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VOICES FOR THE NETWORKED SOCIETY

The EU Chips Act and the Promise of European Semiconductor Sovereignty

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ABSTRACT

This commentary examines the gap between the political promises attached to the European Chips Act and what the resulting investments can realistically deliver. Since 2022, the Act has subsidized 18 semiconductor investments worth €36 billion, justified repeatedly in terms of supply security, resilience, technological sovereignty, and autonomy. Yet most support has gone to front-end manufacturing, while Europe remains highly dependent on non-European capabilities in back-end production, equipment, materials, and design. Drawing on the structure of semiconductor global production networks, the article argues that additional production capacity in Europe can strengthen industrial capabilities and Europe's position in the global industry but cannot by itself create secure or autonomous European semiconductor supply chains. This does not imply that semiconductor subsidies are necessarily misguided; rather, they should be assessed against more realistic objectives. Recent policy debate has begun to place greater emphasis on "strategic indispensability," but the Chips Act 2.0 proposal largely adds this concept to the existing vocabulary of sovereignty, resilience, dependency reduction, and security of supply instead of replacing it.

KEYWORDS

semiconductors \\ technological sovereignty \\ European Union \\ industrial policy \\ supply chains

1 Introduction

When the European Commission proposed the European Chips Act in February 2022, it did so in the context of the global semiconductor shortage. The shortage had severely affected European industry, especially the automotive sector, where carmakers were forced to reduce or temporarily halt production because individual chips were missing (Walsh, 2022). The Commission responded with what was, by European Union (EU) standards, a remarkable industrial policy intervention: the Chips Act opened the door for large-scale state aid to individual semiconductor manufacturing investments that previously would have been difficult to reconcile with European competition policy (Ruck, 2026).

The Commission argued that Europe needed to increase resilience and supply security and reduce external dependencies. In its 2022 communication, it concluded that strengthening Europe's semiconductor capacities was not only a question of competitiveness but also one of "technological sovereignty and security" (European Commission, 2022: 22). Four years later, 18 semiconductor investments have received state aid approval within the framework of the European Chips Act. Together, these projects represent approximately €36 billion in investment, of which around €14.8 billion comes from public subsidies provided by EU member states (see Table 1).

Table 1: Approved European Chips Act state aid cases
Source: Press releases by the European Commission and the firms.

State aid approval	Company	Location	Type	Investment in €mn	State aid in €mn
2022	STMicroelectronics	Italy	Front-end	730	292.5
2023	STMicroelectronics/ GlobalFoundries	France	Front-end	7,500	2,900
2024	STMicroelectronics	Italy	Front-end	5,000	2,000
2024	ESMC (TSMC, Infineon, Bosch, NXP)	Germany	Front-end	10,000	5,000
2024	SiliconBox	Italy	Back-end	3,200	1,300
2025	Infineon	Germany	Front-end	3,540	920
2025	ams OSRAM	Austria	Front-end	567	227
2025	Ephos	Italy	Front-end	101	41.5
2025	Onsemi	Czechia	Front-end	1,640	450
2025	GlobalFoundries	Germany	Front-end	1,100	495

2025	X-FAB	Germany	Front-end and back-end	312	128
2026	Carl Zeiss	Germany	Equipment	541	222
2026	Zadient	Germany	Recycling	161	66
2026	QuantumDiamonds	Germany	Equipment	152	76
2026	Element 3-5	Germany	Front-end	861	353
2026	Vishay	Germany	Front-end	522	214
2026	KLA	Germany	Equipment	180	74
2026	KETEK	Germany	Front-end	44	18
Total				**36,152**	**14,777**

Note: "Investment in €mn" is the total investment, consisting of private investment and state aid. "State aid in €mn" is paid by the member state of the investment location and was approved by the European Commission.

These include large investments such as new or expanded facilities by STMicroelectronics, Infineon, TSMC and its European partners, GlobalFoundries, Onsemi, and ams OSRAM, but also various investments by smaller firms. The subsidies played an important role in making the investments happen (see Raj & Wuttke, 2026). Semiconductor fabs are extraordinarily capital-intensive and are subsidized in every major producing economy. Had the EU continued to abstain from this subsidy competition, its already declining share of global semiconductor manufacturing would likely have fallen further (Raj & Wuttke, 2026). The more difficult question is whether these investments deliver what the political rhetoric surrounding them suggests they do.

