Opinion of the European Economic and Social Committee on 'Addressing structural shortages and strengthening strategic autonomy in the semiconductor ecosystem'

(own-initiative opinion)

(2023/C 140/02)

Rapporteur: **Anastasis YIAPANIS**

Co-rapporteur: **Guido NELISSEN**

Plenary Assembly decision	20.1.2022
Legal basis	Rule 52(2) of the Rules of Procedure
	Own-initiative opinion
Section responsible	Consultative Commission on Industrial Change (CCMI)
Adopted in section	9.12.2022
Adopted at plenary	24.1.2023
Plenary session No	575
Outcome of vote	
(for/against/abstentions)	179/0/4

1. **Conclusions and recommendations**

1.1. The EESC calls for increased transparency and more strategic monitoring and management across chip supply chains, better forecasting of chip availability, and closer partnerships, in coordination with public authorities at European level.

1.2. The Committee considers that the European semiconductor strategy should promote all stages of the semiconductor value chain, with a special focus on the design and manufacturing of chips and back-end production. The implementation of the Chips Act must be carefully assessed and monitored through clear indicators (KPIs) established together with industrial stakeholders and the European Semiconductor Board (ESB).

1.3. The EESC is particularly worried about the EU's current dependency on back-end manufacturing, especially where China is concerned. International cooperation between governments, semiconductor clusters and R & D institutions is vital to address the current shortages, ensure a level playing field and address the needs of society at large.

1.4. The Committee appreciates the EUR 43 billion announced in the EU Chips Act and the future creation of the Chips Fund, and demands that full use be made of the European Recovery and Resilience Plans.

1.5. However, the Committee notes that the European Commission has put too little emphasis on the importance of raw materials, the circularity of the production processes and the existing dependency on third countries, and calls for increased attention on guaranteeing access to the key raw materials used in the production of semiconductors.

1.6. The EESC calls for a careful review of the existing free trade agreements and international partnerships, with a clear view to achieving open strategic autonomy and increasing Europe's resilience.

1.7. Investment should be targeted in areas where European dependency on foreign technology providers is very high. Public support (while avoiding over-subsidisation) at EU and Member State level for investments in breakthrough technologies, virtual design platforms, state-of-the-art chip design capabilities and 'first-of-a-kind' facilities (with a focus on leading-edge chips) is needed to reduce risk and improve return-on-investment periods.

1.8. The Committee would like to see an economically efficient but balanced distribution of the EU funds between MS and regions, and also between large companies, start-ups and SMEs. The EESC also calls for a solid action plan for attracting foreign investment from leading international semiconductor companies.

1.9. The Committee considers that any skills policy should take into account the impact of accelerating innovation on the pace of job creation and job destruction, while involving the social partners from the semiconductor ecosystem, academia and the relevant research centres. Substantial efforts are required to up- and re-skill the workforce, and lifelong learning and VET programmes must help the EU labour market to acquire essential specific skills, especially for workers from the STEM area (science, technology, engineering, and mathematics).

1.10. The EESC highlights the fact that many of the innovations developed by the EU's research and technology organisations (RTOs) are taken up in other parts of the world, and considers that the end-user sectors must be brought closer to the European semiconductor research base.

1.11. The Committee calls for increased support for clusters in digital technologies and better exploitation of the innovation potential of hi-tech SMEs. Furthermore, the EESC calls for consistent legislation with regard to tax incentives that stimulate R & D investments, with a specific focus on R & D in chip design.

1.12. The Committee calls for further innovation and protection against cyber-attacks and better preparedness for further innovative cybersecurity threats.

2. **Challenges for the EU semiconductor strategy**

2.1. The digital revolution and the continuous quest for breakthrough technologies have generated a significant increase in the demand for semiconductors. The COVID-19 pandemic and the post-pandemic recovery period are characterised by widespread supply chain shortages which, together with increased energy prices and supply bottlenecks in crucial raw materials, are hampering economic recovery and dragging down industrial output in the EU.

2.2. The European micro-electronics industry (455 000 direct jobs) enjoys global leadership in dedicated processors for embedded systems, sensors, radio frequency chips, power electronics, silicon wafers, chemicals, and advanced chip-making equipment. The EU also has a strong research base due to its research centres and ambitious R & D initiatives.

