What if the EU ran on microelectronics?

Although microelectronics have a significant role in modern life, their low visibility and complex value chain have contributed to concealing a decline in EU industry in the field. It is broadly assumed that microelectronics are designed in California and manufactured in Taiwan. What if the EU could take a particularly strategic position in this technology?

AdobeStock_199878899

When asked how many microcontrollers they have on their desk, most people would only consider the one in their laptop, whereas in fact, a laptop alone contains several. Besides the microprocessor hosting the Control Processing Unit (CPU), which is not a microcontroller properly speaking, microcontrollers govern laptop functions such as communications, drivers, the power supply, touchpad and screen. There may also be another microcontroller (or several) in their smartphone, plus those in their landline phone, watch, earphones, mouse, calendar, thermometer, printer, chargers, external screen – and even in the coffee machine and the desk lamp. Microelectronics technology is everywhere: it includes semiconductors and components, but is far broader than that. It ranges from the control units for cars, planes and drones to small appliances, medical equipment or mobile phones, reaching over US$600 billion in revenue, up by 19.7 % year-on-year, excluding software development for artificial intelligence (AI).

The microelectronics industry is a strategic asset for Europe, which the European Commission ranks as one of the most research and development (R&D) intensive sectors. The sector supports around 200 000 jobs directly and more than 1 000 000 indirect jobs in Europe. However, the EU share in global chip capacity has decreased from 13 % in 2010 to 7-8 % in 2025. This can be attributed to factors such as growing manufacturing costs – including energy – and low public investment in the required R&D to deploy the complex supply chain and to support initial investment in manufacturing equipment.

The major manufacturers of semiconductor chips are based in the USA (Intel, Micron), Taiwan (TSMC) and South Korea (Samsung, SK Hynix), and most designers (or Fabless semiconductor companies) are also based in the USA (NVIDIA, AMD). Nevertheless, the EU has traditionally been at the forefront of the global semiconductor value chain, holding specific know-how, such as in the production of equipment for manufacturing semiconductors (e.g. ASML in the Netherlands). Furthermore, and although they are decreasing and insufficiently widespread, Europe retains the basic skills for non-advanced everyday (but highly strategic) versions of microelectronics technology.

Potential impacts and developments

Microelectronic components are complete miniaturised circuits composed of standard electronic parts, such as transistors, capacitors, diodes, and resistors, which operate at microscopic scale. These circuits are designed to perform specific functions and, therefore, are closely linked to optimisation in the assembly of

Author: Andrés García Higuera, Scientific Foresight Unit (STOA)

PE 774.687 – October 2025

new products and devices. Modern versions of technological products rely on microelectronics technology to the extent that no product can compete in the market today without it, which risks excluding the small and medium-sized enterprises that are – and will remain – vital to the EU and usually lack the required skills and resources. This is not always about the newest technologies and the highest levels of integration for big production series, it is also about everyday components in a broad variety of industrial sectors. The competitive advantage of already strong microelectronic players has become overwhelming.

According to the European Semiconductor Industry Association (ESIA), in the EU this sector has a multiplier effect of around 2.5 (meaning that every euro invested in the industry generates an additional €2.5 in economic activity), whereas this same factor is 4.3 in the USA and 3.5 in China. Microelectronics accounts for around 1.4 % to 1.6 % of the EU's GDP (€230 billion to €250 billion), 2.2 % to 2.5 % of the USA's GDP (€380 billion to €440 billion) and 2.5 % to 3.0 % of China's GDP (€390 billion to €480 billion).

Strategic sectors such as the automotive industry, AI, telecommunications and defence are fast evolving to models that are ever more dependent on microelectronics to provide new functionalities, which are becoming key market assets. The European Chips Act entered into force on 21 September 2023, together with the Critical Raw Materials Act; they have become key pillars for EU open strategic autonomy, setting a reliable foundation for a competitive EU.

Anticipatory policymaking

While addressing competitiveness in her 2025 State of the Union speech, European Commission President Ursula von der Leyen stressed the need to 'keep up the speed'. The Commission will therefore 'propose an industrial accelerator act for key strategic sectors and technologies'. Von der Leyen concluded that, 'when it comes to digital and clean tech', the EU aims to be 'faster, smarter and more European'. However, and although she particularly referred to critical raw materials and this was implicit in her speech, she did not specifically mention microelectronics or semiconductors. However, they are fundamental to achieving the proposed goals of a competitive knowledge economy and enhanced defence capacity.

Pillar I of the European Chips Act establishes the chips for Europe initiative, which will support technological capacity building and innovation in the Union by bridging the gap between the Union's advanced research and innovation capabilities and their industrial (and dual-use) exploitation. Horizon Europe allocates significant funding for R&D in the microelectronics sector, while the Chips Joint Undertaking (Chips JU) aims to support its development. Related technologies such as the internet of things, edge computing and AI benefit from complementary initiatives such as smart anything everywhere (SAE) and the European processor initiative (EPI). The EU is addressing the skills shortage through programmes such as the digital education action plan and the more specific large-scale partnership (LSP) in microelectronics, which promotes specialised training. Additionally, the Important Project of Common European Interest (IPCEI) in microelectronics allows EU Member States to support related projects with State aid, and initiatives such as Eurostack aim to improve the EU's strategic autonomy.

While the Chips Act is a definite step forward, the strong strategic aspect of this sector requires continued monitoring and sustained action. Policymakers and industry leaders can work together to promote public and private investment and the development of a sustainable business environment suitable for the microelectronics industry, including to support the development of skills, talent, innovation and risk-taking that will bolster European prosperity and security.