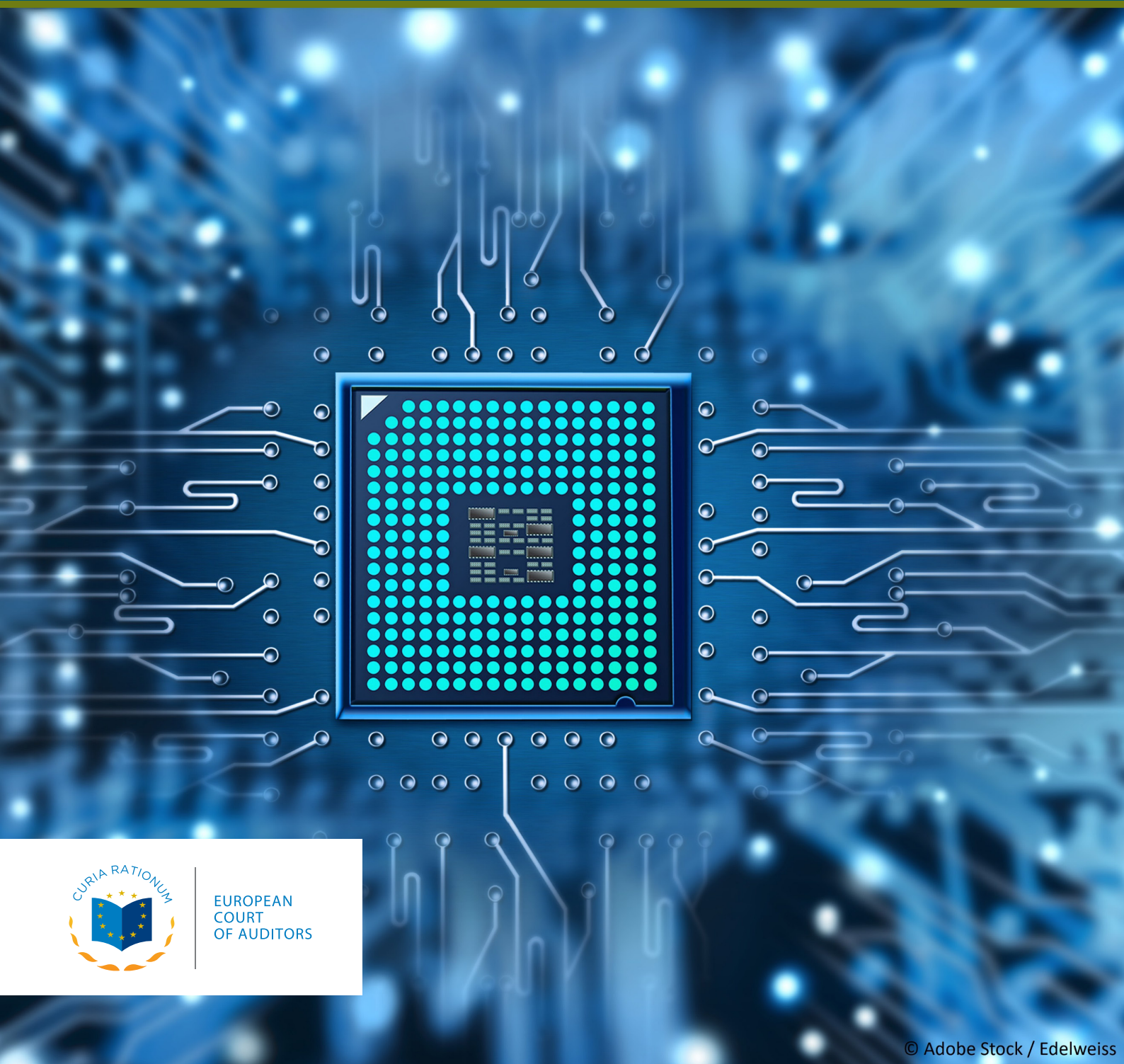
SPECIAL REPORT 12/2025 **EN**

The EU's strategy for microchips

Reasonable progress in its implementation but the Chips Act is very unlikely to be sufficient to reach the overly ambitious Digital Decade target



EUROPEAN COURT OF AUDITORS

Contents

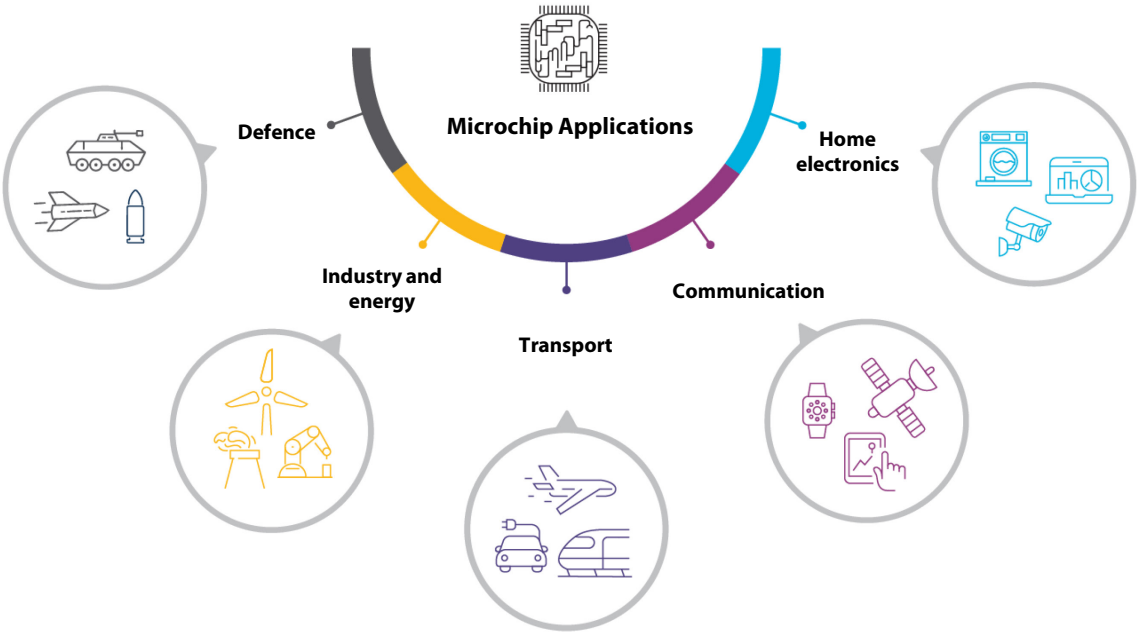
Paragraph

01 Main messages

Why this area is important

01 A microchip, or simply “chip”, is a small electronic device manufactured from semiconductor materials, commonly silicon, that contains etched or printed electronic circuits and components. Microchips are a key element of the electronics devices that feature in our daily lives, ranging from smartphones to cars, satellites and advanced military equipment (***Figure 1***). They also constitute technology essential to the green transition. Overall, the critical role of microchips makes them an essential element of any industrial policy.

Figure 1 | Microchips in our daily lives



Source: ECA.

02 Over the years, the EU's output of microchips has increased, but its share of global manufacturing capacity has decreased significantly. In 2020 the EU's share was estimated at around 9 %[1]. In 2021, with the EU's existing production sites operating at full capacity, the EU's trade deficit for microchips was almost €20 billion[2].

03 In the context of a very complex and globalised microchip value chain (***Figure 2***), total autonomy in microchip production is impossible. However, the COVID-19 pandemic highlighted dependencies of the EU in the global microchip market, and the risk it represents for EU industry. For example, in the pandemic's wake, the shortage of microchips for German carmakers caused car production to collapse to 1975 levels. This resulted in a recognition of the importance of security of supply (either manufactured within the EU or by reliable partners) in order to reduce dependency, and the need for an updated strategy on the EU's role in the global microchip market.

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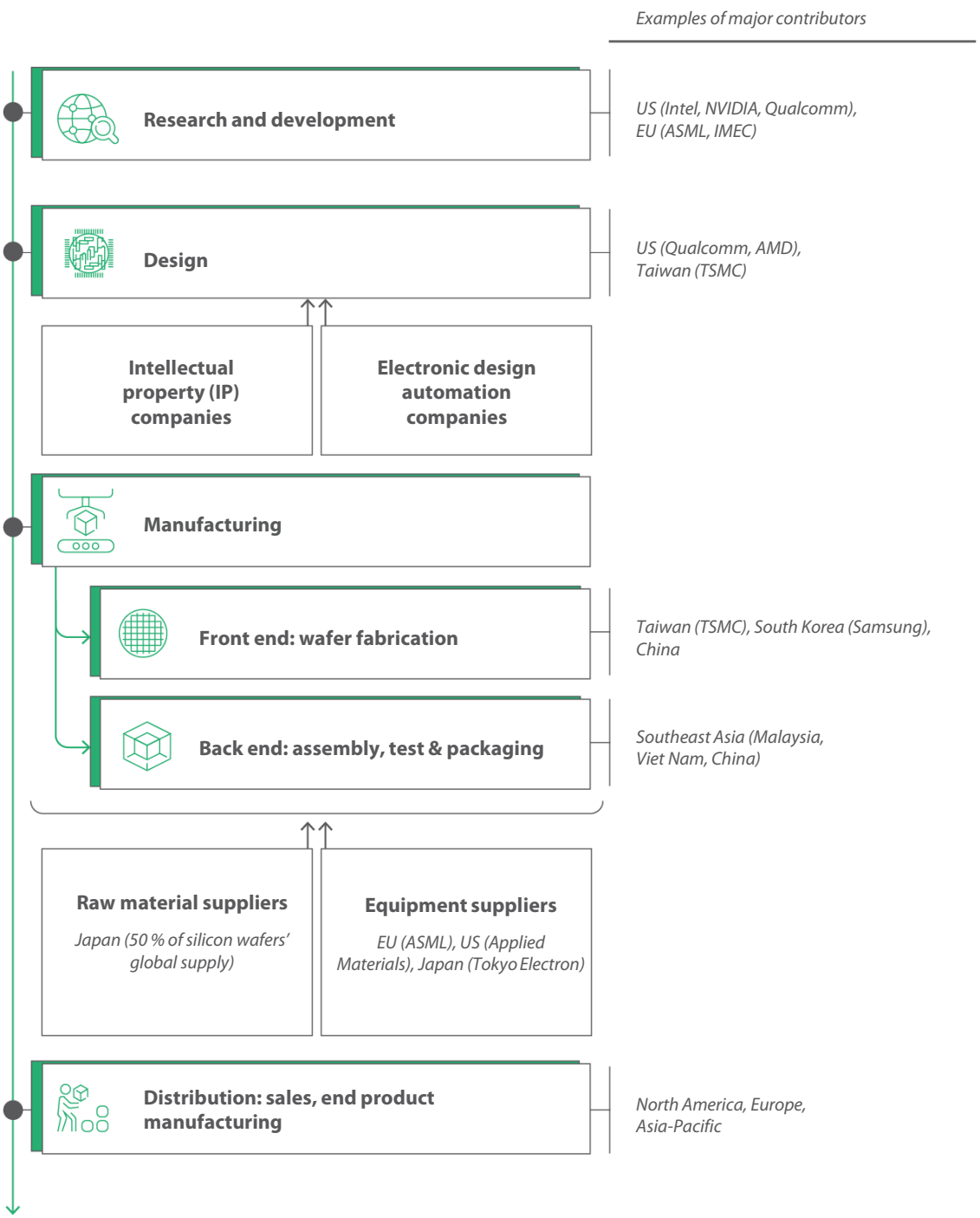
1 Semiconductor Industry Association: Government Incentives and US Competitiveness in Semiconductor Manufacturing, 2020, p. 7 (exhibit 2).

2 Commission staff working document: A Chips Act for Europe, SWD(2022) 147, p. 57.

Figure 2 | Illustration of the complexity in the microchip value chain



Source: ECA, based on publicly available information.

04 As an element of the EU's industrial policy, the EU Chips Act package[3] (hereafter referred to as the Chips Act) was introduced in February 2022 to respond to the global supply chain disruptions provoked by the COVID-19 pandemic, which also affected Europe. The aim of

[3] COM(2022) 45, COM(2022) 46, COM(2022) 47, C/2022/782.

the Chips Act was to confront microchip shortages and strengthen EU's technological leadership. The Chips Act regulation entered into force in September 2023.

05 A range of public and private potential funding streams were identified for the microchip sector, with a minimum of €43 billion in policy-driven investments matched by a commensurate amount of private investment funding announced under the Chips Act. The total can be estimated as at least €86 billion. Member states and industry stakeholders are expected to contribute substantial resources for the implementation of the Chips Act. The Commission adopted the EU's Digital Decade target of 20 % by value of world production in cutting-edge and sustainable microchips by 2030, as the overarching objective of the Chips Act.

06 The objective of our audit was to examine how EU industrial policy supported strengthening the strategic autonomy of the EU microchip industry. We assessed the Chips Act's design against the outcomes of the 2013 Strategy on the micro- and nano-electronic sectors, the alignment of funding with the EU's strategic objectives, the timeliness and progress of the Chips Act implementation and reaching its overall objective, and other factors and risks affecting its success. This audit aims to contribute to crucial debates on the EU's strategic autonomy and industrial policy, complementing our previous work as set out in our special reports on circular economy, batteries, and hydrogen. For more background information, and details on the audit scope and approach, see ***Annex I*** and ***Annex II***.

What we found and recommend

07 Overall, we conclude that the Commission's current strategy (the "Chips Act") provided new impetus for action in the area. The Commission has already made reasonable progress in implementing its strategy, especially with regard to Pillar I, but we found weaknesses in its preparation, implementation and monitoring. Given the current level of investment in manufacturing capacity, the strategy is very unlikely to be sufficient to achieve by 2030 the very ambitious Digital Decade target of a 20 % EU share in the global market value chain by revenue. It is currently predicted that its share will be only 11.7 % by 2030. This target may also be considered overly ambitious for the Chips Act given the Commission's limited mandate and resources and the success of the strategy being largely reliant on member states' actions, investments of the private sector, and other crucial factors, such as the cost of energy.

The Chips Act provided new impetus, although without an impact assessment and clearly defined targets

08 The Chips Act package of 2022 was preceded by a 2013 Strategy that aimed to strengthen the micro- and nano-electronic sectors. While the EU's microchip capacity increased substantially as of 2013, it did not keep pace with global growth meaning the EU's share of the global market declined. The Chips Act picked up where the 2013 Strategy had left off, and responded to the microchip shortage crisis with a set of new actions. These included: reinforcement of technological and innovation capabilities and addressing gaps in the ecosystem (Pillar I); the principles to assess state aid support to investments in innovative "first-of-a-kind" (FOAK) production facilities (Pillar II); monitoring and response mechanisms to anticipate and react to crises (Pillar III) (paragraphs ***17***-***23***).

09 However, the Chips Act was prepared in urgency, meaning the procedures usually applied when preparing legislation were not followed, such as evaluation of previous strategies, and an impact analysis of the proposal. Not fully analysing why the 2013 Strategy fell short of its goals and the resultant failure to draw lessons from the experience could mean that the Chips Act is susceptible to precisely the same problems. We found that the Chips Act lacks clarity regarding its targets and monitoring. In the absence of a full impact assessment, it is difficult to judge whether the Chips Act gives sufficient consideration to industry's needs in mainstream microchips (paragraphs ***24***-***34***).