2.3. The demand for semiconductors in the automotive industry is forecast to grow by 300 % by 2030, while the industrial electronic sector's needs for chips are expected to double by 2030, fuelled by some major trends such as the high-end production technologies of Industry 4.0. The communications sector represents 15 % of EU chip demand, with critical chip components for communication equipment for 5G mainly being designed and produced outside the EU. The healthcare, energy, aerospace, defence, and gaming industries, etc. are all evolving technologically and are experiencing increased demand for both mature and advanced chips for their production processes and products. Chips are also vital for the development of emerging industrial AI and IoT applications, a market that is growing by 50 % every year. Building a chips strategy on these existing and emerging strong end-markets will generate a virtuous circle: making key manufacturing industries in the EU more competitive, while reinforcing semiconductor capabilities within the Union.

2.4. On the other hand, the EU industry is less well represented in a number of important end-markets for semiconductors, such as cloud and data storage, personal computing, wireless communications (smartphones) and consumer devices (gaming). Furthermore, with only 50 semiconductor fabrication plants (fabs) on EU soil, the manufacturing base is rather low, and the EU cannot produce chips with feature sizes below 22nm and has a weak position in design and design automation tools. As a result, the EU had a trade deficit in semiconductors of EUR 19,5 billion in 2021 (EUR 51 billion of imports compared with EUR 31,5 billion of exports) ([1]).

([1]) European Commission SWD — A Chips Act for Europe.

2.5. As demand for and use of chips will only surge in future, the EESC calls for ambitious programmes to reduce the sector's greenhouse gas emissions throughout energy efficiency, renewable energy and breakthrough technologies.

3. **Competitiveness and strategic autonomy**

3.1. The many risks affecting the semiconductor sector (structural shortages, supply chain risks, monopolistic power in key parts of the value chain, geopolitical risks) and their impact on a wide range of industries have raised awareness about the need to strengthen Europe's technological sovereignty in this field.

3.2. Disruptions in the supply of semiconductors are having very negative effects on Europe's economy and society. The complexity of the semiconductor supply chain makes it difficult to identify and assess risks related to disruptions and to take the appropriate mitigating measures. The EESC is of the opinion that the chip value chain can be strengthened by increasing transparency and visibility, ensuring more strategic supply chain monitoring and management, better forecasting of chip availability, and forging closer partnerships across all levels of the supply chain, in coordination with public authorities at European level.

3.3. To address long-term supply concerns and to compete globally in designing and producing increasingly complex state-of-the-art semiconductor components, the EESC considers that the European semiconductor strategy should promote all stages of the semiconductor value chain, including semiconductor research, design, manufacturing of chips, assembly, testing and packaging.

3.4. The EESC considers in particular that the EU must invest in areas where European dependency on foreign technology providers is very high, such as design and electronic design automation, manufacturing capabilities and advanced packaging.

3.5. As semiconductors have clearly become a strategic technological area and the EU lacks manufacturing capabilities for both trailing edge and leading edge chips, the EU needs to support investments in chip production, as this is essential to strengthen manufacturing resilience in key sectors. Indeed, the already high demand for mature chips (12-40 nm technology) by Europe's industrial sectors is still increasing. At the same time, the demand for leading edge chips (below 10nm nodes) is forecast to grow much faster because of the shift towards edge and quantum computing, the IoT, automated driving and artificial intelligence. These technologies are driving radical change in many industrial sectors: engineering, automotive, electronic, health, defence and renewables. These industries certainly have the potential to create a European market to support the European production of leading-edge nodes in the longer term.

3.6. However, in order to prioritise investments, the Committee considers that, first of all, investments should be targeted towards state-of-the-art chip design capabilities, bearing in mind that Europe lacks chip design capabilities for advanced logic semiconductors.

3.7. Special attention must also be paid to back-end manufacturing (including assembly, testing and packaging), which is more labour-intensive, and which could be strategically concentrated in South-Eastern Europe, where labour costs are more competitive. The EESC is worried about the various risks that the EU is exposed to due to its current dependency on back-end manufacturing, especially where China is concerned.

3.8. Guaranteeing access to the key raw materials utilised in the production of semiconductors, such as high-purity chemicals (germanium, boron, indium), special gases (neon, helium, argon), substitutes for silicon (e.g. silicon carbide for better power management) is paramount. Demand for these materials will only grow as the demand for chips rises due to their increasing complexity.

3.9. The Committee notes that the European Commission has put too little emphasis on the importance of raw materials, the circularity of the production processes and the existing dependency on third countries. The EESC has stated that *'the Commission, Member States and industry should therefore jointly discuss how to diversify sources of supply and, in particular, how to improve the recycling of critical raw materials as part of an industrialised circular economy in microelectronics'* ([2]).

