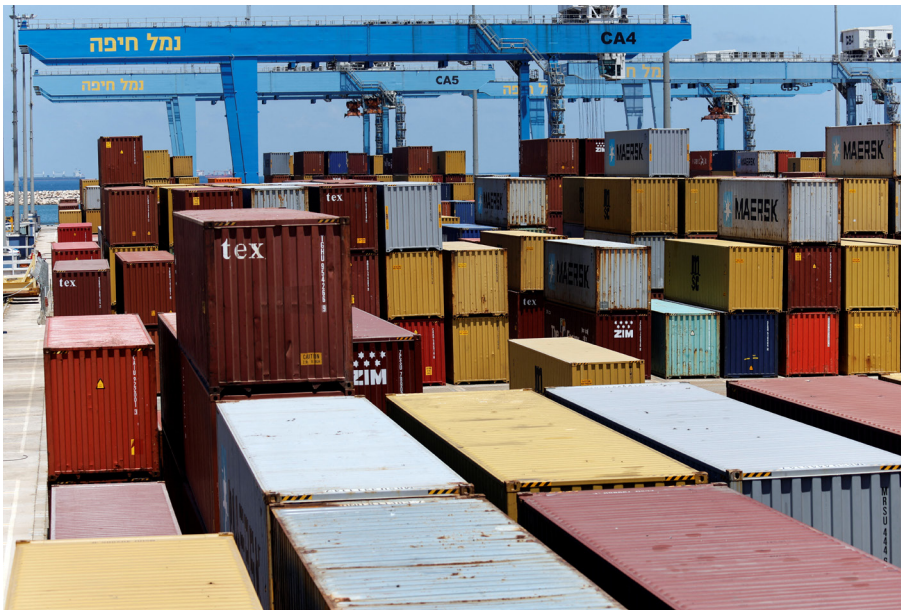
Strategic De-risking Beyond Chips

Through export controls and industrial policy packages, the global semiconductor industry has become an arena of technological competition in recent years. As states seek to "de-risk" critical supply chains further, they face difficult challenges in identifying national security risks from emerging dual-use technologies and making tradeoffs between economic and security considerations.

By Tobias Pulver



Cargo containers on the dock at Haifa Port in Israel in July 2022. *Amir Cohen / Reuters*

After its accession to the WTO in 2001, many Western governments were hopeful that China would continue to liberalize its economy and eventually its political system. Yet in the years following, China maintained a tight grip on its economy. Despite growing frustrations among Western governments, a process of deep economic integration had already taken place. This transformation of the global economy has profound consequences for the nature of today's global economic and technological competition. As tensions between the US and China continued to rise after Xi Jinping came to power in 2012, economic interdependence across the world had already increased dramatically. In pursuit of economic efficiency, global supply chains had become ever more fragmented and complex, structured largely independently of the degree of political alignment between states.

The Covid-19 pandemic and Russia's war on Ukraine eventually laid bare a long-overlooked or deliberately ignored side effect of economic efficiency: States had become dependent on foreign supply of necessary goods or materials, including in technologies perceived as critical. Alarmed by these events, and with the prospect of further supply chain disruptions due to renewed Sino-American great power competition looming large, many states began to acknowledge their vulnerabilities and undertake efforts to increase the resilience of their supply chains.

Although semiconductors – and to a lesser extent rare earth elements (REE) – have been the most prominent arena of renewed technological competition (see CSS Study), there is no reason why de-risking should be limited to these technologies. Indeed, the same rationale applies, in principle, to any goods and technologies that have potential security implications. This includes all dual-use technologies, with emerging general-purpose technologies (GPTs) such as biotechnology, artificial intelligence (AI), or quantum information technologies standing out due to their potential large-scale impact on the economy and innovation.

Managing 21st century technological competition represents a difficult challenge for governments. It requires navigating complex multilateral dependencies, assessing the criticality of technologies, defining new institutional frameworks and processes to assess these risks, and making tradeoffs between economic and security considerations – all in the face of significant uncertainty.

The Second Wave of Globalization

Since the end of the Second World War, a gradual but decisive shift from state-led to business-led R&D has led to technological innovation being increasingly driven by commercial actors. As private firms dominate the technological frontier, commercially produced technologies have become increasingly essential in military procurement and innovation. Whereas commercial "spin-offs" from military technology such as GPS or microwaves used to be common, military technology now relies on "spin-ons" that build on cutting-edge commercial technology. However, as the incentives of private actors do not necessarily align with the security interests of states, this shift has also created new challenges for governments of advanced industrialized states with open economies.

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These challenges are exacerbated by a number of structural changes in the global economy that relate to the "second wave of globalization". The first wave of globalization prior to the First World War was characterized by an increase in inter-industry trade (e.g., Switzerland importing cereals and exporting watches). Though trade in final goods boomed, their production typically remained national. Meanwhile, the second wave of globalization after the end of the Second World War was – and continues to be – marked by trade in intermediate goods within industries (e.g., solar panel components). High levels of international intra-industry trade are linked to heightened technological complexity and firm specialization, which, in turn, meant that supply chains became increasingly global and fragmented. Thus, a shift occurred from national production networks to complex global supply chains, with sometimes hundreds of individual steps being carried out by specialized firms in different countries before the final product is eventually sold.

