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# Fortifying Europe's Semiconductor Ecosystem

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***The chip manufacturing process, though intricate, is divided into three stages: design, production, and final assembly, testing, and packaging. Over the years, companies have started to specialise in a single aspect of one of these steps, making the global chip supply chain a complex web of interdependencies and a high degree of geographic concentration. Despite significant contributions to niches within this supply chain, Europe has historically lagged behind leading regions like the US and Asia in semiconductor production. This enduring gap underscores the need for strategic initiatives like the European Chips Act to bolster Europe's position in the global semiconductor industry.***

## EUROPE LAGGING BEHIND?

Since the dawn of the semiconductor industry, Europe has been behind its competitors. A 1985 OECD report concluded that Europe was trailing the USA and Japan regarding innovation, production, and consumption, rendering Europe dependent on imports. This inspired European countries to develop their own microchip in the 80s, which it branded the "Eurochip".[1] A decade ago, the Commission proposed the New European Industrial Strategy for Electronics, with the aim to double EU chip production to around 20 % of global supply.[2]

Despite its efforts, Europe remains behind, producing less than 10% of global supply.[3] Most of the semiconductor manufacturing today takes place in Taiwan, with one single company – TSMC – accounting for 60% of the world's semiconductors and 90% of the most advanced ones.[4] The US, meanwhile, dominates R&D investments by a wide margin (60 % to the EU's 6%).

That is not to say that Europe's role in the global semiconductor production chain is unimportant. Europe is home to world-leading semiconductor companies. This includes the Dutch ASML, the only company in the world that can produce Extreme Ultraviolet Lithography machines that are used by the most advanced semiconductor factories at TSMC and Samsung, but also the German Zeiss Semiconductor Manufacturing Technology providing the industry with the production of optics for lithography machinery. Research companies like Belgium's imec, France's Leti, and Germany's Fraunhofer are playing a critical role in developing the most advanced chips. Several German companies have significant shares in supplying chemical inputs (BASF) and wafers (STMicroelectronics) quintessential for semiconductor production.

## EXPORT CONTROLS

In October 2022, the US Bureau of Industry and Security (BIS) issued a set of sweeping new export controls for advanced semiconductor manufacturing equipment technology to China. According to the Biden Administration, these export controls were implemented to maintain "as large a lead as possible" in semiconductor technology over China.[5]

The American push to technologically contain China's semiconductor ascend did not stop with this unilateral initiative: the US needed partners to mutually reinforce the export controls to be effective in its aim. Japan (Nikon, Canon) and the Netherlands (ASML) are two countries that export

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critical lithography equipment used to produce advanced semiconductors. In January 2023, news broke that the United States, and the Netherlands reached a deal establishing advanced semiconductor equipment export controls.[6]

When the US disclosed its deal with Dutch Premier Rutte, the EU Commission found itself on the back foot, as it was neither involved in nor informed about the bilateral discussions. This begs the question: is the EU relevant in the great global chip game?

The US-Dutch agreement did not stop a surge in sales of chipmaking equipment from the Netherlands to China. As global demand for ASML machinery slowed, the company successfully lobbied the Dutch government to grant export licenses to China for critical semiconductor manufacturing right before the impending export ban in late 2023. Consequently, rather than declining, China's imports of chipmaking machines rose by 14 % in 2023 to nearly USD 40 billion. In December 2023, imports of lithography equipment from the Netherlands jumped almost ten-fold from December 2022 to USD 1.1 billion, as Chinese firms rushed to go on a buying spree ahead of the Dutch export restrictions. ASML confirmed that most of the equipment it sends to China is not cutting-edge.

It was mainly the second most advanced ASML machines – that use deep ultraviolet (DUV) lithography and, since were previously not subject to an export control ban, China legally stockpiled for years – that has helped China's Semiconductor Manufacturing International Corp. (SMIC) to manufacture a 7-nanometer chip for the latest Huawei smartphone Huawei Mate 60 Pro.[7]

Even though China did not officially retaliate against the export ban, in July 2023 it announced export controls on gallium and germanium, said to protect national security and interest. These controls require exporters to seek permission to ship gallium and germanium products, which are metals widely used in the semiconductor industry, starting in August 2023.