The Commission is responsible for only a small part of the Chips Act funding announced, nevertheless the publicly funded projects we examined were aligned overall with the EU's strategic objectives

10 Investment decisions in the microchip industry are predominantly driven by private sector companies. In the context of the 2013 Strategy and subsequently the Chips Act, a range of different public and private potential funding streams were identified for the microchip sector. The Chips Act announced a total investment of at least €43 billion, with expected further private investment of a similar amount. However, the majority of these funds consist of the industry's own resources or member state budgets, with the Commission being responsible for just a small part (approximately 10 % of public funding) of the total. The Commission has no mandate to coordinate national investments at EU level in order to align them with the Chips Act objectives. Overall, the Commission has only partial information on the total funding provided to, and used by, the industry, which reduces its ability to monitor progress and identify gaps and overlaps (paragraphs ***36***-***45***).

11 While we found that the projects receiving co-funding directly from the Commission, or via the Chips Joint Undertaking (JU) (and its predecessors the Electronic Components and Systems for European Leadership (ECSEL) and the Key Digital Technologies (KDT) joint

undertakings), were generally well-aligned with the goals of the respective strategies, the arrangements in place to measure their effect were incomplete. The Commission also has incomplete information on the state aid investments' contribution towards achieving the strategy's objectives (paragraphs ***46***-***66***).

Implementation of the Chips Act is progressing, but too slow to meet the Digital Decade 20 % target

12 We found that the timeline for implementing the Chips Act's three pillars is unclear, and their implementation is very unlikely to be sufficient to achieve the overarching objective. Pillar I is progressing well but suffering some delays. The uptake of FOAK investments under Pillar II is slow and unlikely to be sufficient for the overall digital target of 20 % to be met by 2030. Lastly, the coordination and crisis-monitoring mechanisms, which were expected to be available in the short term under Pillar III, are still in the very early stages (paragraphs ***67***-***87***).

The Chips Act is likely to be insufficient to stimulate the level of investment needed, with success also depending on global competition and other crucial factors

13 Achievement of the Chips Act objectives does not depend solely on EU action, but is also determined by the level of private sector investment, the EU business competitiveness compared with competing global regions, and other crucial factors. The funding associated with the Chips Act may not be sufficient to support and stimulate the investment the industry needs to increase the EU's share, and so meet the objective of 20 % of global output. Indeed, the Commission's own forecast published in July 2024 predicts a slightly increasing market share to only 11.7 %. We also note that the industry is characterised by a relatively small number of large enterprises undertaking high value projects, meaning that funding is similarly concentrated. As such, the cancellation, delay or failure of an individual project can have a significant overall impact (paragraphs ***89***-***95***).

14 Finally, as the semiconductor industry is global, the EU faces intense international competition, as well as other challenges. Countries around the world have their own strategies for attracting investment, increasing their market share and strengthening the security of their supply. There are also other factors, which also depends on coordination between the EU and member states, impacting the EU's competitiveness and the objectives of the Chips Act, such as export controls, access to the necessary raw materials, the cost of energy and environmental requirements (paragraphs ***96***-***113***).

What we recommend

Recommendation 1

Carry out an urgent reality check on the strategy and take the necessary short-term corrective actions

The Commission should, in close cooperation with both the member states and the industry:

- urgently carry out a reality check on the Chips Act to assess whether the ambitions and targets that it contributes to remain realistic in view of the resources available to achieve them, global competition, as well as other crucial factors, such as energy cost and dependence on raw materials;
- where applicable, take appropriate short-term corrective action needed to help achieve the strategic objectives;
- introduce systematic monitoring to identify as early as possible any impediments to achieving the objectives of the current (and any future) microchip strategy, as well as mechanisms for prompt remedial action.

Target implementation date: 2025

Recommendation 2

Start preparing the next semiconductor strategy

The Commission should, in close cooperation with both member states and the industry, start preparing the next semiconductor strategy. This strategy should:

- build on the result of the above review and the successes and failures of the previous strategies;
- set clear, timebound and realistic objectives taking into account the state of play of the EU's microchip sector, EU industry's short- and long-term needs, global competition, and other crucial factors, such as energy cost and raw material supply;
- propose appropriate actions and funding, including if deemed necessary proposals to adapt the legal framework;
- include a coordinated approach at EU level, including interactions with competing economies on a global scale.

Target implementation date: 2026

02

A closer look at our observations

The Chips Act provided new impetus, although without an impact assessment and clearly defined targets

15 In the wake of the global semiconductor supply shortages following the COVID-19 pandemic, in February 2022 the Commission presented a strategic package for the EU's semiconductor ecosystem (hereafter referred to as the Chips Act), which was followed by adoption of the 2023 Chips Act regulation. This new strategy is the successor to the 2013 Strategy for the micro- and nano-electronic industries in the EU (***Annex II***).

16 We assessed how well the Commission designed the actions under the Chips Act, and notably if it took into account the strengths and shortcomings of the implementation of the 2013 Strategy and satisfactorily addressed industry needs.

The Chips Act provided new momentum after the 2013 Strategy had failed to meet its main objective

The 2013 strategy did not achieve its objective of reversing the decline of the EU market share

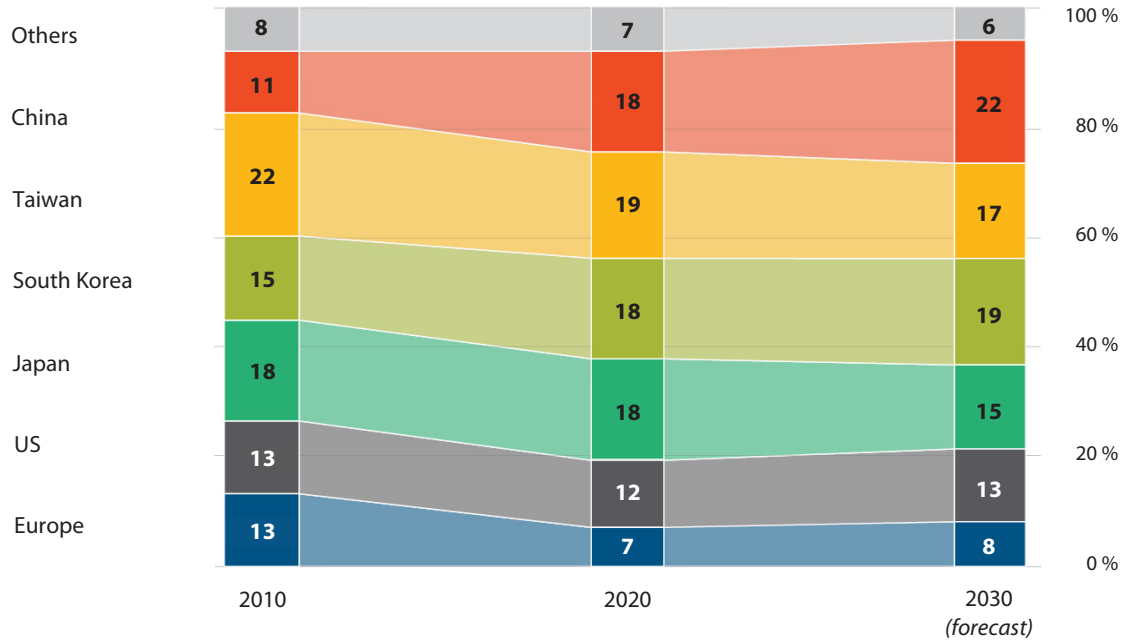
17 The Commission's 2013 Strategy for strengthening the EU's micro- and nano-electronic sectors, aimed to reverse the decline in the EU's share of the global supply, and reach a level of production closer to the EU's share of world gross domestic product within a decade. This would have required doubling the economic value of semiconductor-component production in Europe by 2020 to 2025. The Strategy also aimed

to build on and reinforce the EU's leading technology clusters by supporting EU industrial and technology presences across the full value chain, and to mobilise resources at regional, national and EU levels to stimulate the renewal and growth of EU manufacturing capabilities and ensure the uptake of electronics in all industrial sectors. It also sought better integration of small and medium-sized enterprises (SMEs) in the value chains.

18 In line with the strategy, an industry-led Electronic Leaders Group (ELG) was set up to develop and help implement a roadmap to operationalise the 2013 Strategy. The group prepared an implementation plan with actions to be taken up to 2020.

19 In 2013, the EU's world share of microchip production was approximately 10 %. Over the decade from 2012 to 2022, European semiconductor capacity increased substantially (by 63 %). This was nevertheless insufficient to prevent a decline in the EU's relative share of as global production (***Figure 3***).

Figure 3 | Share of global chip capacity by region in 2010-2030

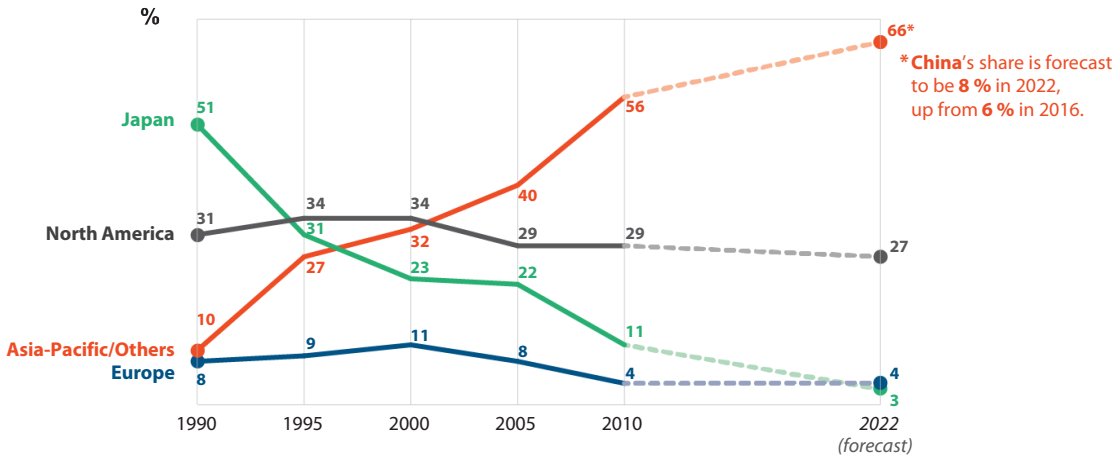


Note: All values shown in 200 mm wafer size equivalents; the chart excludes capacity below 5000 wafer starts per month or less than 200 mm. This reflects the modern semiconductor manufacturing facilities capacity, where wafer diameter is greater than or equal to 200 mm.

Source: ECA based on BCG and SIA study "Emerging resilience in the semiconductor supply chain", 2024.

20 Investment in the EU's semiconductor sector also declined as a proportion of the global total, as was the case with all other competing regions and countries excluding Asia-Pacific. For example, the EU share of global capital expenditure fell from around 10 % in 2000 to 4 % in 2010, and had not improved by the end of that decade (***Figure 4***).

Figure 4 | Shifts in share of capital expenditure related to semiconductors by company headquarters location in 1990-2022



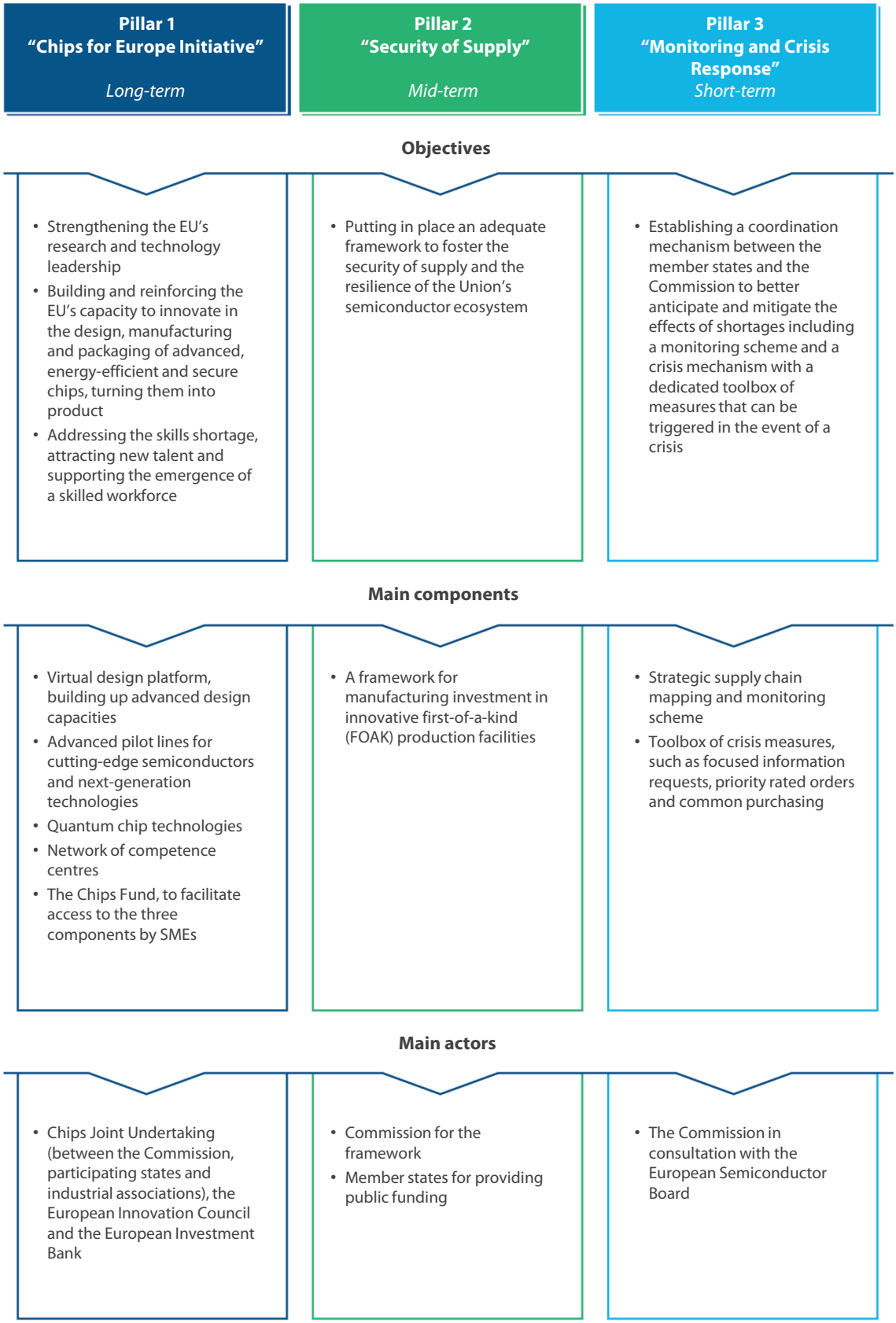
Source: Commission, SWD (2022) 147, p. 74 based on Techinsights (IC Insights) data.

The Chips Act provided new strategic impetus

21 The worldwide shortage of microchips in the context of the pandemic crisis was a reminder of the critical role of semiconductors for the economy. The Chips Act was the EU's response to this shortage, after the 2013 Strategy had failed to increase the EU's share of production of microchips. It comprised one of the Commission's initiatives supporting the 2021 EU Industrial Strategy.

22 The Chips Act provided new momentum, including a focus on increasing manufacturing capacity. It introduced new objectives and actions grouped under three pillars (***Figure 5***).

