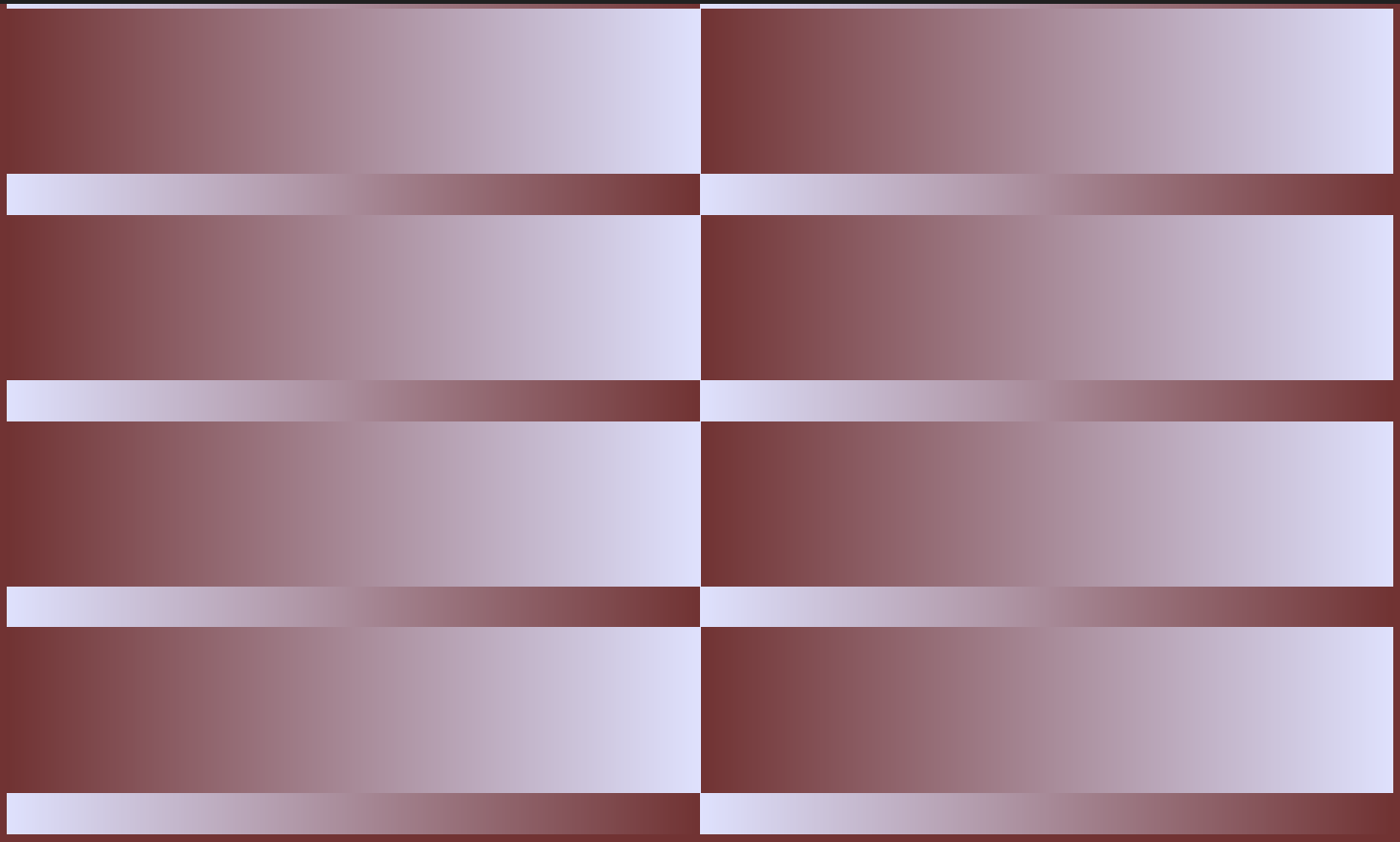

PERSPECTIVE

The Missing Strategy in Europe's Chip Ambitions

Member States Must Drive the Next Steps

Jan-Peter Kleinhans

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Stiftung Neue Verantwortung is now interface

Since 2014, our team has worked on building an independent think tank and publishing well-researched analysis for everyone who wants to understand or shape technology policy in Germany. If we have learned something over the last ten years, it is that the challenges posed by technology cannot be tackled by any country alone, especially when it comes to Europe. This is why our experts have not only focused on Germany during the past years, but also started working across Europe to provide expertise and policy ideas on AI, platform regulation, cyber security, government surveillance or semiconductor strategies.

For 2024 and beyond, we have set ourselves ambitious goals. We will further expand our research beyond Germany and develop SNV into a fully-fledged European Think Tank. We will also be tapping into new research areas and offering policy insights to a wider audience in Europe, recruiting new talent as well as building expert communities and networks in the process. Still, one of the most visible steps for this year is our new name that can be more easily pronounced by our growing international community.

Rest assured, our experts will still continue to engage with Germany’s policy debates in a profound manner. Most importantly, we will remain independent, critical and focused on producing cutting-edge policy research and proposals in the public interest. With this new strategy, we just want to build a bigger house for a wider community.

Please reach out to us with questions and ideas at this stage.

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Executive Summary

European semiconductor technology suppliers hold market-leading—sometimes monopolistic—positions at various points in the global semiconductor value chain. Europe is home to competitive suppliers of semiconductor manufacturing equipment, chemicals, sensors, automotive chips, and power semiconductors, to name just a few. Because of the steep barriers to entry and close customer–supplier relationships, these are not easy markets to enter and successfully compete as a new company. The world depends on semiconductor technologies from European companies, and just as Europe depends on front- and back-end manufacturing in Asia, Asian fabrication plants (fabs) depend on manufacturing equipment and chemicals from European suppliers. Furthermore, manufacturers of electric vehicles all over the world depend on chips from Europe. The list goes on. Semiconductors are a strategic asset to Europe, one that provides geopolitical leverage—as other countries depend on access to our technology.