The chips supply chain is continuously exposed to the risk of disruptions due to geopolitical tensions, making overreliance on imports problematic. In addition, as chip manufacturing requires large quantities of electricity, the high volatility of energy prices resulting from the war in Ukraine devastated the sector. Onshoring energy and chip supply is essential, but the EU also needs a clear geopolitical strategy and practical tools to defend its agenda on the global stage. A balance is required to ensure resilience while still maintaining openness.

## EU CHIPS ACT

Alarmed by the semiconductor shortages during the pandemic and the prospect of lagging behind the US and China, the European Commission proposed the European Chips Act in February 2022. With the Chips Act, the Commission aims to mobilise EUR 43 billion to strengthen the EU's role in global semiconductor manufacturing and make the EU more resilient to future supply chain disruptions.

Due to the strained geopolitical context, the recent demonstration of vulnerabilities in critical supply chains, and the widespread acknowledgement of the importance of chips, the bill was met with a sense of urgency. With our economy set to become increasingly AI-driven, demand for advanced semiconductors will keep soaring. The European Chips Act entered into force in September 2023. It has three pillars: research and innovation, which gives companies the tools and capacity to compete globally; production facilities, which avoid shortages and dependencies; and monitoring, which anticipates and manages crises in the supply chain. There is a fourth unofficial pillar: global cooperation. The EU aims to collaborate with its partners, exchange information, and conduct research and development together. In addition, Member States can contribute through the new European Semiconductor Board.

With the Chips Act, the EU is entering a highly competitive global subsidy race with the US and China. However, one major difference with both competitors is that the EU is much more cautious in its approach towards subsidies. With the US CHIPS & Science Act, the Biden Administration is committing a high proportion (USD 39 billion of the total USD 53 billion) in subsidies for chip manufacturing on US soil.

## POLICY RECOMMENDATIONS

In view of the 2024-2029 political mandate, the EU must resist the urge to rest of its laurels. In the fast-moving, lucrative, and critical sector of advanced semiconductor manufacturing, its policymakers should consider four recommendations that together aim to not only close the gap between the EU and its competitors but help the EU demonstrate genuine global leadership.

### *Focus on own strengths*

It is unrealistic for any company, country – or even the entire EU – to sustain each layer of the chip supply chain. The EU's executive, as well as each Member State should ask themselves: What are they good at? Who are its champions? Where is their comparative advantage? To spend and direct investment efficiently, the EU should leverage and double down on its strengths. EU policymakers should incentivise innovation in these areas through funding research, developing tax incentives, and creating the right environment of low and stable industrial costs and regulation conducive to growth and sustainability.

### *Attract talent to the semiconductor sector*

Countries around the world face skills shortages in the semiconductor sector. The industry desperately needs an educated and skilled workforce. Still, too often, the best talent opts for alternative sectors such as finance and healthcare, where pay and working conditions may be better, or they move abroad. EU policymakers should consider initiatives that incentivise talent at a younger age to consider a career in the semiconductor ecosystem and its benefits, as well as devoted post-graduate programs.

### *Establish a formal private-public platform*

The semiconductor ecosystem needs a voice in government, which can raise concerns and recognise obstacles as they appear. Meanwhile, policymakers should acknowledge the need for a formal platform for industry to consult with and be obliged to provide information to policymakers – arrangements that exist between BIS and the private sector in the US – and, consequently, play an outsized role in monitoring and reporting the impact during crises. Only the industry has the expertise and oversight required to monitor effectively.

### *Build trust with partners*

In the face of current geopolitical risks, democracies must diversify where overreliance on foreign imports threatens the global supply chain. Likeminded governments should cooperate through strategic partnerships to create long-term stability in the supply chain. They should create robust intellectual property regimes, promote transparency over subsidy initiatives (to prevent a race to the bottom), enforce trade secret laws on collective adversaries, continue to forge research alliances to share case studies and best practices, and jointly develop new state-of-the-art technology.

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***In 2024, Fourtold and the Egmont Institute launched new partnership to foster insightful and thought-provoking dialogues on critical issues within the European Union. Leveraging Egmont's expertise in international relations and Fourtold's understanding of the policy agenda, the partnership aims to provide a dynamic platform for discussion, reflection, and analysis, facilitating the exchange of diverse perspectives and the identification of common solutions to complex problems.***

***This paper is inspired by a high-level roundtable on advanced organised by Fourtold and the Egmont Institute, which brought together leading companies in the chips industry and diplomats from the EU, Japan, Taiwan, and the UK.***

# Endnotes


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