Concurrently, the highly specialized knowledge required for the production of these complex intermediate products has also become localized in individual firms. This knowledge is often tacit; that is, it is learned on-the-job and cannot be acquired through textbooks or other means outside of the firm. As a result, it does not diffuse easily. In addition, the vast size of the integrated global economy enables economies of scale that can provide firms with self-perpetuating advantages against competitors if they manage to capture a large share of the global market. Both these developments create barriers to entry that reduce competition and therefore promote oligopolistic and monopolistic market structures which give rise to natural chokepoints in global value chains.

Dependencies Abound

The existence of such chokepoints allows governments with regulatory jurisdiction over the relevant firms to leverage export controls to exclude others from essential parts of a global supply chain. This is particularly effective in cases where the components cannot be easily substituted, and thus any other firm or government is dependent on one or a small number of suppliers. Such chokepoints have therefore become an important source of leverage between states.

Along with several allies and partners, the US has used its leverage in the global semiconductor supply chain to slow down China's AI progress by putting controls on cutting-edge manufacturing equipment as well as chips themselves. In return, China has introduced controls on REEs, leveraging their own market power.

As the use of economic sanctions clearly demonstrates, leveraging economic dependencies for political aims is not historically unprecedented. Nevertheless, economic and technological dependencies are bound to have a more profound impact on great power competition in today's global economic and political environment. The number of chokepoints is much higher than at any other point in history due to the many separate actors that are involved in the production of a single good or technology. These chokepoints are also more globally dispersed, meaning more states possess relevant leverage. Moreover, whereas the national security implications of most economic dependencies used to be limited, this is no longer the case with commercially produced dual-use technologies becoming ever-more important for the defense industry. Finally, the size of China's economy in conjunction with its deep integration into the global economy exacerbates the challenge in many ways. Whereas the Soviet Union was a negligible trading partner for Western economies during the Cold War, China is an essential trading partner for many advanced economies today. Thus, dependencies are not only more likely to exist or emerge between states that are not politically aligned – they are also much more costly to break up, as doing so may deteriorate the relationship with a crucial trading partner.

From Decoupling to De-risking

US policymakers sounded the alarm about potential technological dependencies when they realized that the US could become heavily reliant on 5G communications technology produced by Chinese companies. In response, Huawei and ZTE were essentially banned from selling to US customers in 2019. Soon after, facilitated by shortages in medical supplies, chips, and other essential goods during the Covid-19 pandemic, many other advanced industrialized states began to recognize dependencies in global supply chains as a source of strategic vulnerabilities and leverage.

While measures such as import or export bans on specific products may mitigate a particular issue, they do not address the underlying problem. Some experts and politicians across the globe have therefore called for a decoupling of economic linkages with potentially problematic trading partners. The Trump administration's 2018 tariffs on a number of Chinese imports represent but one example of a policy encouraging decoupling.

However, while it offers a seemingly simple solution, such generic economic decoupling has a steep price tag. First, it leads to an increase in the price of many commercial goods. Second, it prevents domestic industry's access to key export markets, which may undermine their long-term competitiveness vis-à-vis unconstrained competitors. This is problematic from a strategic point of view and is also certain to spark resistance from private industry. Therefore, more selective solutions are called for.

Accordingly, discourse has shifted: Introduced in a speech by European Commission president Ursula von der Leyen in March 2023, the notion of de-risking quickly became a key concept in this field.

Soon after the speech, the notion was picked up and endorsed by the Biden administration and the G7. Proponents of de-risking, including governments of advanced industrialized states and private industry, emphasize the need for a more limited approach that is aimed at identifying specific risks and addressing them through targeted measures. The EU's Critical Raw Materials Act as a response to dependencies in batteries for electric vehicles is an example of this approach. For policymakers, however, a more tailored approach also poses a bigger challenge compared to the blanket solution offered by decoupling.

Developing Solutions

The necessity of making tradeoffs between economic and security considerations creates substantive and procedural challenges. Governments of advanced industrialized states are therefore developing high-level strategy documents to provide guidance, while also establishing dedicated institutional structures to tackle the issue. These efforts are aimed at developing more systematic approaches to navigating risks related to foreign supply dependencies, as opposed to the ad hoc early measures that were developed in the semiconductor context.

The US has embraced technological competition sooner and more comprehensively than most. Various dedicated offices and advisory roles related to "critical and emerging technologies" have been created across departments, including the Departments of Commerce, State and Defense. In addition, think tanks play an important role in providing technical expertise to the government, one notable example being the Emerging Technology Observatory platform developed by the Center for Security and Emerging Technology.

Outside of China and the US, Japan is a notable frontrunner in adjusting to the new economic environment. After adding an economic division to its National Security Secretariat in 2020, Japan created a dedicated ministerial post for economic security in October 2021, and enacted a far-reaching Economic and Security Act in May 2022. The Act provides a comprehensive framework for ensuring resilient supply chains, protecting critical infrastructure, promoting research on critical technologies, and a secret patent system.