Because semiconductors are at the epicenter of the US–China technology rivalry, it is crucial for the European Union (EU) to have a clear-eyed, well-informed semiconductor strategy rooted in current geopolitical reality. Unfortunately, the EU Chips Act is not a long-term semiconductor strategy with meaningful policy objectives but a collection of ideas and initiatives. This necessitates EU member states filling in the blanks—understand the competitive position of their domestic semiconductor industries; articulate why and to what end they want to support this sector, and what their long-term policy objectives are; and invest in their national administrative resources and brainpower. Doing all of that is a prerequisite to being able to engage in, as well as shape, policy discourse meaningfully at the EU level, vis-à-vis the United States and at the international level.

If EU member state governments fail to enhance and intensify their efforts, there is a very real risk that the European semiconductor industry will lose its prominence in the global semiconductor value chain, and Europe would consequently have lost a strategic asset.

Introduction

The importance of the European semiconductor industry sector to the economic and strategic interests of Europe cannot be overstated. European companies are the leaders at various points in the global semiconductor value chain, making it a strategic asset to Europe.[1] Since late 2020, Europe has been deliberating on its

approach to the semiconductor industry. Almost four years later, a lot has happened, especially at the level of the European Union (EU)—thanks to the EU Chips Act, which represents a pivotal initiative aimed at bolstering the semiconductor industry in Europe. However, it falls short of a comprehensive, long-term strategy rooted in the current geopolitical reality. Instead of laying out clear policy objectives, the EU Chips Act is a compilation of various ideas and initiatives.

The emphasis in the EU Chips Act on increasing the EU's share of global chip production capacity to 20% lacks the strategic depth present in the approaches of the United States and Japan, which are more attuned to their geopolitical assessments.

Because the EU Chips Act fails to provide a long-term strategy with clear policy objectives, EU member states must take proactive steps to fill this gap. This includes obtaining a detailed understanding of their semiconductor ecosystems, setting clear long-term objectives, and developing the required administrative expertise to engage effectively at the level of the EU and vis-à-vis the United States.

In the subsequent analysis, the origins and development of the EU Chips Act are explored, highlighting its reactive nature, which is influenced by the COVID-19 pandemic, and shifts in global supply chain dynamics. This paper critiques the goal of achieving a 20% share of global chip production capacity, and argues that even if achieved, this would not meaningfully strengthen the EU's security of supply, technological competitiveness, or national security. The paper also addresses why and how EU member states need to step up and invest in their national resources to meaningfully shape policy discussions.

A brief history of the EU Chips Act

An analysis of any policy initiative needs to reflect on the zeitgeist—that is, the pressing issues at the time and the mindset with which policymakers wrote the text. The European Chips Act, which was proposed by the European Commission in February 2022[2] and came into force in September 2023[3], was written during the global COVID-19 pandemic and influenced by lessons from the COVID-19 pandemic, reflections on overreliance on global private sector supply chains, and the

1 Jeffrey Ding and Allan Dafoe (2021). The Logic of Strategic Assets: From Oil to AI. https://arxiv.org/pdf/2001.03246

2 European Commission (2022). European Chips Act: Communication, Regulation, Joint Undertaking and Recommendation. https://digital-strategy.ec.europa.eu/en/library/european-chips-act-communication-regulation-joint-undertaking-and-recommendation

3 The European Parliament and the Council of the European Union (2023). Regulation (EU) 2023/1781: Establishing a framework of measures for strengthening Europe's semiconductor ecosystem and amending Regulation (EU) 2021/694 (Chips Act). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1781

general feeling that Europe lost some of its share of global manufacturing capacity to Asia. The following is a brief history of these events and how they shaped the EU's discourse on semiconductors at the policy level.

As recently as **March 2020**, there was no mention of semiconductors or chips in the European Commission's *New Industrial Strategy*, which mentions "microelectronics" only in passing as one of several "key enabling technologies".[4] However, just four months later, at Hannover Messe in **July 2020**, Thierry Breton, the EU Commissioner for the Internal Market and leading figure behind the EU Chips Act, suddenly brought up the need for Europe to substantially invest in cutting-edge semiconductor manufacturing: "We must invest massively, with the objective to produce in Europe high-performance processors (with a 2 to 3 nm of feature size) and reach 20% of the world capacity in value."[5] This was well ahead of any signs pointing to a global chip shortage. From that moment on, for a long time, Europe's policy debate on semiconductors largely revolved around the question of whether and how to increase "cutting-edge" front-end manufacturing.[6]

Notably, a month before Breton's speech in Hannover, the "CHIPS for America Act" was introduced to the US Congress.[7] Then, in **September 2020**, shortly after the bill was passed by the US Senate, the American Semiconductor Industry Association (SIA), together with Boston Consulting Group (BCG), published a paper advocating government support for the US semiconductor industry.[8] One of the claims in the SIA–BCG report was that Europe held 44% (vis-à-vis the 37% held by the US) of global chip production capacity in the 1990s, which had drastically declined to approximately 8% in 2020. Naturally, these numbers were quickly picked up by CEOs arguing for more government support for their front-end fabrication plants (fabs) in Europe to rejuvenate the region to its previous manufacturing prowess. However, over the last 40 years, Europe has never possessed a more than 15% share of global chip production capacity.[9] The SIA–BCG report is able to paint a picture of a stark decline in chip production in the US and Europe only because of its deliberately selective and skewed data analysis.[10] But the damage was done. The

4 European Commission (2020). A New Industrial Strategy for Europe. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0102

5 European Commission (2020). Speech by Commissioner Thierry Breton at Hannover Messe Digital Days. https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_20_1362

6 Jan-Peter Kleinhans (2021). The Lack of Semiconductor Manufacturing in Europe: Why the 2nm fab is a bad investment. interface Policy Paper. https://www.interface-eu.org/storage/archive/files/eu-semiconductor-manufacturing.april_.2021.pdf

7 United States Congress (2020). The Creating Helpful Incentives to Produce Semiconductors for America Act, or CHIPS for America Act. https://www.congress.gov/bill/116th-congress/senate-bill/3933/text