3.10. The Committee believes that the implementation of the Chips Act must be carefully assessed and monitored and calls for clear KPIs to assess the progress. The indicators must be established together with industrial stakeholders and the ESB.

4. **EU stakeholder involvement, international cooperation and strategic partnerships**

4.1. The Committee believes that the European Alliance on Processors and Semiconductor Technologies, launched by the Commission in July 2021, has a very important role to play in identifying the existing gaps in the production process and technological uptake in the EU. Strengthening the EU's resilience and ensuring the security of supply chains should be thoroughly discussed within the Alliance, involving the social partners from the semiconductor ecosystem, academia and the relevant research centres.

4.2. The EESC considers that international cooperation between governments, semiconductor clusters and R & D institutions is vital to address the current shortages and ensure mutual trust in order to achieve a level playing field. Furthermore, reinforcing Europe's semiconductor ecosystem will lead to mutual dependencies across the global value chains, which in turn will create leverage on international negotiations and enhance the general resilience of the entire sector. Nevertheless, the EESC has already expressed a clear position that *'a subsidy race must be avoided and funds have to be spent efficiently without creating overcapacities and market distortions'* ([3]).

4.3. The EESC calls for a careful review of the existing free trade agreements and international industrial partnerships, with a clear view to achieving open strategic autonomy and increasing Europe's resilience, in an ever more complicated geopolitical context. Discussions should be intensified within the ESB, which should increase membership by inviting industrial stakeholders and the EU representative social partners, as well as the most important research centres.

4.4. Debates in the European fora must also focus on implementing the proposed expediting of permit processes for new facilities, which could be a major incentive for the negotiation of substantial foreign investments ([4]), which would create immediate demand. More importantly, cutting the administrative burden and implementing regulatory facilities in all MS will reduce fragmentation and ensure predictability for future investments.

5. **Financing**

5.1. The EESC appreciates the EUR 43 billion announced in the EU Chips Act and the future creation of the Chips Fund, but calls for detailed clarification on how these public and private funds will be raised and allocated. Furthermore, the Committee highlights that full use should be made of the European Recovery and Resilience Plans, which aim to dedicate 20 % of their budget to the digital transformation of the MS.

5.2. The EESC considers that public support at EU and MS level for investments in breakthrough technologies, virtual design platforms and "first-of-a-kind" facilities (with a focus on leading-edge chips) is needed in order to reduce risks and improve returns on investment periods for the facilities that have to be built from scratch.

([2]) Opinion of the European Economic and Social Committee on 'Proposal for a Regulation of the European Parliament and of the Council establishing a framework of measures for strengthening Europe's semiconductor ecosystem (Chips Act)' (COM(2022) 46 final — 2022/0032 (COD)) (OJ C 365, 23.9.2022, p. 34).

([3]) Opinion of the European Economic and Social Committee on 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on "A Chips Act for Europe"' (COM(2022) 45 final) (OJ C 365, 23.9.2022, p. 23).

([4]) Such as the ongoing negotiations with Intel from USA, Samsung from South Korea and TSMC from Taiwan.

5.3. Since the proposed ESB will comprise representatives of the MS, the EESC is worried that it will be the Member States who will fight each other for a larger share of the funds. Therefore, the Committee would like to see an economically efficient but balanced distribution of the EU funds between MS and regions, and also between large companies, start-ups and SMEs, so that no one is left behind. Furthermore, regarding the Chips Joint Undertaking, the EESC has already stated that specific criteria should be designed and that "*social policy criteria, such as the attitude of the undertaking concerned to social dialogue and collective bargaining, and priority cooperation with suppliers established in the EU — but also the number of additional sustainable jobs created by the investment, as well as the quality of working conditions — should all play a role here*" ([5]).

5.4. The proposed Chips Fund will increase the availability of loans and venture capital financing and facilitate the further growth of small innovative semiconductor companies. However, a fully-fledged European venture capital market is needed to help these companies cross the "Valley of Death" that leads from demonstration to market introduction. The EESC calls for practical guidance, especially for start-ups and SMEs, on how these funds can be accessed.

5.5. Lastly, the Committee would like to see a solid action plan for also attracting foreign investment, especially from international semiconductor leading companies, in order to attract both capital and know-how to EU soil.