2 What Was Promised

The language used in the Commission's state aid decisions is revealing. Four of the 18 approvals state that the investment will strengthen Europe's "security of supply, resilience and digital sovereignty in semiconductor technologies." Three use almost the same formulation but refer to "technological autonomy." Other decisions argue that the investment will "increase technological autonomy," boost "autonomy and technological leadership," or strengthen the EU's "position and autonomy in the semiconductor value chain." The terminology has changed somewhat over time, but the underlying message remains consistent: subsidizing semiconductor production in Europe is presented as reinforcing Europe's autonomy and the security of its supply.

This is also the logic of the original Chips Act. The 2022 Commission communication described the concentration of semiconductor production in a limited number of locations as a vulnerability and argued that increasing production capacity in Europe would address supply-security concerns and reduce external dependencies. The Commission explicitly linked attracting semiconductor manufacturing investment to Europe to strengthening supply security. At first sight, this seems convincing. If European industry suffered because it could not obtain enough semiconductors during the 2020–2022 shortage, building more semiconductor factories in Europe appears to be an obvious response. More European production should mean less dependence on Asian production and, therefore, more secure access to chips. The problem is that semiconductor production does not work like this.

3 The Global Semiconductor Production Network

Semiconductor manufacturing is embedded in one of the most fragmented and geographically dispersed production networks of any major industry (Yeung, 2022). Put simply, the semiconductor value chain can be divided into five broad areas: chip design, semiconductor manufacturing equipment, materials, wafer fabrication ("front-end" production), and assembly, packaging, and testing ("back-end" production). Front-end production alone consists of hundreds of individual processes using highly specialized machines, chemicals, gases, wafers, and other inputs. In some sub-processes, only one or a handful of suppliers worldwide are technologically capable of providing the necessary equipment or materials. Thus, the production of an individual semiconductor involves repeated movements between production sites and countries. Products often move between several front-end sites, then to one Asian facility for assembly, another for testing, and eventually to a separate distribution center. Replicating every specialized production step at every site to increase supply security would be economically prohibitive (Personal communication, May 26, 2023).

This matters for interpreting the Chips Act investments. Most subsidized projects are front-end investments (see Table 1). They add wafer-fabrication capacity in Europe; however, Europe has very little back-end production capacity–less than 1% of global capacity according to ZVEI (2025). Among the 18 subsidized investments, only one and a half are back-end projects. Assembly, packaging, and testing remain heavily concentrated in Asia. Chips manufactured in a subsidized European fab will therefore leave Europe again for back-end processes in Asia before they might return as finished semiconductor products.

In addition, European production does not equate to production for European customers. Semiconductor fabs operate in global markets. A wafer manufactured in Dresden, Crolles, or Agrate is not reserved for a customer in Germany, France, or Italy. As one industry interviewee put it: "In Europe, chips are not produced for Europe alone. Or US for US. Everybody produces for the world market." (Personal communication, May 26, 2023)

The same problem becomes apparent when looking beyond fabrication. Europe is exceptionally strong in some parts of semiconductor equipment. ASML holds a unique position in advanced lithography, while firms such as Zeiss and Trumpf provide critical components to ASML. This strength in lithography equipment is arguably one of Europe's strongest positions anywhere in the global semiconductor production network (Germann et al., 2024). Nevertheless, European fabs still depend on a broad range of equipment from US and Japanese suppliers. In this regard, the first Chips Act did little to induce major equipment producers such as Applied Materials, Lam Research, or Tokyo Electron to develop greenfield production in Europe. The picture for semiconductor materials is even more striking. Materials are not even eligible for state aid support under the current version of the Chips Act, despite dependencies on highly concentrated suppliers for critical chemicals and other inputs (ZVEI, 2025).