8 Antonio Varas, Raj Varadarajan, Jimmy Goodrich, and Falan Yinug (2020). BCG and SIA Report: Government Incentives and US Competitiveness in Semiconductor Manufacturing. https://www.semiconductors.org/wp-content/uploads/2020/09/Government-Incentives-and-US-Competitiveness-in-Semiconductor-Manufacturing-Sep-2020.pdf

9 European Semiconductor Industry Association (ESIA) (2021). Trends in Worldwide Semiconductor Production Capacity. https://www.eusemiconductors.eu/sites/default/files/ESIA_PR_WWCapacity_2021.pdf

10 While the chart in the SIA–BCG report is titled "global manufacturing capacity by location," they only included 8" and 12" fabs with more than 5,000 wafer starts per month. For a more thorough explanation of the shortcomings of the SIA–BCG report, see the

narrative of the lost manufacturing glory years of Europe fit all too well with the zeitgeist during the first waves of the COVID-19 pandemic, during which governments and citizens alike were struggling to obtain personal protective equipment, air filters, and hand sanitizers.

In **December 2020**, half a year after Breton stated that Europe's goal should be to boost its share of global chip production capacity to 20% by 2030, most EU member states signed the *European Initiative on Processors and Semiconductor Technologies* declaration,[11] in which these EU member states accurately recognized that a "new geopolitical, industrial and technological reality is redefining the playing field. In what has long been a global business, major regions are reinforcing their local semiconductor ecosystems with a view to avoiding excessive dependencies on imports."[12] However, instead of formulating a vision of how the EU's semiconductor strategy should navigate this new "geopolitical reality," the declaration only states in rather generic terms that Europe needs to invest in semiconductor technologies to ensure its "technology sovereignty and competitiveness, as well as our capacity to address key environmental and societal challenges and new emerging mass markets."[13] Notably, the declaration does not mention the 20% goal.

However, a few months later, in **March 2021**, the goal of Europe expanding its share of global semiconductor production capacity to 20% was back on the table. In its *2030 Digital Compass*, the European Commission mentions only a single goal in re semiconductors: "The production of cutting-edge and sustainable semiconductors in Europe, including processors, is at least 20% of world production in value."[14]

In **May 2021**, the European Commission released a new industrial strategy, *Updating the 2020 New Industrial Strategy: Building a Stronger Single Market for Europe's Recovery*.[15] The new strategy views the EU's industries through the lens of dependencies and capacities.[16] The accompanying staff working document (SWD)[17]

following: Jan-Peter Kleinhans (2021). Europe didn't Have 44% of Global Chip Production Capacity in the 90s. Sorry. https://www.linkedin.com/pulse/europe-didnt-have-44-global-chip-production-capacity-90s-kleinhans/.

11 EU Member States (2020). Declaration: A European Initiative on Processors and Semiconductor Technologies. https://digital-strategy.ec.europa.eu/en/library/joint-declaration-processors-and-semiconductor-technologies

12 Ibid.

13 Ibid.

14 European Commission (2021). 2030 Digital Compass: The European way for the Digital Decade. https://eufordigital.eu/wp-content/uploads/2021/03/2030-Digital-Compass-the-European-way-for-the-Digital-Decade.pdf

15 European Commission (2021). Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's Recovery. https://commission.europa.eu/document/download/9ab0244c-6ca3-4b11-bef9-422c7eb34f39_en?filename=communication-industrial-strategy-update-2020_en.pdf

16 The concept of identifying, assessing, and ultimately managing Europe's dependencies and capacities in technology ecosystems is a very nuanced approach on paper. However, it takes tremendous administrative resources and depends on substantial knowledge about the respective technology ecosystem. See, for example, the following: Dr. Tim Rühlig (2024). Reverse Dependency: Making Europe's Digital Technological Strengths Indispensable to China. https://dgap.org/en/research/publications/reverse-dependency-making-europes-digital-technological-strengths and Jan-Peter Kleinhans and Julia Christina Hess (2022). Governments' Role in the Global Semiconductor Value Chain #2. https://www.stiftung-nv.de/publications/downloadPdf/eca-mapping.

17 A staff working document (SWD) of the European Commission provides background, analysis, and data supporting legislative proposals and policies. It is nonbinding and aims to inform decision-making and ensure transparency.

briefly assesses EU's strategic dependencies and capacities across multiple sectors, including semiconductors.[18] One of the conclusions of the short chapter on semiconductors was that "with high entry cost, escalating trade tensions and subsidies at global level, dependence on Asia for advanced chip fabrication and on the US for chip design tools, the EU supply chain is left increasingly vulnerable. Europe needs to strengthen its own industrial position to minimise risks from trade disruptions and boost innovation and competitiveness in the application sectors."[19]

The new industrial strategy also reiterates that an "industrial alliance on processors and semiconductor technologies" would be launched in the second quarter of 2021.[20] Three years later, that industrial alliance has yet to come to fruition. One reason is disagreement regarding who should be allowed to join the alliance: only companies headquartered in the EU vs. the inclusion of foreign companies.

In the **second half of 2021,** the drafting of the proposal for the EU Chips Act was in full swing at the European Commission. This was during a period marked by **global chip shortages** that led to production losses in many industries, especially the automotive industry.[21] With the emergence of the Omicron variant, the **COVID-19 pandemic** was running rampant in Europe and abroad.[22] Shortages of personal protective equipment, such as FFP2 masks, from early in the pandemic were still on everybody's minds,[23] and Europe was facing several challenges with its vaccine procurement efforts.[24]

The Directorate-General for Communications Networks, Content and Technology (DG CNECT), under Thierry Breton, singularly drafted most of the EU Chips Act, with atypically little interaction with other DGs. One reason for this was speed. The goal was to roughly match US legislation in terms of timing and size of subsidies. Thierry Breton confirmed this in **November 2021** on a webinar with Pat Gelsinger, CEO of Intel, during which the former stated that the goal was to be "pretty comparable," in terms of speed and subsidies offered, to the US CHIPS Act. [25]

