as Speaker he would establish a Select Committee on China. Under Republican leadership, this committee is likely to hold hearings aimed at least in part at applying pressure on the Biden Administration to be tougher on China. In addition, the committee may propose legislation that would impose sanctions on China including restrictions on imports, exports and investments. How effective they will be will depend on the legislation and its implementation, but Sino-American relations are not likely to improve in the near future.

Meanwhile, on 5 December 2022, the U.S.-EU Trade and Technology Council (TTC) met outside Washington, D.C., chaired by several cabinet ministers from each side. One of the TTC's working groups is on 'Building Resilient Semiconductor Supply Chains.' A future task of the TTC will be to coordinate between the U.S. CHIPS and Science Act, which was enacted on 9 August, and the European Chips Act, which is still in the EU legislative process and is expected to be enacted sometime in 2023.

At this point, the EU appears far less concerned than the United States about the national security challenge posed by China. Perhaps reflecting this difference of views, the TTC's Joint Statement says the following about U.S.-EU cooperation in semiconductor supply chains:

Building on this baseline of transparency, cooperation on potential disruptions and a common understanding of global demand, we will work to avoid subsidy races and market distortions, and ensure a more resilient, sustainable and innovative semiconductors value chain.

The lack of a clear focus on China in the semiconductor portion of this U.S.-EU Joint Statement by the TTC is in stark contrast to the heightened concern about China that has been growing in the United States over the past decade, a concern that will almost certainly be accelerated by the work of the House Select Committee on China. At this point, it is too soon to know whether the U.S. attempt to significantly strengthen its supply chain security will be successful, and to what extent the other major non-Chinese parties in the semiconductor industry (Taiwan, South Korea, Japan, Europe, etc.) will align with the United States.

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