Figure 5 | The three pillars of the Chips Act



Source: ECA based on the Chips Act and SWD(2022) 147 A Chips Act for Europe.

23 The main changes in the Chips Act compared to the previous strategy were:

- while the 2013 Strategy built mainly on existing strengths, the aim of **Pillar I** was to tackle gaps in the ecosystem by focusing on transferring theoretical knowledge gained at the research stage to the fabrication of the commercial products, on primary new pilot lines;
- **Pillar II** clarifies the principles for assessing state aid for investments in innovative FOAK production facilities;
- the **Pillar III** coordination mechanism for anticipating and reacting to crises had not existed in the 2013 Strategy and was entirely new.

The Chips Act was drawn up with urgency, resulting in several gaps

The Commission did not build the Chips Act on a full evaluation and impact assessment

24 The Chips Act was produced as a matter of urgency, partly in response to post-COVID-19 pandemic shortages. The Commission acknowledged some of the lessons learned from the 2013 Strategy, including the fact that insufficient focus had been placed on manufacturing capacity, but did not conduct a full evaluation of the 2013 Strategy's impact. Furthermore, applying the derogation set out in the Better Regulation guidelines, the Commission did not carry out either a full impact assessment or a public consultation on the proposed Chips Act.

25 Instead, the Commission published a staff working document SWD(2022) 147 in 2022, after the Chips Act package had been issued. This summarised the current industry status, and set out the overarching objective of the Chips Act and relevant budgetary information. The document identified existing weaknesses, such as the industry's short-term focus, the insufficient attention paid to microchip design, lack of a monitoring framework, and low political momentum. However, it lacked an analysis of any trade-offs involved, and possible alternative actions and their potential impact. The SWD did not explain how the new strategy set out in the Chips Act addressed the 2013 Strategy's market-growth failure, or how new actions might rectify this. Consequently, the Chips Act could be susceptible to precisely the same problems.

26 The Commission's justification for not conducting a full impact assessment was the urgency of the situation due to the crisis. However, we note that many of the 2013 Strategy actions had been oriented towards 2020, hence the work on an updated strategy was long overdue.

The Chips Act actions lack clarity on timetables and monitoring

27 The Chips Act does not include measurable targets for any of the strategy's pillars:

- For **Pillar I**, the regulation provides for the monitoring of nine key performance indicators (KPIs), such as the number of legal entities involved in the actions supported by the initiative, and the number of active competence centres in the EU. However, no target values were specified for these KPIs.
- For **Pillar II**, the Commission's goal was to define the assessment principles for FOAKs, but it did not establish any measurable KPIs or additional operational targets for FOAK uptake.
- Similarly, **Pillar III** lacks a clear timetable with milestones.

28 In the absence of measurable Pillar II uptake targets, the SWD indicated that the 2030 Digital Decade[4] objective of delivering 20 % by value of the world's cutting-edge and sustainable microchip production would be used to measure the strategy's success. Achieving this would require the EU's production capacity to be approximately quadrupled by 2030, which is extremely ambitious. We have also identified problems with the application of the 20 % target (***Box 1***).

[4] COM(2021) 118.

Box 1

Problems with applying the 20 % target to the Chips Act

The Digital Compass defines cutting-edge and sustainable microchips as those below 5 nanometres (nm), and those 10 times more energy efficient, compared to 2021 standards respectively.

When setting the Digital Decade target of doubling EU global share of cutting-edge and sustainable microchip production by 2030, the Commission estimated a baseline of 10 % in 2020. However, this baseline was not consistent with the target it set as it referred to the revenues of EU-headquartered companies across the value chain, rather than statistics on cutting-edge microchip production in the EU. As far as the production of cutting-edge microchips is concerned, we note that in 2020 the only two companies manufacturing microchips at 5 nm were located in Taiwan and South Korea, while the EU did not have any manufacturing capabilities below 22 nm.

During our audit, the members state authorities we interviewed expressed the view that the Commission did not clarify how the EU target was to be incorporated into national targets.

Chipmakers and member state authorities view the 20 % target as a goal to be aspired to rather than something they will realistically achieve.

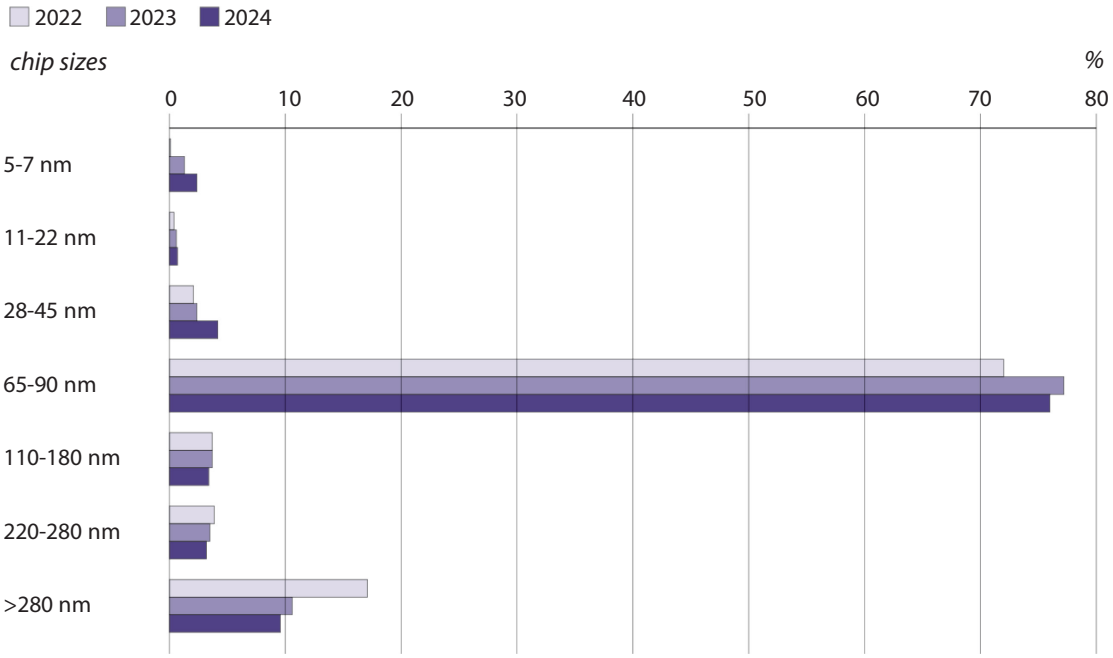
29 Under the 2030 Digital Decade Policy Programme, member states must submit roadmaps outlining policies and actions for achieving digital targets, including key investments in manufacturing capacity supporting the 20 % target. However, the roadmaps of the member states visited did not provide any information on their national contribution to the 20 % target. Moreover, none of the member states in question had drawn up strategic documents setting out their plans for increasing cutting-edge microchip manufacturing.

European industry's current demand may not be sufficiently considered in the Chips Act

30 Pillars I and II of the Chips Act focus on mid- to long-term objectives. Pillar I mainly targets state-of-the-art technologies, including cutting-edge microchips of smaller sizes. Pillar II also provides guidance to companies on applying for state aid for facilities that manufacture mainstream microchips, as long they involve an innovative element (e.g. better energy performance, novel manufacturing process, etc.). While the Commission expected progress in certain deliverables to be made by 2023 to 2025 (e.g. pilot lines, competence centres and first FOAKs), the impact of many projects and initiatives will only become apparent in the longer term.

31 However, the main EU supply problems during the COVID-19 pandemic were not due to a shortage of cutting-edge microchips[5]. According to industry expectations at that time, demand for such microchips in the short- to mid-term was likely to be low, with the bulk of the market being in 65-90 nm microchips (***Figure 6***). This was confirmed by our interviews with national authorities and chipmakers.

Figure 6 | Projected aggregated demand of EU companies surveyed by size of microchip between 2022 and 2024



Source: European Chips Survey Report (43 respondents), by DG GROW and JRC, July 2022.

32 European demand for mainstream microchips is currently growing more quickly than EU-based chipmakers can supply them. The Joint Research Centre (JRC) highlighted a €6 billion trade deficit in both advanced and less advanced microchips[6], with over 30 % of EU imports of mainstream microchips being sourced from China. As this type of microchip is needed for technology associated with the green transition, this trade deficit is likely to increase in the future.

33 Furthermore, we note that mainstream microchips are still considered relevant also outside the EU. For example, China recently sought to boost its domestic production of less advanced microchips[7]. The Joint Statement of EU-US Trade and Technology Council of

[5] SWD(2022) 147, pp. 16-17.

[6] "Semiconductors in the EU", Publications Office of the European Union JRC133850, 2023, p. 16.

[7] "Mapping China's semiconductor ecosystem in global context: Strategic dimensions and conclusions", Stiftung Neue Verantwortung | Merics (2021), p. 37.

4-5 April 2024 expressed “shared concerns about non-market economic policies and practices that may lead to distortionary effects or excessive dependencies for mainstream semiconductors”.

34 In the absence of a full impact assessment (paragraph *24*), it is difficult to judge whether the Chips Act gives sufficient consideration to industry’s needs in mainstream microchips.

The Commission is responsible for only a small part of the Chips Act funding announced, nevertheless the publicly funded projects we examined were aligned overall with the EU’s strategic objectives

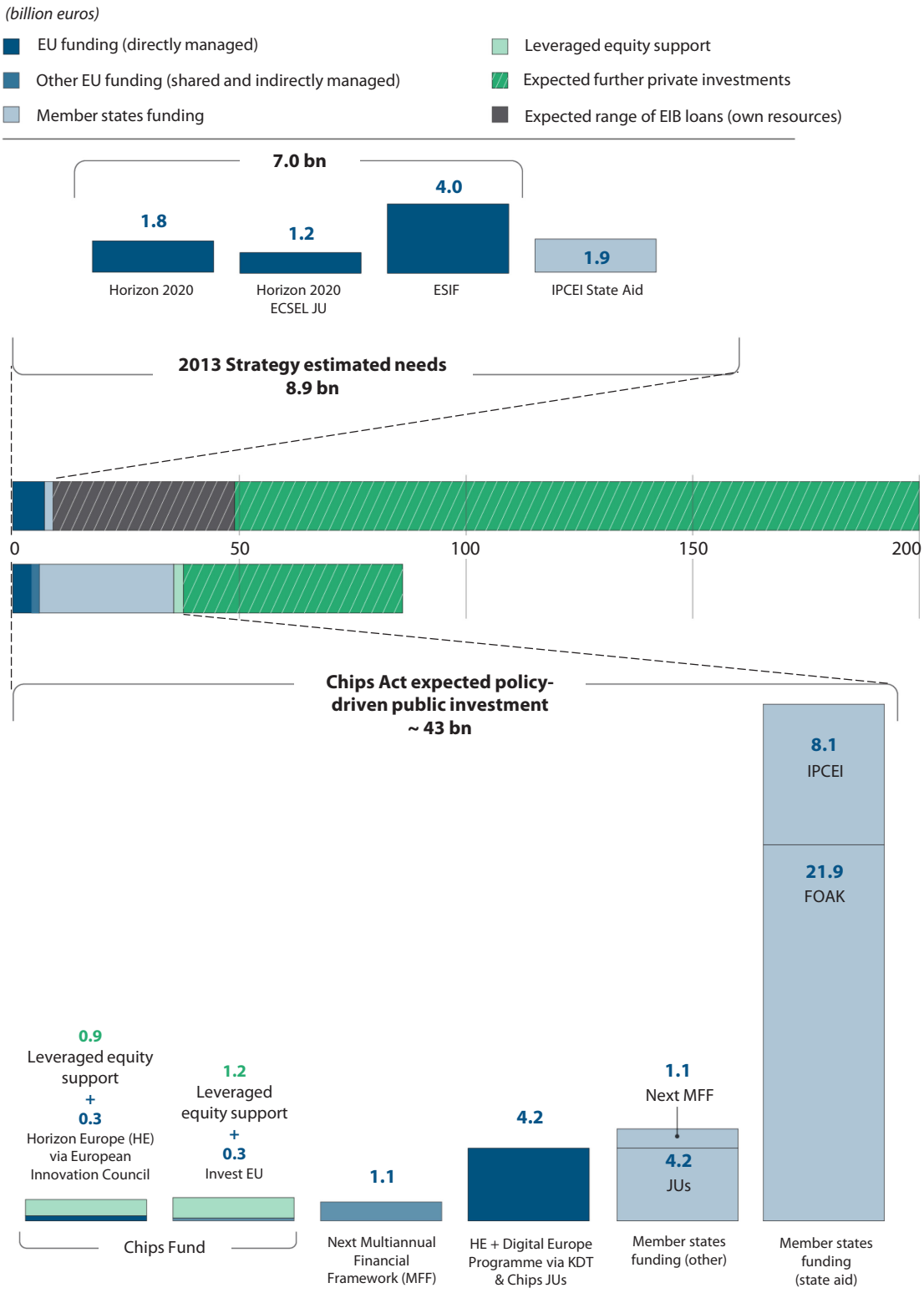
35 In a context where investment decisions in the microchip industry are predominantly driven by private sector companies, we analysed the EU and other public funding streams in support of the consecutive EU strategies for microchips over the 2014-2020 and 2021-2027 periods. We also assessed whether the calls and projects we audited were aligned with the strategic objectives. In the case of the 2014-2020 projects, we audited whether they achieved their intended results.

Information on expected total funding is incomplete, as the Commission is responsible for only a small part of it

36 Financial support for semiconductor projects is provided through multiple EU funding streams such as the Horizon framework programmes, European Structural and Investment Funds (ESIF), the European Fund for Strategic Investments (EFSI) and InvestEU. The European Investment Bank (EIB) also provides financing to the sector. This funding complements national public financing (e.g. grants, state aid and tax incentives). The Recovery and Resilience Facility (RRF) may also provide financing to the semiconductor industry over the 2021-2027 period.

37 However, the information available does not allow a direct comparison of the funding available under the two consecutive strategies, and given the fact that investments mostly depend on investors’ decisions and the willingness of member states to support them, the Commission does not have a complete picture of the situation (paragraph *39*). ***Figure 7*** illustrates the main funding streams under the two EU strategies.

Figure 7 | The main funding streams for the EU semiconductor strategies in 2014-2020 and 2021-2027



Source: ECA analysis of the 2013 Strategy, ELG roadmap and implementation plan, Chips Act and SWD, as well as Commission data.