18 European Commission (2021). Staff Working Document (SWD): Updating the 2020 New Industrial Strategy: Building a Stronger Single Market for Europe's Recovery. https://commission.europa.eu/document/download/0a5bdf82-400d-4c9c-ad54-51766e508969_en?filename=swd-strategic-dependencies-capacities_en.pdf

19 Ibid.

20 European Commission. Industrial Alliance on Processors and Semiconductor Technologies. https://single-market-economy.ec.europa.eu/industry/industrial-alliances/industrial-alliance-processors-and-semiconductor-technologies_en

21 Jan-Peter Kleinhans and Julia Christina Hess (2021). Interface Report: Understanding the Global Chip Shortages: Why and How the Semiconductor Value Chain was Disrupted. https://www.interface-eu.org/storage/archive/files/understanding_the_global_chip_shortages.pdf

22 Josh Holder (2021). The New York Times: See Where Covid is Surging Across Europe: The Discovery of the Omicron Variant Adds Further Pressure to an Already Buckling Continent. https://www.nytimes.com/interactive/2021/11/30/world/europe/europe-covid-surge-omicron.html

23 Chad P Bown (2021). How COVID-19 Medical Supply Shortages Led to Extraordinary Trade and Industrial Policy. Asian Economic Policy Review. 2022 Jan; 17(1): 114–135. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8441910/

24 Jillian Deutsch and Sarah Wheaton (2021). Politico: How Europe Fell Behind on Vaccines:

25 Bruno Liebhaberg, Patrick Gelsinger (2021). CERRE Think Tank YouTube Channel: Chips Crunch: An EU "Third Way" to Strategic Autonomy in Semiconductors? https://www.youtube.com/live/jKRCtx8fBzg?feature=shared&t=3003

When the EU Chips Act was then proposed by the European Commission in **February 2022**, it became clear that all the aforementioned dynamics had strongly influenced the text. First, the EU Chips Act maintains its focus on chip manufacturing with the provision of state aid to semiconductor companies to build more fabs in Europe. Perhaps driven by the conviction that "real men have fabs," the EU Chips Act reiterates the goal of the *2030 Digital Compass* for Europe to account for 20% of global chip production capacity by 2030.[26] Second, policy tools that might have proven somewhat useful in securing vaccine deliveries—common purchasing, priority-rated orders, and export authorization—were repurposed for a fundamentally different value chain: the semiconductor value chain.[27] The underlying idea was that, *if subsidies are the carrot, the crisis response toolbox is the stick*.

By **September 2023,** the EU Chips Act came into force, with several minor but few, if any, substantial changes. Time seemed of the essence, and there was a consensus that, despite its many flaws, the EU Chips Act addresses the right issues—even if some were not much more than mere ideas at the time.

The EU Chips Act: Great ideas, no strategy

Notwithstanding its many flaws, without the EU Chips Act, the semiconductor industry in Europe would never have received the attention of policymakers that it garnered. There has been a substantial amount of capacity building in Brussels and other capitals to get smart about semiconductors—the foundational technology for digitalization, green transition, future mobility, and many other challenges. Before 2020, only a few people knew about the machines that ASML and ZEISS are building, the role that Korea, Singapore, and Japan play in the semiconductor value chain, or the types of chips that Infineon and NXP produce.[28] However, all this changed owing to global chip shortages and the EU Chips Act.

The EU Chips Act introduced many noteworthy initiatives,[29] including the following: a **strategic mapping**[30] of the semiconductor sector; a **virtual design**

26 Claus Aasholm (2024). Semiconductor Business Intelligence: Real Men have Fabs. https://semiwiki.com/semiconductor-manufacturers/344511-real-men-have-fabs/

27 Jan-Peter Kleinhans and Julia Christina Hess (2022). Interface Report: Governments' Role in the Global Semiconductor Value Chain #3. https://www.stiftung-nv.de/publications/eca-toolbox

28 Jan-Peter Kleinhans and Nurzat Baisakova (2020). The Global Semiconductor Value Chain: A Technology Primer for Policy Makers. interface Policy Paper. https://www.stiftung-nv.de/publications/global-semiconductor-value-chain-technology-primer-policy-makers

29 The European Parliament and the Council of the European Union (2023). Regulation (EU) 2023/1781: Establishing a Framework of Measures for Strengthening Europe's Semiconductor Ecosystem and Amending Regulation (EU) 2021/694 (Chips Act). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1781

platform to lower the barriers to entry to chip design, especially for small and medium-sized companies (SME) and startups; different equity and debt solutions for SMEs and startups under the **Chips Fund**; **competence centers** in each member state to facilitate access to the virtual design platform and pilot lines; and a **European Semiconductor Board** comprising EU member states, which advises the European Commission.

Thus, from subsidizing manufacturing and strengthening chip design to research and development (R&D) and easier access to finance, **the EU Chips Act is addressing many challenges and initiating a wide range of activities**—some of which make more sense than others.[31]

However, the EU Chips Act fails to meaningfully articulate *why* the semiconductor industry should be supported, and to what end. How would one assess the success of the EU Chips Act in the future? A higher number of semiconductor unicorns? More front-end manufacturing capacity? More postdocs and PhDs researching semiconductor technologies? Higher market shares for European chip suppliers? Or all the above—and, thus, simply more of everything?

Clearly articulating the rationale and goals for supporting the chip sector is crucial to ensuring that the EU Chips Act and the consequent attention from policymakers are not just a one-off. Justifying that this sector is worth continuous government attention is essential to meaningfully prioritizing and focusing government resources over the long term. In this regard, perhaps the EU can learn from its allies.