In other words, the policy has predominantly added European capacity at one stage of a production network whose other stages remain globally distributed. This is economically meaningful for certain investment locations like Dresden, but it is difficult to reconcile with strong claims about increased autonomy or supply security.

4 Differences Between Supply Security and Sovereignty

The problem is not simply that Europe has failed to achieve semiconductor autarky. Academic work on technological sovereignty does not generally define sovereignty in this way. Recent contributions instead understand technological sovereignty as the capacity of a state or political entity to secure access to technologies considered critical to its welfare and ability to act (Edler et al., 2023; Mansikkamäki et al., 2026; March & Schieferdecker, 2023). Crucially, this can include sourcing technologies from abroad. The distinction is therefore not between domestic and foreign production but between manageable interdependence and one-sided structural dependency.

This more sophisticated conception makes sense. No major semiconductor economy is self-sufficient. The United States depends on foreign lithography equipment and manufacturing capacity; Taiwan depends on foreign equipment, materials, and design software; Japan is strong in materials and equipment but depends on foreign firms and markets in other segments. Even China, despite making enormous investments in domestic capacity, remains embedded in global technological networks.

Consequently, the problem with European semiconductor policy is not that it has failed to eliminate all foreign dependence—this would be an unreasonable standard. The problem is that the political justification of individual production investments often implies a much simpler relationship between territorial production and security than actually exists. Building another front-end fab in Europe may increase manufacturing capacity, preserve technological

capabilities, strengthen an industrial cluster, and prevent Europe's position in semiconductor production from deteriorating further. But a European fab dependent on American and Japanese equipment, globally sourced materials, and Asian back-end facilities does not provide "supply security" in any straightforward sense. Nor does locating a globally operating firm's production facility inside the EU make the European semiconductor ecosystem autonomous.

This distinction matters because the way policies are justified affects how they are evaluated. If semiconductor subsidies are sold primarily as measures for achieving autonomy and securing the European supply, their success will be judged against outcomes that the structure of the industry makes impossible to deliver. The more defensible case for the Chips Act is different: Europe needs to retain meaningful industrial and technological capabilities in strategically important parts of a global production network. The subsidies are necessary to make the investments happen because other world regions also subsidize (Raj & Wuttke, 2026). In addition, there may also be conventional economic rationales for such subsidies: earlier research on subsidized semiconductor investments in Dresden found substantial regional spillovers and fiscal returns (Edler et al., 2002).

5 Has the EU Started to Recognize This? The European Chips Act 2.0

There are signs that European semiconductor policy is becoming more realistic. Notably, the distribution of subsidized projects has slowly broadened beyond front-end fabs. Recent approvals include investments in semiconductor equipment and related activities (see Table 1).

The discussion among industry representatives and policymakers is also shifting toward the idea of Europe becoming or remaining indispensable to global semiconductor production (Teer et al. 2025). This is an important change in emphasis. Strategic indispensability starts from the premise that international technological interdependence cannot simply be eliminated. The objective instead is to maintain capabilities that other actors also depend on, such as ASML's lithography machines. A representative from a European semiconductor industry association described this very shift. In their view, talk of complete autonomy had become less credible because reproducing every stage of semiconductor production in Europe would require enormous and economically unrealistic subsidies. The emerging discussion instead concerns strengthening technological bottlenecks in which Europe already possesses capabilities that others need, creating some degree of reciprocal dependence and bargaining power. (Personal communication, October 31, 2025)

The European Commission has initiated an update to the European Chips Act by proposing a regulation that would replace the initial Chips Act from 2022, if adopted. Published in June 2026 as part of the EU's broader Technological Sovereignty Package (European Commission, 2026), the Chips Act 2.0 proposal reflects some lessons from the implementation of the first

act. It places greater emphasis on demand-side measures and on translating research and pilot-line capabilities into industrial-scale production; it also seeks to improve the EU's still limited visibility over semiconductor supply chains, gives greater formal attention to parts of the value chain that received little support under the first Act, and extends eligibility to previously excluded areas such as specialty materials and printed circuit boards. It also adds "indispensability" more explicitly to the policy vocabulary: strategic projects are expected to contribute to the "indispensability, resilience and prosperity" (p. 2) of the European semiconductor value chain, as well as to technological sovereignty and leadership.