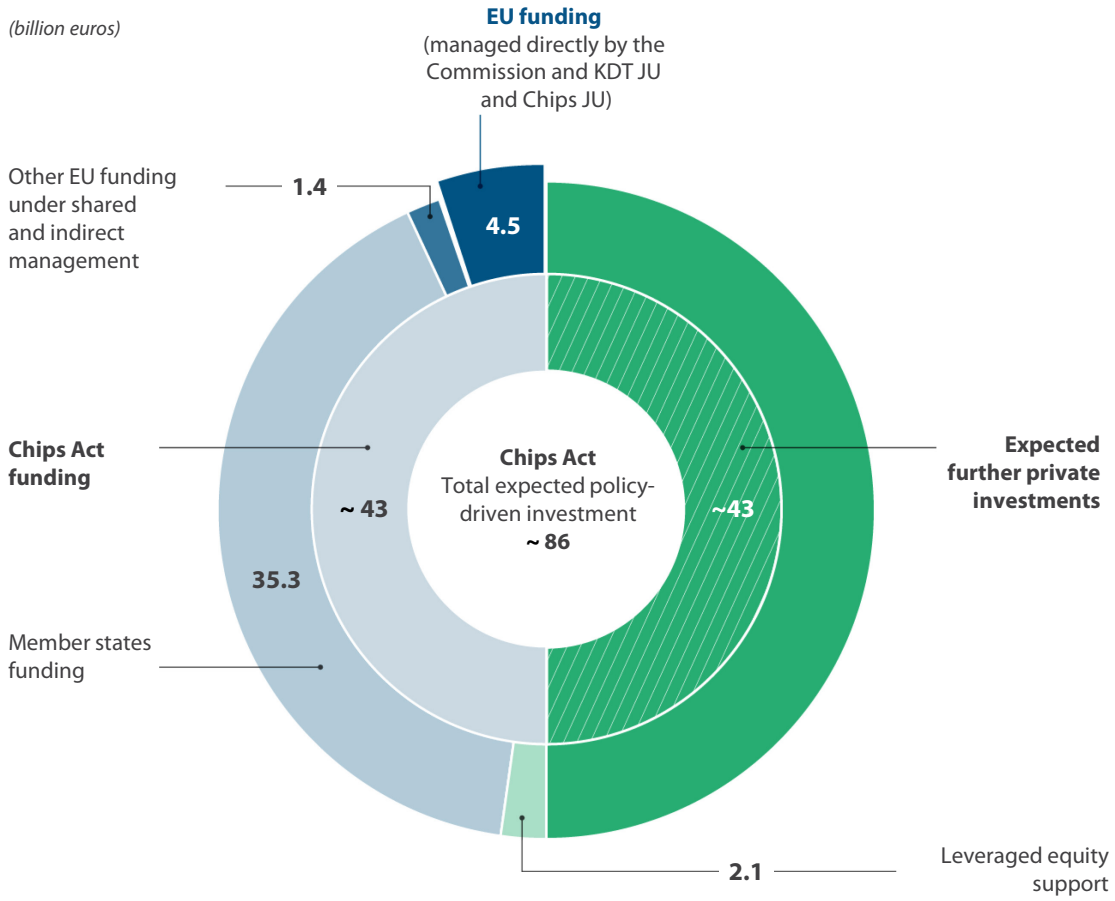
38 The **2013 Strategy** did not provide an estimate of the total investment needed. The ELG Roadmap estimated that a total public investment of €50-60 billion was required to stimulate a total investment of more than €200 billion[8]. The EU budget and national funds represented only a small proportion (€8.9 billion) of the public investment, with most of the rest being expected to come from EIB loans (ranging from €10 to €40 billion). However, the ELG Roadmap took no account of either of the other existing sources of funding, such as the member states' co-funding of EU grants, or national contributions in the form of state aid.

39 The strategic package for the **Chips Act** was more specific, announcing a minimum of €43 billion in policy-driven investments up to 2030, which were expected to be matched by a commensurate amount of private investment. This could mean total expected investment funding of at least €86 billion. This is still much smaller than the needs estimated in the ELG Roadmap for the 2013 Strategy, but the corresponding funding streams are better identified. However, the estimate, does not include certain EU funds considered in the roadmap for the 2013 Strategy (e.g. ESIFs), or RRF funds, or EIB financing (€2 billion between 2021 and 2023) to the sector.

40 Overall, the Commission is only responsible – directly or through the Chips JU – for a very small part of the €86 billion Chips Act estimated funding, i.e. mainly the Horizon Europe and Digital Europe Programme funds, totalling around €4.5 billion. The remainder is mostly under the responsibility of member states and private companies (***Figure 8***). While the Commission approves state aid for Pillar II investments, it has no mandate to coordinate such investments at EU level in terms of aligning them with the Chips Act objectives.

[8] A European Industry Strategic Roadmap for Micro- and Nano-Electronic Components and Systems – Implementation Plan, ELG 2014, pp. 11-13, 19.

Figure 8 | Chips Act expected funding per type of origin (EU, public, private) in 2021-2027



Source: ECA, based on information provided by the Commission, the Chips Act package and SWD(2022) 147.

41 For example, the most material part of the expected public funding covers expansion of manufacturing capacity through FOAKs. The €21.9 billion depend on member states and private investors. Similarly, the 2023 Projects of Common European Interest (IPCEI) initiative, accounting for €8.1 billion of the Chips Act expected funding, also ultimately depends on member state and private sector investments.

The Commission's information on the funding disbursed is incomplete

42 In the context of the EU's industrial policy for microchips, the Commission's information on the EU funding disbursed to the sector was limited to a subset of projects to which it had given grants either directly (Horizon 2020 and Horizon Europe) or via joint undertakings (Chips JU and its predecessors ECSEL JU and KDT JU), and which were specifically designed to contribute to the strategies' objectives, i.e.:

- over the 2014-2020 period, 102 projects totalling €0.5 billion (out of a €1.8 billion budget related to Horizon 2020, ***Figure 7***) managed directly by the Commission, and 91 projects implemented by the ECSEL JU that took up its budget of €1.2 billion;

- over the 2021-2027 period, 30 Horizon Europe projects valued at €342 million for implementation by the KDT JU, and nine subsequent calls launched by the Chips JU that were still underway in 2024, with an allocation of €2.3 billion (both out of a total JU budget of € 4.2 billion). During the audit, the Commission also provided us with a non-exhaustive list of 26 other Horizon Europe projects totalling €115 million whose objectives aligned with the Chips Act, even though it became operational later.

43 The Commission had no information on the funding contributing to the semiconductor strategies that was disbursed under the ESIF, EFSI, and RRF for either the 2014-2020 or the 2021-2027 periods. Nor did it have information on related EIB financing disbursed.

44 Similarly, in the case of state aid streams in the context of the EU's industrial policy for microchips, the Commission did not use information on the actual amounts disbursed at national level under either the 2018 or the 2023 IPCEI for monitoring purposes, and had no such information at project level. With regard to ad hoc state aid under the 2013 Strategy (i.e. aid not based on a scheme already approved), the Commission did not monitor its contribution to the Strategy but did provide us with the details of three decisions approving €0.5 billion of state aid that it considered relevant to the audit. In addition, our search in the Commission's databases in connection with the 10 semiconductor companies we selected for audit revealed over 400 state aid grants awarded up to January 2022 amounting to €1.6 billion, 83 % of which was provided by France and Germany.

45 Despite the importance of the FOAK investments, the Commission, with regard to the Chips Act, monitors expected investments, including state aid, on the basis of information such as press releases, negotiations underway, and notifications from national authorities. The Commission identified 29 potential investments in production capacity or ones that were already underway. The list included 13 expected FOAK projects (four approved and nine planned), involving €26 billion of state aid and an expected €60 billion of private investment.

The Commission funds projects that are generally aligned with the strategies but has incomplete insight into their actual contribution

EU funds under the Commission's direct management are likely to have positive effects, although these are not quantified

46 **With regard to the 2014-2020 period**, we examined the Horizon 2020 work programmes under which the 102 projects identified by the Commission (paragraph ***42***) were funded. We found that the relevant objectives were aligned to the 2013 Strategy. However, a 2023 evaluation study[9] contracted by the Commission to evaluate Horizon 2020 highlighted research gaps in certain levels of technology readiness for deployment.

47 The Commission could not provide any quantification of contributions in relation to the strategic objectives at project level. The objectives of the Horizon 2020 project we examined (***Annex III***, project 1) were incidentally aligned with the 2013 Strategy's goals.

48 **As for the 2021-2027 period**, we examined the three calls under which the 26 Horizon Europe projects under way were selected (paragraph ***42***), and confirmed that they focused on research relevant to semiconductors and Pillar I. We also noted that they could contribute to closing the research gap referred to in paragraph ***46***.

49 We also identified and examined a Horizon Europe project (***Annex III***, project 2) that was not included in the list of 26 other Horizon Europe projects provided by the Commission (paragraph ***42***). Its objectives were aligned with the Pillar I objective of increasing the EU research and technology leadership. At the time of our audit the project was at the early implementation stage, so it was too early to assess its potential effects.

There is increased focus on the EU strategic objectives applicable to projects implemented by JUs, though the extent of their contribution is unclear

50 Part of the Horizon 2020 and Horizon Europe funding for research and development is also implemented by JUs (depending on the period: the Chips JU or its predecessors ECSEL JU and KDT JU).

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[9] "Evaluation Study on the European Framework Programmes for Research and Innovation for Addressing Global Challenges and Industrial Competitiveness – Focus on Activities for the Digital and Industrial Transition. Phase 1 Final report – Horizon 2020", Commission, April 2023, p. 68.

51 **In the 2014-2020 period**, the 2023 evaluation study generally noted that the ECSEL JU boosted research and innovation in electronic components. It did not, however, focus on projects that maximise contribution to the EU long-term objectives and challenges, since the research was driven by the short-term priorities of the industry and participating member states. Moreover, the Commission had no clear information on how many of the 91 ECSEL JU projects (paragraph ***42***) contributed directly to the 2013 Strategy objectives.

52 The three completed ECSEL JU projects we examined (***Annex III***, projects 4, 5 and 6) were aligned with the 2013 Strategy objectives. One project contributed to increasing capacity to produce less-advanced microchips. The other two delivered on research into cutting-edge microchip manufacturing. We note that, as the equipment developed under these two projects is currently used primarily outside the EU, their effects contribute to non-EU microchip production.

53 **With regard to the 2021-2027 period**, the KDT JU introduced in its work programmes specific focus topics to target certain technology areas considered more strategic in the long term. However, only a small number of the KDT JU's 2021-2022 activities (eight projects out of a total of 30, representing 23 % of the total funding allocation) contributed to the objectives by design (paragraph ***42***). The Commission did not monitor how many of the remaining 22 KDT JU projects contributed directly to the Chips Act objectives.

54 During our audit we examined a KDT JU project (project 3 in ***Annex III***) under which the Commission finances the EUROPRACTICE platform. The project's objectives are relevant and contribute to the research objectives of the Chips Act. While the project was still underway, some of the KPIs reported indicated that the content and level of use of the platform's services were below target at the time of our audit.

55 Since 2023, the Chips JU (which replaced the KDT JU), has managed the implementation of Pillar I. We found that the design of the nine calls and two underlying work programmes, launched at the time of the audit, support directly all components of Pillar I (virtual design platform, pilot lines and competence centres). As the calls were under way, we could not assess their contribution to the Chips Act objectives.

State aid is expected to play a significant role in increasing manufacturing capacity, but the Commission does not have information on how much it contributes to EU objectives

IPCEI state aid supports to manufacturing capacity goals

56 The first IPCEI for microelectronics (IPCEI 2018) was joined by Austria, France, Germany, Italy, and United Kingdom. It focused on power semiconductors, energy-efficient microchips, sensors, advanced optical equipment and compound materials. The Commission approved **€1.9 billion** of state aid to 32 companies, supporting an expected €6.5 billion of private funding. About €5.8 billion out of a total cost of €8.7 billion related to first industrial deployment (FID) activities[10]. According to the member states[11], FID in this IPCEI should allow for the development of highly innovative products and/or deployment of new production processes and to bring them to the market.

57 Our analysis confirmed that the objectives of the 2018 IPCEI decision were aligned with those of the 2013 Strategy. The participants we interviewed acknowledged the IPCEI's role in supporting the EU's strategic goals and stabilising its semiconductor industry. The objectives of the two IPCEI 2018 projects we examined (***Annex III***, projects 7 and 8) were aligned with those of the decision. They contributed to new fabrication facilities, with pilot lines later upgraded for microchip mass production, thereby supporting the EU goal of expanding manufacturing capability.

58 However, we noted that the Commission did not evaluate the contribution of the 2018 IPCEI to the 2013 Strategy. Moreover, neither the IPCEI decision nor the annual reporting specified any relevant KPIs.

59 The stakeholders we interviewed identified timing and coordination problems. The stakeholders mentioned the protracted approval time, which compares unfavourably with the pace of technological change in the industry. Similar issues were noted in an evaluation[12] carried out on behalf of the German authorities (for example project approval time of four years). It also brought up legal matters within member states that delay individual activities (including the FID), and limited coordination between the Commission and member states with regard to reporting requirements and late fund disbursement.

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[10] C(2018) 8864, Commission's IPCEI 2018 communication, 13 December 2018, p. 68.

[11] Ibid, p. 6.

[12] Evaluation of the "IPCEI on Microelectronics" funding measure – Final report, PwC June 2023.

60 The second IPCEI on microelectronics (2023 IPCEI) approved by the Commission concerned state support provided to 68 projects by 56 companies across 14 member states. At the time of our audit, some projects were still awaiting for support to be granted at national level. The state aid of €8.1 billion is expected to complement €13.7 billion in private investment, with €7.6 billion out of the total for FIDs, surpassing the previous IPCEI.

61 Overall, the design and objectives of 2023 IPCEI are aligned with the Chips Act. The companies we interviewed were positive about the role of the 2023 IPCEI in both the Chips Act and in supporting EU semiconductor manufacturing through investments in FIDs. We found that the objectives of the Dutch project in our sample aimed at contributing to the Chips JU pilot lines under Pillar I (***Annex III***, project 9). However, it was too early to determine its impact.

62 We also noted improvements in the monitoring of the 2023 IPCEI projects. The member states and companies involved introduced over 30 KPIs to measure project progress, environmental impact and spillover effects. Most of them specified EU-aggregated target values. It is nevertheless too soon to observe how they will be applied at member state and project level.

FOAKs are likely to contribute to increased manufacturing capacity, but the Commission will face challenges in obtaining information on their actual effects

63 In the case of the 2014-2020 period, the information the Commission had available was limited to three state aid decisions relevant to the semiconductor industry (paragraph ***44***). Furthermore, it did not monitor the completion and results of such projects in relation to the 2013 Strategy. At that time, the Commission's Directorate-General for Communications Networks, Content and Technology (DG CNECT), responsible for the 2013 Strategy, was not consulted on any of these decisions and had no information on their implementation. Our analysis of the projects' objectives, nonetheless, confirmed the alignment of these decisions with the 2013 Strategy.

64 As for the 2021-2027 period, technical analysis of the technology and evaluation of spillover effect have increased DG CNECT's involvement in the Commission's approval of state aid for FOAKs.

65 At the time of our audit, the Commission had approved state aid decisions, for the 2021-2027 period in respect of four FOAK investments for a total of €10.2 billion in state aid and €21 billion in private investments. The Italian project we examined (***Annex III***, project 10) provides an example of the potential contribution to the security of supply in terms of silicon carbide technology for the EU.

66 The lack of information available on implementation is similar to the previous period. There are no requirements for national authorities or beneficiaries to report the progress of projects, and their effects, to the Commission. It will therefore be challenging for the Commission to monitor and evaluate the investments' impact in relation to the Chips Act and on achieving the 20 % digital target.