For the **United States,** the CHIPS and Science Act—which subsumes the CHIPS for America Act—is an important element in its technology rivalry with China. When the CHIPS and Science Act was signed into law in August 2022, the press release headline was as follows: "CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains, and Counter China."[32] Subsequently, the accompanying national security guardrails for companies receiving government subsidies made this even more obvious, as companies that receive funding from the US government cannot expand their manufacturing in China.[33] One of the rationales here is that "investments do not benefit foreign countries of concern [China] and foreign entities of concern."[34] In September 2023, US Commerce Secretary Gina Raimondo stated,

30 Jan-Peter Kleinhans and Julia Christina Hess (2022). Interface Report: Governments' Role in the Global Semiconductor Value Chain #2. https://www.interface-eu.org/publications/eca-mapping

31 Jan-Peter Kleinhans and Julia Christina Hess (2022). Interface Report: Governments' Role in the Global Semiconductor Value Chain #3. and https://www.stiftung-nv.de/publications/eca-monitoring https://www.stiftung-nv.de/publications/eca-toolbox; Jan-Peter Kleinhans and Julia Christina Hess (2022). Interface Report: Governments' Role in the Global Semiconductor Value Chain #1. https://www.stiftung-nv.de/publications/eca-monitoring

32 United States White House (2022). FACT SHEET: CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains, and Counter China. https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/09/fact-sheet-chips-and-science-act-will-lower-costs-create-jobs-strengthen-supply-chains-and-counter-china/

33 National Institute of Standards and Technology (NIST) (2023). CHIPS for America:

"we have to be absolutely vigilant that not a penny of this helps China to get ahead of us."[35] In June 2024, a new bipartisan bill was introduced that would restrict companies that receive US government funding from purchasing Chinese semiconductor manufacturing equipment for their fabs in the United States.[36] Thus, in the future, one measure of success of the US CHIPS and Science Act would be whether the technological gap[37] between the United States and China widened or, at the very least, stagnated.[38]

Considering **Japan**, its semiconductor strategy differs from that of the United States but is similarly rooted in geopolitics. A key concept in Japan's economic security strategy[39] is "maintaining, boosting and obtaining strategic indispensability".[40] The policy objective is to ensure that Japanese companies (continue to) play an indispensable role in global value chains.[41] Ultimately, the policy objective of "strategic indispensability" is merely a means to an end—increasing Japan's ability to resist coercion from other countries.[42] This is a very fitting strategy for the semiconductor ecosystem in Japan, with its market-leading equipment and chemical suppliers.[43] One example of how Japan's policy objective of strategic indispensability is implemented is the acquisition of the Japanese semiconductor chemical supplier JSR by the state-backed Japan Investment Corporation (JIC).[44] JSR is a leading global supplier of photoresists, a crucial chemical for semiconductor production.[45] The rationale behind the decision of the Japanese government to acquire JSR via JIC and the resulting delisting of the company was to "strengthen the international competitiveness of [Japan's] semiconductor materials industry."[46]

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34 National Institute of Standards and Technology (NIST) (2023). CHIPS for America: CHIPS Incentives Program - Approach to National Security. https://www.nist.gov/system/files/documents/2023/09/22/National%20Security%20Guidebook.pdf

35 David Shepardson (2023). Reuters: US Finalizes Rules to Prevent China from Benefiting from $52 Billion in Chips Funding. https://www.reuters.com/technology/us-finalizes-rules-prevent-china-benefiting-52-bln-chips-funding-2023-09-22/

36 Alexandra Kelley (2024). Nextgov: Lawmakers Look to Amend CHIPS Act to Cover Manufacturing Gear. https://www.nextgov.com/modernization/2024/06/lawmakers-look-amend-chips-act-cover-manufacturing-gear/397494/

37 Alex Gordon and https://www.semiconductors.org/tracking-the-progress-of-the-chips-rd-programs/

38 Hanna Dohmen, Jacob Feldgoise, and Charles Kupchan (2024). Foreign Affairs: https://www.foreignaffairs.com/china/limits-china-chip-ban

39 Cabinet Office of Japan (Webpage Accessed 26.07.2024). Economic Security. https://www.cao.go.jp/keizai_anzen_hosho/index.html

40 Kazuto Suzuki (2022). The Japan Institute of International Affairs (JIIA): https://www.jiia.or.jp/en/ajiss_commentary/japans-economic-security-and-semiconductor-industry.html

41 Kazuto Suzuki (2021). Geoeconomic Briefing: What Japan needs to do to boost its economic security. https://apinitiative.org/en/2021/12/03/29186/

42 Gregory C. Allen (2023). Center for Strategic and International Studies (CSIS): The Post-October 7 World: International Perspectives on Semiconductors and Geopolitics. https://www.csis.org/analysis/post-october-7-world

43 SEMI (2021). SEMI Comments to Risks in the Semiconductor Manufacturing and Advanced Packaging Supply Chain Notice of Request for Public Comments. https://www.semi.org/sites/semi.org/files/2021-11/Apr%205%20Final%20SEMI%20Supply%20Chain%20Comments.pdf; Takashi Yunogami (湯之上隆) (2023). JBpress: Semiconductor Manufacturing is on the Brink of Halting, will this Signal the end of Human Civilisation? https://jbpress.ismedia.jp/articles/-/73333

44 JSR Corporation

45 Takako Fujiu and Riho Nagao (2024). Nikkei Asia: Japan Chip Materials Maker JSR Seeks to Scale up After $6bn Takeover. https://asia.nikkei.com/Business/Tech/Semiconductors/Japan-chip-materials-maker-JSR-seeks-to-scale-up-after-6bn-takeover

46 JSR Corporation (Webpage Accessed 26.07.2024). FAQ Regarding Scheduled Commencement of the Tender Offer by JICC-02 Ltd. https://www.jsr.co.jp/jsr_e/ir/library/tob-faq.html

Thus, one measure of the success of Japan's semiconductor strategy would be whether the country is able to grow the number of market-leading Japanese semiconductor technology suppliers that play an indispensable role in the global semiconductor supply chain.

Notably, EU policymakers would do well to learn from Japan's approach and focus less on the share of global production capacity and more on reverse dependencies and indispensability.[47] In other words, the guiding question should not just be where and how to decrease dependence on foreign technology suppliers; Rather, it is equally important to consider how to ensure that, in the future, the global semiconductor value chain still depends on European technology providers.