Yet the problematic older promises remain. The same proposal defines technological sovereignty as a strategic imperative and continues to promise reductions in strategic dependencies while making supply security one of its central objectives. Most strikingly, it claims that expanding both European semiconductor demand and supply will contribute to "shorter and more secure supply chains" and "enhanced strategic autonomy" (European Commission, 2026, p. 2).

In short, the Commission has not replaced the older vocabulary of autonomy, resilience, dependency reduction, and supply security with indispensability but has layered indispensability on top. Promising sovereignty, resilience, and reduced dependencies is evidently difficult to resist when seeking political support for interventionist and resource-intensive policies. Existing research has shown just how politically useful the language of technological sovereignty and strategic autonomy can be in EU policymaking, not least because its ambiguity allows actors with quite different interests to rally behind the same policy agenda (Bassens & Hendrikse, 2022; Seidl & Schmitz, 2024).

6 A More Realistic View of European Semiconductor Policy

The European Chips Act has influenced the geography of semiconductor investment. It has helped bring new manufacturing capacity to Europe and probably prevented the further erosion of Europe's position in global semiconductor production (see Raj & Wuttke, 2026). However, these outcomes should not be confused with semiconductor sovereignty. Semiconductor production is organized through global production networks because extreme specialization makes this technologically and economically efficient. Public subsidies can change the location of individual investments, and they can preserve or expand technological and manufacturing capabilities. However, they cannot turn these investments into self-contained European supply chains or guarantee European customers access to semiconductors in a future crisis. The sooner this distinction is made explicit, the more useful the debate about European semiconductor policy will become.

This raises another question: are semiconductor subsidies still warranted if they mainly induce investments that would otherwise take place elsewhere instead of delivering "supply security"? Semiconductor fabs have long been subsidized in the major producing economies, and abstaining from the subsidy competition would not return the industry to some undistorted market outcome. It would more likely accelerate the relocation of investments away from Europe. The relevant question is therefore less whether subsidies can create sovereignty than whether maintaining particular semiconductor capabilities in Europe generates benefits that justify their public cost. EU state aid control already provides a mechanism for ensuring that waste is minimized in this regard. State aid decisions examine whether public support is necessary for an investment to take place in the EU, including whether alternative locations outside Europe actually offer the subsidies that firms claim they do (see Schmitz et al., 2026).

Abandoning grand claims would also make it easier to think more clearly about technological sovereignty. As discussed above, the academic literature does not equate technological sovereignty with producing everything domestically. Instead, the concept describes the ability to secure access to technologies considered critical without becoming subject to one-sided structural dependencies. For semiconductors, this necessarily requires international relationships. Europe is strong in some segments of the production network and highly dependent on other regions in others. Instead of pretending that these dependencies can all be removed, policy could focus more explicitly on how access to critical capabilities can be secured. Where Europe has little capacity, for example in back-end, this may require durable relationships with semiconductor economies that specialize in assembly, packaging, and testing, such as Malaysia (see Wuttke, 2026). Similar questions arise for materials, equipment, and design tools.

The growing discussion of "strategic indispensability" is interesting in this respect because it turns the perspective around. Instead of only asking how Europe can reduce its dependence on others, it inquires where other actors depend on European capabilities. ASML and the European lithography ecosystem provide the obvious example. However, indispensability should not become the next vague policy concept onto which unrealistic expectations are projected. Recent work on semiconductor chokepoints already shows that technological indispensability does not automatically translate into political leverage. Whether a chokepoint can be used depends on substitutability, collateral economic costs, relationships between countries, state control over the relevant node, and the interests and agency of the firms that possess the technology (Rogers, 2026; Hynek, 2026).

The proposed Chips Act 2.0 does not resolve any of these tensions. It incorporates some lessons from the implementation of the first Act and adds "indispensability" to the objectives of European semiconductor policy, but it retains the familiar promises of reduced dependencies and security of supply. The result is less a reconsideration of what semiconductor policy can realistically achieve than an expansion of the list of things it is expected to achieve.

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