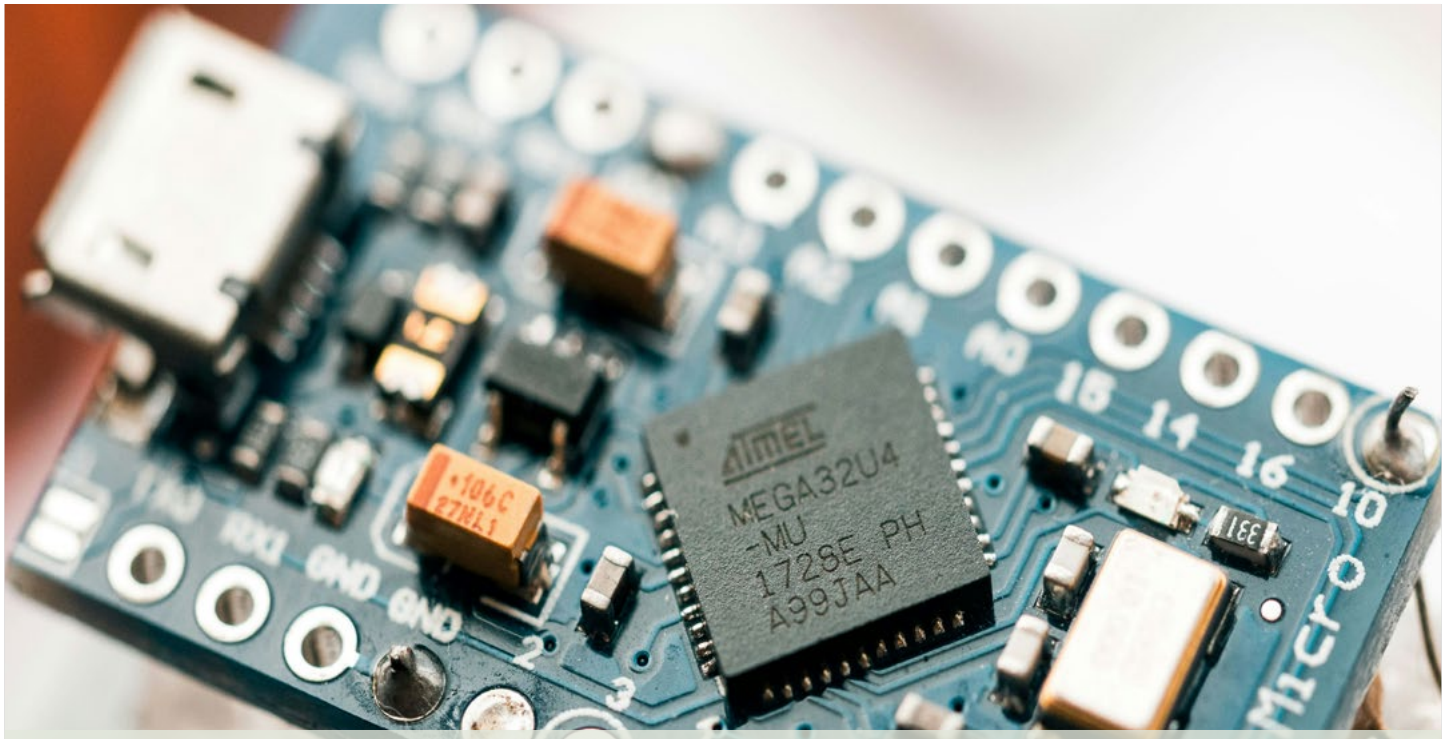
Norwegian Institute of International Affairs

POLICY BRIEF – 5 / 2024



Chips in the crosshairs

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Brief Summary

- The increasing use of economic sanctions coupled with the globalization of production of key goods and services has increased the security concerns around economic dependencies.

- For the global manufacturing of semiconductors (chips), their increasing criticality in modern economies have made them a focal point in tensions between Washington and Beijing.

- Spillovers from the Sino-US tensions on Dutch export policies highlight the challenges states face in navigating this new terrain.

- Mapping economic networks to identify those prone to weaponization will be a key exercise for states preparing for greater political turmoil at the international level

The global supply chain for semiconductors has become a focal point of global technology politics. In the span of a few years, the US, China, and the EU amongst others have made moves to bolster the resilience of the supply chain for designing and manufacturing chips. Moreover, since 2022 efforts by the US to exclude Chinese access to both crucial materials, chips, and the equipment required to make them has thrust the industry into the centre of Sino-US tensions and rivalry.