Regional share of chip production capacity should not guide policy-making

As indicated in the first section, accounting for "20% of world [semiconductor] production in value" by 2030 is a prominent goal of the EU's semiconductor policy, and one could argue that this is the EU's long-term policy objective.[48] First established in the *2030 Digital Compass* in 2021, it is a very clear goal that is easy to measure. Furthermore, it is part of the EU's *Digital Decade* policy program, which publishes regular status reports.[49] In fact, regarding semiconductors, Europe's share of global chip production capacity[50] is the only target tracked in the annual *Digital Decade* status reports.[51]

However, although the 20% goal is very clear, it should not guide policy formulation. That is not to say that Europe should not subsidize fabs. Rather, the policy objective of providing heavy subsidies—to attract investments to the EU—cannot merely be to boost the EU's share of global chip production capacity to 20%. Aiming for a certain percentage of domestic production might make sense for commodities and less diversified goods, such as steel, energy, vaccines, personal protective equipment, and

47 Dr. Tim Rühlig (2024). DGAP Report: Reverse Dependency: Making Europe's Digital Technological Strengths Indispensable to China. https://dgap.org/en/research/publications/reverse-dependency-making-europes-digital-technological-strengths

48 European Commission (2021). 2030 Digital Compass: The European way for the Digital Decade. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0118

49 European Commission (Webpage Accessed 26.07.2024). Europe's Digital Decade. https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade

50 Notably, the Digital Decade status report 2024 did not measure Europe's share of global semiconductor manufacturing capacity (wafer capacity) or share of global semiconductor sales but instead calculated the share of revenue in Europe across the value chain—from chemicals and equipment to front-end and back-end manufacturing.

51 European Commission (2024). 2030 Digital Decade: Report on the State of the Digital Decade 2024. https://ec.europa.eu/newsroom/dae/redirection/document/106687

food. However, it does not make sense for highly diversified technologies produced in global value chains with transnational division of labor, low levels of substitutability, and strong customer–supplier alliances. The following are some of the reasons why its share of global chip production capacity should not guide the formulation of EU semiconductor policies:

Semiconductors are highly diversified and depend on specialized manufacturing. A fab for producing cutting-edge memory chips cannot be used to produce any other type of semiconductor—for example, power semiconductors for charging the batteries of an electric vehicle, image sensors in a smartphone camera, or high-performance artificial intelligence (AI) accelerators for cloud-based machine learning. Each of these chip types depends on dedicated, specialized process nodes. For example, although essentially all cutting-edge AI accelerators for cloud computing are presently produced in Taiwan by the Taiwan Semiconductor Manufacturing Company (TSMC), the country has a minuscule manufacturing capacity for producing cutting-edge memory chips or modern—silicon-carbide or gallium-nitride—power semiconductors. However, all three types of chips—and many more—are required to build an AI data center. Furthermore, there is limited substitutability in chip production: if a chip was designed for production on TSMC's 7 nm process, one cannot simply switch to Samsung's 7 nm process. This creates long-term path dependencies through strong interdependencies.[52] Thus, even if Europe were to achieve its goal of growing its share of world chip production capacity to 20%, the EU would still be dependent on foreign fabs for most of the manufacturing technologies involved.

Modern products require a variety of chip types. Contemporary complex products, such as smartphones, cars, and ATMs, depend on various types of chips—including memory chips, microcontrollers, voltage regulators, and processors—typically sourced from all over the world. Even if only a few of these chips are unavailable, the product cannot be finished. Because manufacturing is highly diversified and depends on the type of chip (consider the first reason), more domestic manufacturing would not make Europe more resilient against supply chain disruptions, whether caused by natural disasters or export restrictions.[53] This is why supply chain resilience needs to be addressed primarily via supply chain management and influencing the purchasing behavior of end-customer industries.[54]

Fabs depend on foreign suppliers. Increasing domestic manufacturing capacity does not reduce this dependence. Fabs in Dresden, Magdeburg, Crolles, and Agrate will

52 Jan-Peter Kleinhaus and Julia Christina Hess (2021). Interface: Understanding the Global Chip Shortages. https://www.interface-eu.org/publications/understanding-global-chip-shortages

53 Ibid.

54 Ibid.

still require wafers, chemicals, and equipment from countries like Japan and the United States. Additionally, fabs produce finished wafers, not chips, which are typically sent to Asia—mainly Taiwan, China, and Malaysia—for assembly, testing, and packaging. Europe has minimal capacity for these post-wafer fabrication processes, including packaging, production of printed circuit boards and substrates.[55] With member states' subsidies largely targeting front-end fabs, Europe will still rely on Asia for downstream processes.

Assessing the EU's goal of supplying 20% of global chip production capacity, one must wonder how this would improve the technological competitiveness, national security, or supply chain resilience of the EU. Similar to the crisis response toolbox[56] in the EU Chips Act, this goal is a policy objective that might prove meaningful in other sectors but loses all meaning when applied to the semiconductor industry or any other high-tech industry characterized by a transnational division of labor, high levels of specialization, and steep barriers to entry.

How EU member states can improve the status quo

Ultimately, the EU Chips Act is what it is: a collection of initiatives and efforts that cut across the semiconductor value chain rather than a long-term strategy rooted in current geopolitical realities. Although some stakeholders are already advocating for an EU Chips Act 2.0, an update to the EU Chips Act would most likely only change things on paper, but not on the ground. More importantly, EU member states still need to step up their game and fill in the blanks.[57]

EU member states will have to continuously assess the nexus of economic security and semiconductors, not least because of the ongoing US–China technology rivalry. The US government has set the tone and agenda over the last couple of years; the EU and its member states have largely been in a reactive mode regarding semiconductors and economic security. From export controls on manufacturing equipment[58] to assessing potential threats from China's build-out of mature node

55 IPC (2024). Securing the European Union's Electronics Ecosystem. https://emails.ipc.org/links/IPC-Securing-Europe-Electronics-Ecosystem.pdf

56 The crisis response toolbox in the EU Chips Act comprises common purchasing, priority-rated orders, and export authorizations that are supposed to alleviate shortages and lessen the impact of supply chain disruptions. However, these tools are neither effective nor efficient for achieving these goals. For a thorough analysis, see the following: Jan-Peter Kleinhans and Julia Christina Hess (2022). Interface: Governments' Role in the Global Semiconductor Value Chain #3. https://www.interface-eu.org/publications/eca-toolbox

57 European Semiconductor Industry Alliance (2024). Towards a more competitive semiconductor industry for Europe. https://www.eusemiconductors.eu/sites/default/files/ESIA_Key%20Recommendations%202024-2029_digital_final_0.pdf

58 Digital Power China (2024). Reverse Dependency: Making Europe's Digital Technological Strengths Indispensable to China.

capacity[59], the US government has and will continue to put the various challenges with China's semiconductor ecosystem at the top of its agenda when in dialogue with EU member states and the European Commission.