Implementation of the Chips Act is progressing, but too slow to meet the Digital Decade 20 % target

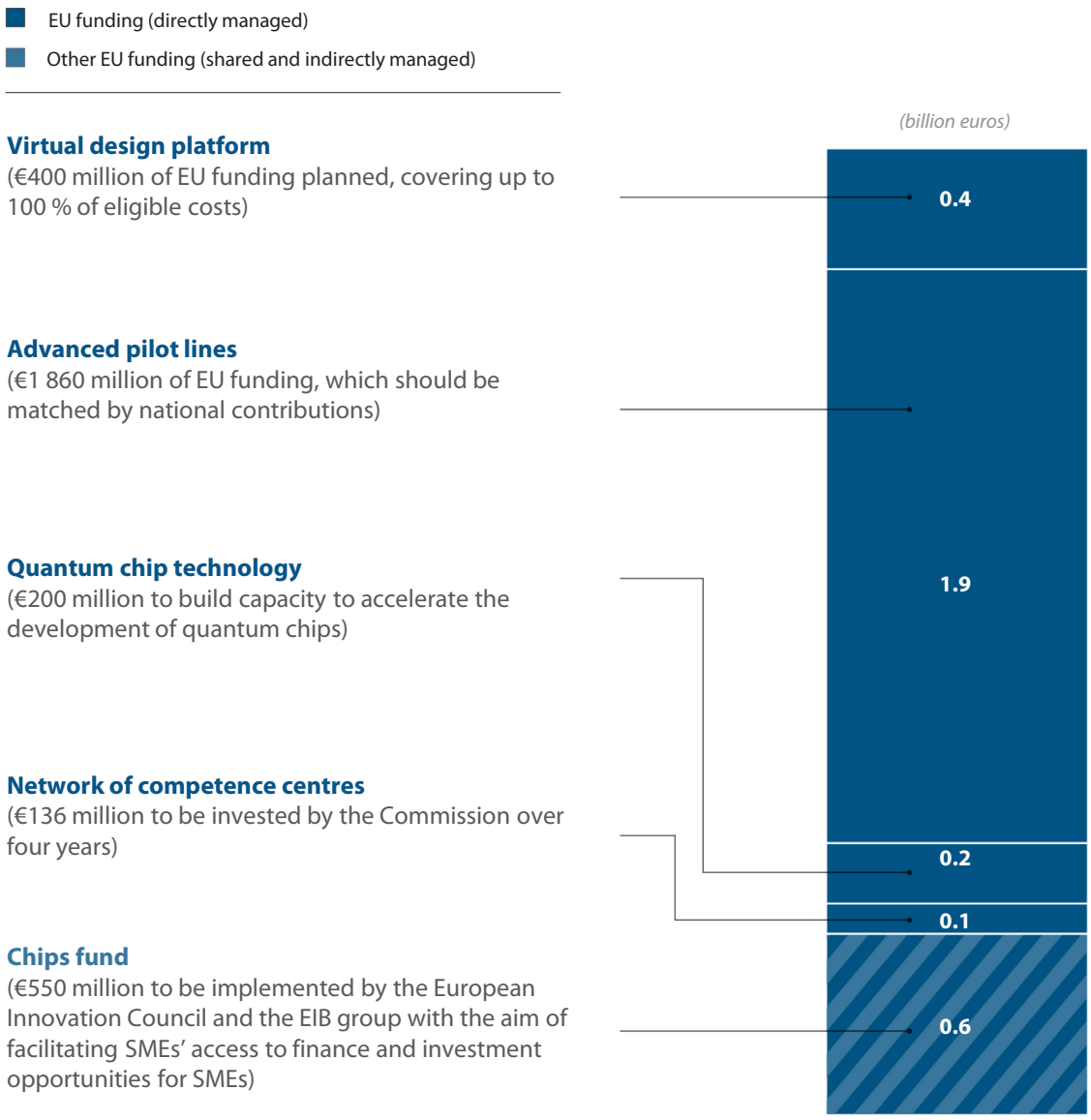
67 We examined the progress of the implementation and timeliness of the actions defined under each pillar of the Chips Act (paragraph ***22***). We looked whether the actions defined for each pillar of the Chips Act were being implemented in a timely and coordinated manner to allow the achievement of the strategy objectives.

Pillar I is progressing well, but has suffered some delays

68 The Pillar I initiative is designed around five components (***Figure 9***). Following significant preparatory work, its implementation began after the adoption of the Chips Act regulation in September 2023. According to the Commission, in order for the initiative to succeed, all the components need to be in place and work together smoothly[13]. Effective coordination of all the components is a prerequisite, and delays in any one of them may impact the effectiveness of the initiative as a whole. The Chips Act did not include a clear timetable for the implementation of Pillar I actions. The KPIs for Pillar I were not monitored or reported on at the time of our audit as, according to the Commission, this is only possible once the different components have been put in place. Current progress in completing the design platform, combined with ongoing calls for competence centres, suggests that not all of the components (including pilot lines) will be in place by the end of 2025.

[13] SWD(2022) 147, pp. 63-64.

Figure 9 | The five components of Pillar I and projected EU funding



Source: ECA, based on information provided by the Commission as at November 2024.

69 The **virtual design platform** is an online tool aimed at enabling academia, start-ups and SMEs to design and develop microchips. It is intended to be an extension of, and successor to, the EU-cofinanced EUROPRACTICE platform, which has provided similar services since 1995, primarily to academia. The Commission expects the EUROPRACTICE services to be integrated into the new design platform within two years of its launch.

70 An initial €25 million call (6 % of the budget) for its coordination and support was launched in August 2024. A second call was pending at the time of our audit, making it challenging for the platform to begin operating by the end of 2025, as the Commission had expected at that time.

71 The **pilot lines** objective is that they serve as a bridge from development to production. Their purpose is to provide industry with facilities for testing, experimenting with and validating semiconductor technologies and system design concepts.

72 The first four calls for pilot lines were launched by the Chips JU in December 2023 after extensive discussions between the Commission, leading research and technology organisations (RTOs) and industry. This interaction started before the Chips Act was published. The Act essentially formalised the outcomes of those discussions with regard to the technology areas of the pilot lines.

73 The stakeholders we interviewed were positive about the relevance and need for such pilot lines. The calls were open to all EU entities, but the three-month deadline was short, given the complexity of the subject and the extensive administrative requirements. Without questioning the relevance of the four pilot lines, we note the limited competition in terms of the ability to respond to the calls.

74 In April 2024, the Chips JU began negotiations with the consortia that won the calls. According to the four RTOs we interviewed, conclusion of the agreements would be slightly delayed because of the need to clarify the details of the co-ownership of the equipment and the service pricing models. The Commission expects the initial capacity of the first four pilot lines to be reached by the beginning of 2025 and then for them to achieve full capacity by the end of 2026. In July 2024, the Chips JU launched a call for a fifth pilot line for advanced photonics, which would see its first operation by the end of 2025 and achieve full capacity by the end of 2026.

75 With regard to **quantum chip technologies**, at the time of our audit preparations were underway with a call planned for September 2024.

76 The **network of competence centres** planned for the member states is intended to provide start-ups, SMEs, small mid-caps and academia with access to the new virtual design platform and pilot lines. The Chips Act provides member states with the possibility of establishing at least one competence centre in their territory. Neither the Chips Act nor the Chips JU's work programme has specified deadlines or target numbers for these centres, but the Commission is aiming for them to be operational by the end of 2025, aligning their deployment with that of both the new design platform and the pilot lines.

77 In July 2024, the Chips JU launched one call for competence centres, and another call to establish a network for the competence centres. In November 2024, the Chips JU selected 29 competence centres for 25 participating states and amended the 2024 work programme to include a second call for competence centres for the remaining four participating states.

78 The **Chips Fund** aims to improve access to capital for start-ups, scale-ups, SMEs and other companies in the semiconductor value chain. It is divided into two elements:

- the first one, under Horizon Europe's European Innovation Council Accelerator programme, provides for a €300 million investment aimed at attracting €900 million in private funding;
- the second, under the InvestEU Fund managed by the European Investment Fund (EIF), provides a €125 million guarantee matched with EIF resources to reach 250 million of investable resources, intended to mobilise €1.2 billion in equity-based financing.

79 The first element was still at an early stage of implementation at the time of our audit. A total of €44 million in grants and €152 million in equity were committed across 19 projects that are directly, and by design, implementing the Chips Fund with funding granted via dedicated European Innovation Council Accelerator Challenges. In the second case, the Commission had limited information on its progress. It had committed funds but, given the early stage and the time needed for deployment, the EIF had supported only a small number of final recipients by the time of our audit.

FOAK take-up under pillar II is unlikely to contribute significantly, or in good time, to the Digital Decade 20 % target

80 Pillar II of the Chips Act focuses on boosting public and private investment to increase EU production capacity. To do so, it clarifies that state aid to facilitate the financing of FOAK production facilities can be granted under Article 107 (3)(c) of the Treaty on Functioning of the European Union. FOAKs are meant to bring an innovative element to the internal market regarding the manufacturing processes or the final product, which can be based on new or existing technology nodes.

81 The Chips Act specified the principles for assessing aid support for investments in FOAK facilities. However, its take-up has been slow. While the Commission has been tracking 29 current and potential investments intended to increase manufacturing capacity, our analysis showed that only 13 of them can be considered FOAKs (paragraph ***45***). We also note that only two of these related to sub-5nm (i.e. cutting edge) projects with the potential to contribute to the Digital Decade target of 20 %.

82 At the time of our audit, out of the current and potential 13 FOAK facilities:

- only four had received the Commission's FOAK state aid approval, three of which the Commission expects to be operating at full capacity in 2029;
- six had entered negotiations, although the two cutting-edge (sub-5nm) projects had been put on hold by the chipmaker;
- three are at the stage of early talks with the Commission.

83 Lastly, even when the state aid is approved, there is no guarantee that the projects will proceed and be completed as planned. It will ultimately depend on investor decisions, based on customer demand and market conditions. In any case, building a semiconductor fabrication plant takes four to five years, so new production facilities approved in 2025 may only begin production in 2030. This makes them unlikely to contribute to the Digital Decade target of 20 %.

Pillar III - some progress in monitoring but crisis response mechanisms are not yet ready for deployment

84 **The concept of a "monitoring mechanism"** evolved between the 2022 strategic package of Chips Act proposals and the final regulation. While the 2022 Chips Act planned for monitoring the supply chain by member states alone, the 2023 Chips Act regulation set out that the Commission would conduct a strategic mapping of the EU's strengths and weaknesses in the global semiconductor sector. The Commission, in consultation with the European Semiconductor Board (ESB) (the new governance body introduced by the Chips Act), would then develop the necessary framework and methodology. Based on this, the ESB would create early warning indicators to monitor potential disruptions affecting the EU's semiconductor supply or trade.

85 The Chips Act did not include a clear timetable for the implementation of Pillar III actions. The preparatory work started in 2022. The Commission's formal work on the monitoring mechanism began once the Chips Act regulation had entered into force in September 2023, but it will require the technical expertise and support of an external contractor. The Commission plans to launch the relevant procurement procedure at the beginning of 2025.

86 The Chips Act introduced the crisis response mechanism: an "emergency toolbox" of actions that the Commission, in consultation with the ESB, may take in response to anticipated or confirmed shortages in EU supply, once the crisis stage is reached. It includes:

- information gathering;
- joint procurement to allow the Commission to make purchases on behalf of participating member states;
- priority-rated orders to ensure supply to critical sectors as set out in the Chips Act regulation.

87 While the first two elements are ready for deployment under the Chips Act regulation, priority-rated orders can only take effect as of 2028. According to the regulation, the Commission may require production facilities that obtained certain labels to accept priority-rated orders. At the time of our audit, three of the four approved FOAK facilities had applied for a label allowing priority-rated orders and were expected to start operating at full capacity between 2028 and 2032. The approval process for applications made by six other companies was underway. It remains to be seen how this mechanism will work in practice, given the variety of microchips used by industry and the time needed to requalify production lines, even between ostensibly similar products.

The Chips Act is unlikely to be sufficient for stimulating the level of investment needed, with success also dependent on global competition and other crucial factors

88 We examined whether the scale of both the investments planned and the EU funding available is commensurate with the EU's objective of increasing its market share. We also analysed other aspects affecting the EU business competitiveness in the microchip sector, i.e. the strategies to support microchip production put forward by other global economies and other crucial elements.

The investments to be triggered by the Chips Act is unlikely to match the scale of the industry

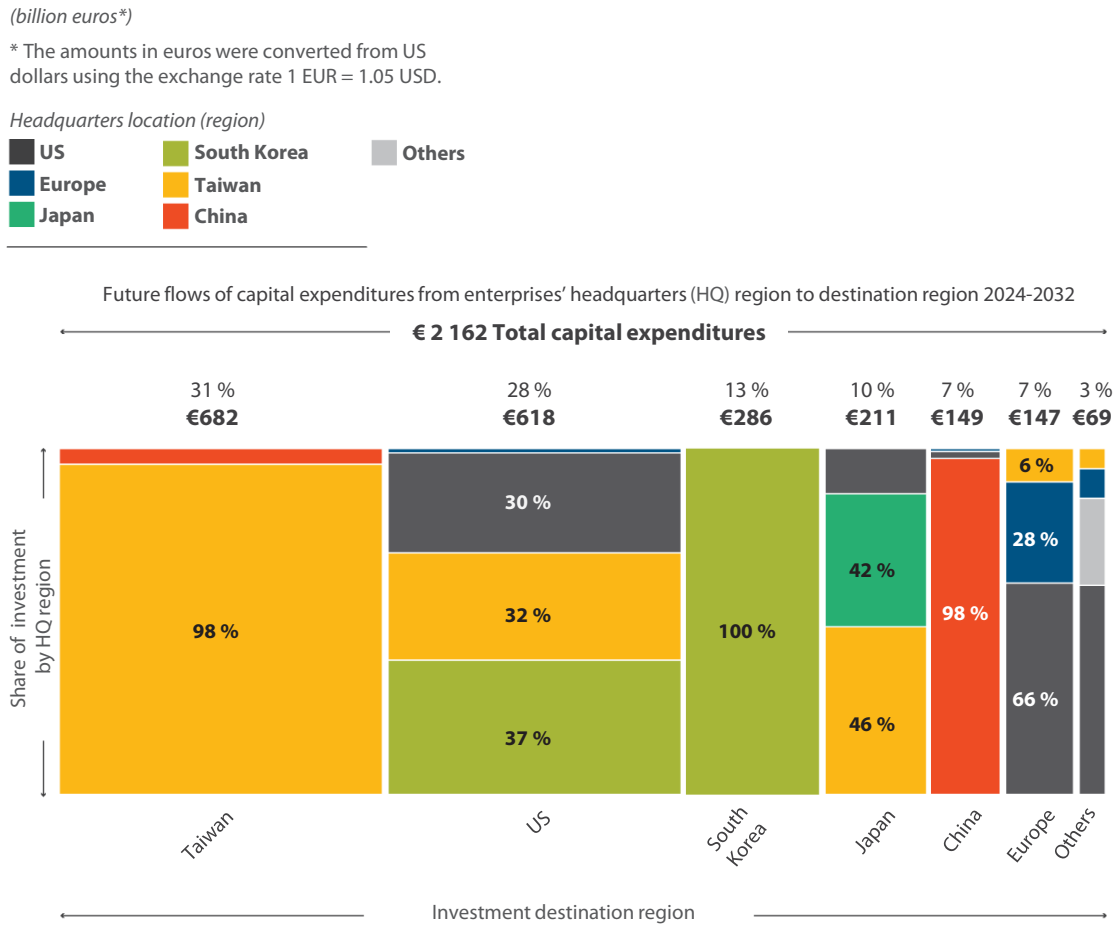
89 The Chips Act ambition was to mobilise at least €86 billion over the 2022-2030 period (paragraph ***39***). By way of comparison, according to a JRC report[14] the top global semiconductor manufacturers budgeted for $425 billion (€405 billion)[15] of investment over the 2020-2023 period, 60 % of which was accounted for by TSMC, Samsung and Intel. Among these top three manufacturers, only TSMC has significant plans underway for investing in the EU.