This policy brief sketches out the development of both the politics of the global chip industry, and how reconfiguration of global supply chains has placed corporate actors across the globe at the centre of these developments. With networks of manufacturing evolving rapidly over the last few decades, companies based in smaller states could develop a global footprint through specializing in niches within integrated global production. As these networks come under scrutiny as security vulnerabilities and strategic assets, the home states of these companies are forced to navigate

tricky political issues and cross-pressures. As such, the semiconductor industry can act as a cautionary tale of the geopolitical risks faced by smaller states occupying key economic niches in an increasingly tense political environment.

Chips at the foundation of the digital economy

With the increasing use of digital technologies for all facets of contemporary societies, political and scholarly attention has increasingly turned towards the security and resilience of such networks and technologies. Amongst one of the most pressing issues is the underlying infrastructures and goods that enable continued digitalization, both in terms of physical infrastructure, key digital services, and the actual trade goods embedded in all forms of new technologies. Arguably the most foundational of these underlying goods is the criticality of chips. As the basic building block for the storage of information digitally and the computation on data, the entire digital revolution is built on the evolution of increasingly tiny and powerful silicon chips.

Enabling the wide variety of technologies in widespread use today, the rapid growth in the computing capabilities of modern chips has been remarkable. Over the past sixty years, the number of transistors on leading semiconductor chips has moved from 4 to 11,8 billion. The resulting decrease in cost of computation and the ability to perform ever-more complex computing tasks on ever-smaller chips has in turn allowed for the development of more complex use-cases with greater real-life impacts. Colloquially known as “Moores law”, the trend wherein the capabilities double roughly every two years has been the motor for technological development and economic growth.

While the criticality of semiconductors has already elevated the production and supply of them to strategic importance, the years ahead looks likely to elevate their role further. Of the four critical technology areas identified by the European Union, advanced chip manufacturing is one the four and a key ingredient in the development of the other three. A 2022 survey on expectation for future chip demand by the European Union estimates that demand would double, in particular for the most advanced leading-edge chips. The surge in demand is tied to growing use of Artificial Intelligence (AI), as the advances in recent years in developing more advanced and capable AI-models has been spurred by the ability to perform larger computing operations at speed. Both for current and next-generation AI-models, access to the cutting-edge semiconductors is essential, and a requirement to remain competitive in the development of new use-cases.

Chips in the crosshairs

If the growing importance of semiconductors for economies and strategic purposes underline their centrality, their intersection with growing tensions in international politics exacerbates the issue. The reasons for the industry rising on the political agenda is tied to a multiplicity of developments, such as the growing tensions between the US and China, the dispersal of the supply chain for manufacturing of chips globally, and the increasing use of economic tools for coercive purposes writ large.

To start with the latter point, the resurgence in state interventions into the global economy in the name of national security and strategic interests have been given multiple conceptualizations, such as geoeconomics, the return of industrial policy, neomercantilism, or the emergence of the economic security state. While the reasons for such reframing of economic dependencies are multiple, one of the major reasons has been the growing use of economic dependencies coercively. The use of economic coercion is by no means a new phenomenon. However, after decades of globalization the recent resurgence in interest in sanctions and economic statecraft has made the issue more salient. Most notably through the increasing China-US tensions, increasingly playing out through efforts to win out in tightly integrated and interdependent economic networks.

As a consequence of both increasing political tensions and the global “chip shortage” during the Covid-pandemic, states have become concerned about their dependencies on the semiconductor supply chain. To address these dependencies, political interventions to build up domestic supply has been initiated across the globe. In Beijing, the “Made in China 2025” strategy aimed to lessen the reliance on foreign production of chips amongst other products. In the EU, the 2023 Chips Act provided €15 billion in new investments to bolster European competitiveness in the global industry. The US on the other hand, through their 2022 Chips act offered $52.7 billion in incentives, with the majority going to subsidize domestic manufacturing.

While efforts to build up domestic capacities is one key set of interventions, they are complemented by recent measures from Washington targeting

Chinese ambitions to upscale their technological self-sufficiency. While tensions surrounding technological interdependence between the two superpowers has a longer history, the shift into chip exports and manufacturing is a more recent phenomenon. As late as 2018, the export of both chips and the equipment needed to manufacture them was growing, as these appeared to be politicized to a smaller extent. Yet since then, the enforcement of existing regulations tightened and new rules were developed.

In the second half of 2022, a number of policy interventions and formulations of strategic perspectives signalled the intent by Washington to politicise the chip industry to a greater extent. In a speech given on September 16th that year, national security advisor Jake Sullivan claimed that as part of a reorientation of economic and strategic policy, wherein the US would shift its approach in order to maintain “as large a lead as possible” over strategic competitors in key technologies. For chips, this resulted in a tightening of export control a few weeks later, with additional restrictions added in 2023.