Although the European Commission, with its *European Economic Security Strategy*[60] unveiled in June 2023 and subsequent efforts[61], certainly tries to think through these challenges, the human resources of the commission are severely limited. Furthermore, companies and industry associations often have closer relationships with their member state governments than with the European Commission. Lastly, many EU member states had only lukewarm responses to the European Commission's requests to map the domestic semiconductor industry and national risk assessments for *advanced semiconductors* under the economic security strategy.

Considering the European Commission's political guidelines for 2024–2029 regarding the semiconductor industry, these guidelines will work only with (much more) active engagement from EU member states. The European Commission plans to "prioritise advancing Europe's economic security and economic statecraft [...] based on a clear-eyed risk assessment, [...] build a genuine coordinated approach to export controls, [and] develop economic security standards for key supply chains with our G7 and other like-minded partners."[62]

To meaningfully inform their discussions and develop their positions, EU member state governments will need to invest in three things: first, a **good understanding of their respective domestic semiconductor ecosystems**—its strengths and weaknesses, from chemicals and equipment suppliers to chip design and manufacturing; second, a **long-term strategy and policy objectives** articulating why and to what end this sector receives support; and third, **administrative resources and brainpower** to assess risks, form opinions, develop strategies, coordinate with other member states, and engage with the European Commission. Furthermore, undertaking all this does not have to be a gargantuan endeavor; rather, each member state can **start small and consult with peers**.

1 | Understanding the strengths and weaknesses of the domestic ecosystem. Over the last couple of years, the US government has put out several requests for information

https://dgap.org/en/research/publications/reverse-dependency

59 Reva Goujon, Jan-Peter Kleinhans and Laura Gormley (2024). Thin Ice: US Pathways to Regulating China-Sourced Legacy Chips. https://rhg.com/research/thin-ice-us-pathways-to-regulating-china-sourced-legacy-chips/

60 European Commission (2023). European Economic Security Strategy. JOIN(2023) 20 final. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023JC0020

61 European Commission (2024). Commission proposes new initiatives to strengthen economic security. Press Release. https://ec.europa.eu/commission/presscorner/detail/en/IP_24_363

62 Ursula von der Leyen (2024). Political Guidelines for The Next European Commission 2024–2029. https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648_en?filename=Political%20Guidelines%202024-2029_EN.pdf

and conducted surveys to learn about the country's semiconductor ecosystem.[63] At present, however, many EU member states have not performed a proper mapping and analysis of the strengths and weaknesses of their respective domestic semiconductor ecosystems, including supplier markets.[64] Due to a lack of resources, mappings performed by the European Commission do not provide the necessary granularity to meaningfully inform policy decisions.[65] This mapping really should be performed by EU member states, especially because their domestic ecosystems differ. For example, while Germany, France, and Italy have substantial wafer fabrication capacity, Belgium and the Netherlands have no manufacturing capabilities but are home to leading research and technology organizations (RTOs) and equipment suppliers. A granular understanding of a country's semiconductor ecosystem forms the basis for subsequently developing long-term policy objectives and a clear understanding of why and to what end the sector receives support.

2 | Why this sector and to what end? To move beyond merely reacting to whatever comes next in the US—China technology rivalry, EU member states need to possess a clear understanding of why and to what end they want to support their respective domestic semiconductor industry. The long-term policy objectives, and how these objectives shape efforts in relation to "promote, protect and partner"[66] should be at the fore. Because EU member states have different semiconductor ecosystems, foreign policy agendas, and geopolitical assessments, the *why* and long-term policy objectives of each member state will most likely also differ. Only after this has been made explicit, at least between governments, can there be a thriving meaningful exchange between EU member states as well as at the level of the EU, among the G7, and with the United States. In particular, for future discussions with the European Commission regarding further risk assessments, economic security standards, and coordinated export controls, each EU member state possessing a clear understanding of its long-term policy objectives for its semiconductor industry is essential for navigating and shaping those discussions.

3 | The need for brainpower as an administrative resource. By August 2023, more than 140 people worked at the CHIPS for America office in the US Department of Commerce.[67] This was possible because the US CHIPS and Science Act allows the

63 U.S. Department of Commerce Bureau of Industry and Security (2024). Assessment Of The Status Of The Microelectronics Industrial Base In The United States. https://www.bis.doc.gov/index.php/documents/technology-evaluation/3402-section-9904-report-final-20231221/file

64 Jan-Peter Kleinhans and Jula Hess (2022). Recommendations for the EU Chips Act: Long-term government value chain mapping. Interface Policy Paper. https://www.interface-eu.org/publications/eca-mapping

65 European Commission (2022). Commission Staff Working Document – A Chips Act for Europe. SWD(2022) 147 final. https://ec.europa.eu/newsroom/dae/redirection/document/86690

66 European Commission (2023). European Economic Security Strategy. JOIN(2023) 20 final. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023JC0020

67 The White House (2023). Fact Sheet: One Year after the CHIPS and Science Act, Biden-Harris Administration Marks Historic Progress in Bringing Semiconductor Supply Chains Home, Supporting Innovation, and Protecting National Security. https://www.whitehouse.gov/briefing-room/statements-releases/2023/08/09/

US Department of Commerce to utilize up to two percent of its annual allocation for salaries and expenses—two percent of $53 billion is approximately $1 billion for the US Department of Commerce to hire personnel and purchase and analyze data.[68] In addition, through the International Technology Security and Innovation Fund (ITSI), the US State Department is receiving $100 million per year over a five-year period to partner with allies to strengthen supply chain resilience and incentivize geographic diversification.[69] Notwithstanding one's views on the US government's approach to curbing China's advances in semiconductor technologies[70], the US government is walking the talk. The US has heavily invested in developing its capacity to understand, assess, and sway the semiconductor value chain, and the collective brainpower employed allows the US to set the agenda at the international level.