90 SEMI, the global industry association representing the electronics manufacturing supply chain, estimates that EU-bound capital expenditure up to 2032 would be €147 billion out of a world total of €2 162 billion (***Figure 10***). An ASML position paper from February 2022 states that maintaining an EU market share of 8 % in the production of microchips would require capital expenditure of $66 billion (€63 billion), while achieving a 20 % share would require expenditure of $264 billion (€251 billion) by 2030, given the EU's limited starting position in advanced microchips.

[14] European Commission: Joint Research Centre, Cerutti, I. and Nardo, M., *Semiconductors in the EU*, Publications Office of the European Union, 2023.

[15] The conversion of amounts in US Dollar into Euro are provided in this report for illustrative purposes on the basis of exchange rate of €1.00 = $1.05.

Figure 10 | Forecast capital expenditure flows between regions in 2024-2032

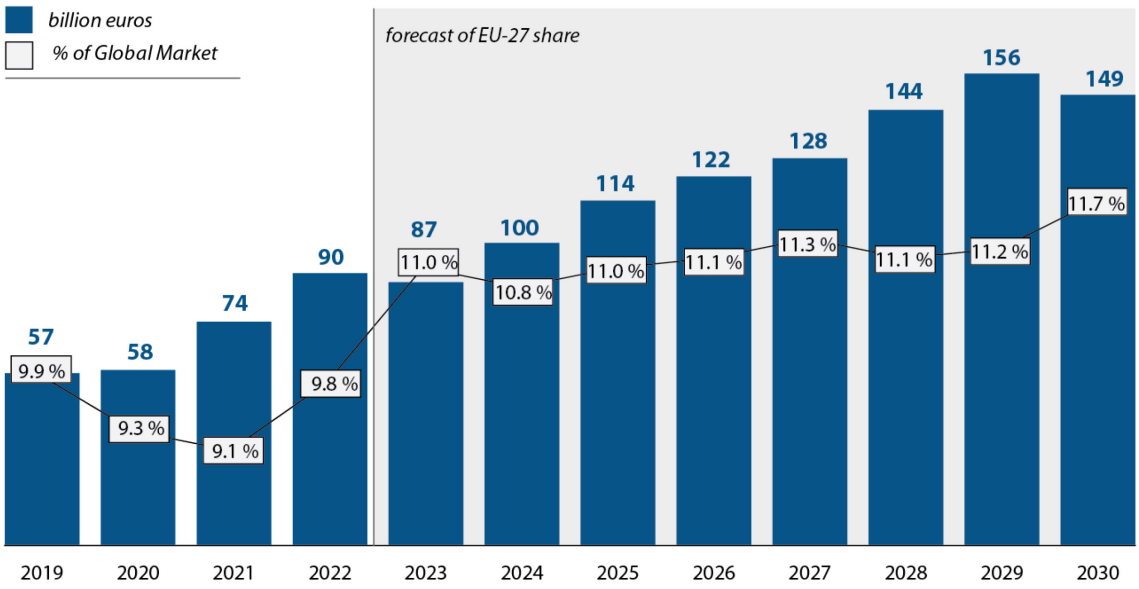


Source: ECA based on BCG and SIA study "Emerging resilience in the semiconductor supply chain", 2024.

91 The JRC and stakeholders in the semiconductor industry we interviewed stated that the policy-driven investment announced in the Chips Act is unlikely to be sufficient to meet the EU's market share goals. Recent forecasts in a study contracted by the Commission show that, despite the expected significant increase in manufacturing capacity, the EU's overall share of the global value chain would only increase slightly (reaching 11.7 % in 2030) (***Figure 11***).

Figure 11 | 2030 forecast of EU-27 share of global market value chain

Semiconductor value chain revenues in the EU



Source: COM(2024) 260 – Annex II, page 14, Figure 8; based on the study by IDC – International Data Corporation ("Semiconductors market data by feature size, sector and region" CNECT/2022/MVP/0084).

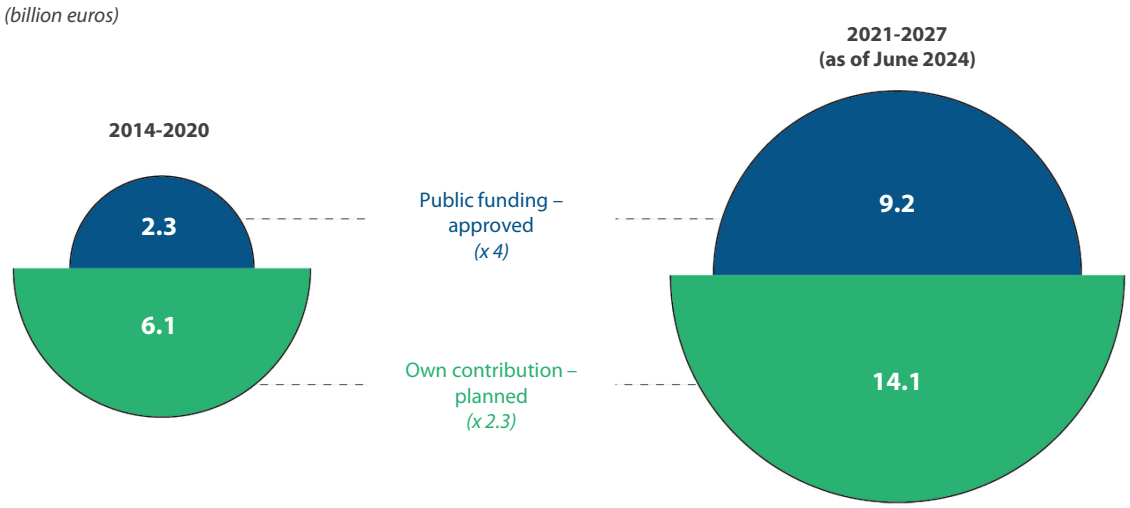
92 Finally, in the situation where the investments are driven mostly by the industry (paragraph ***64***) we also note a risk of deadweight, by which public investment does not actually generate additional activity and innovation. The practice[16] of allowing projects start-up prior to the Commission decision to receive state aid can speed up the implementation of projects. However, we note that it may increase the risk of deadweight because it favours projects that are ready to take the risk of implementation without public funding. In 2021, the Commission updated its IPCEI guidance to include a claw-back mechanism triggered in line with the level of profits. This was introduced as a safeguard to ensure that state aid remains proportionate and is limited to that which is necessary, though its effectiveness in addressing the risk of deadweight is yet to be seen.

[16] DG COMP code of good practices for a transparent, inclusive, faster design and assessment of IPCEIs, Commission, May 2023.

Concentration of funding is intrinsic to the sector, but engenders specific risks

93 The industry is characterised by a relatively small number of large companies. We interviewed 14 key beneficiaries (paragraph *17* in *Annex I*) for which EU and public funding had been approved. This sample illustrates that this small number of large companies received a significant amount of funding, which even increased in the current period (*Figure 12*). These entities participated in 300 projects under state aid programmes, Horizon 2020, and Horizon Europe.

Figure 12 | Public funding and own contribution for 14 selected beneficiaries



Source: ECA, based on information from 14 beneficiaries, status as at June 2024.

94 At the time of our audit, although the Chips Act expected funding had been only partially allocated, the public funds approved for the 2021-2027 period in respect of the 14 beneficiaries sampled were already four times higher than for 2014-2020. We also note, however, that the magnitude of the private investment compared to the funds received is proportionally lower in the new period compared to the previous one. Concentration of funds on a small number of large enterprises is bound to increase in the current programming period, given that large projects (FOAKs and IPCEIs) take up a significant part of the funding. In addition, concentration across large member states can be expected to increase, due to the high reliance on state aid funding sources embodied in the Chips Act.

95 Concentration across a limited number of large enterprises and projects is intrinsic to this highly capital-intensive industry. Further consolidation can also be beneficial[17]. However, achievement of the Chips Act's strategic objectives may be impacted significantly, were large investment to be cancelled, delayed or fail.

The Chips Act competes with other global economies' strategies

96 The Chips Act is just one of several strategies worldwide aimed at strengthening domestic supply chains amid fears of disruptions and rising geopolitical tensions. Other governments are also investing in semiconductor research and manufacturing. ***Figure 13*** provides an overview of main measures under key multiannual strategies up to May 2024.

[17] M. Draghi, *The future of European competitiveness*, 2024.

Figure 13 | Overview of the governmental incentives in other major regions

Measures		Guidance	Impact
Target	**Key incentive amounts** *(amounts in billion*)*	**Key initiatives**	**New fabrication & assembly, test and packaging investments since 2020[3]**
China			
Reach 70 % self-sufficiency by 2025	**€135.2** equity funds	Big Fund I, II, III and local funds State-owned enterprise leaders National science fund	~30[4]
South Korea			
Secure foothold in Logic, bolster fabrication plant leadership	**€52.4** in tax incentives	Tax incentives under K-Chips Act Public-private education programs	3
US			
Achieve resilience in semiconductor supply chain	**€37.1** in grants[1]	25 % investment tax credit Grants under the CHIPS Act State-level support	26
Japan			
Earn €107 billion* sales by 2030	**€16.7** in grants	National fiscal funding Leading-Edge Semiconductor Technology Centre	4
Taiwan			
Breakthrough 1 nm breakthrough by 2030	**€16.7** in tax incentives[2]	Financial subsidies under the Chip Innovation Programme Industry-academia coop, tax credits	7

* The amounts in euros were converted from US dollars using the exchange rate 1 EUR = 1.05 USD.
[1] $39 bn for manufacturing; $13.2 bn for Research and Development and workforce development.
[2] 25 % tax credit pledging to give back $2.3 bn per annum over 7 years.
[3] Comprises fab and Assembly, Test and Packaging projects that have been announced, started, or completed since 2020.
[4] May undercount the total number of sites in China.

Source: ECA based on BCG and SIA study "Emerging resilience in the semiconductor supply chain", 2024.

97 Global economies' microchip strategies often result in competing goals and actions. While the EU is trying to increase its self-sufficiency in areas like cutting-edge microchips, other global economies are working to maintain their existing strengths, or trying to catch-up in the areas in which they are lagging behind (***Box 2***).

Box 2

Competing initiatives in the global microchip sector

Many countries' initiatives, including those of the US, Taiwan and Japan, compete directly with the Chips Act, focusing heavily on advanced technology research and development.

The EU and the US share similarly ambitious objectives to boost their semiconductor production capacity to reduce reliance on Asia-dominated supply chains and enhance domestic resilience in critical technologies. Both regions have set targets to capture a significant share of the market, with the EU aiming for 20 % and the US stating that it is on track for 30 % of global production by 2032.

Taiwan has launched a NT$300 billion (€8.8 billion[18]) programme to foster semiconductor innovation in artificial intelligence, talent development and international investment. Long-term target is a 40 % market share in integrated circuit design and 80 % in advanced semiconductors by 2033.

Japan's RAPIDUS initiative is targeting the production of 2 nm microchips by 2027. The US is investing in automotive semiconductor technologies, traditionally an EU strength.

98 Several of these strategies provide support to the industry in the form of tax incentives. This approach cannot be replicated at EU level as such incentives are the prerogative of the member states (which in certain circumstances have to notify them to the Commission). We noted that some member states have used tax incentives specific to the microchip industry, while others have general schemes that the sector has benefited from (***Box 3***). But the Commission has no information on this type of support. Uncoordinated use of such support might create a risk of competition between the member states, which could, in turn, reduce the effectiveness of such support at EU level.

[18] The conversion of amounts in New Taiwanese Dollar into Euro is provided for illustrative purposes on the basis of exchange rate of €1.00 = NT$34.14.

Box 3

Examples of tax incentives for the EU microchip industry

Italy has several tax incentives for the semiconductor industry, as part of its broader strategy for strengthening the sector. For example, in response to the Chips Act, tax credits of around €0.5 billion up to 2028 were introduced for R&D activities in microelectronics in 2023[19].

In the Netherlands, corporate tax reductions totalling €3.1 billion were granted to two semiconductor industry companies between 2018 and 2022, compared to annual average EU funding for the Dutch semiconductor industry of €66 million between 2015 and 2022.

In Germany, an energy tax-reduction scheme exempted large energy consumers, including semiconductor companies, from network charges. The Commission, however, deemed this measure incompatible with the internal market, and required the member state to recover the aid.

99 Moreover, although the Commission analysed global strategies to some degree, when the Chips Act was drawn up, the industry landscape never stands still. Since the Chips Act became operational, other economies have announced major initiatives impacting investment attractiveness and seeking potential future market share. Notably, in addition to the grants the US included in its own Chips Act (***Figure 13***), in 2022 it allocated a further $280 billion (€267 billion) over 10 years under its Chips and Science Act. $200 billion (€190 billion) of this sum was set aside for scientific research and FID, as well as for workforce development and regional tech hubs.

100 While this is a dynamic, fast-changing, competitive environment, we note that the Chips Act and its actions are not subject to frequent reassessment in the light of industry developments or in response to competing strategies. The Commission is required to submit the first evaluation and review of the Chips Act regulation by September 2026. The new multiannual framework negotiations are likely to begin in 2025 to 2026, and there is therefore a risk that the strategy will not be assessed and reviewed in time to determine and align the funding needed. Development of the post-2030 strategy should begin sufficiently early to ensure that it is prepared thoroughly and operational on time.

[19] The Omnibus Decree DL No. 104, 10 August 2023, Article 5.

Other factors are crucial to achieving the Chips Act objectives

101 Other factors also pose significant risks to achieving the objectives of the Chips Act. This includes when cooperation between the EU and member states regarding their policies and initiatives is insufficient.

Dependence on foreign raw materials

102 A number of the chemicals, substrates and other materials needed for semiconductor production are scarce, and not necessarily extracted or otherwise produced in the EU. This presents a challenge to the EU's aim of strategic autonomy, as confirmed by the semiconductor manufacturers we interviewed. In this respect, the EU is often at a disadvantage compared to China and the US, and a JRC analysis found that the EU remains heavily reliant on foreign imports[20], with China, for example, producing 95 % of the world's refined gallium.

103 In April 2024 the Raw Materials Act entered into force, establishing a framework aimed at ensuring a secure and sustainable supply of critical raw materials.

Energy requirements and costs

104 Semiconductor manufacturing is highly energy intensive, consuming even more electricity than the automotive and refining industries[21]. With more advanced plants in Europe, energy demands and strains on grid capacity may be expected to rise, especially as newer processes require up to 10 times more power than previous technologies.

105 High energy prices in the EU compared to other regions, e.g. the US, add to competitiveness challenges, prompting the need for energy cost support and in some cases grid capacity increase[22].

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[20] Cerutti, I. and Nardo, M., p. 38.

[21] Alfieri, F. and Spiliotopoulos, C., *ICT Task Force study: Final Report*, Publications Office of the European Union, 2023, p. 20.

[22] "The Netherlands to invest €2.5 billion to strengthen business climate for chip industry in Brainport Eindhoven", Government of the Netherlands, 28 March 2024.

Environmental issues

106 Semiconductor production is resource intensive. In addition to energy, it demands substantial supplies of water and hazardous chemicals[23]. Environmental requirements are, therefore, an important factor for the industry.