In contrast, the EU lags behind with respect to the creation of dedicated institutional structures. It released its first high-level European Economic Security Strategy in June 2023. Security and defense policy is generally the responsibility of individual member states, which may help explain the delay. Nevertheless, alongside this high-level strategy, the EU has also established the Strategic Technologies for Europe Platform, which has been tasked to steer EU funds with the aim of ensuring the "strategic sovereignty of the Union."

Although frameworks are now in place in many advanced industrialized states, overall, policy responses to these challenges are still being developed. Beyond semiconductors and REEs, the extent to which governments are willing to provide the required funds to pursue comprehensive de-risking remains unclear for now.

GPTs as Strategic Assets

The scope of the policy challenge, even under a more narrow de-risking approach, is especially visible in the US context. While the initial list of critical and emerging technologies from October 2020 already contained twenty "technology areas", the February 2022 update expanded this to no less than 103 "key subfields", many of which are fully-fledged industrial ecosystems consisting of multiple complex supply chains.

Nevertheless, in practice, efforts are most concentrated in the areas of advanced computing, AI, biotechnology, and quantum information technology – all of which can be viewed as emerging GPTs. In essence, GPTs are highly pervasive and foundational dual-use technologies. Examples include the steam engine, electricity, and more recently the computer. Economists have long acknowledged GPTs as key drivers of economic growth and innovation, and their long-term economic impact alone makes them a critical asset. However, in an environment where military innovation heavily relies on commercialized technology, GPTs also represent a key strategic asset from a narrower, national security point of view. Taken together, these factors create powerful incentives for states to avoid dependencies in GPTs, and possibly even secure leverage through a strong domestic industry. At the same time, emerging GPTs pose a particularly tough de-risking challenge as their supply chains are less mature and not necessarily fully commercialized yet. Potential future chokepoints may thus not yet be recognizable.

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Despite a focus on emerging GPTs, concrete measures have so far largely been limited to advanced semiconductors and REEs. This is for two reasons: First, although semiconductor technology continues to advance, the global supply chain is highly mature and several chokepoints have solidified. This is not the case for biotechnology, quantum, and AI. Secondly, although semiconductors are a foundational technology, government efforts focus overwhelmingly on the latest generations of chips, which are critical to cutting-edge AI development. Efforts relating to semiconductors are therefore best understood in the context of competition over the lead in AI.

Different Visions of De-risking

Though emerging GPTs represent a focal point of most economic security strategies today, approaches still differ across governments. This is not surprising, as the US, the EU, and other advanced industrialized states all face different geopolitical risks. This casts doubts over the compatibility of their visions of de-risking.

It is not a coincidence that the notion of de-risking was popularized by a leader of a region for whom China does not represent an acute security threat. In Europe, considerations about the relative gains of trade with China are not very pressing. In contrast, successive US administrations have viewed long-term competition with China

Further Reading

Bernhard Bartsch / Claudia Wessling, **"From a China Strategy to No Strategy at All: Exploring the Diversity of European Approaches,"** *European Think Tank Network on China,* June 2023.

Ben Murphy, **"Chokepoints: China's Self-Identified Strategic Technology Import Dependencies,"** *Center for Security and Emerging Technology,* May 2022.

William Reinsch / Thibault Denamiel / Matthew Schleich, **"Optimizing U.S. Export Controls for Critical and Emerging Technologies,"** *Center for Strategic and International Studies,* February 2024.

as one of the most important challenges their nation is facing. Accordingly, the focus of European economic security policy has been on addressing its own vulnerabilities, whereas the US version of de-risking is decidedly more comprehensive. US outbound investment and trade controls vis-à-vis China have become markedly more stringent since the late 2010s. Meanwhile, the European Commission has only just proposed conducting a risk assessment on outbound investments for a "narrow set of advanced technologies" to determine "if and which policy response is warranted" in a January 2024 White Paper.

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For states such as South Korea and Japan in the Indo-Pacific, the strategic situation is more complicated yet. Openly adversarial behavior vis-à-vis China carries a much bigger risk for Seoul or Tokyo: They are more vulnerable in case of a military escalation, while also being more prone to potential retaliatory coercive economic measures compared to the US. At the same time, compared to Europe, de-risking may be more pressing due to the geographical proximity to China.

A Brittle Consensus

Although there is some agreement on the need to de-risk critical supply chains for now, conflicting incentives of different governments are destined to complicate matters where coordinated solutions are desirable or needed. Moreover, even the weak current consensus on de-risking may not hold for long, with Trump recently announcing plans to double down on his blunt tariff strategy in case of a second presidency. It is thus unclear whether any level of agreement concerning technological competition will persist among the US and its allies.

In this volatile environment, governments are well-advised to develop their own robust approach to technological competition, rather than simply following Washington's lead. They cannot afford to do nothing, however – the potential ripple effects of US-China competition and other geopolitical risks demand a response. Moreover, investing in capabilities relevant for emerging GPTs also represents an opportunity, both to gain leverage vis-à-vis conventionally more powerful nations, and to reap the long-term economic reward.

For more on Artificial Intelligence and Security Politics, see CSS core theme page.

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