However, the same cannot be said for the EU and its member states. There are only two handfuls of people at DG CNECT who work on semiconductors from Monday to Friday. These individuals manage the European Semiconductor Board and kickstarted the Chips Joint Undertaking. They ideate how the virtual design platform, the network of competence centers, and the pilot lines all interact with one another. They develop supply chain monitoring mechanisms and advance digital partnerships with Japan, Korea, and Singapore. They are also supposed to assess the various economic security risks in relation to semiconductor technologies. It does not look any better at the member state level, as most EU member states with semiconductor industries have only a few, if any, government officials dedicated solely to the semiconductor industry; these government officials typically also oversee various other technologies. Undoubtedly, no EU member state needs a dedicated chips office staffed with hundreds of people. However, developing long-term policy objectives and a domestic strategy that guides engagement at the level of the EU and international levels is only possible—for such a complex value chain—if a sufficient number of government officials have only the semiconductor sector in their portfolio.

4 | Start small and consult with peers. Assessing the domestic semiconductor ecosystem, developing long-term policy objectives, and joining the EU and international discussions can strain the resources of EU member state governments; most EU member states face this challenge. However, exchanging views and learning

fact-sheet-one-year-after-the-chips-and-science-act-biden-harris-administration-marks-historic-progress-in-bringing-semiconductor-supply

68 US Chips And Science Act (2022). Public Law 117-167, H.R. 4346. https://www.govinfo.gov/content/pkg/PLAW-117publ167/pdf/PLAW-117publ167.pdf

69 US Department of State (2023). The U.S. Department of State International Technology Security and Innovation Fund. https://www.state.gov/the-u-s-department-of-state-international-technology-security-and-innovation-fund/

70 Ansgar Baums (2024). The "Chokepoint" Fallacy of Tech Export Controls. Stimson Center. https://www.stimson.org/2024/the-chokepoint-fallacy-of-tech-export-controls/

from each other among a small group of governments with shared interests in the semiconductor sector would be a good start.[71] Any one of the EU member state governments can learn from those that have already performed a proper mapping of their domestic ecosystem, and from those that already have (internal) semiconductor strategies or are currently developing plans to support the semiconductor sector. These governments could explain their rationale among such a group of peers, as well as outline to the end to which they are pursuing those efforts—and the guiding principles applied. This would illuminate differences in priorities and policy objectives, facilitating a better understanding of why various governments are pursuing certain efforts within the EU and internationally. Finally, such a space among peers would also create room to exchange views on initiatives from the European Commission, the US government, and multilateral forums.

Conclusion

Semiconductors are the foundational technology behind autonomous driving, renewable energy, AI, quantum computing, telecommunication networks, and countless other technology ecosystems. They are indispensable to all sectors. They will also continue to be the epicenter of the US–China technology rivalry, as both governments have identified semiconductors as a strategic asset or, in the words of the US government, as a "force-multiplying technology."[72]

The open questions are as follows: How do EU member state governments perceive this technology? Is the semiconductor industry just another sector in need of government attention and support, or a strategic asset with direct implications for a country's economic and national security? If it is the latter, then being home to market-leading companies in this sector translates to geopolitical leverage.[73] This would make it crucial for EU member states to continuously think through the challenges at the nexus of their economic security, China, and semiconductor technologies, as well as develop long-term policy objectives.

So far, several EU member states have been eager to provide money to the sector but often forgot to invest in their own capacity to understand this complex, transnational ecosystem, let alone shape and define a clear position at the nexus of economic security and semiconductor technologies. Although some EU member states mapped their domestic semiconductor ecosystems or formulated strategies[74],

71 Marloes Smeets (2024). LinkedIn Post. Ministry of Economic Affairs. https://www.linkedin.com/posts/marloes-smeets_sitting-in-a-slightly-cramped-and-overheated-activity-7214297491876257792-f9SD/

72 Reva Goujon (2022). Running Target: Next-Level US Tech Controls on China. Rhodium Group. https://rhg.com/research/running-target/

73 Digital Power China (2024). Reverse Dependency: Making Europe's Digital Technological Strengths Indispensable to China. https://dgap.org/en/research/publications/reverse-dependency

many left most of this work to the European Commission. For example, the German government will likely provide more than €20 billion in state aid to a handful of fab projects without a single page of semiconductor strategy written down that articulates its long-term policy objectives and intentions.

Going forward, EU member states will need to enhance and intensify their efforts to understand their domestic ecosystem and their position in the global semiconductor value chain, develop long-term policy objectives that capture the end for which they support the semiconductor sector and where their priorities lie, and invest in their resources to execute all the above.

If none of this happens, there is a strong probability that the US government will continue to set the agenda and shape semiconductor policy debates in Europe, especially regarding economic security and China. This would be to the detriment of—first and foremost—EU semiconductor companies, which face the consequences of the extraterritoriality of ever-expanding US export controls.[75] However, it would also mean that EU member state governments take a back seat in discussions with the European Commission, which seems determined to develop its European economic security approach.

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74 Agenda Publica (2023). PERTE Chip: Spain in search of its place in the European semiconductor effort. https://agendapublica.es/noticia/18605/perte-chip-spain-search-of-its-place-european-semiconductor-effort ; French Government (2022). Electronique 2030. https://presse.economie.gouv.fr/download?n=22-DOSSIER-DE-PRESSE-%E2%80%93-Electronique-2030.pdf&id=96873

75 Bloomberg (2024). US Floats Tougher Trade Rules to Rein In China Chip Industry. https://www.bloomberg.com/news/articles/2024-07-17/us-considers-tougher-trade-rules-against-companies-in-chip-crackdown-on-china

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