107 At the time of audit, five EU member states had proposed restricting several synthetic chemicals integral to semiconductor production, as they are linked to health risk and long lasting environmental impact, which the European Chemicals Agency was considering in 2024. On the other hand, the European Semiconductor Industry Association has advocated for certain exemptions from chemical usage and recycling requirements, arguing that the industry would otherwise risk a competitive disadvantage compared to regions with more lenient policies[24].

108 In the US, the recent Building Chips in America Act envisaged lowering environmental requirements for semiconductor projects. For the EU, the Commission intends to put forward a new chemicals industry package aiming at clarity and simplification, but it is too early to assess if it will have impact on the semiconductor industry.

Geopolitical tensions and export controls

109 The global supply chain for microchips is very exposed to the effects of geopolitical tension. For example, Russian's war of aggression against Ukraine disrupted global neon supplies, which are vital for laser lithography in microchip production[25]. The geopolitical risk to the global supply chain is even more acute given, for example, the outsized importance of Taiwan (with a microchips giant like TSMC) and China in the supply chain (***Figure 3***). In this context, cross-strait tensions between China and Taiwan represent a source of persistent insecurity for the sector.

110 In our interviews with industry stakeholders and national authorities, we noted the concern that export controls in the EU and other parts of the world may significantly impact the EU's semiconductor industry, disrupting global supply chains and limiting access to critical materials and advanced technology. Such restrictions raise production costs, delay access to equipment and affect EU competitiveness. The related negotiations often take place at member state level, rather than EU. As an example, the export of ASML's

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[23] "The green transition of the IC industry", IMEC Vision Paper, 2022.

[24] "Towards a more competitive semiconductor industry for Europe", European Semiconductor Industry Association.

[25] Georgitzikis, K. and D`elia, E., Rare Gases (Krypton, Neon, Xenon): Impact assessment for supply security, European Commission, 2022, JRC130349.

advanced equipment to China was restricted as the outcome of discussions between the US and the Netherlands. Following the US export controls on cutting-edge semiconductor equipment to China in 2022, Japan and the Netherlands agreed on additional curbs in March 2023[26]. The US may seek to extend[27] these controls to include less advanced machinery and equipment.

111 In January 2024, the Commission released a White Paper on Export Controls, proposing initiatives to harmonise EU export policies for better economic security. It advocates for a more coordinated approach to replace fragmented national policies and an expanded Dual-Use Regulation to include emerging technologies. Additionally, a White Paper on Outbound Investments proposed a review of certain investment transactions involving sensitive technologies related to microchip production.

Shortage of skilled workers

112 Based on our interviews with industry stakeholders and national authorities, we noted that the semiconductor industry faces a severe shortage of skilled labour. This skills gap hinders production, with high demand for specialised expertise and for staff with lower education levels[28], both of which are essential to scaling up EU manufacturing. The global gap is projected to reach one million skilled workers by 2030[29].

113 The Chips Act includes skills development as a strategic goal under Pillar I, which tasks future competence centres with expanding EU skills resources. The EUROPRACTICE platform, the related RETICLES project, and the European Chips Skills Academy aim to help bridge the gap. More generally, the upskilling objective can also be funded by EU budget instruments such as the European Social Fund+ or Digital Europe, or under the RRF.

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[26] Netherlands to restrict chip exports after US pressure over China threat | Financial Times, 8 March 2023.

[27] Chip sector caught in battle of AI versus geopolitics | Financial Times, 17 July 2024.

[28] SWD(2022) 147, p. 59.

[29] Deloitte, p. 5.

This report was adopted by Chamber II, headed by Ms Annemie Turtelboom, Member of the Court of Auditors, in Luxembourg at its meeting of 26 February 2025.

For the Court of Auditors

Tony Murphy
President

Annexes

Annex I – About the audit

The nature and importance of microchips

01 A microchip, or simply "chip", is a small electronic device manufactured from semiconductor materials, commonly silicon, that contains etched or printed electronic circuits and components. Microchips play a vital role in our daily lives, powering smartphones, vehicles, healthcare systems, energy infrastructure, mobility solutions, communication technologies, satellites, and advanced military applications.

02 Moore's Law posits that transistor density will double every two years. It provides a reliable predictor of industry progress. Advanced manufacturing technology now uses transistors ranging from 7 nm down to 5 nm, which allows more transistors to be placed on a single microchip. This increases processing power and energy efficiency. The next generation of so-called **cutting-edge microchips** will use transistors below 5 nm. Advances are also possible in the materials on which transistors are etched, e.g. gallium nitride, which offers greater energy efficiency than silicon.

03 Chips can be categorised into three main types, based on their functionality:

- **logic microchips** for processing complex information to execute tasks, e.g. in computers;
- **memory microchips** for storing information, e.g. in devices like laptop hard drives;
- **application specific integrated circuits**, which are tailored to specific tasks in industrial applications, such as automotive and manufacturing.

The EU's position in the global value chain

04 Over the past 20 years, EU microchip output has increased[1], but its share in global manufacturing capacity across all types of microchips has decreased significantly to just 9 % in 2020, due to ever increasing global production. In 2021, with the EU's existing production sites operating at full capacity, its trade deficit in semiconductors stood at almost €20 billion[2]. **Research** within the semiconductor value chain is led by the US and Asia, with significant contributions from countries like Japan and South Korea. The EU plays a notable role through its RTOs and cooperation programmes, focusing on innovation and high-tech advances.

05 Logic microchip **design** is led by the US, with contributions from the UK, Japan, South Korea, Taiwan, and China. Design of memory microchips is dominated by South Korea and the US, with support from Japan, Taiwan, and China.

06 Microchip **production** is centred in East Asia, with Taiwan and South Korea manufacturing cutting-edge microchips. The EU focuses on **ASICs** – Application-Specific Integrated Circuits and holds a key competitive advantage in producing equipment for advanced microchip manufacturing.

07 The **raw materials** step of the global semiconductor value chain is dominated by China, Japan, South Korea and the US, while the EU plays a limited role, focused on niche material refinement. Similarly, **packaging and testing** are concentrated in Asia, with China, Taiwan, and Malaysia leading, and the EU contributing mainly to specialised, high-value-added areas.

08 The industry is highly capital-intensive and therefore characterised by a relatively small number of large players. Global economies compete to attract the private investment by offering significant subsidies and other incentives.

09 Against this backdrop, the global microchip market is growing rapidly, with annual revenues projected to rise from $600 billion (€571 billion) in 2022 to $1 trillion (€952 billion) by 2030. Without swift and substantial investment, the EU's global market

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[1] Semiconductor Industry Association: Emerging resilience in the semiconductor supply chain, May 2024, p. 15.

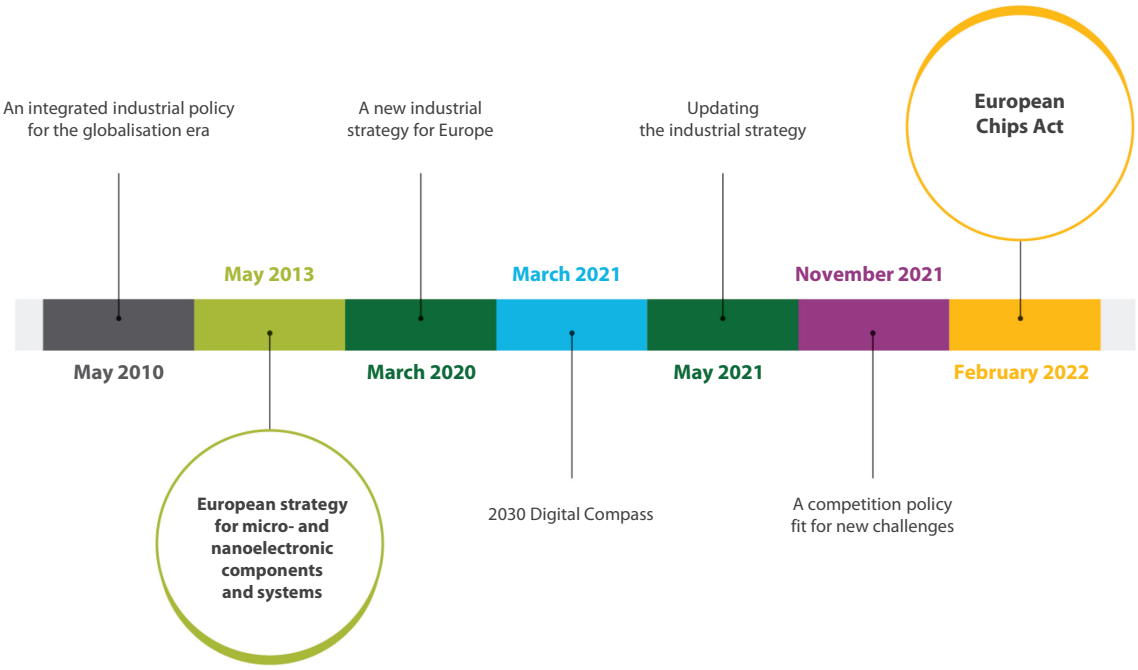
[2] SWD(2022) 147, p. 57.

share is projected to fall below 5 %, further endangering its industrial competitiveness and technological autonomy[3].

EU strategic framework and legislation on microchips

10 ***Figure 1*** shows a timeline of the main policy documents since 2013, including the 2013 Strategy and the Chips Act – the main EU strategic documents relevant to microchips. ***Annex II*** presents these two strategies in more detail, as well as other relevant policy documents.

Figure 1 | Main policy documents since 2013



Source: ECA.

[3] *Global Semiconductor Trends and the Future of EU Chip Capabilities*, European Parliamentary Research Service, 2022.

Roles, responsibilities and main funding sources in support of EU microchip strategies

11 As far as EU and public funds are concerned, since 2013 support to the microchip industry has been provided mainly in the form of:

- grants under programmes managed directly by the Commission, such as Horizon 2020 (2014-2020 period) and Horizon Europe and Digital Europe (2021-2027). The Commission is responsible for awarding grants and monitoring their implementation, and is supported by the Chips JU;
- grants under programmes managed jointly by the Commission and member states, such as the European Regional Development Fund. The Commission approves member states' multiannual programmes and monitors their implementation. National or regional authorities are responsible for the selection and implementation of specific projects;
- grants and other forms of financial support (e.g. guarantees) under programmes such as the EFSI (2014-2020 period) and the InvestEU programme (2021-2027). Related projects are selected and monitored by the relevant implementing partner, mainly the EIB Group;
- RRF funds, in case of member states that included such investments in their plans, which are assessed by the Commission and approved by the Council;
- grants from national budgets (state aid under IPCEIs, FOAKs and ad-hoc cases) for companies selected by national authorities.

12 The **microchip industry and private companies** are the key players in investing significant resources into research, and the design and manufacture of microchips. Their role is critical to the success of the Chips Act, which is heavily dependent on private investment expanding manufacturing capacity.

13 The **Commission** plays a key role in implementing and monitoring the Chips Act and works with industry and other stakeholders via the Chips JU, which is responsible for implementing the Chips for Europe Initiative. It also approves state aid notified by member states with a focus on its compatibility with the EU's internal market, but has limited implementation monitoring responsibilities. The **EIB** Group (European Investment Bank and European Investment Fund) also closely cooperates with the Commission in the context of the Chips Fund.

14 **Member states** play a crucial role in incentivising companies to invest in research and production capacity. They manage the national and regional programmes funded by the European Regional Development Fund and administer state aid at national level to support these efforts.

Audit scope and approach

15 The objective of the audit was to examine how EU industrial policy supported strengthening the strategic autonomy of the EU microchip industry. Through this audit we assessed:

- the design of the Chips Act following the 2013 Strategy results;
- the alignment of the EU and public funding available with the objectives of both the 2013 Strategy and the Chips Act;
- the timeliness of the implementation of the Chips Act with regard to the EU's strategic objectives;
- other factors and risks that could affect the success of the Chips Act.

16 Through our report, we aim to provide insights and recommendations; these could also contribute to the Commission's first intermediate evaluation and review of the Chips Act, which are to be presented to the European Parliament and the Council by September 2026.

17 Our audit covers the period from May 2013 to July 2024. Where possible, however, we have used the most recent information available. As part of our audit work:

- we reviewed strategic documents, legislation, policy papers and reports at EU and national level;
- we interviewed representatives of the Commission, Chips JU, EIB, EIF, national authorities, and Supreme Audit Institutions, and associations and representatives of the EU semiconductor industry;
- we visited Germany, Italy and the Netherlands; these member states were selected on the basis of criteria such as presence of semiconductor clusters and their importance to the EU's role within the global value chain, concentration of key beneficiaries of EU and national public funds, and the existence of national digital strategies;

- we interviewed 14 beneficiaries in the semiconductor industry, i.e. 10 companies (8 chipmakers and 2 equipment manufacturers) and 4 RTOs, which were chosen because they were among the greatest beneficiaries of EU and public funds (with the approved total amount of €11.5 billion of public funding, see paragraph ***93***);

- we selected 10 relevant projects of significant beneficiaries – six from the 2014-2020 period and four for 2021-2027, which received financing from various funding streams and represented different value chain steps. We analysed the documentation, focusing on their corresponding selection process, agreed objectives, implementation progress, results achieved, and obstacles and challenges encountered (see ***Annex III***).

Annex II – Main policy documents since 2013

The 2013 Strategy

01 The 2013 Strategy[1], announced by Commission Vice President Neelie Kroes, emphasised the urgency of bolstering the EU's position in semiconductor production, stating: "*Others are aggressively investing in computer chips and Europe cannot be left behind*". Kroes outlined a goal for the EU to overtake the US in microchip production. The strategy highlighted the EU's strengths and weaknesses, identifying modest and fragmented investment as a key shortfall compared to global actors.

02 The 2013 Strategy led to the formation of the Electronic Leaders Group (ELG), comprising 11 CEOs of major electronics companies, to develop a roadmap and an implementation plan targeting 2020. The ELG focused on boosting demand, supply, and production capacity with the aim of doubling EU microchip production and creating 250 000 direct jobs. Key initiatives included the ECSEL JU (succeeded by KDT JU), and the IPCEI on microelectronics, which was highlighted in the ELG roadmap as a strategic tool for strengthening the EU's microelectronics capabilities[2].

The Chips Act

03 The Chips Act was introduced in response to the EU's stagnation in the global microchip market and the significant supply chain disruptions caused by the COVID-19 pandemic[3]. The Commission's President, Ursula von der Leyen, announced the initiative in her 2021 State of the Union address, emphasising the need to "*put all of our focus on it*". The proposal for the Chips Act regulation was unveiled in February 2022 as part of the broader Chips Act package and entered into force in September 2023.

04 The Chips Act Communication stated that, despite strengths in some areas, Europe was dependent on imports, thus making it vulnerable to supply chain disruptions. It posited that in the event of such disruption, industries such as the automotive sector could run out of microchips in a matter of weeks. Europe also had limited manufacturing capacity for mature nodes (22 nm), and none at all for cutting-edge microchips (7 nm and below).

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1 COM(2013) 298.

2 SWD(2022) 147, p. 33.

3 COM(2022) 45, p. 1.

05 The Chips Act aims to bolster the EU's leadership in semiconductor technology and ensure a secure supply chain by enhancing production capacity and advancing cutting-edge technologies. It sets the goal of achieving 20 % of "*world production in value of cutting-edge and sustainable semiconductors by 2030*", thereby reducing dependence and capitalising on economic opportunities in the microchip industry. To accomplish this, the Chips Act outlined three pillars.