Global supply chains and niches

This ramping-up of geo-economic competition poses multiple challenges for states. In the decades since the cold war, the globalization of supply chains and manufacturing contributed to reorganizing how goods are made. Because the production of many advanced goods is dispersed across the globe, forming complex links of specialized niche suppliers, securing globalized supply chains is out of reach of most states. Such processes of specialization and globalization has been evident for the chip supply chain as well. Being a rapidly evolving and cut-throat industry, globalization was driven by and enabling the pursuit of emerging niches within the semiconductor supply chain. What had once been done in-house was increasingly distributed across the globe as companies specialized in a subset of the manufacturing process.

A case in point is the role of Taiwanese company TSMC in the manufacturing of the most advanced chips. Through specializing in the manufacturing of chips designed and developed by other companies, TSMC could corner a crucial niche of the global supply chain by cornering the capital and know-how needed to run an expensive and sophisticated operation. Resultingly, in the manufacturing of advanced chips TSMC did not only obtain a near monopoly, but one that is increasingly difficult to challenge due to the complexity and high capital costs required for competitors to emerge. While less advanced chips are made elsewhere, the unique ability of TSMC to produce the most sophisticated products means that they are responsible for producing a third of the worlds computing power. The combination of consolidation of a key part of the supply chain and the difficulties in building alternatives has elevated TSMC and the manufacturing of chips to the highest political levels.

As an example, TSMC is but the most well-known case of a process that has occurred in multiple places in the global chip supply chain. While this process has dispersed production across the globe, this globalization has not resulted in greater diversity and resilience. Rather, the high capital costs and advanced production methods has led to consolidation at vital stages of the semiconductor supply chain, creating multiple bottlenecks and chokepoints for the production of the most advanced chips.

One of the most critical of these bottlenecks is the Dutch company ASML in the production of the most advanced photolithography equipment needed in the manufacturing of chips. While this is ostensibly a small part of the supply chain, it is nevertheless a highly critical node due to the lack of alternatives and the difficulty in replacing the outputs. Without access to such equipment, building alternate chip manufacturing capabilities is impossible, thrusting ASML into the vortex of escalating export controls and political measures.

The crucial role of ASML in enabling chip production, and the intentions of the US to limit Chinese ability to ramp up its domestic production, made ASML a key chokepoint to leverage for the latter ambitions. Reportedly, the shift in Washington towards stricter enforcement of rules domestically coincided with a ramping up of pressure on Dutch officials to limit the export of ASLM equipment. In early 2023, a deal between Washington and Amsterdam limited the sale of equipment to Beijing, resulting in calls for greater EU involvement in making sure that European interests are maintained in the escalating trade conflict.

Small states in global supply chains

The growing politicization of global supply chains, recasting economic dependencies in a strategic light, is starting to reshape global trade and manufacturing. Due to their criticality and the

concentration of key parts of the global supply chain, the production of chips is emerging as a crucial case for how such dynamics will play out. Significant investments have been made by the major political actors to ensure that the semiconductor supply chain is secure and protected against adversaries, while the US leveraging Chinese dependencies signals a large shift in how such dependencies are mobilized in international politics.

The shifting politics of chip supply chains also holds valuable lessons for smaller states, and the peculiar challenges they face in managing the transition to a geoeconomic world. One dimension of this is the limited ability of smaller states to act independently in securing supply chains. Both in terms of capacity to identify vulnerabilities and in ability to restructure globalized industries, smaller states have little capacity to act on their own.

Yet the globalization of chip production and the consolidation of market niches also reveal how specialization and the pursuit of market niches allowed companies based in small home markets to become key nodes in the global supply chain. Through becoming key nodes in globalized networks, this allows smaller states to play an outsized role. Key economic chokepoints are not only localized within the global superpowers but distributed across the globe. For both TSMC and ASML, their criticality for the chip supply chain elevates the importance of their home states as well.

Such importance can be both a blessing and a curse. While it undoubtedly empowers and elevates the strategic significance of smaller states, is also exposes them to political pressure of overt and covert nature. Identifying potential chokepoints for key supply chains is therefore likely to be of great importance for smaller states, in order to identify and plan for potentially thorny political questions in the future. The trajectory of the semiconductor supply chain, globalizing and subsequently becoming the site of great power politics, is one that could potentially be replicated across similarly strategically valuable sectors.

Further Reading:

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Khan, Saif M. (2020): U.S. Semiconductor Exports to China. Current Policies and Trends. CSET. Georgetown. Available online at https://cset.georgetown.edu/publication/u-s-semiconductor-exports-to-china-current-policies-and-trends/.

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Norwegian Institute of International Affairs

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