6. **Skills**

6.1. Digital skills have become a key intangible asset of the digital industrial revolution and the availability of a skilled workforce has become an important element for investment decisions, while the lack of skills is seriously slowing down the deployment of digital capabilities. Digital education and awareness-raising among society on the societal impact of digital applications (both benefits and risks related to concentration of power or respect for personal life) are crucial tools for consumers and civil society to contribute responsibly to future developments in the chip ecosystem and for attracting the younger generation. The EESC also calls for specific attention to be paid to the need to protect the health of workers in chip manufacturing who are exposed to hazardous substances.

6.2. Currently, the number of open positions for engineers, design specialists and technicians is growing at an alarming rate. The EESC welcomes the recently created Skills Partnership for the Digital Ecosystem. As part of the European Skills Agenda, it should help achieve the targets of the Digital Decade programme (equipping 80 % of people with basic digital skills, reducing gender imbalances and having 20 million ICT specialists by 2030), those of the EU Skills Agenda and those of the European Pillar of Social Rights (60 % of adults attending training courses).

6.3. Any skills policy should take into account the impact of accelerating innovation on the pace of job creation and job destruction, including the transformation of the labour market caused by technological developments in AI. Low- and medium-skilled jobs are at particular risk of disappearing (being replaced by digital tools and automation), while the demand for advanced digital skills will only grow. The EESC considers that tackling these challenges will require substantial efforts for up- and re-skilling of the workforce, especially for workers affected by technological skills obsolescence. Furthermore, lifelong learning and VET programmes must help the EU labour market to specialise by acquiring essential specific skills. Therefore, it will be of key importance to provide students with access to state-of-the-art design and manufacturing equipment and real-life training experience.

6.4. The Committee also considers that the EU needs a coherent legislative framework to attract a foreign labour force specialised in semiconductors. The EESC appreciates the Commission Communication on attracting skills and talent to the EU ([6]) and considers that this must be complemented by up- and re-skilling programmes, including for workers from the STEM area.

([5]) Opinion of the European Economic and Social Committee on "Proposal for a Regulation of the European Parliament and of the Council establishing a framework of measures for strengthening Europe's semiconductor ecosystem (Chips Act)" (COM(2022) 46 final — 2022/0032 (COD)) (OJ C 365, 23.9.2022, p. 34).

([6]) COM(2022) 657 final — Communication from the Commission on attracting skills and talent in the EU.

6.5. On the other hand, the EESC is worried that the lack of skills throughout the world will result in a war for talent, resulting in an internal (within the EU) or international brain drain. The EESC therefore looks forward to the upcoming Communication on "Brain drain — mitigating challenges associated with population decline".

7. **R & D&I**

7.1. The EESC highlights that, unfortunately, many of the innovations developed by the EU's RTOs are taken up in other parts of the world and have not led to a stronger EU manufacturing base. Therefore, the EESC considers that EU RTOs must draw together the entire industrial base and the existing semiconductor know-how, upgrade and build semiconductor pilot lines and explore and exploit opportunities for the future in key areas such as edge computing, artificial intelligence and cybersecurity. In this respect, bringing the end-user sectors much closer to the European research base will be key.

7.2. The Committee calls for long-term innovation roadmaps to support the digital transition, as they allow for a pro-active approach to driving R & D investments in longer-term strategic targets and to addressing the gaps in the semiconductor ecosystem. Furthermore, the Committee calls for the innovation potential of hi-tech SMEs to be better exploited; these companies are often highly specialised, agile and active in high-value niche markets.

7.3. The EESC points out that better protection for companies' valuable intellectual property integrated in chips has to be ensured and welcomes the clear rules announced in the Chips Act. The future activity of the ESB must include timely consultations with industry stakeholders on the effective protection of EU intellectual property rights.

7.4. The Committee believes that special investment should be directed towards R & D in chip design, as this provides the lion's share of value added and can also strengthen the business case for more advanced manufacturing capacity. In this context, the strongly developing bioeconomy, with vast future applications, should be also taken into account. The Commission should analyse the opportunities to adopt consistent legislation with regard to tax incentives that stimulate R & D investments, especially regarding future consortia that comprise large companies, SMEs, start-ups and spinoffs from research institutions.

7.5. Cybersecurity has become a major topic for many industrial sectors such as automotive, engineering, communications, healthcare, aerospace and defence. The EESC calls for further innovation and protection against cyber-attacks and the need to be prepared for further innovative cybersecurity threats. The Committee supports the proposal for a EU Cyber Resilience Act which will introduce new cybersecurity requirements and create a better understanding of cyber threats among producers and consumers. The EESC also calls for further reinforcement of the role of the European Union Agency for Cybersecurity.

Brussels, 24 January 2023.

The President
of the European Economic and Social Committee
Christa SCHWENG