06 ***Pillar I – "Chips for Europe Initiative":*** It was designed to address the research, development, and related infrastructure gaps in the EU, and thereby boost the EU's ability to operate at the cutting edge of microchip technology. The KDT JU was transformed into the Chips JU, reinforced, and reoriented towards the objectives of the strategy, featuring a new design platform and new types of experimental pilot lines. New measures were introduced to tackle skills bottlenecks and facilitate access to debt financing and equity for start-ups, scale-ups, SMEs and companies with small/mid-market capitalisation.

07 ***Pillar II – "Security of Supply":*** Its target was to boost the EU's manufacturing and production capabilities. To do this, it built on the state aid revisions in the 2013 Strategy, such as the IPCEI and Horizon 2020. The Commission's proposal for a regulation[4] clarifies the state aid assessment framework for fostering public and private investment in FOAKs that can be provided under the Treaty on Functioning of the European Union. In the short term (2024-2025), it aims to consolidate the EU's position, and in the mid- to long-term (2026-2030), it should drive progress towards the goal of a 20 % market share by 2030[5].

08 ***Pillar III – "Monitoring and crisis response":*** It focuses on crisis actions, in terms of monitoring and response. It aims to establish a coordination mechanism between the Commission, member states and industry to monitor supply, estimate demand and anticipate future disruptions and crises. This concept is based on two components:

- a strategic supply chain mapping and monitoring scheme;
- a dedicated toolbox of measures that can be used when a crisis stage is activated, such as focused information requests, priority-rated orders and joint procurement.

[4] COM(2022) 46.

[5] SWD(2022) 147, p. 82.

Other Commission communications relevant to semiconductors

09 **The 2010 communication "*An Integrated Industrial Policy for the Globalisation Era*"**[6] highlighted the strategic importance of key enabling technologies (KETs), such as micro- and nano-electronics, advanced materials, and biotechnology, as critical drivers for industrial innovation and competitiveness. It emphasised the need to develop a coordinated EU approach to KETs, in order to bridge the gap between research and market deployment.

10 This focus on KETs directly influenced the 2013 Strategy by prioritising investments and initiatives to strengthen the EU's capabilities in microelectronics as a foundational KET, fostering innovation, industrial leadership, and value chain development within the EU.

11 **In March 2020, the EU launched "A New Industrial Strategy for Europe"**[7], with the goal of driving the twin transition to green and digital economies while enhancing competitiveness and strategic autonomy. The strategy pledged support for key strategic technologies, including microelectronics, and laid the groundwork for the Chips Act by highlighting the need to reduce strategic dependencies, foster technological sovereignty, and strengthen critical value chains, such as that of semiconductors.

12 **In March 2021, the Commission released the 2030 Digital Compass Communication**[8], which eventually resulted in the Digital Decade Decision[9] in 2022. This Decision set out the target of having the "*production, in accordance with Union law on environmental sustainability, of cutting-edge semiconductors in the Union […] at least [at] 20 % of world production in value*" by 2030, along with the requirement that member states provide annual updates on their progress. The Commission later embraced this target as the overarching objective of the Chips Act.

13 **In May 2021, the Commission launched the updated 2020 Industrial Strategy**[10], to take into account the impact of, and vulnerabilities highlighted by, the first year of the COVID-19 pandemic with regard to European industry. This was accompanied by in-depth reviews of strategic areas, of which semiconductors was one. It also announced plans for the

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6 COM(2010) 614.

7 COM(2020) 102.

8 COM(2021) 118.

9 Decision (EU) 2022/2481.

10 COM(2021) 350.

Commission to launch the Industrial Alliance on Processors and Semiconductor Technologies in the second quarter of 2021, which aimed to strengthen the EU's capabilities in semiconductor technologies. The alliance was later acknowledged in the Chips Act as key stakeholder in the EU's semiconductor ecosystem and was meant to be consulted by the ESB.

14 **In November 2021, the Commission released "*A Competition Policy Fit for New Challenges*"**[11], highlighting the role of competition policy in supporting the green and digital transitions. It emphasised fostering innovation, adapting to evolving market dynamics, and addressing distortions in critical sectors like that of semiconductors. The communication reinforced the significance of the IPCEIs. It also highlighted the need to support innovative semiconductor facilities that would bring new capabilities to the EU market, introducing them under the FOAK concept into the microelectronics sector. The Chips Act builds on these principles to promote investments and innovation, and thereby strengthen the EU's strategic autonomy and resilience in semiconductors.

[11] COM(2021) 713.

Annex III – Overview of the projects examined

01 The **Horizon 2020** project **EPIQUS** focuses on quantum capabilities. Led by an Italian RTO in a consortium with EU and South Korean partners, it builds on prior EU-funded research in quantum photonics. Though technical delays have hindered progress, the project aligns indirectly with the EU's 2013 Strategy and directly with the pillar I objectives of the Chips Act in its fundamental research in ground-breaking technology such as quantum. It is aimed at developing the first breakthrough device simulating quantum mechanical problems in a compact device operating at both ~800 nm and room temperatures.

02 The **Horizon Europe** project entitled Advanced modelling and characterisation for power semiconductor materials and technologies (**AddMorePower**) focuses on pioneering new materials and 3D integration for power semiconductors. Initiated in January 2023, this project, coordinated by a German RTO, aims to enable the semiconductor industries' transition to advanced semiconductor materials. Its outcomes are likely to support Chips Act goals related to fundamental research in cutting-edge semiconductor materials and technologies and their application in an industrially relevant environment. The new materials are expected to be usable for microchip sizes of 1nm to 10 mm.

03 The **Horizon Europe** project **RETICLES** (Research, Entrepreneurship, Training, IP-exchange & Chip platform of EUROPRACTICE Services) is maintained by an EU RTO located in Belgium. The project is a successor to EUROPRACTICE, a platform that provides EU academia and SMEs with a full range of microelectronic services needed to design, fabricate, package and integrate microelectronic circuits. RETICLES has set an overarching goal of strengthening design capacity in the EU and further lowering the barriers to gain access to advanced semiconductor technologies. The RETICLES project is not geared towards a specific type of semiconductor or production node, its main objective is to establish open access services enabling affordable prototyping in advanced nano-electronics technologies and fully packaged systems supporting pillar I of the Chips Act.

04 The purpose of the **ECSEL JU project TAKEMI5** is to discover, develop and demonstrate both lithographic, metrology, processes and integration technologies enabling module integration for the 5 nm node on a pilot line. The project is coordinated by a semiconductor equipment manufacturer based in the Netherlands and being implemented with 25 partners. It is aligned with the Chips Act objective of leadership in cutting-edge semiconductor technologies. In line with the demand estimated at the time of signature of the grant agreement, various semiconductor equipment tools developed in the project have already been ordered by semiconductor manufacturers in the US and Asia. Although we could not obtain direct evidence of number of EUV tool shipments to EU chipmakers, in September 2023 Intel announced the first use of this technology in Ireland.

05 The **ECSEL JU project PIN3S** focused on the development and integration of process modules to a sufficiently high maturity level, and development of adequate patterning technology and metrology capabilities for the 3nm node and beyond. The project is coordinated by a semiconductor equipment manufacturer based in the Netherlands and being implemented with 24 partners. It is aligned with the 2013 Strategy in its fostering of EU strengths, as well as with the Chips Act objective of leadership in cutting-edge semiconductor technologies.

06 The **ECSEL JU project ADMONT** established a "More-than-Moore" pilot line providing a "one-stop-shop" for diversifying complementary metal oxide semiconductor technology applications in fields such as smart: energy, mobility, health and production. Led by a German semiconductor manufacturer and implemented in cooperation with fourteen European partners, including two German RTOs, the project involved conducting applied research and first industrial deployment (FID) for industrial applications related to wafer sizes of 200 mm and compatible with microchip feature sizes of 350nm. As a result of its implementation, the capabilities of the pilot line were demonstrated. The project expanded EU manufacturing capabilities by increasing silicon wafer capacity in one EU front-end fabrication plant by 400 %, allowing some back-end processes to be transferred back to Europe from Asia. We noted however that several key performance indicators, e.g. relating to yield targets, were not fully achieved during the project's implementation.

07 One **2018 IPCEI** project implemented in Germany involved developing power semiconductors, smart sensors, and related FID on 300 mm, 200 mm and 150 mm wafer lines. These semiconductors are used in, among other areas, the automotive industry, consumer electronics and the internet of things. The 300 mm fabrication plant took four years to build and was fully operational by December 2020, thus enhancing the EU manufacturing capacity of such wafer sizes. The beneficiary plans to continue developing smart sensor technology for the 300 mm fabrication plant under the 2023 IPCEI, in line with the objectives of the Chips Act.

08 Another **2018 IPCEI project**, approved by Italy in 2019, focused on R&D and FID for energy-efficient microchips, power semiconductors, and smart sensors. It included a new 300 mm silicon wafer pilot line for automotive, satellite and consumer electronics, and computing markets. Once complete, the line is expected to produce 120 nm microchip nodes, with further miniaturisation to 22 nm technology capabilities envisaged, in line with the objectives of pillars I and II of the Chips Act.

09 The **IPCEI 2023** project **Next GEN-7A** implemented in the Netherlands comprises R&D and FID activities for High-NA EUV lithography for advanced microchip production. It aims to develop and provide High-NA EUV technology for one of the Chips JU pilot lines. Running from January 2024 to December 2029, it aligns with pillar I of the Chips Act and is likely to contribute to the 2030 Digital Decade goal of a 20 % global market share.

10 The **FOAK** investment in Italy, approved by COM decision SA.103083, concerns the construction of the EU's first 150 mm silicon carbide substrates production facility for power electronics. Set to start production in 2027, it aims to meet 40 % to 50 % of the beneficiary's substrates needs currently sourced outside the EU, thus enhancing supply chain resilience. The project's total cost is €730 million, with approved state aid of €292 million, having being granted under the Italian Recovery and Resilience Plan. The beneficiary has also planned a further investment in a new front-end facility for producing 200 mm substrates in Italy. This investment, with an estimated total cost of €5 billion, and up to €2.1 billion in state aid, has already been approved as another FOAK. The "integrated production facility" label (paragraph ***87***) has been applied for in respect of this new facility, which will focus on automotive power microchips and is expected to reach full capacity by 2032. Both projects align with the objectives of pillars I and II of the Chips Act.

Abbreviations

BCG: Boston Consulting Group

DG CNECT: Directorate-General for Communications Networks, Content and Technology

ECSEL JU: Electronic Components and Systems for European Leadership Joint Undertaking

EFSI: European Fund for Strategic Investments

EIB: European Investment Bank

ESB: European Semiconductor Board

ESIF: European Structural and Investment Funds

FID: First industrial deployment

FOAK: First-of-a-kind

IPCEI: Important projects of common European interest

JRC: Joint Research Centre

JU: Joint Undertaking

KDT: Key Digital Technologies Joint Undertaking

KETs: Key Enabling Technologies

KPI: Key Performance Indicator

nm: Nanometre

R&D: Research and development

RRF: Recovery and Resilience Facility

RTO: Research and technology organisation

SIA: Semiconductor Industry Association

SMEs: Small and medium-sized enterprise

SWD: Staff Working Document

Glossary

Capital expenditure: Long-term spending on fixed assets.

Chip: Electronic device comprising various functional elements on a single piece of semiconductor material, also referred to as an "integrated circuit".

European Fund for Strategic Investments: Support mechanism launched by the EIB Group and the Commission, as part of the Investment Plan for Europe, to mobilise private investment in projects of strategic importance for the EU.

Horizon 2020: The EU's research and innovation funding programme for the 2014-2020 period.

Horizon Europe: The EU's research and innovation funding programme for the 2021-2027 period.

Impact assessment: Analysis of the likely (*ex ante*) or actual (*ex post*) effects of a policy initiative or other course of action.

Important projects of common European interest: Large-scale projects bringing together knowledge, expertise, financial resources, and economic actors from different member states and creating significant benefits for the EU as a whole.

Joint Undertaking: EU body established with a partner to carry out a project or activity in the area of research and industry.

Mainstream/legacy microchip: Less advanced microchip of 28 nanometres or more, according to the definition applicable at the time of our audit.

Pilot line: Physical infrastructure and equipment needed to produce small series of pre-commercial products.

Quantum: Class of technology that works by using the principles of quantum mechanics (the physics of sub-atomic particles).

Semiconductor ecosystem: Network of companies, organisations, technologies, and processes involved in the design, manufacturing, testing, and distribution of semiconductor devices.

State aid: Direct or indirect government support for a business or an organisation, putting it at an advantage over its competitors.

Strategic autonomy: Capacity to act independently in strategically important policy areas without being overly reliant on other countries.

Wafer: In the context of the microchip industry, a thin, flat slice of semiconductor material (typically silicon) that forms the base of a microchip.

Replies of the Commission

https://www.eca.europa.eu/en/publications/sr-2025-12

Timeline

https://www.eca.europa.eu/en/publications/sr-2025-12

Audit team

The ECA's special reports set out the results of its audits of EU policies and programmes, or of management-related topics from specific budgetary areas. The ECA selects and designs these audit tasks to be of maximum impact by considering the risks to performance or compliance, the level of income or spending involved, forthcoming developments and political and public interest.

This performance audit was carried out by Audit Chamber II – Investment for cohesion, growth and inclusion, headed by ECA Member Annemie Turtelboom. The audit was led by ECA Member Annemie Turtelboom, supported by Eric Braucourt, Head of Private Office and Guido Fara, Private Office Attaché; Gediminas Macys, Principal Manager; Rafal Gorajski, Head of Task; Manja Ernst, Deputy Head of Task; Aleksandra Klis-Lemieszonek, Nils Odins, Daniel Tibor, Federica Di Marcantonio and Panagiotis Pavlopoulos, Auditors; Austin Maloney, audit support; Maria Malvezzi, trainee. Alexandra Damir-Binzaru provided graphical support.

From left to right: Federica Di Marcantonio, Gediminas Macys, Panagiotis Pavlopoulos, Manja Ernst, Eric Braucourt, Rafal Gorajski, Guido Fara, Annemie Turtelboom, Austin Maloney, Aleksandra Klis-Lemieszonek.

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Microchips are crucial in modern society, from home electronics to defence, and their importance is only set to grow. This audit assesses how EU industrial policy supported the strengthening of the European microchip industry's strategic autonomy. We found that despite reasonable progress in implementation, the Chips Act is very unlikely to be enough to reach the very ambitious Digital Decade target of a 20 % share in the global market value chain by revenue. This target may have been overly ambitious, given the Commission's limited mandate and resources, reliance on member state's actions, private sector investments and other factors such as energy costs. We recommend that the Commission carries out an urgent reality check and swiftly begins preparing the next strategy.

ECA special report pursuant to Article 287(4), second subparagraph, TFEU.

EUROPEAN COURT OF AUDITORS

Publications Office of the European Union

EUROPEAN COURT OF AUDITORS
12, rue Alcide De Gasperi
1615 Luxembourg
LUXEMBOURG

Tel. +352 4398-1

Enquiries: eca.europa.eu/en/contact
Website: eca.europa.eu
Social media: @EUauditors